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Vice Chancellor—Student Affairs, 541 Mrak Hall, 752-2417; or
Director, Office of Civil Rights, Department of Health,
Education and Welfare.**

It is the responsibility of the individual student to become familiar 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

1975-76

Davis Campus	Fall 1975	Winter 1976	Spring 1976 (Fall 1976)
Pick up registration and course enrollment materials from Registrar's Office (all continuing students).	June 2- Aug. 29, Monday- Friday	Nov. 19-21, Wednesday- Friday† (1975)	Feb. 23-25, Monday- Wednesday†
Advisers available to all continuing students.	June 5-6, Thursday- Friday	Nov. 20-21, Thursday- Friday† (1975)	Feb. 24-25, Tuesday- Wednesday†
Turn in course enrollment materials (all continuing students).	Aug. 1-29, Friday- Friday	Nov. 24-25, Monday- Tuesday† (1975)	Feb. 26-27, Thursday- Friday†
Turn in Registration Packets and Fee Payments (all continuing students).	Aug. 1- Sept. 5, Friday- Friday	Nov. 24- Dec. 9, Monday- Tuesday (1975)	Feb. 26- Mar. 8, Thursday- Monday
Late Registration for continuing students.	Sept. 13- Oct. 15, Saturday- Wednesday	Dec. 10- Jan. 20, Wednesday- Tuesday	Mar. 9- Apr. 4, Tuesday- Sunday
Quarter begins.	Sept. 29, Monday	Jan. 5, Monday	Apr. 1, Thursday
Orientation and testing.	Sept. 29- Oct. 1, Monday- Wednesday	Jan. 5-6, Monday- Tuesday	Apr. 1-2, Thursday- Friday
Registration and payment of fees, in person.	Sept. 30, Tuesday	Jan. 5, Monday	Apr. 1, Thursday
Instruction begins.	Oct. 2, Thursday	Jan. 7, Wednesday	Apr. 5, Monday
Last day of late registration.	Oct. 15, Wednesday	Jan. 20, Tuesday	Apr. 16, Friday
Final date to file petition to change status from part-time to full-time (or vice versa) student.	Oct. 15, Wednesday	Jan. 20, Tuesday	Apr. 16, Friday
Final date to file petitions with appropriate departments to add courses to study list.	Oct. 15, Wednesday	Jan. 20, Tuesday	Apr. 16, Friday
Final date to file petitions with appropriate departments to drop courses. Thereafter permission may be granted by the dean of school or college only under exceptional circumstances.	Nov. 5, Wednesday	Feb. 10, Tuesday	May 7, Friday
Final date for undergraduates to file petitions to take courses on a Passed/Not Passed basis with student's school or college. Exceptions rarely approved.	Nov. 5, Wednesday	Feb. 10, Tuesday	May 7, Friday
Final date for graduate students to file petitions with the Dean of the Graduate Division to take courses on a Satisfactory/Unsatisfactory basis.	Nov. 5, Wednesday	Feb. 10, Tuesday	May 7, Friday
Verification of Study List Form available on or about this date.	Nov. 17, Monday	Feb. 23, Monday	May 21, Friday

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

Davis Campus	Fall 1975	Winter 1976	Spring 1976	(Fall 1976)
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 2, Monday	Nov. 5, Wednesday (1975)	Feb. 4, Wednesday	
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, Saturday (1974)	July 31, Thursday (1975)	Oct. 31, Friday (1975)	Nov. 30, Sunday (1975)
Credentials and applications for admission to graduate standing must be filed with the Dean of the Graduate Division on or before this date.	June 1, Sunday	Oct. 1, Wednesday (1975)	Jan. 1, Thursday	June 1, Tuesday
Applications for admission to the School of Medicine for 1976-77 must be filed with the School before this date.				Dec. 1, Monday (1975)
Applications for admission to the School of Veterinary Medicine for 1976-77 must be filed with the Office of Admissions on or before this date.				Nov. 1, Saturday (1975)
Applications for admission to the School of Law for 1976-77 must be filed with the School on or before this date.				Mar. 1, Monday (1976)
Application for readmission to undergraduate status must be filed with the Registrar on or before this date.	Aug. 19, Tuesday	Nov. 21, Friday (1975)	Feb. 13, Friday	Aug. 18, Wednesday‡
Applications for readmission to graduate status must be filed with the Registrar on or before this date.	Aug. 15, Friday	Nov. 21, Friday (1975)	Feb. 20, Friday	Aug. 13, 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. 15, Wednesday	Jan. 20, Tuesday	Apr. 16, Friday	July 2, Friday (for Sept. 1976)
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.	Oct. 10, Friday	Jan. 12, Monday	Apr. 9, Friday	July 2, Friday (for Sept. 1976)
Theses for masters' degrees must be filed with the committees in charge on or before this date.	Nov. 14, Friday	Feb. 20, Friday	May 14, Friday	Aug. 6, Friday (for Sept. 1976)
Theses for masters' degrees must be filed with the Dean of the Graduate Division on or before this date.	Dec. 19, Friday	Mar. 24, Wednesday	June 18, Friday	Sept. 10, Friday (for Sept. 1976)
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. 29, Friday	Nov. 24, Monday (1975)	Mar. 1, Monday	May 31, Monday (for Sept. 1976)
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. 1, Wednesday	Jan. 5, Monday	Apr. 2, Friday	July 1, Thursday (for Sept. 1976)

‡Dates are subject to change and should be checked with appropriate *Class Schedule and Room Directory*.

Davis Campus

	Fall 1975	Winter 1976	Spring 1976	(Fall 1976)
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.	Dec. 1, Monday	Mar. 1, Monday	June 4, Friday	Aug. 31, Tuesday (for Sept. 1976)
Applications for fellowships and graduate scholarships for 1976-77 must be filed on or before this date.				Jan. 15, Thursday
Applications for 1976-77 undergraduate scholarships must be filed on or before this date.				Dec. 15, Monday (1975)
Instruction ends.	Dec. 13, Saturday	Mar. 16, Tuesday	June 10, Thursday	
Final examinations.	Dec. 15-20, Monday-Saturday	Mar. 18-24, Thursday-Wednesday	June 12-18, Saturday-Friday	
Quarter ends.	Dec. 20, Saturday	Mar. 24, Wednesday	June 18, Friday	
Academic and administrative holidays.	Nov. 27-28, Thursday-Friday	Feb. 16, Monday	May 31, Monday	July 5, Monday (Summer)
	Dec. 25-26, Thursday-Friday	Mar. 29, Monday	————	Sept. 6, Monday
	Jan. 1-2, Thursday-Friday (1976)	————	————	
Commencement Week	————	————	Mid-June	



THE UNIVERSITY OF CALIFORNIA

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; seven, including the President of the University, serve *ex officio*; and, in an experimental program begun in 1975, a Student Regent will be selected each year from a list of names submitted to the Board by the Student Body Presidents' Council. 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 DAVIS CAMPUS

Originally known as the University Farm, the Davis campus was acquired to serve the rural population of California, offering three years of instruction in the principles and practices 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 DAVIS CAMPUS TODAY

The University of California, Davis, has been a general campus for more than 20 years. With an enrollment of over 16,200 students, more than 4,000 of whom are graduate students; a faculty of some 1,050; 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 addressing ourselves to these new and different challenges facing 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. We have been re-examining our goals and formulating a new academic plan to anticipate the problems of steady-state enrollment and to adjust to a period of slower growth.

Looking ahead into an era of development in an uncertain environment, the Davis campus retains its fundamental assumption that academic programs at all levels of the University—graduate, undergraduate, and professional—reinforce and strengthen each other. We remain committed to the encouragement of learning, to the development of the capacity for independent study, and to the creation of an environment that will enhance the intellectual and personal development of its students.

STUDENT-FACULTY-STAFF COOPERATION

Communication

The spirit of friendliness and openness at Davis 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. Over the last several years the campus administration has been moving toward decentralization of decision making and involvement in the decision-making process of individuals affected by the decisions. Working through constituent groups on campus — the Academic Senate, Associated Students, Graduate Student Assembly, Academic Staff Organization, and University Staff Assembly — all members of the campus community can have a voice in the direction of University affairs.

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 a 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 or she 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 32,500. Its population 20 years ago was 3,500 and the projection for 20 years from now in the Davis urban area is 50,000. 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 range, with excellent ski areas such as Squaw Valley, lie two hours to the east.

The community offers many facilities. More than twenty 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.

The City of Davis recreation programs offer a wide variety of planned programs 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. The new Davis Veterans Memorial Center has facilities for concerts and theatre performances, exhibits, meetings, and special events. There are two movie houses in town and a branch of the Yolo County Free Library housing 45,000 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 four 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 1975-76 range from \$12 for motorcycles through \$24 for Residence Hall lots and \$36 for perimeter lots open to students, to \$48 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.

The Associated Students (ASUCD) operate Unitrans, a service of five bus-lines 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. A regional transit bus system links Davis and Sacramento.

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 on 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 Art Conservation Laboratory, 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 1,240,000 volumes and annually receives 30,500 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; 1,100,000 items on various forms of microcopy; some 45,000 maps; more than 430,000 pamphlets; a number of speech and music phonorecords; about 310,000 items in the F. Hal Higgins Library of Agricultural Technology; and a rare book collection of 16,000 volumes. In addition to the main collection in the Peter J. Shields 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 Shields Library provides orientation and assistance in using the library 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 Shields 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 5,300 currently received, unbound titles of periodicals in a closed stack area. They are available for use only in the Shields 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. Information concerning the Program for Part-Time Degree Students may be obtained in Room 376, Mrak Hall, or by telephoning (916) 752-2820.

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 are available to part-time students after enrollment.

Students may transfer from full- to part-time and back to full-time as their circumstances change. The Petition to Change Status may be obtained from the Division of Extended Learning.

Some financial aid is available to part-time students. Aid is awarded on the basis of need.

Student Health Center. Fees paid by part-time degree students do not include student health services. If an emergency arises, a student may receive care at the Student Health Center and will be charged appropriate fees for services. Students may elect to purchase a Health Care Card from the Student Health Center for a quarterly rate of \$40. The Health Care Card may be purchased from the Insurance Office at the Student Health Center.

Bachelor's Degrees

1) *Davis*. Part-time students who are able to arrange their schedules in order to attend classes on the Davis campus may enroll in any bachelor's degree program currently offered. It is possible for a student to earn some of the credit for the degree by taking course work during the late afternoon and evening hours. A list of the afternoon and evening courses for each quarter is available in the *Class Schedule*.

2) *Stockton*. The University offers regular upper division courses in San Joaquin County. Courses in several academic fields in the social sciences are offered in order to serve a variety of people with diverse interests. Most of these courses are held in the evenings, and they can be used for credit toward bachelor's degrees by registered students. About half of the upper division work needed for a degree can be completed in the Stockton area, and it will be necessary to come to Davis to complete the remaining requirements. Some of the courses in Stockton are given with the assistance of a special closed-circuit television system which permits instructors teaching in Davis to be seen and heard in Stockton. Two-way telephone communication between the students in Stockton and the instructor in the Davis classroom allows Stockton students to participate in the class sessions.

3) *Solano and Northern Contra Costa Counties*. The University offers regular upper division courses in Solano County at Solano Community College, and in Northern Contra Costa County at Diablo Valley College.

These courses can be used for credit towards a bachelor's degree by registered students. Most of these courses will be held in the evenings. Students will be able to complete a portion of the upper division work needed for a degree off campus and it may be necessary to come to Davis to complete the remaining requirements. Courses in several academic fields will be offered in order to serve a variety of people of diverse interests. In addition, the area will be served by TV classes during the day and in the evening. The TV receiving sites include Solano Community College, Fairfield; Diablo Valley College, Pleasant Hill; Los Medanos College, Pittsburg; and other selected sites.

4) *Yuba, Sutter, Butte, and Colusa Counties*. The University, through an instructional closed-circuit television system, offers regular upper division courses which can be used by registered students for credit towards a bachelor's degree. Students participate in live classes from Davis through a closed-circuit television system. Two-way telephone connection allows students to participate in the class sessions. Some classes with Davis faculty are taught at Yuba College in Marysville.

Admission to Undergraduate Status. Applicants must be qualified to matriculate as upper-division students and should have completed 84 quarter units (56 semester units) which are transferable to the University of California. Transfer credit will be granted for courses consistent with the University curriculum which have been completed in accredited colleges and universities. The University accepts 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 admis-

sible but able to demonstrate capacity for University work) may also be enrolled.

Unit Limitations. Undergraduate part-time students are limited to a maximum of 9 units and a minimum of 3 units per quarter.

Fees. Undergraduate fees are \$103.50 per quarter. Nonresident students (those not able to establish California residency) must pay an additional \$42 per unit. The \$9 ASUCD fee is optional.

Master's Degrees

1) *Davis.* The majority of the master's degree programs on the Davis campus are available for part-time study. Graduate courses are generally scheduled during regular daytime hours although the following programs may be completed by taking courses almost entirely in the late afternoons or evenings: education, geology, mathematics (emphasis on teaching), and physical education. Several other departments offer evening courses, which may be counted toward the appropriate degrees. In addition, the Master of Administration, a joint program of the Davis and Riverside campuses, offers specialties in business, public, and environmental administration. Classes are held on campus and may be in intensive weekend format. The program is designed for those working full time.

2) *Sacramento.* The Department of Civil Engineering offers master's degree programs with emphases in transportation planning, environmental engineering, structural engineering, and soil mechanics. The courses for these programs are given at the Department of Public Works and the Aerojet Corporation with the assistance of a closed-circuit television system which connects students in Sacramento with Davis classes. Also, the Department of Mechanical Engineering offers courses leading to a master's degree using the same television system. Students in Sacramento communicate with the instructors in Davis during the class sessions via a two-way telephone system. Special arrangements are made to assure that the students in Sacramento receive adequate individual attention from faculty members. In addition, courses in other fields will be available on television. The Master of Administration degree program with emphasis on business, public, and environmental administration, is available through a combination of courses on closed-circuit television, some intensive weekend courses and other regularly scheduled courses in Davis.

3) *Livermore.* The departments of Applied Science, Civil Engineering, Electrical Engineering, and Mechanical Engineering are currently offering master's degree programs to part-time students at the Lawrence Livermore Laboratory. The courses offered are taught in Davis and received in Livermore via a closed-circuit television system similar to the one now in operation in Sacramento. The Master of Administration degree program with emphasis on business, public, and environmental administration, is available through a combination of courses on closed-circuit television, some intensive weekend courses and other regularly scheduled courses at Davis.

4) *Solano and Northern Contra Costa Counties.* The Master of Administration degree program with emphasis on business, public, and environmental ad-

ministration, is available through a combination of courses on closed-circuit television with telephone to the campus classroom, some intensive weekend courses, and other regularly scheduled courses at Davis. Master's programs in Engineering (Civil, Electrical, Chemical) are available via television at Diablo Valley College, Pleasant Hill; Solano Community College, Fairfield; Los Medanos College, Pittsburg; and other selected sites.

5) *Yuba, Sutter, Butte, and Colusa Counties*. The Master of Administration degree program with emphasis on business, public, and environmental administration is available through a combination of courses on closed-circuit television with telephone to the campus classroom, some intensive weekend courses, and other regularly scheduled courses at Davis. Master's programs in Engineering (Civil, Electrical) are available via television at Yuba College and Beale Air Force Base, Marysville; Butte County Center, Oroville; and Eskaton Hospital, Colusa.

Admission to Graduate Status. In general, applicants 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 experience may also be considered. Particular departments may have additional admission requirements.

For the Master of Administration degree program, grades received in the student's final two years of undergraduate work should average at least 3.2 on a 4.0 scale. Letters of recommendation and work experience will be considered. Applicants must also submit scores from the Admission Test for Graduate Study in Business or the Graduate Record Examination (verbal and quantitative test sections).

Unit Limitations. Graduate students may take a maximum of 6 units per quarter.

Fees. The fee for graduate students is \$113.50 per quarter (\$115 for students in the Master of Administration degree program). Nonresidents (those not able to establish California residency) must pay an additional \$42 per unit. The \$9 ASUCD fee is optional.

University Employees

Full-time University employees who are eligible to enter the University as upper-division students working towards bachelor's degrees or as graduate students working towards most master's degrees should apply for admission through the Program for Part-Time Degree Students. They may take advantage of the special admission deadlines established for this program, and they may elect to follow either a 1/2- or a 1/3-fee plan depending upon the number of units they are taking a quarter. University employees who wish to enter the University in lower-division status for work toward a bachelor's degree or in graduate status for work toward a doctorate and those persons who are employed less than full-time should consult the Division of Extended Learning for application procedures.

Summer Sessions

In 1976 there will be two regular six-week Summer Sessions running from June 21 through July 30 and August 2 through September 10. 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 43). 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. A number of special intensive short-term courses for teachers may be offered. Information concerning the Davis Summer Sessions may be obtained in Room 376, Mrak Hall, or by telephoning (916) 752-1647.

Summer Sessions will also be conducted on the Berkeley, Irvine, Los Angeles, Riverside, Santa Barbara, Santa Cruz, and San Diego campuses.

Announcements concerning Summer Sessions in 1976 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 classes 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 may 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. The 1975-76 program includes chamber music and dance concerts, drama and mime, solo recitals, orchestral performances, films, lectures, poetry readings, and free noon entertainments on the Quad. Student tickets are available at reduced prices to events for which there is a charge.

The Conference Program

The Conferences and Campus Services 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 Conferences and Campus Services 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 4475 Chemistry Annex and those interested in using conference facilities should telephone (916) 752-2813.

CAMPUS TOURS

Tours of the Davis campus are available throughout the year. For further information contact the Visitor Services and Ceremonies Office, Room 129, Mrak Hall, or telephone (916) 752-0539.

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.

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 23.

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 a second 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) to (f) pattern above. 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 College Entrance Examination Board (CEEB) scores from the following examinations.

1. The Scholastic Aptitude Test.
2. Three 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 examinations. 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.

Written inquiries and arrangements to take the tests should be made with the Educational Testing Service, P.O. Box 592, Princeton, New Jersey 08540. Telephone inquiries may be directed to either Berkeley (415) 849-0950 or Princeton (609) 921-9000. 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. Complete processing of the admissions application cannot be accomplished until all 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 or her 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 the student 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 FRESHMAN 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 21).

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 22). 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. 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 1730, and the score on any one Achievement Test must not be less than 500.

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 or her 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*, a University of California publication sent to high school and community college counselors.

A student needing additional preparation is advised to attend one of the many excellent California community colleges. There a student can take courses applicable toward the requirements of the college or school of the University in which he or she 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 a 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 22. If the applicant has earned 12 units or more of college credit subsequent to high school graduation, the examination requirement may be disregarded.

Requirements for 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. 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.* Upon completion of at least 84 transferable quarter units (56 semester units), the required high school subjects may be waived.

3. 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.**

Nonresident applicants are to follow the requirements below in applying for admission to advanced standing:

1. Those *eligible* for admission from high school (3.4 grade-point average), who have attended another collegiate institution, must present from that institution a statement of good standing and a grade-point average of 2.8.*

2. Those *ineligible* for admission from high school because of subject omissions only must complete transferable college-level courses in the required subjects with at least C grades and maintain an overall average of 2.8.*

3. Those *ineligible* for admission because of graduating from high school with less than a 3.4 grade-point average in required subjects must complete at least 84 quarter units (56 semester units) of transferable work with a grade-point average of 2.8 or higher. Upon successful completion of that work, two units of required high school subjects may be waived.

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

*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.

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 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 the scope of the material covered. Examination arrangements are made through the College Entrance Examination Board, 800 Welch Road, Palo Alto 94304.

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 29). Early filing will allow time for exchange of necessary correspondence and will help the applicant, if admitted.

An applicant from another country whose native language is not English may be admitted only after demonstrating that his or her command of English will permit the applicant 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 or she has acquired the necessary proficiency in the use of English.

Foreign students whose schooling has not been in English are required to take the Test of English as a Foreign Language (TOEFL). Arrangements to take the test may be made by 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 for (1) courses in the student's own language and literature completed in his or her country at institutions of college level, (2) upper division or graduate courses taken in the University of California, or (3) upper division or graduate courses taken 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, the student 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. Admission to the College of Agricultural and Environmental Sciences is extremely limited and applications will not be accepted without prior permission from the Dean of the College; interested applicants should write to the Dean before submitting a formal application. Under extraordinary circumstances and by the permission

of the Dean, students may be admitted in limited status to the College of Engineering.)

Applicants for Second Bachelor's Degree

The second bachelor's degree is granted only to students who have completely changed their objectives. 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. Admission to the College of Agricultural and Environmental Sciences is extremely limited and applications will not be accepted without prior permission from the Dean of that College; interested applicants should write to the Dean before submitting a formal application.)

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. EOP considers all complete applications from the following categories: those eligible for admission as freshmen, those eligible for advanced standing admission, transfers, and students with academic potential who are normally ineligible for admission.

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

REQUIREMENTS FOR ADMISSION TO GRADUATE STANDING

See page 212 or the *Announcement of the Graduate Division*.

APPLICATION PROCEDURES

Applicants are expected to study the admission requirements (starting on page 21) to determine as closely as possible their eligibility before following the steps outlined below. Undergraduate applications 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 or her 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 freshmen and new advanced standing students that may be admitted. Once these quotas have been filled, additional applications cannot be accepted and will be referred 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 1976	January 5	July 1-31 (1975)
Spring 1976	April 1	October 1-31 (1975)
Fall 1976	September 27*	November 1-30 (1975)

2. Application Fee

The completed application form, accompanied by a \$20 nonrefundable application fee, should be submitted to the Office of Admissions. (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 or her 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 95616.

Students still in high school should request their school to send directly to

*Date subject to change.

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 Admission

There are three stages of notification in the admissions cycle. After the initial processing of an application, a card will be sent to the applicant acknowledging receipt of the application. This card should arrive a few weeks after filing for admission. A second card will be sent to advise the applicant of the campus where he or she will be admitted if the applicant is eligible. In most cases this card will be sent within three or four 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 advance deposit. This deposit will be credited to the University registration fee if the student registers for the quarter

in which he or she is accepted. (The advance deposit is not required of inter-campus transfer or readmitted students.)

8. Change of Campus

If, after an applicant has filed for admission to the Davis campus, his or her plans change and the applicant prefers to be considered for admission to another campus, he or she must write to the Director of Admissions, University Hall, University of California, Berkeley, California 94720, indicating the reasons for the change. Such requests must be received before the end of the filing period, and the records will be transferred to the campus where the applicant wishes to be considered.

9. Reapplication

An applicant who does not meet the admission requirements, or one who was admitted but did not register in the quarter for which he or she was accepted and who later desires to attend the University, must submit a new application for admission with the \$20 fee during the appropriate filing period. The new application will be acted upon in light of the current availability of facilities and current admission status.

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 or she 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 190. 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 197. 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 198. 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 42).

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 45).

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

a) submitting a Statement of Residence (see page 35);

b) returning the completed medical history forms and the results of a tuberculin skin test to the Student Health Center (see page 54).

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*).

\$50 REDUCED FEE PROGRAM

Undergraduate students are authorized to petition for a \$50 reduction in the Education Fee when enrolling for less than 9 units (including non-credit courses, e.g., Subject A) in any quarter. Petitions are available at the Part-Time Degree Program Office and must be filed with the Registrar's Office no later than the tenth day of instruction.

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 the student's college (when required), and, in the case of a graduate student, his or her 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 or she temporarily ceases formal studies at Davis while pursuing other activities that may assist in clarifying his or her educational goals, provide job opportunities and practical experience away from the campus, allow time for the solution of personal problems, and enhance the prospect of successful completion of the student's academic program. The intent of the program is to make it possible for a student to suspend

his or her academic work, leave the campus, and later resume 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 Planned Educational Leave Program is required to file an application form, including a brief explanation of the reasons for leaving the Davis campus, and must state in writing when he or she intends to resume 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 or her 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 the Planned Educational Leave, a student is guaranteed readmission if he or she resumes regular academic work at the agreed upon date. Students 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 the student's 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 or she returns. (The readmission fee is collected in advance.) A student is not eligible to receive normal University services during the period of the planned leave. Certain limited services, however, such as placement services, counseling services, faculty advising, and Selective Service counseling are available. Students on Planned Educational Leave may purchase a health care card from the Student Health Service and may retain library privileges by purchasing a library card. Male students are urged to consult the Office of 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 aid upon the student's return.

For applications and specific information about the Planned Educational Leave Program, students should consult the Counseling Center, located in North Hall. 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

nontransferable, 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 8.

RULES GOVERNING RESIDENCE

Nonresident Tuition Fee. Students who have not been residents of California for more than one year immediately prior to the residence determination date for each term in which they propose to attend the University are charged, along with other fees, a nonresident tuition fee of \$500 for the quarter (or \$750 for the semester). The residence determination date is the day instruction begins at the last of the University of California campuses to open for the quarter (and for schools on the semester system, the day instruction begins for the semester).

General. California residence is established by an adult who has relinquished his or her prior residence and is physically present within the state with the intent to make California the permanent home. California residence must be established more than one year prior to the term for which residence classification is requested. Indicia of California residence include, but are not limited to: registering and voting in California elections; designating California as the permanent address on all school and employment records, including military records if one is in the military service; obtaining a California I.D. card or driver's license; obtaining California vehicle registration; paying California income taxes as a resident; establishing an abode where one's permanent belongings are kept; licensing for professional practice in California, etc. Conduct inconsistent with the claim of California residence includes, but is not necessarily limited to: maintaining voter registration and voting in person or by absentee ballot in another state; obtaining a divorce in another state; attending an out-of-state institution as a resident; obtaining a loan requiring residence in another state; maintaining an out-of-state driver's license and vehicle registration, etc.

A student who is within California for educational purposes only does not gain the status of resident regardless of the length of his or her stay in California.

The residence of the parent with whom an unmarried minor (under age 18) child maintains his or her place of abode is the residence of the unmarried minor child. When the minor lives with neither parent, his or her residence is that of the parent with whom he or she maintained his or her last place of abode. The minor may establish his or her residence when both parents are deceased and a legal guardian has not been appointed. The residence of an unmarried minor who has a parent living cannot be changed by his or her own act, by the appointment of a legal guardian, or by relinquishment of a parent's right of control.

A man or woman establishes his or her residence. A woman's residence shall not be derived from that of her husband, or vice versa.

Following is a list of exceptions to the California residence requirements:

1. A student who remains in this state after his or her parent, who was theretofore domiciled in California for at least one year prior to leaving

- and has, during the student's minority and within one year immediately prior to the residence determination date, established residence elsewhere, shall be entitled to resident classification until the student has attained the age of majority and has resided in the state the minimum time necessary to become a resident so long as, once enrolled, he or she maintains continuous attendance at an institution.
2. 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 within California for the entire year immediately prior to the residence determination date and have evidenced the intent to make California their permanent home may be eligible for resident status.
 3. A student shall be entitled to resident classification if immediately prior to the residence determination date he or she has lived with and been under the continuous direct care and control of any adult or adults other than a parent for not less than two years, provided that the adult or adults having such control have been California residents during the year immediately prior to the residence determination date. This exception continues until the student has attained the age of majority and has resided in the state the minimum time necessary to become a resident student, so long as continuous attendance is maintained at an institution.
 4. 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 United States military stationed in California on active duty. Such resident classification may be maintained until the student has resided in California the minimum time necessary to become a resident. If a student is enrolled in an institution and the member of the military is transferred on military orders to a place outside the United States immediately after having been on active duty in California, the student is entitled to retain resident classification under conditions set forth above.
 5. A student who is a member of the United States military stationed in California on active duty, except a member of the military assigned for educational purposes to a state-supported institution of higher education, shall be entitled to resident classification until he or she has resided in the state the minimum time necessary to become a resident.
 6. A student who is an adult alien is entitled to resident 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 and has thereafter established and maintained residence in California for more than one year immediately prior to the residence determination date.
 7. A student who is a minor alien shall be entitled to resident classification if the student and the parent from whom residence is derived have been lawfully admitted to the United States for permanent residence, provided that the parent has had residence in California for more than one year after acquiring a permanent resident visa prior to the residence determination date for the term.
 8. 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 resident status.

New and returning students are required to complete a Statement of Legal Residence. The student's 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 is not a complete explanation of the law regarding residence. The student should also note that changes may have been made in the rate of nonresident tuition and the residence requirements between the time this Catalog statement is published and the relevant residence determination date. Regulations have been adopted by The Regents, a copy of which is available for inspection in the Registrar's Office of the campus.

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 fees he or she 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 Residence Deputy, may make written appeal to the Attorney in Residence Matters at the above address within 120 days after notification of the final decision by the Residence Deputy.



Scholastic Requirements

EVALUATIONS

Every instructor is required to assign a letter grade for each student registered in his or her 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 Not Passed (NP) grading option. Subject to regulation by the faculties of the various colleges and schools, an undergraduate student in good standing is authorized to petition to undertake specific courses on a Passed/Not Passed basis up to a maximum of one-third of the units taken in residence at the Davis campus, and including courses which instructors specify Passed/Not Passed grading only. Units thus earned can be counted in satisfaction of degree requirements, but such courses will be disregarded in determining the student's grade-point average. 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. (See page 218 for Special Study Courses.)

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. (See page 218 for Special Study Courses.)

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.

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

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

All grades except I are final when filed by an instructor in the 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 the student satisfactorily completes the course work in a way specified by the instructor. An I grade must be replaced before the end of the third succeeding term of the student's academic residence. 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 disqualification. While I grades do not count in the grade-point average for or against the student's record during his or her enrollment, they could weigh negatively at the time of 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 or she has received a grade of D, F, or NP (Not Passed). In computing the grade-point average of an undergraduate who repeats courses in the University in which he or she 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 or she takes the class. However, when a course is repeated the units completed will be credited towards a degree only once. Repetition of a course more than once requires approval by the appropriate dean in all instances.

The QUANTITY of work attempted by the student is measured in quarter units (see page 217) 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 multiply 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 or she falls below a C average, the student will be scholastically deficient.

CLASS LEVEL

A student may determine his or her 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 68.

SCHOLASTIC DEFICIENCIES

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

Students shall be placed on probation for failure to meet qualitative and/or quantitative standards of scholarship. The qualitative standards of scholarship require that students maintain a C average (2.0) or better for all work under-

taken in the University and for the work undertaken in any one term. The quantitative standards, referred to as minimal progress requirements, define satisfactory scholarship in terms of numbers of units that must be completed. Minimal progress requirements do not apply to students enrolled in the Division of Extended Learning's Part-Time Degree Program or to students who have their academic dean's approval to carry less than a minimum program because of medical disability or employment.

The following courses do not count toward unit minimums: (a) courses graded F, NP, or I, (b) courses repeated to improve D grades, (c) non-credit courses, e.g., Subject A, (d) courses taken in summer session, (e) work taken to make up an "Incomplete." (Units do count retroactively for the quarter the I grade was incurred, once it is made up.) Courses graded "In Progress" do count as though they were units completed.

A student will be placed on probation or subject to disqualification from further registration at the University,

	<i>Probation</i>	<i>Subject to Disqualification</i>
If, at the end of any quarter, a student's grade-point average is <i>less than</i> :	2.0 (but not less than 1.5) for the term; <i>or</i> less than 2.0 for all courses taken within the University of California.	1.5 for the term; <i>or</i> if the student has more than 16 units graded I (incomplete); <i>or</i> completed two consecutive quarters on probation.
If, during a student's first three quarters at UCD, units completed are <i>less than</i> :	36 (but more than 30).	30.
If, at the end of a student's fourth quarter at UCD, or thereafter, units completed are <i>less than</i> :	12 for the term; <i>or</i> less than 40 (but more than 34) in three consecutive quarters.	34 in three consecutive quarters.

The faculty of the student's school or college 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 or she 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 Registrar's Office, a student will be provided

with an official transcript of work completed in regular sessions 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 campus of the University 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 advisers. 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." (See page 181 for final examination regulations in the College of Letters and Science.)

Wherever practicable, final examinations are written and must be completed within a previously announced time limit.

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

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 or her 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 a 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) 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 600 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. Students who score below 450 on the (CEEB) Achievement Test in English Composition are not eligible to take the Diagnostic Essay Examination.

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 25 (English for Foreign Students) 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.

This requirement may be met in any of the following ways:

1. One high school unit in American history, or ½ high school unit in American history and ½ 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: Economics 111; History

17A, 17B, 21A, 21B, 27A, 27B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 175C, 176A, 176B, 177, 180A, 180B, 183A, 183B (upper division courses may be taken only with the consent of the instructor); Native American Studies 20, 116, 130A, 130B, 130C, 155; Political Science 1, 5, 5D, 100, 101, 102, 103, 104, 105, 106, 109A, 109B, 113, 127, 128, 160, 163; 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 through courses in the area of American History and Institutions at another collegiate institution 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 contact the Political Science departmental 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 Requirements, 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 the student's 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 or she completes at least 16 units or passes a comprehensive examination in the 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 the student in the University. An exception to this rule is authorized for those students undertaking certain honors courses.

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 or she plans to receive the degree. The dates for filing are published in the calendar on page 8 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/Not Passed 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 in the College of Agricultural and Environmental Sciences and College of Engineering, and for honors and highest honors in the College of Letters and Science. 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 or School Medal is given to the outstanding graduating student of each of the colleges and professional schools.

Student Expenses, Scholarships, Financial Aid, and Housing

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 or her own budget in keeping with his

or her 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	9.00	...
Education fee	100.00	120.00
Total for California residents	\$ 212.50	\$ 223.50
Tuition for nonresidents	500.00	500.00
Total for nonresidents	\$ 712.50	\$ 723.50

Additional approximated costs:

Room and board	\$650-950
Books and supplies	\$ 80-150
Miscellaneous (includes travel, laundry and clothing, recreation, medical and dental care, and toiletries) ...	\$250-350

The costs listed above are average costs. Fees are subject to revision.

Students may be subject to the following fees for optional services: parking, \$36 or \$24 for cars, depending on the type of permit desired, and \$12 for motorcycles; \$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 "Statement of Intention to Register" deposit is nonrefundable and is applied toward the University Registration Fee at the first registration.

SCHOLARSHIPS

Undergraduate scholarships are awarded on the basis of academic excellence and scholastic achievement. Most scholarships are *not* restricted to students with financial need. Some scholarships are restricted to students who meet given donor criteria. All scholarship applicants are also expected to apply for a California State Scholarship.

Application

The Scholarship Application includes a Statement of Purpose by the student, one recommendation from a teacher, principal, dean or academic adviser, and the Scholarship Data Sheet. Transcripts are not required, but the grade-point

average must be certified on the Scholarship Application. The application deadline is *December 15* for the following academic year. Applications are available from the Scholarship Office, Mrak Hall, University of California, Davis 95616.

Regents' and President's Scholarships

Regents' and President's Scholarships are among the highest honors that may be conferred upon an undergraduate student. The University provides annually to each campus a number of Regents' and President's Scholarships, available to students who will be freshmen or juniors beginning the following Fall Quarter. Selection of these awards is made by the Chancellor's Regents' Scholarship Advisory Committee and includes a personal interview.

University, Donor, and Agency Scholarships

These scholarships are made possible through the generosity of individual donors, private corporations and agencies, and The Regents of the University of California. These scholarships, with the exception of some agency grants, are awarded by the Undergraduate Committee on Scholarships, Honors, and Prizes. Normally, scholarships are awarded for one year. A grade-point average of 3.0 (a B grade) is generally required for a recipient to be considered for awards.

Cal Aggie Alumni Scholarships

Alumni Scholarships, which are made possible through the generosity of alumni of the University of California, are awarded to students entering the University for the first time. Recipients are selected by the Alumni Scholarship Committees of the candidate's county of residence.

FINANCIAL AID PROGRAM

The Financial Aid Office provides financial assistance and counseling to students who would be unable to pursue their education at the University without such help. 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 or her parents or 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 or her family. These premises are assumed in determining the type and amount of assistance necessary to meet the student's financial deficit.

The following information describes the various types of financial assistance available on the Davis campus and the procedures for making application for

assistance. We invite you to make further inquiries about the Financial Aid Program and about the various ways in which a college education might be financed.

Application Procedures

Applications for financial aid are included at the back of the Undergraduate Admissions Packet. They may also be obtained from the Financial Aid Office, North Hall, University of California, Davis 95616. The application consists of the student's personal and budgetary information; a copy of the Federal Income Tax return; and a Student Financial Statement or a Parents' Confidential Statement, which are sent directly to the College Scholarship Service for an evaluation of need.

Each applicant's budget, family income, and personal resources are analyzed to determine his or her financial need. The eligible student is then awarded a combination of loans, grants, scholarships, or employment under the Work-Study program. The amount of the financial aid award is based upon the student's financial need and the availability of University, State and Federal funds.

Application Deadlines. Applications are due *April 15* for the following academic year. The deadline for students who also wish to be considered for *scholarships* is *December 15* for the following academic year. A Student Financial Statement or a Parents' Confidential Statement must be sent to the College Scholarship Service at least *one month before* these filing deadlines.

Undergraduate California residents are required to file an application for a *California State Scholarship* with the California State Scholarship and Loan Commission. Applications are due in November for the following academic year, and a Parents' Confidential Statement must be sent to the College Scholarship Service at least one month prior to this deadline. Additionally, all undergraduate first-, second-, and third-year applicants (including nonresidents) are required to file an application for a Federal *Basic Educational Opportunity Grant* (BEOG). Application forms for these programs are available from the Financial Aid Office and from high school and community college counselors.

TYPES OF AID

Graduate Aid

There are various scholarships and fellowships available to graduate students through the Graduate Division. See page 215 for Fellowship/Assistantship details. Graduate students are also eligible for most types of aid handled through the Financial Aid Office. Graduate students should follow the same procedures for applying for these funds as undergraduates (see application procedures in preceding section).

There are a limited number of Regents' and President's Scholarships available to entering medical and veterinary students. Medical and veterinary students must use the undergraduate scholarship application forms to apply for these scholarships.

University of California Grants

A grant is an outright gift that does not have to be repaid. Whenever awarding guidelines and funding levels permit, a student's financial aid award is partially made up of grants. Awards are based on financial need.

California State Scholarship and College Opportunity Grant

Only California residents are eligible for assistance under these programs. The California State Scholarship program offers awards to a maximum of \$600 per year depending on financial need. As stated above, all undergraduate financial aid applicants who are California residents must apply for a state scholarship. The College Opportunity Grant program is designed to assist students from low-income families. Students are urged to make early request for information from their high school or community college counselors or from the California State Scholarship and Loan Commission, 1410 Fifth Street, Sacramento, California 95814.

Supplementary Educational Opportunity Grant (SEOG)

These grants are awarded to students who are U.S. citizens or permanent residents, and whose substantial financial need would otherwise prevent them from attending the University. Grants range from \$200 to \$1,500 per year with a maximum of \$4,000 for a four-year program or \$5,000 for a five-year program. The amount of the grant may not exceed 50 percent of the total financial aid award, and the recipient must be at least a half-time student in good academic standing.

Basic Educational Opportunity Grant (BEOG)

This program entitles needy students to a maximum grant of \$1,400 per year, less whatever contribution may be expected from a student's family. As stated above, all first-, second-, and third-year financial aid applicants are required to file applications for these grants.

Educational Fee Grant

In this program qualified California resident students are provided with a grant to pay the \$300 Educational Fee for the first year of attendance at the University. Awards are made, according to financial need, to any qualified undergraduate entering the University for the first time.

Educational Opportunity Program (EOP) Grant

This program provides grants to assist eligible students who have been admitted to the University under the Educational Opportunity Program.

Improved Access Grant

This program is designed to assist financially needy upper division transfer students. Emphasis is given to students who have completed 56 or more

semester units (84 quarter units) of transferable work in a community college with a grade-point average of 2.0 or better. The amount of the grant depends on the financial need of the student.

National Direct Student Loan (NDSL)

Needy students who are U.S. citizens or permanent residents are eligible for these loans. Undergraduates may be granted up to \$2,500 for the first two academic years and a total of \$5,000 over a four-year period. The ceiling on graduate loans is higher (up to \$10,000 including any loans made as an undergraduate), but all students may be limited to a percentage of their need because of the heavy demand and limited funds.

Repayment starts nine months after graduation or withdrawal from school, and may be extended over 10 years at 3 percent interest. Deferment of repayment is possible for members of the Armed Forces, Peace Corps, VISTA, and students who transfer to other schools. A portion of the loan may be forgiven for veterans who served in an area of hostilities after June 30, 1972, and for recipients who enter the teaching profession and teach at an officially designated school with a high enrollment of students from low-income families or as a full-time teacher of handicapped children.

Educational Fee Deferment Loan

This program enables California residents who establish financial need to delay payment of all or a portion of the \$300 Educational Fee. Repayment at 3 percent interest begins nine months after the student graduates or withdraws from the University. Repayment may be deferred for members of the Armed Forces, the Peace Corps, or VISTA.

Regents' Loan

Loans up to \$1,500 per year or \$6,000 per student are available to qualified students. Repayment at 3 percent interest begins after graduation or withdrawal from the University. Students who undertake graduate studies at the University of California may defer payment until such studies are completed or terminated.

Guaranteed Student Loan (GSL)

Loans up to \$2,500 per year at 7 percent annual interest are available through banks and other lending institutions. Interest while the student is in school is paid by the government for those who qualify for interest benefits. Repayment begins nine months after the student graduates or withdraws from school. Applications and information are available at the Financial Aid Office.

Short-Term and Emergency Loans

The generosity of the Cal Aggie Alumni Association, ASUCD, and friends of the University provides funds for loans that are available at any time during the academic year for registered students. Thirty-day Emergency Loans of \$50 are

available at no interest to meet temporary, emergency financial needs. Short-Term Loans are available at no interest for amounts up to \$200, to be repaid within the academic year. Further information is available at the Financial Aid Office.

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. 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 or her 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.

Health Professions Student Assistance Programs

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. Funds are awarded under these programs each year, provided there is an allocation made by the Federal government to the University. 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 nine-month academic year is \$3,500 and the maximum scholarship in a twelve-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 ten-year period. Conditions of deferment and cancellation of the loan (practice in a shortage area) 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 students will give most of their time and attention to college studies. If

possible, students should avoid outside employment until they have become adjusted to their new environment, have established sound study habits, and are maintaining a good scholastic standing. By the end of the first quarter the student should know the demands of University life and his or her own capabilities well enough to plan a program combining studies and work.

The Student Employment Center helps students find part-time and summer employment both on and off campus. It also assists students' spouses in obtaining part-time and full-time employment. Job listings are maintained at the Student Employment Center and interested students are invited to come to University House Annex for information and job referrals.

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.

Veterans Benefits

The Veterans Affairs Office is available to assist veterans and veterans' dependents who are eligible for benefits under Federal and State laws. The Office provides forms, information, and advice on insuring receipt of these benefits. It also certifies student attendance to the Veterans Administration, resolves benefit payment difficulties, and coordinates special services available to veterans in such areas as employment, financial aid, and tutorial assistance.

In order to receive benefits, students must initiate their claims with this office before or at the time of registration, and return each quarter with their current registration card.

New students whose eligibility has not been determined by the Veterans Administration should apply to the V.A. at least three months prior to enrollment. Veterans and veterans' dependents not receiving advance payment of benefits should be prepared to support themselves financially for two months pending receipt of their V.A. check. For additional information, contact the Veterans Affairs Office, 200 Silo, or call (916) 752-2020.

LIVING ACCOMMODATIONS

Residence Halls

The University provides the atmosphere of a living-learning experience for students in a variety of residence hall arrangements. Each residence area is staffed by students as well as professionals who work in conjunction with the residents to create and maintain an environment conducive to the achievement of their educational goals. There are three undergraduate residence areas

accommodating approximately 3,000 students on the Davis campus. Each area has its own dining hall and an individual architectural atmosphere. The few single rooms which are available are usually occupied by returning students.

The procedure for applying for undergraduate housing is as follows: On part B of the University application form an applicant may check "University Operated Housing" under the section on "Student Housing Information Request," and the Admissions Office will automatically forward the student's name and address to the Housing Office. Information and applications are mailed during the quarter preceding the quarter for which the student has applied.

The graduate facilities can accommodate 180 graduate students in single rooms. Applicants must apply directly to the Housing Office when requesting information. Applications and brochures are mailed to students in the quarter preceding the quarter for which they have applied.

For the 1975-76 academic year the on-campus room-and-board rate, which includes 19 meals per week, is \$1,400. Single rooms are an additional \$100 per year. The rates are subject to change each academic year. Payment is usually made in installments according to a payment schedule. A reservation fee payment will be required when a signed contract is returned. Rooms in the residence halls contain all of the necessary furniture and also include study lamps, linen, and blankets. Telephone and weekly laundering of linen are included in the room-and-board rate.

When the applicant receives the housing application, it should be completed and returned immediately. The availability of a contract is dependent upon the date of arrival of the housing application and the applicant's acceptance to the University. A returned application is not a commitment to accept housing or a guarantee of a room. Specific questions should be directed to the Housing Office, Room 111, South Hall, University of California, Davis 95616.

Housing for Married Students

There are 476 apartments for married students and their families 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 1974-75 were: one bedroom, unfurnished, \$99; two bedrooms, unfurnished, \$113; two bedrooms furnished, \$130. Rates include water, gas, trash collection, and electricity. Pets are not permitted.

The demand for married student housing is high, and apartments are assigned only from a waiting list (the average waiting period is 8-10 months). Priority on the list is established by submitting (a) an application card which may be obtained by writing Married Student Housing, Orchard Park, University of California, Davis 95616 and (b) a \$10 non-refundable application fee. (The \$10 application fee will be applied toward the \$50 Security Deposit if an assignment is accepted.)

Off-Campus Housing

The Housing Office offers a variety of services to students living in the

community through the off-campus housing program. A comprehensive listing service is available to all those looking for housing, as well as assistance with housing choices and selection of roommates. Listings include rooms, apartments, houses, duplexes, roommate spaces, and roommates available. Since the listings change from day to day, there are no prepared lists furnished by mail.

The student's off-campus experience is largely determined by personal lifestyle, location, planning, choice of roommates, homemaking skills, and other factors. The Off-Campus Housing staff acts as a resource to students when problems arise related to off-campus living and provides counseling and mediation for landlord/tenant issues and roommate difficulties.

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.

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 UCD 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 the *Housing Viewpoint* which is a helpful guide to living in the community. Additional material is available at the Housing Office in South Hall, Room 114.

There are a number of independent living groups in Davis which provide another housing alternative for undergraduate students. This experience is unique in that it offers participation in an independent, self-governing living group which determines policies and programs for itself and works to resolve its own problems. Membership is achieved through an informal selection process. Students interested in off-campus independent living groups should contact the group directly or through the Off-Campus Housing Office.

The size of the living groups ranges from 10 to 40 members. The monthly cost of group living at Davis varies from approximately \$70 in some houses to \$130 in others. Among the independent living groups associated with the Davis campus are La Maison Francaise, Sihaya House, and sororities and fraternities.

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 have a health evaluation by the University medical examiners.

In addition, each prospective student is advised to have a physical examination by his or her own physician to determine 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. Applicants with contagious diseases will be excluded from the classroom.

Students returning after an absence must also 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. Each regularly enrolled student paying full registration fees is entitled to such medical care as the Student Health Service is staffed and equipped to provide from the first day of the quarter (or summer session) through the last day of the quarter (or summer session) or to the date of official withdrawal.

Outpatient care in general and specialty clinics; hospital care; and use of the major and minor surgeries, intensive care unit, and ancillary services including x-ray, laboratory, physical therapy, and pharmacy are available to students through the campus health program. Clinics are held at regularly scheduled hours and emergency care is provided on a 24-hour basis.

Inpatient care, made available through a health plan purchased from registration funds, is provided to all students paying full registration fees. Eligibility for this service is indicated at the time fees are paid by a certification on the reverse side of the registration card.

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 Health Center 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 or her 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.

The facilities of the Health Center are open to students' dependents on a fee-for-service basis. Also, a Dependents' Health Insurance Plan is available as an optional benefit. This health plan may be purchased at the beginning of each quarter in the Student Health Center. Information regarding the coverage of dependents is available at the Student Health Center.

ADVISING SERVICES

In addition to coordinating all orientation programs for the general campus, Advising Services provides a broad range of academic advising and informational services. Both qualified students and professional staff members are available to assist students in planning academic schedules and professional careers (especially in health sciences and law); to provide information regarding major requirements, applications, and educational options; and make referrals to other campus services. The Director may be contacted in Room 222, South Hall, telephone 752-3000.

Academic Advising Intern Program

The Academic Advising Intern Program (AAIP) is coordinated and staffed by students. The purpose of this program is to offer students peer advising in academic department, division, and college offices. These student advisers are knowledgeable about the policies, requirements, and courses within their departments and are responsible for sharing this information with their fellow students. The advisers also assist students who are in the "undeclared" or "exploratory" programs.

In addition to advising students, the peer advisers work on selected advising related projects and assure increased communication between students and faculty.

Interns are available in the following departments: Agricultural Economics, Agricultural Exploratory, Animal Physiology, Animal Science, Applied Behavioral Sciences, Art, Biological Sciences, Chicano Studies, Dramatic Art, Economics, Education, Engineering, Food Science and Technology, History, International Relations, Mathematics, Nutrition, Textiles and Consumer Science, Political Science, Psychology, Sociology, and Zoology.

Further information regarding AAIP can be obtained from the AAIP Coordinators Office, Room 218, South Hall, telephone 752-3000.

The First Resort: Peer Academic Advising

The First Resort, located in Temporary Building 115 (corner of California and

Peter J. Shields avenues) 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 services on campus and keeps up to date with the requirements of the various UCD colleges. The staff is prepared to advise new and continuing students on matters relating to academic requirements, course selection, choosing a major, and program planning. *The First Resort* also maintains a tutorial listing and referral center for use by all students. Information can be obtained by contacting the office between 10 a.m. and 4 p.m., Monday through Friday, or telephoning 752-2807.

Health Sciences Advising

The Health Sciences Advising Office, located in Room 103, South Hall (telephone 752-2672), is an advising center for students interested in the health sciences. Professional and peer staff offer individual and group advising sessions to acquaint students with career possibilities and provide information concerning prerequisites, admissions procedures, curriculum, and selection criteria for schools and training programs. The office maintains an extensive library of catalogs, brochures, and periodicals for student use.

Orientation and Summer Advising

The orientation staff is responsible for all orientation programs for the general student body. Current activities include Preview Day, Summer Advising and Registration Conference, Orientation Week, and Winter and Spring Orientation. These programs are designed to acquaint new and prospective students with campus facilities and academic offerings, as well as provide attention to individual advising needs. As its primary goal, the staff seeks to facilitate a smooth transition into the campus environment and thereby increase the student's readiness for learning. The Orientation and Summer Advising Coordinator may be contacted in Room 214, South Hall, 752-2022.

Pre-Law Advising

The Pre-Law Advising Office, located in Room 216, South Hall, telephone 752-3009, is an academic and career advising service for students interested in law. Through individual and group advising sessions, this office seeks to acquaint students with career possibilities in law, law school admission procedures, the Law School Admission Test, and academic program planning. The office maintains an extensive reference library for student use which contains law school bulletins, books on the legal profession, and pre-law informational publications.

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.

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 Career Planning and Placement Center and students may use this library at their convenience. Those interested in a work-learn experience which may aid in career planning should contact the Work-Learn Center, South Hall.

Career Placement Service

Students and alumni seeking careers in business, industry, agriculture, and government are invited to use the services of the Career Planning and 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 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 and counselors who provide educational/vocational and personal/social counseling to all regularly enrolled students. Through individual interviews and group work, they:

- a) help students with personal and interpersonal concerns;
- b) assist students in their choice of academic majors and future occupational and life goals;
- c) provide a wide range of psychological testing when appropriate;
- d) work with students who are involved in the process of self-exploration;
- e) organize and lead personal growth and life goals groups; and
- f) offer consultative services to student groups and campus units.

WOMEN'S RESOURCES AND RESEARCH CENTER

The Women's Resources and Research Center (Women's Center) serves the students, staff, and faculty of the Davis campus as a storehouse of information on the concerns of women and as a center for personal involvement. The Women's Center provides discussion groups, a library, special events, a news-

letter, peer counseling, and referrals in such areas as career choice, personal growth, job discrimination, rape, child care, sexuality, and legislation. The Women's Center is staffed by professionals, student interns, peer counselors, and community volunteers.

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 throughout the student's University career. The EOP staff provides counseling services and supportive educational programs designed to assist the student in his or her 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 services 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 or her educational curriculum. This office is located in Temporary Building 10, the Learning Assistance Center.

WORK-LEARN CAMPUSWIDE 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 field 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 on-the-job experience.

Work-learn experiences cover a spectrum of activities. To name only a few possibilities, the student may serve as: a curriculum and teacher aide in school districts or in a compensatory education program; a youth casework 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 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, Economics, History, Consumer Science, and the American Studies Program.

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

SELECTIVE SERVICE AND VETERANS AFFAIRS

The Office for Selective Service and Veterans Affairs, located at 200 Silo, provides information and counseling on veterans' educational benefits and assists students who have inquiries and problems regarding their Selective Service status.

The Selective Service component will, upon a student's request, certify information on the student's educational progress to the appropriate local board. It is dependent upon each individual to initiate such a request. A 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 when there are no inductions, 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; students with questions and concerns are urged to contact this Office.

The Veterans Affairs component coordinates the financial benefits to which veterans and certain veterans' dependents are entitled under State and Federal laws. It provides forms, information, and advice on insuring receipt of these benefits. The Office certifies student attendance to the Veterans Administration and resolves benefit payment difficulties. It also serves those in need of personal assistance related to their status on such matters as unit certification, correction of so-called "bad paper," orientation, employment, financial aid, and tutorial assistance. For additional information on receipt of benefits for veterans and veterans' dependents, see "Veterans Benefits" on page 51.

INTERNATIONAL STUDENT SERVICES

Over the past three decades the Davis campus has played a leading role in the education of students from a large number of countries in a variety of disciplines. The campus has not only contributed significantly to the educational and cultural development of these students, but also has gained considerably from their presence in the University and the Davis community. In the future, the Davis campus will maintain a commitment to international education.

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

A special assistance program for new international students is held annually the week prior to the regular Fall Quarter registration period. All new and transfer international students are urged to attend this program which assists in actual registration and class enrollment, procedures which can be confusing to any new student. It also provides help, advice, and information on housing (leases, landlord and tenants' rights and obligations, as well as availability, location, and cost), academic regulations and structure, cultural differences, legal and visa expectations, introduction to services offered on campus, tours of the campus and surrounding areas, banking information and assistance, etc.

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 45), international students should count on a minimum of \$325 per month for 12 months for living expenses, books and supplies, and incidental expenses. The recommendation of the Services for International Students and Scholars Office is \$350 per month. 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 to purchase towels, bedding, 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 expenses.

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.

SERVICES TO HANDICAPPED STUDENTS

Specialized advice, assistance, and resources are available to physically disabled and blind persons who are entering or continuing students at the Davis campus. A full-time program has been established to provide an environment where University students are minimally disadvantaged by physical circumstance.

Although individual circumstances call for individual partnerships with resource staff, program activities are designed to help students find the specialized living, educational, mobility, personal, and agency resources to gain equality of opportunity for the University educational experience. Therefore, the student may wish to work with the staff on needs for special living arrangements including accessible housing, attendant recruitment, and health maintenance. Educational resources have included taped materials, readers, priority for class enrollment, and special equipment. Activities increasing mobility include: campus and community orientation assistance; advice on mobility aids and vehicles; wheelchair and equipment repair; and help with accessible transportation. Concerns about managing social situations or independence, career goals, agency barriers to financial assistance, or planning for a transition from UCD to a job or graduate school are examples of instances where the personally experienced staff may be a special resource.

Individuals may be eligible for training, financial aid, counseling, and placement support from the State Department of Rehabilitation if it is determined that they are handicapped vocationally by a disability. The University program may be able to facilitate applying for or using such benefits on this campus, but it is not an office for this agency. Similarly, students sponsored under Veterans, Social Security, or other insurance disability programs may find the liaison services of this office useful, but should contact the appropriate local agency to become eligible.

Early contact and a campus visit are important to a productive staff-student partnership in meeting needs. Write or phone (916) 752-3184, Services to Handicapped Students, University of California, Davis 95616, for detailed information or 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 (84 quarter units minimum) by the time of participation in the program; the equivalent of two years of University-level language preparation with at least a B average (except where classes are taught in English); and the ability to adapt successfully to a different culture. Students planning to study abroad during their senior year are advised to investigate academic residency requirements with their college Dean's Office. Graduate students are eligible for consideration at some centers (in addition to a special two-year program in Hong Kong) 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. There are three fellowships (teaching assistantships) in Hong Kong for graduate students in certain limited fields.

In 1975-76, academic-year programs for undergraduates will be continued in the United Kingdom and Ireland (ten campuses), Japan, Sweden, Norway, France (Bordeaux, Grenoble, Montpellier, Poitiers, Pau-Paris, and Paris), Lebanon, Germany, Italy, Israel (Jerusalem and Haifa), Ireland, Spain (Madrid and Barcelona), Kenya, Ghana, Mexico City, Brazil, and the U.S.S.R. A two-year program in Hong Kong, predominantly for concentration on language and of special interest to students in Asian or Chinese Studies, will accommodate students in the senior year and first year of graduate study. A new program for students interested in film has been established in Paris. 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 \$3,100 to \$5,000.

The Education Abroad Program is administered centrally from the Santa Barbara campus. Detailed information on the program and application forms are available on the UCD campus from the Education Abroad section of the Services for International Students and Scholars Office, Room 323, South Hall. Academic advice can be obtained from the Faculty EAP Coordinator, H. J. Ketellapper, Letters and Science Dean's Office, 150 Mrak Hall. Generally, applications are submitted during the Fall Quarter of the year preceding the period of study abroad. Printed materials pertaining to other opportunities for study, travel, and employment abroad are available from the Services for International Students and Scholars 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:

1. Dishonesty, such as cheating, plagiarism, or knowingly furnishing false information to the University;
2. Forgery, alteration, or misuse of University documents, records, or identifications;
3. Obstruction or disruption of teaching, research, administration, disciplinary procedures, or other University activities;
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 the campus or other facility;
5. Theft of or damage to property of the University or property of others while on University premises and, during times of campus emergencies, wrongful destruction of or damage to property within one mile of the campus or other facility;
6. Unauthorized entry to or use of University facilities, equipment, or resources;

7. Violation of University policies or of campus regulations, including campus regulations concerning the registration of campus 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, lewd or indecent conduct or obscene 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 at a University-sponsored or -supervised function 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.

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. The system of student discipline is administered by the Coordinator of Student Conduct, Room 462, Memorial Union.

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 or she 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 or she 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 or she 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 the student violates any of the terms set forth in the notice of dismissal as determined after the opportunity for a hearing, he or she 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 chairpersons, 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 Unitrans, a system of five buslines running to North, East, and West 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*, a compilation of student evaluations of courses and instructors; 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 welcom-

ing 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 service projects, 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 ORGANIZATIONS AND ACTIVITIES

Over 270 student organizations are served by the Student Organizations and Activities Center which is located in Room 10, Lower Freeborn Hall (telephone 752-2027). 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.

The Student Organizations and Activities staff provides on-going advising and support services for student organizations. Students, staff, and faculty are encouraged to visit the Student Organizations and Activities Office if they wish to become involved in a student organization or would like to find out about activities, events, and services available on campus.

RECREATIONAL FACILITIES AND PROGRAMS

Student recreational activities are centered in the Memorial Union, Recreational Swimming Pool Complex, Putah Creek Recreation Area, Silo Barn Student Center, Equestrian Center, Silo Craft Center, Outdoor Adventures, Coffee House and snack bars, Gymnasium and intramural playing fields, and campus theatres.

The Memorial Union, located at the north end of the Quad, contains conference rooms; offices for the Student Activities and ASUCD staffs, activities chairpersons and officers; lounges with magazines and newspapers; the Dining Commons; the UCD Bookstore; campus radio station (KDVS) and the campus newspaper, *California Aggie*; Memorial Union Art Gallery; the Campbell Library for recreational reading; Cameron Music Listening Room; the music rehearsal room with piano, music stands, and chairs for rehearsals; the Games Area with bowling lanes, billiards tables, facilities for cards and chess, and a TV lounge; Freeborn Hall, the largest campus auditorium, for concerts, dances, banquets, and conferences; the Campus Box Office; the Information Desk where the campus calendar of events is compiled; the Reservation Desk handling use of campus facilities; the "Corral" a small store which features candy, tobacco, gifts, magazines, etc.; and the outdoor plazas. The Associated Students run a Coffee House in the Memorial Union where delicatessen-type food, coffee, tea, cider, and soft drinks are sold in an informal atmosphere.

The Recreational Swimming Pool Complex has a large, cloverleaf-shaped swimming pool, separate wading pool, bath house, snack bar terrace, shuffleboard courts, and a lodge. The Pool Lodge has a lounge with a fireplace, well-equipped kitchen, and meeting rooms.

The Putah Creek Recreation Area features bicycle and walking paths with footbridges at convenient intervals, a well-developed arboretum, a bridle path, picnic areas, and a small lake with boating facilities. The Putah Creek Rec Lodge, set on a grassy area suitable for small team sports, has outdoor barbecue pits and tables as well as an indoor fireplace, kitchen, and multi-purpose room suitable for dancing.

Throughout the year, recreational horseback riding instruction and trail riding are offered at the Equestrian Center located southwest of the Veterinary Medicine Teaching Hospital. Information for this program is available at the Memorial Union Information Desk, phone 752-2222.

The Silo Barn Student Center has a main floor meeting room, table tennis and game facilities, a snack bar area, and a branch bookstore.

The new Craft Center located in the Silo Barn has photo facilities, jewelry and metal sculpture rooms, weaving equipment, and facilities for sewing, silk-screening, ceramics, block printing, leather work, and woodworking.

The Outdoor Adventures Program located in Temporary Building 24, phone 752-1995, just east of the Silo Barn functions as a recreational switchboard, resource center, and rental outlet to facilitate student-initiated outdoor adventures. It is run by student volunteers and is a friendly place to stop by and get some help.

A major feature of the Davis campus is the Intramural Recreation Program. 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—residence halls, 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, the Main Theatre in 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.

CAL AGGIE ALUMNI ASSOCIATION

Alumni are one of the major constituents of the Davis campus community. The Cal Aggie Alumni Association brings all Davis alumni together to accomplish the organization's primary objective—service to the University. The following sample of programs and activities shows the extent of alumni involvement at Davis:

- an active and long-standing Alumni Scholarship Program that last year provided recognition and financial assistance to over 100 outstanding incoming students;
- a unique Ambassador Program that provides an orientation mechanism for incoming students, an internship and job placement service for Davis students, and establishes a nationwide information and community orientation network for the use of seniors and graduating students;
- a joint program with all the schools and colleges in recognizing their outstanding graduating students;
- a broad program of involvement with Sacramento legislators;
- a comprehensive program which provides personal service and financial assistance to activities that enhance the Davis campus, its students, faculty, and alumni. Representative of these efforts are Cal Aggie Camp, the *Spec-tator*, Picnic Day, the Work-Learn Program, the Cal Aggie Marching Band, fraternities and sororities, UC Student Lobby, and many others.

All graduates of the Davis campus are automatically members of the Association and anyone who completes 12 or more quarter units may apply for membership after leaving the University. There is a Sustaining Membership category for those alumni who financially support the programs and activities of the Association, and which entitles these members to numerous benefits. The Director and Staff of the Association are located on campus in the Alumni Center, University House, University of California, Davis 95616 (telephone 752-0286).





Requirements and Curricula

The programs 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.

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College of Agricultural and Environmental Sciences

- 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 or her individual abilities and interests
- to provide the knowledge and sense of competence necessary for successful pursuit of a career.

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 inter-relations of the various ways of studying the universe
- to cultivate the skills and self-discipline essential for successful inquiry and action

§ § §

FACULTY OF THE COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

AGRICULTURAL ECONOMICS

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Varden Fuller, Ph.D. (*Emeritus*)
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NOTE: For key to footnote symbols, see page 220.

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NOTE: For key to footnote symbols, see page 220.

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Assistant Professor:

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Soils and Plant Nutrition

Professors:

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Francis E. Broadbent, Ph.D.
C. C. Delwiche, Ph.D.
Emanuel Epstein, Ph.D.
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NOTE: For key to footnote symbols, see page 220.

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Rex E. Marsh, A.B.

§ § §

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 are designed to meet these challenges and to contribute significantly to progress in these changing times.

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. This structure provides freedom of action for students in choosing courses and forming curricula. From the College's point of view this freedom has brought the need to assist students in developing the maturity required for such judgmental responsibility. The challenge of assisting students to meet their educational goals has been given to the faculty who serve as academic advisers. These advisers seek to guide

each student individually in planning a curriculum for a quality education. An ongoing review and updating of the College's teaching programs characterizes faculty and administrative concern, not only with providing good teaching in important areas of knowledge, but also with student receptivity to subjects being taught. Good advising has an importance equivalent to good teaching. The College is organized to help students determine what they want and need to learn and then to assist them 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, programs provide students with opportunities to explore the utility of their training in study-internship situations. Departmental and College offices and advising services provide career guidance and the Bixby Work-Learn Program provides work experience opportunities for students in areas as varied as ranching, city planning, laboratory research, child development, marketing, resource management, veterinary medicine, and teaching. The College is geared toward preparing people to meet successfully the challenge of leading productive lives, both from personal and societal standpoints.

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 participate in designing the College's programs and are active in the implementation of the College plan. The College, departmental, and general faculty committees which determine a wide spectrum of educational and administrative policies include student members. Any student desirous of taking part in the committee system of the 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 faculty advisers, department chairpersons, 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 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 experience. For example, the student who has the academic side of his or her 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

Students in the College are assigned faculty advisers to help them with the planning of programs in areas of individual educational interests. The assignments are made by Master Advisers, each of whom is responsible for coordinating advising in a major program area. 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 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 advisers is to sensitize students to the educational opportunities which the Davis campus presents, to discuss the implications in the choice of one option or another, and generally, on the basis of experience, to help students meet their educational goals. The great potential which an adviser-student relationship can have for students has long been recognized within the College. As a result, students are strongly urged to consult with their advisers each quarter prior to registration for classes. The underlying philosophy of program planning, then, is that advising is a joint adviser-advisee responsibility.

As educational objectives evolve a student may, in consultation with the Master Adviser for the major, choose a new adviser whose area of expertise corresponds more directly to these specific educational objectives. Because of unique knowledge, experience, and interest in a particular field, the faculty adviser can be of particular value to the student.

General advising on academic programs is available to all students at the College's Academic Advising Office, 129 Hunt Hall, which coordinates all advising activities in the College.

Orientation Classes

Each quarter the College offers an orientation class for its students (see page 452). The course was established in order to facilitate the assimilation of students into the academic community, to assist them in formulating educational objectives, and to help them identify the many educational opportunities available on the Davis campus. Although not required of all students, this course is recommended as a useful means for 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 content 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 more detailed descriptions of each of its course offerings. These descriptions are current and contain information in such areas as: course goals, texts used, preparation required of students, 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" provide an excellent guide for students as they search for the courses which will make up their Davis campus educational experience.

Each quarter just before the time of advising, copies of the "Expanded Course Descriptions" are available for student use on campus at the Shields Library Reference and Periodicals departments, College offices, advisers' offices, departmental offices, *The First Resort*, and in dormitory head resident's offices.

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 in the College's Academic Advising Office, other advising centers, and at *The First Resort* (see page 55). 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 offices for action.

Associate Deans of Resident Instruction

The College has associate deans who work with students toward the realization of their educational objectives. They welcome the opportunity to become acquainted with individual students and engage in informal conversations. Students are encouraged, therefore, to consult with a dean on matters related to the success of their academic programs. It is through such mechanisms that the deans keep themselves apprised of the state of the educational process for which they are responsible. There is an Associate Dean responsible for each of the following subject areas: Animal Sciences, Applied Economic and Behavioral Sciences, Biological Sciences, Plant Sciences, Resource Sciences and Engineering, Food, Nutrition and Consumer Sciences, and Pest and Disease Management.

Work-Learn Opportunities

Students in the College wishing to enrich their academic program through a work-learn internship should contact the Bixby Work-Learn Office. Intern-

ships may assist in career selection, expand experience, and integrate classroom and field work. In many cases academic credit can be granted for work-learn internships.

As students often prepare for careers about which they are not fully knowledgeable, they may fail to grasp the usefulness and importance of their courses, or they may not realize which courses will lead to acceptable career possibilities. Work-learn experience may assist in removing doubts about chosen careers and improve motivation, learning, and achievement.

The Bixby Work-Learn Program provides work-learn opportunities in many fields for which the College prepares students. This voluntary program provides supervised internships, full-time or part-time, in summer or in any quarter of the academic year. Interested students should either visit or write to the Bixby Work-Learn Office or the Campus Work-Learn Center.

To facilitate credit for work-learn internships, the College has initiated an internship course, Work-Learn 192 (see page 528). 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 internships are also possible through courses in Applied Behavioral Sciences (see page 245) and environmental management internships in Environmental Studies (see page 347).

The Student's Role

Although many services are provided to assist in program planning, it is the student who, in the last analysis, determines the program he or she will pursue. The most crucial decision the prospective student makes in this process is the selection of his or her 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. Our advisers know the resources of the College and can help the student in using them to accomplish 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 misunderstood to be hard and fast rules. The citation of "courses normally taken by students" often leads students mistakenly to believe the courses so cited are specifically required.

The concept of prerequisite knowledge which underlies the listing of prerequisite courses in the course descriptions is particularly misunderstood. Education 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 preparatory knowledge through prerequisite courses, but that is not the only route available. Students who have acquired the prerequisite knowledge by other means need not take the specified prerequisite. Instructors will often indicate to students, on the basis of informal discussions, that they are prepared for advanced study without the need for examinations or courses. Courses may also be challenged by examination. Students should also note that many upper division courses have no specific preparatory requirements and may be 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 may 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 all requirements for graduation are fulfilled. In brief these are:

University Requirements: The Subject A, American History and Institutions, and residency requirements; the unit requirement of 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 42-44 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 requirements under various majors beginning on page 88 of this section.

Natural Sciences, Social Sciences, and Humanities Requirements: The purpose of these requirements is to provide breadth to the student's program. Since the broadening effect of any particular course is dependent on the student's major and 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 the 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.

Each student, in conjunction with an adviser, must prepare and file with the Dean of the College no later than the end of the second quarter of the junior year (not more than 120 units in residence or by transfer) a written plan specifying a program leading to satisfaction of the student's goals and graduation requirements. This does not preclude a change of major or program modifications. Registration for future quarters will be denied students who do not comply with this regulation.

A full-time regular undergraduate student who does not pass at least 36 units during the first three terms of enrollment on the Davis campus shall be placed on probation. A full-time regular undergraduate student who does not pass at least 30 units during the first three terms of enrollment on the Davis campus shall be subject to disqualification. Beginning with the fourth term of enrollment at Davis, a full-time regular undergraduate student who does not pass at least 12 units in any term, or at least 40 units during any three consecutive terms, shall be placed (or remain) on probation. Such a student who does not pass at least 34 units during any three consecutive terms shall be subject to disqualification. A full-time regular undergraduate student shall be subject to disqualification after two consecutive terms on probation.

Passed/Not Passed Option

A regular student *in good standing* registered in the College of Agricultural and Environmental Sciences may elect to take courses on a Passed/Not Passed 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. 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 on a Passed/Not Passed grading basis, including courses which are *required* to be taken on a Passed/Not Passed basis *only*, as designated in course descriptions. Courses in which grades of D or F are earned may not be repeated with the Passed/Not Passed option. (See also page 38.)

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 186. Students should consider the list carefully in selecting course work in the same areas to avoid taking equivalent courses and thus duplicating credit. Credit may not be earned in the University for courses which duplicate credit already allowed for advanced placement examinations.

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 88 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 222 of this catalog. Students need not present identical courses but only ones having similar content. Students attending community colleges 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 prepare for transfer to the Davis campus, students are encouraged to write directly to the Associate Dean responsible for their intended major (see pages 85-87 for specific information) and/or to plan a visit to the campus to discuss their programs with faculty advisers.

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

Graduating students who are completing their majors with distinction may be recommended for honors, high honors, or highest honors. The names of students to whom 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:

Total quarter units completed at UC	Grade-Point Average		
	Honors	High Honors	Highest Honors
135 or more	3.20	3.40	3.60
90-134	3.40	3.55	3.70
45-89	3.50	3.65	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 45).

Teaching Credentials

Inquiries concerning preparation for teaching credentials in agriculture and home economics 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. They are listed according to subject matter areas and/or the Associate Dean under whom they are administered. Questions regarding a major should be addressed to the appropriate Associate Dean. Complete outlines of these majors and programs are presented on pages 88-124.

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.

Animal Sciences—M. Ronning, Associate Dean
College Office, 228 Mrak Hall, 752-6970

Majors in Animal Sciences:

Animal Science
Avian Sciences

Wildlife and Fisheries Biology

Individual or Interdisciplinary Majors and Programs:

Agricultural Science and Management

Exploratory (non-degree program) Individual Major

Applied Economic and Behavioral Sciences—E. J. Blakely, Associate Dean

College Office, 228 Mrak Hall, 752-6360

Majors in Applied Economics:

Agricultural Economics and Business Management

Development, Resource and Consumer Economics

Majors in Behavioral Sciences:

Agricultural Education

Human (Child) Development

Applied Behavioral Sciences

Native American Studies

Design

Biological Sciences*—E. E. Conn, ** Associate Dean

Division Office, 150 Mrak Hall, 752-0391

Majors in Biological Sciences:

Bacteriology

Genetics

Biochemistry

Physiology

Biological Sciences

Zoology

Botany

Food, Nutrition, and Consumer Sciences—————, Associate Dean

College Office, 228 Mrak Hall, 752-0107

Majors in Food Sciences:

Fermentation Science

Food Science

Food Biochemistry

Food Service Management

Majors in Nutrition:

Community Nutrition

Nutrition Science

Dietetics

Majors in Consumer Sciences:

Consumer Food Science

Textiles

Home Economics

Plant Sciences, and Pest and Disease Management—J. M. Lyons, Associate Dean

College Office, 228 Mrak Hall, 752-0819

Majors and Programs in Plant Sciences:

Plant Science

Range and Wildlands Science

Preforestry (non-degree program)

Majors in Pest and Disease Management:

Entomology

Interdisciplinary Programs:

Agrarian Studies

*International Agricultural
Development*

* An Intercollegiate Division.

** Associate Dean of the Division of Biological Sciences.

Resource Sciences and Engineering—D. R. Nielsen, Associate Dean
College Office, 228 Mrak Hall, 752-0110

Majors in Resource Sciences:

<i>Atmospheric Science</i>	<i>Environmental Toxicology</i>
<i>Environmental Planning and Management</i>	<i>Renewable Natural Resources</i>
	<i>Soil and Water Science</i>

Majors in Engineering:

(see *College of Engineering*, page 128)

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 students in finding majors best suited to them and their needs*. Students 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 the Master Adviser for the Individual Major about this special program, the student plans his or her major with an adviser or a group of advisers. *The proposed program is then submitted to a special committee for review at least four quarters before the student 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.

Examples of some individual major programs developed recently are: Business Management and Human Relations, Creative Therapeutic Recreation, Family Development, Geobotany, Health Sciences, Human Ecology, Hydro-meteorology, 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.

Preveterinary Medicine

Preprofessional training requirements for application to the School of Veterinary Medicine are outlined on pages 198 and 205. Students interested in satisfying those requirements have two programmatic options in the College of Agricultural and Environmental Sciences. They may enter into the Exploratory Program or they may select any one of the established majors in the College (see pp. 85-87). An undergraduate major should be selected on the basis of individual interest and aptitude; there is no advantage gained toward admis-

sion by selecting one major over another. All advisers in the College, and especially those in the Animal Science and Biological Sciences subject matter areas, are informed of preveterinary requirements and will help students integrate those into given major programs. Students wishing further advice can be referred to certain advisers with special knowledge of matters relating to veterinary medicine by contacting the College Office, 228 Mrak Hall; Office of the Associate Dean-Student Services, School of Veterinary Medicine, 1024 Haring Hall; or Health Sciences Advising Office, Room 224 South Hall.

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 services, 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

*Social Sciences and the Humanities** 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.

Natural Sciences † 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. The program is to include, but is not limited to, courses in chemistry, biochemistry and/or physiology, mathematics (statistics and/or calculus), biological sciences (general biology and/or botany, genetics, microbiology or zoology), ecology, and the earth sciences.

Agricultural Specialization † 36

* 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.

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

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

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. Students should contact departmental advisers for up-to-date lists of courses which are acceptable for the breadth subject matter requirement.

Bachelor of Science Major Requirements* UNITS

<i>Preparatory Subject Matter</i>	43
English (choose from English 1, 2, 3, 4A, 4B, 5F, or 5P)	4
English (from above list) or rhetoric (Rhetoric 1 or 3)	4
American History and Institutions†	8
Economic principles (Economics 1A-1B)	10
Accounting (Economics 11A-11B)	7
Statistics (Mathematics 13)	4
Mathematics including calculus	6
<i>Depth Subject Matter‡</i>	44-45
Theory: Agricultural Economics 100A, 100B	6
Statistics: choose two from Agricultural Economics 106A, 106B, and 155	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.*

† Students meeting the American History and Institutions requirement may substitute social sciences as interpreted under the Social Sciences Breadth Subject Matter requirement.

‡ Students graduating with this major are required to maintain at least a C average (2.0) in all Agricultural Economics courses taken at the University.

Senior research: Agricultural Economics 190A, 190B	4
Economics: any two upper division courses	6
<i>Agricultural Economics Option</i> (Preprofessional)	23
Mathematics 16B	
Agricultural Economics 100C	
Economics 101	
Additional upper division agricultural economics and economics	
or	
<i>Agricultural Business Management Option</i>	22
Agricultural Economics 18	
Restricted electives: choose 18 units from Agricultural	
Economics 100C, 112, 113, 114, 117, 130, 140, 145, 150, 171;	
Economics 134, 150, 160, 161.	
<i>Breadth Subject Matter</i>	32
Agriculture (excluding agricultural economics and consumer economics)	
Natural sciences (including mathematics beyond preparatory	
subject matter)	
Social sciences (excluding economics), history, and philosophy	
Required: 8 units in one area and 12 units in each of the other two.	
<i>Unrestricted Electives</i>	60-61
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>	65
Agricultural economics	9
Agricultural Education 160	3
Agricultural engineering	11
Animal sciences	16
Applied Behavioral Sciences 191A-191B	2

* 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.

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
Breadth Subject Matter	33
English 1, and choose from English 2, 3 or English/Rhetoric 9A, 9B, or 9C	12
Economics 1A or 1B	5
Social sciences and humanities electives†	16
Restricted Electives 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; Water Science 110A, 110B.	
Unrestricted Electives	26
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 professional preparation include: Education 110, 120, 301; Agricultural Education 160, 320B, 323; and 9 postgraduate quarter units of courses selected from the areas of agriculture, applied behavioral sciences, community development, or ethnic studies.

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.

Bachelor of Science Major Requirements*

	UNITS
Preparatory Subject Matter	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
Depth Subject Matter	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

* For convenience in program planning the *usual* courses taken to satisfy the requirement 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.

2

4
18

Specialization (Animal Science, Food Science and Technology, or Plant Science)	18
Breadth Subject Matter	36
English and/or rhetoric (choose from English 1, 2, 3, 4A, 5F, 5P and/or Rhetoric 1, 3)	8
Economics (Economics 1A, 1B)	10
Social sciences and humanities electives	18
Restricted Electives to supplement or expand any of the above areas	19
Unrestricted Electives	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.

Bachelor of Science Major Requirements*

	UNITS
Preparatory Subject Matter	42
General biological sciences (including Biological Sciences 1, Zoology 2, plus one from Bacteriology 2 and 3, 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
Depth Subject Matter	48-49
Biochemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Nutrition (Nutrition 110, or 103 plus one additional course)	5
Physiology (Physiology 101, 101L)	6
Genetics (Genetics 100A-100B)	6
Animal science:	25
Choose 7 units from Animal Science 114, 115, 116, 117, 118A, 118B.	
Choose 18 units from Biochemistry 102; Animal Genetics 107, 108, 109, 110, 112, 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.	
Breadth Subject Matter †	20
Social science and humanities and/or art of communication	20

*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.

Unrestricted Electives 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 focuses on human and community development and prepares students for creative work in helping others improve their social and physical environments. The study of human social behavior is emphasized together with study of the processes and strategies of social change. Knowledge of the behavioral and environmental sciences is integrated with development of the skills necessary to using this knowledge in solving social problems. The curriculum is intended primarily for students with career goals oriented toward public, community, and institutional involvement. Examples of employment opportunities in a wide variety of settings include community development, community education, institutional development, and inter-group relations. The breadth 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 or her adviser select course sequences, in Applied Behavioral Sciences and other areas, that are most appropriate to the student's educational and career goals. *The Applied Behavioral Sciences major is a student-designed program and is available upon special application after admission to the College through an entry major such as Exploratory.*

Bachelor of Science Major Requirements UNITS

Depth Subject Matter 60

All units must be upper-division and two-thirds of these must be in behavioral sciences.

Individualized program, including senior project, to be determined by student and advisory committee. A minimum of 20 units in Applied Behavioral Sciences courses is required.

Breadth Subject Matter 80

A minimum of 12 units in each of the following areas*

Inquiry: intellectual skills of inquiry and critical analysis.

Environmental Studies: understanding the dynamic interaction of people and their environment.

Personal and Social Behavior: understanding the dynamics of human relationships extending from the individual to the international level.

Creative Expressions: exploration and development of the student's own creative powers, intellectual and aesthetic.

Basic Communication: skill in oral and written communication.

Unrestricted Electives 40

Total Units for the Degree 180

Other Requirements

Admission: Develop, in consultation with an adviser, a statement of

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

academic and career objectives and a plan for attaining stated goals.
 Graduation: Minimum of one year in residence in the major after completion of major proposal 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.

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

* 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.

Unrestricted Electives 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>	41
Avian sciences	3
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
Mathematics (Mathematics 13)	4
Physics (Physics 2A and 2B or 2C)	6
<i>Depth Subject Matter</i>	51
Biochemistry (Biochemistry 101A, 101B)	6
Genetics (Genetics 100A, 100B)	6
Nutrition (Nutrition 110)	5
Physiology (Physiology 101, 101L)	6
Laboratory units in above listed subjects	4
Specialized courses related to avian species	24
<i>Breadth Subject Matter</i>	24
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5F, 5P, and/or Rhetoric 1, 3)	8
Social sciences and humanities electives†	16
<i>Restricted Electives</i> to supplement or expand any of the above areas	27
<i>Unrestricted Electives</i> ‡	37
Total Units for the Degree	180

With the **BACTERIOLOGY** major, a B.S. degree can be obtained in either the

* 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.

† 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.

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 170 and 257.

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
<i>Preparatory Subject Matter</i>	50-58
Biological sciences: Biological Sciences 1 and at least one course from Bacteriology 2-3 or 102-103, Botany 2 or Zoology 2	10-11
Chemistry 1A-1B-1C, 5; or 4A-4B-4C (students may start with Chemistry 4A and continue with 1B-1C but not vice versa)	15-19
Mathematics 16A-16B-16C or 21A-21B-21C and one additional course in statistics (e.g., Mathematics 13 or 130A)	13-16
Physics (Physics 2A-2B-2C and 3A-3B-3C; or 4A-4C-4D† or 5A-5B-5C)	12 minimum
<i>Depth Subject Matter</i>	41
Biochemistry 101A-101B, 101L	11
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>	32
English 1, plus four additional units in English or rhetoric	8
Social sciences and humanities (including foreign languages and additional English and rhetoric courses)†	24
<i>Restricted Electives</i>	15
Upper division courses in biochemistry and related areas, to include at least three courses from Biochemistry 122, 133, 143, 153, and at least one additional lecture or laboratory course in a biological science.	
No more than 3 units of courses numbered 192, 197T, 198, or 199 may be used (check with adviser or Master Adviser).	
Recommended: Biochemistry 190 and one upper division chemistry course.	
<i>Unrestricted Electives</i> (including 199, etc.)	34-42
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.*

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

‡ Physics 4B and 4E are optional. Students electing the Physics 4 sequence should elect Mathematics 21A-21B-21C and 22A-22B-22C.

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 170 and 261.

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 170 and 264.

CHILD DEVELOPMENT—See Human (Child) Development.

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 science, nutrition science, and community nutrition. The major enables students to qualify for graduate admission into some master's degree programs in Public Health Nutrition, greatly increasing career opportunities.

By selecting appropriate additional courses,† students may also fulfill the academic requirements for admission to an approved internship in Dietetics and to additional master's degree programs in Public Health Nutrition.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	45-46
Written expression (English 1, 2, 5F)	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)	7
Bacteriology with laboratory (Bacteriology 2, 3)	5
<i>Depth Subject Matter</i>	44-45
Nutrition 102A, 102B, 102L (or 110, 111, 111L)	9-10
Nutrition 116A-116B	6
Nutrition 118-118L, 119	7
Food Science and Technology 112	4
Food Science and Technology 100A, 100AL, 100B, 100BL	10
Consumer Economics 141, 142	8
<i>Breadth Subject Matter</i>	43
Principles of economics (Economics 1A)	5
General psychology (Psychology 2B)	5
Sociology, social problems, race relations, social systems in rural and urban society (Sociology 3, 130, 143)	16 ✓
Cultural anthropology (Anthropology 2)	4
Applied Behavioral Sciences 47, 151B	6
Human Development 100A	4
Methods of teaching (Applied Behavioral Sciences 161)	3

* 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: Agricultural Economics 112; Biochemistry 101A-101B, and Food Service Management 125, 126, 127.

Unrestricted Electives 46-48

The following courses are recommended depending upon a student's specific career objectives: Economics 1B; Biochemistry 101A-101B; Nutrition 114; Food Science and Technology 107; Human Development 100B, 110; Food Service 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 socioeconomic 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 careers such as food product development, quality assurance, marketing and sensory analysis, extension service, creative writing, and community service.

The major provides academic preparation for those who plan to pursue a teaching credential or to undertake graduate study leading to the M.S. degree in Food Science or in Consumer Science.

Bachelor of Science Major Requirements*

UNITS

<i>Preparatory Subject Matter</i>	59
Biochemistry (Biochemistry 101A-101B)	6
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A-1B-1C, 8A-8B)	21
Mathematics, statistics and physics (Mathematics 19, Agricultural Science and Management 150, Physics 10)	10
Microbiology with laboratory (Bacteriology 2, 3)	5
Physiology (Physiology 2 or 101)	4
Written and oral expression (English 1, Rhetoric 1)	8
<i>Depth Subject Matter</i>	62
Community nutrition (Nutrition 118, 118L)	4
Consumer economics (Consumer Economics 141, 142)	8
Food Science and Technology and related courses including Food Science and Technology 100A, 100AL, 100B, 100BL, 107, 107L, 112 and one course each in food chemistry, food microbiology and food processing	40
Human nutrition with laboratory (Nutrition 110, 111, 111L)	10
<i>Breadth Subject Matter</i>	24
Courses in the social sciences and humanities including at least one course from three of the following areas: cultural anthropology, economics, psychology, sociology or applied behavioral sciences	24
<i>Unrestricted Electives</i>	35
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.

DESIGN challenges students whose professions will involve them in constructing the future shape of our everyday lives. Through visual and aesthetic communication they will build a real time/space environment. The primary factor in a designer's relationship to the community or environment is a knowledgeable, sound background in design. Without such expertise the relationship is meaningless. The designer must have the skill to be imaginative yet practical.

The curriculum in design offers emphasis in costume, textiles, and environments with supporting graphics courses. This is not a static program but changing in content and size to reflect the needs of the students and faculty. Through individual planning the program offers flexibility to allow for (1) concentration on specialty, (2) preparation for graduate design programs in universities and professional schools, (3) general education in design stimulating the creativity of the individual, and (4) techniques for self-education throughout one's entire life-span.

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*.

Students should contact departmental advisers for up-to-date lists of courses which are accepted for the Breadth Subject Matter requirement.

** 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 English 1, 2, 3, 4A 4B, 5F or 5P)	4
English (from the above) or rhetoric (Rhetoric 1 or 3)	4
American History and Institutions‡	8
Economic principles (Economics 1A-1B)	10
Statistics (Mathematics 13)	4
Mathematics, including calculus	6
<i>Depth Subject Matter</i>	38-40
Theory: Agricultural Economics 100A-100B-100C, Economics 101	14
Statistics: choose two courses from Agricultural Economics 106A, 106B, 155	6
Senior Research: Agricultural Economics 190A, 190B	4
Policy and planning: choose four courses from Agricultural Economics 120, 148; Economics 125A, 125B, 130, 131, 152; Applied Behavioral Sciences 151A, 151B, or equivalent	14-16
<i>Breadth Subject Matter</i>	32
Natural sciences (including mathematics beyond Preparatory Subject Matter requirement) and agriculture (excluding agricultural economics and consumer economics)	12 minimum
Social sciences (excluding economics), history, and philosophy	12 minimum
<i>Restricted Electives</i>	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 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, food science, communication, and management. This major fulfills the academic requirements for admission into a dietetics internship or the equivalent which must be completed 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 institutions. Students will be qualified for admission to graduate programs in dietetics, nutrition science, public health nutrition, and food service management.

Students wishing to complete requirements for the *Clinical* or *Community Nutrition* options in Dietetics should elect those courses specified under the suggested electives.

*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 Sciences as interpreted under the Social Sciences Breadth Subject Matter requirement.

It may be necessary to limit enrollment in this major due to limitation of UCD resources.

Bachelor of Science Major Requirements*	UNITS
<i>Preparatory Subject Matter</i>	43-50
Written expression (English 1)	4
Oral expression (Rhetoric 1,3)	4
Statistics (Mathematics 13 or Economics 12)	4
Physics (Physics 2A-2B-2C or 10 or Agricultural Engineering Technology 121, 121L, Consumer Technology 17, 17L)	4-9
Chemistry, general and organic (Chemistry 1A, 1B, 8A, 8B)	16
Biology (Biological Sciences 1)	5
Bacteriology with laboratory (Bacteriology 2,3)	5
Computer logic or programming (Consumer Technology 31 or Mathematics 19)	1-3
<i>Depth Subject Matter</i>	59-61
Biochemistry (Biochemistry 101A, 101B)	6
Physiology (Physiology 101, 101L)	7
Food Science and Technology 100A, 100AL, 100B, 100BL	10
Nutrition 110, 111, 111L, 116A, 116B, 190; and 114 or 117 or 118	20-22
Food Service Management 125, 126, 127	12
Agricultural Economics 112	4
<i>Breadth Subject Matter</i>	16-20
Principles of economics (Economics 1A or 2A-2B)	5-7
Sociology or cultural anthropology	4
General psychology, Psychology 2B or 10	4-5
Principles of learning or methods of teaching (Applied Behavioral Sciences 161 or Home Economics Education 300 or Education 110)	3-4
<i>Electives</i>	49-62
<i>Restricted:</i>	
For the <i>Clinical Dietetics</i> specialization include the following courses:	
Biochemistry laboratory (Biochemistry 101L or 102)	4-5
Chemistry, qualitative and quantitative analysis (Chemistry 1C, 5)	9
Human Anatomy (Medicine) 102	4
For the <i>Community Nutrition</i> specialization include the following courses:	
Nutrition 118, 118L, 119	7
Anthropology 2	4
Sociology 3, 130, 143	12
<i>Unrestricted:</i>	
The following courses recommended depending upon the stu- dent's specific career goals: Epidemiology and Preventive Medicine 150; Food Science and Technology 1, 104, 104L, 107, 108A-108B, 112; Consumer Science 100, 135; Plant Sci- ence 2; Viticulture and Enology 3; Applied Behavioral Sci- ences 151A, 151B; Economics 11A-11B; Work-Learn 192.	
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 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 community 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
<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 collection 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
Total Units for the Degree	180

The ENVIRONMENTAL PLANNING AND MANAGEMENT major provides opportunities to study the relationships between man and the environment through a common core of courses, and the development of special competence in one of five options. Positions illustrative of each option are listed to indicate the employment opportunities in the public or private sector that may be available to graduates with additional study and/or experience.

1) *Environmental Interpretation* emphasizes interpretative programs and communication processes to promote ecological and historical awareness and understanding: park naturalist, outdoor education specialist, conservation information officer.

*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.

2) *Environmental Planning* is a preprofessional program emphasizing the use of information to develop alternatives for decisions on the form, function, and future of urban and natural areas: urban and regional planner, planning consultant, resource analyst.

3) *Landscape Architecture* is a preprofessional program emphasizing the design and development of landscapes: landscape architect, landscape contractor, recreation planner.

4) *Landscape Management* emphasizes development, maintenance, and operation of landscaped areas and facilities: park superintendent, landscape contractor, golf course superintendent, maintenance contractor.

5) *Park and Recreation Administration* is a preprofessional program that emphasizes the administrative processes in the allocation, development, and management of park and recreation systems, areas, and facilities: park and recreation director, park ranger, park superintendent, resort manager, recreation planner.

The Environmental Planning and Management advisers recommend career experience through work-learn internships, summer jobs, or stopping out for a quarter or more to work with appropriate public agencies or private firms.

Bachelor of Science Major Requirements*

UNITS

<i>Common Core Courses</i>	70
Lower Division:	
Chemistry (Chemistry 1A or 10)	4†
Physics (Physics 2A or 10)	3†
Earth sciences (Geography 1, Geology 1, Soil Science 2 or Water Science 2)	6†
Biology (Biological Sciences 1 or 10)	4†
Mathematics (Mathematics 13, 16A, 16B, 19, 29, 36 or Agricultural Science and Management 150)	6†
Environmental quality (Environmental Planning and Management 1)	3
Landscape design (Environmental Planning and Management 20, 22)	6
Economics (Economics 1A, 1B or 2A)	4†
Other social sciences: introductory courses in at least two of the following subject areas: cultural anthropology (Anthropology 2), cultural geography (Geography 2), psychology (Psychol- ogy 2B, 2C or 10), sociology (Sociology 1)	11†
Expository writing (English 1)	4
Public speaking (Rhetoric 1 or 3)	4
Humanities elective	4
Upper Division:	
Urban and regional planning (Environmental Planning and Management 110)	4

*For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses may be taken with the adviser's approval. *Courses shown without parentheses are required.*

†Minimum units are indicated. If more units are taken in order to meet this unit requirement, the extra units may be counted as Individual Requirements. Additional courses in the same subject to be used as Individual Requirements must be approved by an adviser.

Outdoor recreation (Environmental Planning and Management 116)	4
General ecology (Botany 117, Entomology 104, Environmental Studies 100 or Zoology 125)	3†
<i>Depth Subject Matter</i>	80
<i>Environmental Interpretation Option</i>	
Chemistry 1B	5
Botany 2	5
Zoology 2	6
Entomology 1	5
Environmental horticulture (Environmental Horticulture 6)	3
Environmental Planning and Management 160	3
Plant taxonomy (Environmental Horticulture 105 or Botany 108)	4
Animal ecology (Zoology 125, Entomology 104 or Environmental Studies 110)	3†
Plant ecology (Botany 101, 117 or Plant Science 101)	3†
Meteorology (Atmospheric Science 20 or Geography 3)	3†
Resource economics (Agricultural Economics 147 or 148)	4
History (History 183A, 183B, 189A or 189B)	8
Communication (English 5F, 5P, 20, 100A, 100B, 100C, 103; Rhetoric 3, 41, 42, 150, 151, 155A, 155B or 156)	8
Individual requirements**	20
<i>Environmental Planning Option</i>	
Natural sciences (Botany 2 and Wildlife and Fisheries Biology 10 or Zoology 2; or with approval, such courses as, Environmental Studies 131, Atmospheric Science 20, Water Science 120, Zoology 116)	7†
Environmental awareness (Environmental Studies 170)	4
History of urban form (Art 168)	4
Urban geography (Geography 155)	4
Urban economics (Economics 125A)	4
Urban society (Sociology 143)	4
Drafting and perspective (Design 21)	4
Local government and politics (Political Science 100)	4
Cartography (Geography 105) or Interpretation of aerial photography (Geography 106)	4
Public mechanisms for controlling land use (Environmental Studies 160)	4
Individual requirements**	37
<i>Landscape Architecture Option</i>	
Botany 2	5
Wildlife and Fisheries Biology 10 or Zoology 2	4†
Introduction to environmental plants (Environmental Horticulture 6)	3
Design (Art 16, Design 21, or Engineering 4)	3†
Three dimensional design (Art 14, 112A, or 121A)	4
Landscape construction (Environmental Horticulture 104)	3
Taxonomy and ecology of environmental plants (Environmental Horticulture 105)	4
Landscape horticulture (Environmental Horticulture 128A, 128B or 130A, 133)	5†
Design of recreation environments (Environmental Planning and Management 136)	3

**Courses selected with the adviser's approval to complement each student's program option in this major. The list of courses to be used as Individual Requirements must have the adviser's approval no later than Winter Quarter of the junior year.

†Minimum units are indicated. If more units are taken in order to meet this unit requirement the extra units may be counted as Individual Requirements. Additional courses in the same subject to be used as Individual Requirements must be approved by an adviser.

Site planning and design (Environmental Planning and Management 151)	4
Advanced landscape construction (Environmental Planning and Management 154)	4
Plant selection for environmental design (Environmental Planning and Management 155)	3
Landscape design problems (Environmental Planning and Management 183, 184)	8
Individual requirements**	27
<i>Landscape Management Option</i>	
Botany 2	5
Wildlife and Fisheries Biology 10 or Zoology 2	4†
Landscape construction (Environmental Horticulture 104)	3
Taxonomy and ecology of environmental plants (Environmental Horticulture 105)	4
Landscape horticulture (Environmental Horticulture 128A, 128B or 130A, 133)	5†
Pest control (Entomology 110, Nematology 110, Plant Pathology 120, Plant Science 120)	8
Plant Science 101, 102 or 109	7
Fundamentals of business organization (Agricultural Economics 112)	4
Environmental awareness (Environmental Studies 170)	4
Individual requirements**	36
<i>Park and Recreation Administration Option</i>	
Botany 2	5
Wildlife and Fisheries Biology 10 or Zoology 2	4†
Introduction to environmental plants (Environmental Horticulture 6)	3
Landscape horticulture (Environmental Horticulture 128A, 128B or 130A, 133)	5†
Park administration (Environmental Planning and Management 122)	4
Planning of recreation environments (Environmental Planning and Management 134)	4
Design of recreation environments (Environmental Planning and Management 136)	3
Park operations (Environmental Planning and Management 144)	4
Urban economics (Economics 125A) or natural resources economics (Agricultural Economics 147)	4
Public administration (Agricultural Economics 112, Political Science 181, 182 or 183)	4
Environmental awareness (Environmental Studies 170)	4
Individual requirements**	37
<i>Unrestricted Electives</i>	30
Total Units for the Degree	180

ENVIRONMENTAL TOXICOLOGY deals with the properties, fate, biological effects, detection and regulation of natural and man-made toxicants present in the environment. Toxicants studied in the major include pesticides, pollutants,

**Courses selected with the adviser's approval to complement each student's program option in this major. The list of courses to be used as Individual Requirements must have the adviser's approval no later than Winter Quarter of the junior year.

†Minimum units are indicated. If more units are taken in order to meet this unit requirement, the extra units may be counted as Individual Requirements. Additional courses in the same subject to be used as Individual requirements must be approved by an adviser.

industrial chemicals, and poisons produced by microbes, plants, and animals. The objective of the major is to provide training which will enable students to apply the principles of the physical and biological sciences to the study of toxicants as a basis for solving problems occasioned by the presence of toxicants. Through the appropriate choice of electives, students have the opportunity to specialize in any one of several areas of environmental toxicology. Students electing to emphasize the application of the physical sciences to the study of toxicants would qualify for positions in residue analysis, environmental monitoring and forensic toxicology. Those electing to emphasize the application of the biological sciences to the study of toxicants would qualify for positions in animal toxicology, environmental health and safety, and pest control. The major can also serve as preparation for graduate school.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	58-63
Biological sciences (Biological Sciences 1)	5
Other biological sciences (entomology, zoology, botany, bacteriology, physiology)	10-12
Chemistry (Chemistry 1A-1B-1C and 8A-8B or 128A-128B-128C)	21-24
Environmental science (Environmental Toxicology 10)	3
Mathematics (Mathematics 16A-16B or 21A-21B, 13, 19)	13
Physics (Physics 2A, 2B)	6
<i>Depth Subject Matter</i>	53
Biochemistry 101A, 101B	6
Environmental Toxicology 101, 112A, 112B, 114A, 114B, 130A-130E, 138	23
Electives selected for area of specialization with approval of adviser	24
<i>Breadth Subject Matter</i>	50
English and/or rhetoric	8
Social sciences and humanities electives†	12
Electives selected with approval of adviser to complement pro- gram options: courses in agricultural economics, environ- mental studies, sociology, political science, and psychology are particularly recommended	30
<i>Unrestricted Electives</i>	13-20
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 microorganisms as production and processing agents. A broad interdisciplinary food-related education is offered which may be combined with specializations in *enology* (wine studies), *brewing science*, and *fermentation* of other foods and beverages. Industrial fermentations such as those used in the production of microbial cells, drugs,

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

enzymes, solvents, acids, and vitamins, in the expansion of the food supply, and in waste management and preservation of the environment, are further opportunities for study. Courses are selected in consultation with advisers. Graduates qualify for supervisory, technical, research, sales, or executive positions in the food, beverage, and allied industries, in the fermentation industries, and in government agencies.

The major provides preparation for graduate study leading to the M.S. degree in Food Science and the M.S. and Ph.D. degrees in Microbiology, Agricultural Chemistry or Biochemistry.

It may be necessary to limit enrollment in this major due to limitations placed on UCD resources.

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 approval physical or natural sciences†	6
Written or oral expression (English 1, 2, 5F, 5P, and/or Rhetoric 1)	8
<i>Depth Subject Matter</i>	30
Choose from: Viticulture and Enology 3, 123, 124, 125, 126, 140, 217, 219; Food Science and Technology 102, 104, 104L, 105, 106, 110A, 110B, 111, 235; Biochemistry 123; Bacteriology 105A, 105B, 105AL, 105BL, 130A-130B-130L, 230, 250; Engineering: Agricultural 245; Nutrition 122; Environmental Toxicology 180; Physiology 103; Water Science 116, 120, 124.	
<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

*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.

‡Chemistry 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.

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 16A, 16B, 16C or 21A, 21B, 21C) and one course from Mathematics 13, 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	8
<i>Depth Subject Matter</i>	27
Food Science and Technology, including 103, 113, and 125	23
Biochemistry 123, 123L	4
<i>Breadth Subject Matter</i>	22
Social sciences and humanities, including 4 units of rhetoric†	22
<i>Restricted Electives</i>	28
Three upper division courses from biochemistry, plant or animal physiology, and bacteriology (e.g., Biochemistry 122, 153; Physiology 100A, 100B; Bacteriology 130A-130B; Food Science and Technology 104) and two upper division courses from environmental toxicology, public health, and nutrition	15
Other courses in area of food biochemistry	13
<i>Unrestricted Electives</i>	20-25
Total Units for the Degree	180

FOOD SCIENCE applies physical, biological, engineering, and social sciences to processing, preservation, packaging, storage, evaluation and utilization of foods. Instruction emphasizes the principles of biology, chemistry, microbiology, and other sciences as they are applied to the conversion of raw materials into processed foods. General principles are stressed, not specific food commodities.

*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 requirements may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Students completing this major receive excellent training and experience for employment in the world's largest industry, the food industry. Opportunities for employment include positions in the food and allied industries where graduates can engage in processing, sensory evaluation, quality assurance, product development, research, and management functions; in education as teachers; and in research, extension, and administration. Local, state and federal governments offer opportunities for employment as research supervisors, in regulatory agencies, in policy and management positions. Graduate study for the Food Science graduate may lead to the M.S. degree in Food Science or the Ph.D. degree in related fields such as agricultural chemistry, biochemistry, microbiology 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, 5F, 5P 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>	38
Selected in accordance with student's educational goal and upon approval of adviser.	
<i>Unrestricted Electives</i>	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, as well as 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 or her 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.‡

* 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.

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

‡ To fulfill the academic requirements for an internship in Dietetics add: Biochemistry 101A-101B, Nutrition 116A-116B, and 3 units of principles of education. From Breadth Subject Matter, choose Psychology 2B and a course in anthropology or sociology.

Bachelor of Science Major Requirements*

UNITS

<i>Preparatory Subject Matter</i>	65
Written expression (English 1, 2, 5F)	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)	7
Bacteriology with laboratory (Bacteriology 2, 3)	5
<i>Depth Subject Matter</i>	53
Consumer Science 100: Food Science and Technology 100A, 100AL, 100B, 100BL	13
Nutrition 102A-102B, 102L	9
Microbiology of food (Food Science and Technology 104)	3
Food Service Management 125, 126, 127	12
Business law (Agricultural Economics 18)	4
Fundamentals of business management (Agricultural Economics 112, and 113 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>	54
The following courses recommended depending upon student's specific career goals: Applied Behavioral Sciences 151A-151B; Agricultural Economics 130; Economics 134, 150, 151; Epidemiology and Preventive Medicine 150; Food Science and Technology 104L, 108A-108B, 112; Plant Science 112; Viticulture and Enology 3.	
Total Units for the Degree	180

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>	57-68
Biological sciences (Biological Sciences 1)	5
Two of the following courses or course sequences: Bacteriology 2 and 3, or 102 and 103; Botany 2; Zoology 2	9-12

*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.

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) ..	13-16
Depth Subject Matter	22-25
Biochemistry 101A-101B	6
Genetics 100A-100B-100L	7
Three additional courses in genetics	9-12
Breadth Subject Matter	36
English and/or rhetoric	8
Social sciences and humanities†	28
Restricted Electives	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
Unrestricted Electives	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 community college levels after completion of a one-year credential program. The program encompasses the broad field of family and consumer sciences combining laboratory work with academic theory in such areas as human (child) development, food science, nutrition, and textiles.

Graduates are qualified to enter graduate programs in Child Development and Consumer Science, or with additional courses in biological sciences, the M.S. degree program in Food Science and Nutrition.

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

It may be necessary to limit enrollment in this major due to limitations placed on UCD resources.

Bachelor of Science Major Requirements*

UNITS

Preparatory Subject Matter	58-60
Biological and physical sciences:	
Biological sciences (Biological Sciences 1)	5
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Statistics (Mathematics 13 or Economics 12)	4-5
Additional course(s), recommended:	
bacteriology, physiology, or physics	4

* 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.

Social sciences and humanities:	
Cultural anthropology (Anthropology 2) or sociology	4
Introduction to design	4
Economics (Economics 1A)	5
Written or oral expression (English 1, 2, 5F, 5P, and/or Rhetoric 1)	8
Psychology 2B or 10	4-5
Additional course(s), recommended:	
Economics 1B or Psychology 2C	4-5
<i>Depth Subject Matter</i>	60
Consumer Economics 141, 142	8
Food Science and Technology 100A, 100B	6
Human Development 100A, 100B	8
Consumer Science 140	4
Nutrition 102A, 102B	8
Textiles and Clothing 7, 172 (clothing); 6, 160 or 162 (textiles)	11
Restricted Electives	15
Applied Behavioral Sciences 150; Biological Sciences 12; Consumer Science 100, 145; Consumer Technology 111; Design 180A-180B-180C; Food Science and Technology 100AL, 100B, 112; Human Development 30A-30B, 100C or 110; Nutrition 102L, 118; Textiles and Clothing 17A, 17B, 160, 160L or 162, 162L.	
<i>Unrestricted Electives</i>	60-62
Total Units for the Degree	
	180

HUMAN (CHILD) DEVELOPMENT is an appropriate undergraduate major for students wanting to explore the developmental process in humans throughout the life cycle. Concentrating on the periods between birth and young adulthood, cognitive and personality/social development are studied from various perspectives. The emphasis is on the interrelationship of the development of the person, the family, and the community. It is an appropriate major for those planning to pursue advanced degrees in the behavioral sciences and offers course work useful for persons who will later pursue careers in education, child guidance, social welfare, health science related fields, or research in human development. Students of Human Development observe infants, children, and adults in a variety of situations. They may also participate in study projects with people from different socioeconomic and cultural backgrounds who function in a variety of institutional settings (schools, hospitals, mental health clinics, and group foster homes).

Students enrolled in the major are required to consult an academic adviser in the Human Development program.

Students who anticipate exploring the biological aspects of Human Development should include in their preparatory course work the prerequisites for upper division biological sciences courses.

Bachelor of Science Major Requirements*

UNITS

<i>Preparatory Subject Matter</i> (must be completed prior to admission to major)	44-47
Anthropology 1 and 2	8
Biological Sciences 1 (or its equivalent)	5
Genetics 10, or 100A-100B or 115	4-6
Nutrition 10 or 102A	3-4
Physiology (Physiology 2 or 101 recommended)	4
Psychology 2A, 2B, 2C	13
Statistics (Mathematics 13)	4
Human Development 30A-30B	3
<i>Depth Subject Matter</i>	48
Human Development, upper division courses to include 100A-100B-100C	20
Additional upper division Human Development or related courses from list of restricted electives as determined in consultation with faculty adviser	28
<i>Breadth Subject Matter</i>	20
English or rhetoric, to include at least one upper division course, one course emphasizing expository skills (English 1, 2, 3, 103, or Rhetoric 1) and one course emphasizing criticism or analysis of persuasive forms (English 45, 110A or Rhetoric 120)	12
American history or political science	8
<i>Unrestricted Electives</i>	65-68
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.

Bachelor of Science Major Requirements*

UNITS

<i>Preparatory Subject Matter</i>	54-55
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Physics	4
Mathematics (Mathematics and/or statistics)	6-7

* 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.*

Economics	5
Biological sciences (animal or plant physiology, bacteriology, biochemistry, botany, genetics, zoology)	15
English and/or rhetoric	8
<i>Depth Subject Matter</i>	34
International Agricultural Development 101 or 102 and 190, and (International Agricultural Development 10, 195, 198, 199)	10
Primary field of specialization	24
Courses chosen to provide depth of understanding in one of the following, or closely related, fields and to include at least 16 upper-division units: agricultural economics, animal sciences, environmental sciences, food sciences, plant sciences, resource sciences; additional units earned in in- ternational agricultural development courses may be used in partial satisfaction of this specialization requirement.	
<i>Breadth Subject Matter</i>	18
Social sciences and humanities†	18
<i>Restricted Electives</i>	44
Agricultural and other science electives (including added mathematics)	16
Economics or agricultural economics	8
Humanities and social science courses relevant to an under- standing of development (Anthropology 2, 122, 123, 162, 165; Economics 118; Environmental Studies 101, 133; Geography 2, 5, 141, 142; History 188A, 188B; Political Science 4, 108, 109A, 109B, 145, 170, 178, 185A; Sociology 1, 102, 141, 144) or other courses of comparable emphasis**	20
<i>Unrestricted Electives</i> ‡	29-30
Total Units for the Degree	180

The NATIVE AMERICAN STUDIES major is designed to affect the lives of American Indian people as directly as possible. In order to accomplish this the major is designed to prepare persons to: (1) work with Indian people as community service personnel, teachers, tribal administrators, etc.; (2) understand Indian values and problems; (3) develop data and creative products directly usable by Indian people or by schools and agencies serving Indian people; (4) apply results of past experiences or research to finding solutions to the many problems faced by Indian communities; (5) further creative development of Indian people through innovations within the context of Indian artistic and musical traditions; and (6) enter into graduate programs either in Native American Studies or in related fields. The student, in consultation with the Native American Studies Major Review Committee, will select the course sequence most appropriate for the student's educational goals. A minimum of 20 units shall be in a primary field of specialization.

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

**Students with special interest in particular countries or regions may obtain approval of the adviser to elect social science courses appropriate to such interests in satisfying this requirement.

‡Students not proficient in a foreign language should choose courses in a single language through course 3 as electives.

Bachelor of Science Major Requirements*

UNITS

<i>Preparatory Subject Matter</i>	36
Introduction to Native American studies (Native American Studies 1)†	4
Native American experience (Native American Studies 20)†	4
Native American art (Native American Studies 33)†	4
<i>Inquiry courses</i> which develop intellectual skills in: scientific methods, research methods, statistics, logical thinking, and systems analysis	4
<i>Creative expression</i> courses which explore and develop creative powers (e.g., art, music, design, etc.)	4
<i>Personal and social behavior</i> courses which build an understanding of the dynamics of human relationship from the individual to the international level (e.g., psychology, sociology, anthropology, literature, communication, etc.)	8
<i>Ecological and environmental studies</i> courses which build an understanding of the dynamic interaction of man and man's environment (e.g., life science, earth science, environmental science, etc.)	8
<i>Depth Subject Matter</i>	69
Native American ethno-history (Native American Studies 130A-130B-130C)	12
Native American community development (Native American Studies 161)	4
Field experience in Native American studies (Native American Studies 195)	12
Native American studies senior project (Native American Studies 196)	5
Individualized program to be determined by the student and the Native American Studies Major Review Committee (a minimum of 20 units shall be in a primary field of specialization)	36
<i>Breadth Subject Matter</i>	32
Additional inquiry courses	8
Additional creative expression courses	8
Additional personal and social behavior courses	4
Additional ecological and environmental studies courses	4
Additional units from the above four categories	8
<i>Unrestrictive Electives</i>	43
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, vet-

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

†Students may substitute other Native American Studies courses with the approval of the Native American Studies Major Review Committee.

erinary medicine, public health, dietetics,[†] and other health sciences; (3) technical work in nutrition in animal, food, and pharmaceutical industries; (4) technical writing; and (5) health education. Students should consult their adviser with respect to additional courses appropriate to their specific interest.

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 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, 5F, 5P 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.	
<i>Breadth Subject Matter</i>	20
Courses in social sciences and humanities.	
<i>Restricted Electives</i>	47
Biochemistry laboratory (Biochemistry 101L, 102, 123)	3-5
Calculus or physics (excluding Physics 10)	6
Foods and food science	6
Physiology with laboratory (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.

*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, choose the following courses from the categories in which they appear above: English 1, Rhetoric 1, Psychology 2B or 10, Sociology or Anthropology 2, Economics 1A, Physics 2A, 2B, 2C; Food Science and Technology 100A, 100B, Nutrition 110, 111, 111L, 116A, 116B, 190 and 114 or 117. The following courses must be added: Agricultural Economics 112; Food Science and Technology 100AL, 100BL; Consumer Technology 31; Food Service Management 125, 126, 127; Applied Behavioral Sciences 173 or Education 110. Students intending to apply for admission to a dietetic internship must contact the Master Adviser in Dietetics no later than the first quarter of the junior year for information on procedures.

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 sciences 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

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, crop protection, 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>	38-39
Plant science (Plant Science 1, 2)	7
Soil science (Soil Science 2)	4
Water science (Water Science 2 or 110A)	3-4
Entomology (Entomology 110 or 112)	4
Nematology and/or weed science	4
Genetics (Genetics 100A, 100B)	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.*

Plant pathology (Plant Pathology 120)	4
Plant physiology (Botany 111A, 111B)	6
Breadth Subject Matter	20
Written expression (English 1, 2, or 5F)	4
Oral expression (Rhetoric 1 or 3)	4
Social sciences and humanities electives†	12
Restricted Electives	45
Courses supportive of the major in the agricultural and natural sciences and in economics and agricultural economics, selected with the approval of adviser. Should include at least three courses in the area of specialization or closely related field.	
Specialization may be taken in: agronomy, floriculture, landscape horticulture, nursery management, plant pathology, pomology, vegetable crops, and viticulture.	
Unrestricted Electives	40-41
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 least 84 quarter units of credit with a grade-point average of C or higher. In addition, the student 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.

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

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

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 experience, 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 and/or water science (Soil Science 2 and two upper division courses from Soil 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
Wildlife ecology (Wildlife and Fisheries Biology 135, 151 or Entomology 104)	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 offers an opportunity for a general education in the natural resources, providing maximum adaptability in meeting individual needs, interests, and objectives. The program serves particularly well (a) the needs of students possessing significant but nonspecific interests in the natural resources of California and adjacent states; (b) the

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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.

careers and activities associated with resource utilization and management; (c) students contemplating natural resources-related occupations, but who are uncertain regarding the selection of a specific major; and (d) students whose academic goals involve acquisition of multiple interest capabilities not provided through traditional programs. All Renewable Natural Resources programs, regardless of emphasis, integrate the benefits of a "core" of essential social, physical, and biological sciences with the advantages of a large block of elective courses. Campus counseling and Work-Learn Center assistance complement adviser efforts to insure students maximum opportunity for personal development and professional satisfaction.

The major will prepare the student for participation as an enlightened citizen in resource issues of public concern. Employment in general areas of natural resource use, education, and conservation is open to graduates. With appropriate electives, this major can provide preparation for graduate programs.

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 pre-

* 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.

pare for a career involving these resources as well as for those who have a more general interest in their use and protection. Programs are designed to meet the needs of students having interests which may include land use, soil survey, soil management and conservation, plant nutrition, diagnostic technology, irrigation and drainage, water resources management, water quality, general soil science, and general water science. For example, those wishing to emphasize water quality 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 agri-businesses such as 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>	60
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Mathematics, including calculus, statistics, and computer programming	13
Chemistry, including Chemistry 1A-1B or 4A-4B, and a more advanced course	13
Physics (Physics 2A-2B-2C or 4A-4B-4C)	9
Economics or agricultural economics	3
English	8
Rhetoric	4
<i>Depth Subject Matter</i>	45
Physical sciences, biological sciences and/or mathematics with approval of adviser	18
Soil Science 2	4
Water Science 2	4
Upper division soil science and water science	16
Special study or experience (Soil Science 199, Water Science 199, or Work Learn 192 in the major area)	3
<i>Breadth Subject Matter</i>	22
Social sciences and humanities†	13
At least one upper division course chosen with adviser's approval from each of the following three areas: resource management; environmental law; environmental economics and decision making	9
<i>Restricted Electives</i> to supplement or expand areas of student interest selected with approval of adviser	29
<i>Unrestricted Electives</i>	24
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.*

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

The **TEXTILES** major is concerned with the study of the chemical and physical properties, applications, and care of fibers and fabrics; their use in design; and the socioeconomic aspects of textiles. Two options are offered: *Textile Science* places emphasis on the *scientific disciplines* related to textiles and can lead to careers in research and development, technical service, product control, merchandising, and marketing; *Consumer Textiles* stresses the social science-business aspects of textiles and clothing and can lead to careers in merchandising, extension service, design, creative writing, and teaching (after completion of an additional year in the teaching credential program). Students interested in a career in textile chemistry are advised to take additional elective course work in chemistry, physics, and mathematics after consultation with the Master Adviser. This major qualifies students to enter graduate programs such as the M.S. degree programs in Consumer Science and Agricultural Chemistry with specializations in Textiles and Clothing or Textile Science.

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

Bachelor of Science Major Requirements*

<i>Consumer Textiles Option</i>	UNITS
<i>Preparatory Subject Matter</i>	52-58
Cultural anthropology (Anthropology 2)	4
Introductory psychology (Psychology 2B or 10)	4-5
Statistics (Mathematics 13 or Economics 12)	4-5
Sociology (Sociology 1 or 3)	4-5
History or art, one course	3-4
Written expression, two courses (English 1, 2, 5F, 5P)	8
Oral expression, one course (Rhetoric 1)	4
Economics, principles of (Economics 1A, 1B or 2A, 2B, 2C)	10
Physical and biological sciences, two courses (Chemistry 10 or Physics 10, Biological Sciences 10)	8-10
Computer science (Mathematics 19)	3
<i>Depth Subject Matter</i>	51
Textiles and Clothing 6, 7, 17A, 17B, 162, 162L, 172, 175, 180A-180B	28
Consumer Economics 141	4
Consumer Science 100	3
Design 143 or 144	3
Agricultural Economics 18, 112	8
Psychology 145	5
<i>Restricted Electives</i>	30
Choose from courses: Agricultural Economics 113, 117; Psychology 2C; Design 142A, 142B, 170A, 170B, 170C; Economics 11A, 11B, 134; Rhetoric 42, 155A; Sociology 123, 126, 140, 148; Mathematics 16A, 16B, 16C; Textiles and Clo- thing 47.	
<i>Unrestricted Electives</i>	41-47

* 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.*

Textile Science Option

<i>Preparatory Subject Matter</i>	57-65
Cultural anthropology (Anthropology 2) or Sociology, one course (Sociology 1 or 3)	4-5
Chemistry, including organic (Chemistry 1A-1B and 8A-8B or 128A-128B-128C)	16-19
Physics (Physics 2A and 2B or 10)	4-6
Introductory psychology (Psychology 2B or 10)	4-5
Statistics, one course (Mathematics 13 or Economics 12)	4-5
Written expression, two courses (English 1, 2, 5F, 5P)	8
Oral expression, one course (Rhetoric 1)	4
Economics, principles of (Economics 1A-1B or 2A-2B-2C)	10
Computer science (Mathematics 19)	3
<i>Depth Subject Matter</i>	40
Textiles and Clothing 6, 7, 160, 160L, 161, 161L, 162, 162L, 172, 180A-180B	25
Consumer Economics 141	4
Agricultural Economics 18, 112	8
Consumer Science 100	3
<i>Restricted Electives</i>	35
Choose from courses: Agricultural Science and Management 150; Agricultural Economics 113, 117; Biological Sciences 1; Chemistry 1C, 5, 107A, 107B, 108; Economics 11A, 11B, 134; Mathematics 16A, 16B, 16C; Physics 2C; Textiles and Clothing 17A, 17B, 47, 175; Rhetoric 42, 155A; Psychology 145.	
<i>Unrestricted Electives</i>	40-48
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 for ecological stability, recreation, and 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 provides training in biology appropriate to careers as wildlife or fisheries biologists, animal control specialists, game or fish technicians, or, following additional academic preparation, for careers in teaching, 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, 105A)	14
Physics (Physics 2A, 2B, 2C)	9
Zoology (Zoology 2)	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.

<i>Depth Subject Matter</i>	25-28
Biochemistry (Biochemistry 101A, 101B).....	6
Ecology (Environmental Studies 100 or Entomology 104 or Zoology 125)	3-4
Genetics (Genetics 100A, 100B)	6
Physiology (Physiology 110A, 110B or Physiology 101 plus one additional upper division physiology course; Physiology 101L does not satisfy this requirement)	6-7
Zoology (Zoology 105 or 106)	4-5
<i>Breadth Subject Matter</i>	20
English I and Rhetoric I, or equivalents	8
Social science and humanities†	12
<i>Courses in the Major</i>	16
Wildlife and Fisheries Biology 108	4
Upper division courses selected with adviser's approval from: Wildlife and Fisheries Biology 110, 110L, 111, 111L, 120, 121, 122, 135, 135L, 140, 151, 152, 152L, 190, 198, 199	12
<i>Additional courses (select Plan I or Plan II)</i>	15-19
<i>Plan I: Wildlife Biology specialization</i>	
Botany 108	5
Botany 117	4
Wildlife and Fisheries Biology 101	6
<i>Plan II: Fisheries Biology specialization</i>	
Entomology 116	3
Environmental Studies 140 or 150C	3-4
Mathematics 19, 105B	6
Wildlife and Fisheries Biology 102	6
<i>Unrestricted Electives</i>	37-44
	<hr/>
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 170 and 529.

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

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.

Twelve undergraduate engineering curricula are offered at Davis: Aeronautical, Agricultural, Chemical, Civil, Electrical, Mechanical Engineering, and Materials Science and Engineering, in addition to five formal double-major programs. 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 established curricula.

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 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 21.

There are no separate or additional requirements for admission to the College of Engineering. However, it is advisable that students who plan to study engineering include in their high school programs the following subjects:

<i>Subject Areas</i>	<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, 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 UCD 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 the 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 or she 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	

* Or equivalent integrated courses covering same subject material.

be in chemistry for engineering and science students and at least 12 units in physics for engineering and science students).....	27
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
	—
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 the student's 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 20 to 25 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 or her own choice whenever the student has an alternative preference. A close relationship between the student and the 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*, Temporary Building 115.

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 the 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 or her future choice of curriculum is encouraged to make use of the many sources of advising and counseling available to students. These include the faculty adviser, instructors, student advisers, the academic deans in the College Office, and personnel in the Counseling Center, the Office of Placement Services, and the Office of Student Development.

A number of freshman 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 Upper Division programs.

PLANNING A PROGRAM

The student is responsible for planning his or her own program. Many

sources of assistance are available. A student is strongly urged to consult with a faculty adviser each quarter prior to registration for classes. Program planning assistance is also available from the student advisers in the Student Center in Bainer Hall, *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 five additional required courses are prerequisite to required upper division Engineering courses. They are: Engineering 5A, 17, 35, Physics 4A, and 4C. These five 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. 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 students avoid courses for which they are 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:

- a. Mathematics 11 (if not completed in high school)
- b. Mathematics 21A (if not completed in high school)
- c. Subject A (if not yet otherwise satisfied)
- d. Other (Engineering 3 or 4, English 1, Rhetoric 1, or other humanities-social sciences electives; Chemistry 1A or 4A)

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

Students who plan to graduate, or are considering the possibility of graduat-

ing, under the Chemical Engineering curriculum should take Chemistry 4A-4B-4C in the 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 five 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 usually receives normal pay for the work assignment and may expect each assignment to entail responsibilities appropriate to his or her 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. 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, 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 on a part time basis or for the three- or four-month summer period. Because of the hours spent off campus, the time needed to complete the undergraduate program may be extended to approximately five years, unless only part-time or summer assignments are involved. Students who have participated in the program generally express the

opinion that the advantages far 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 a 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 42-44) 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 the twelve approved curricula (in Aeronautical, Agricultural, Chemical, Civil, Electrical, and Mechanical Engineering, Materials Science and Engineering, and formal double majors 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 or her faculty adviser, and submit it to the College Committee on Undergraduate Study for approval. Requirements for the Individual Engineering Major are given on page 160.

The student is held responsible for planning his or her 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 or she 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 186) satisfy parts of the student's chosen curriculum. Duplicate credit may not be earned in courses for which Advanced Placement Credit has been allowed.

Minimum Rate of Progress

A full-time regular undergraduate student in the College of Engineering who does not pass at least 36 units during his or her first three terms of enrollment on the Davis campus is placed on probation. A full-time regular undergraduate student in the College of Engineering who does not pass at least 30 units during his or her first three terms of enrollment on the Davis Campus is subject to disqualification.

After three terms of enrollment at Davis, a full-time regular undergraduate student in the College of Engineering who does not pass at least 12 units in any term, or at least 40 units during any three consecutive terms, is placed (or remains) on probation. If such a student does not pass at least 34 units during any three consecutive terms, he or she is subject to disqualification.

A full-time regular undergraduate student in the College of Engineering is subject to disqualification after two consecutive terms on probation.

Electives

There are four kinds of elective courses in the Engineering curricula: Basic Science and Mathematics, Humanities-Social Sciences, Technical, and Unrestricted.

Basic Science and Mathematics Electives. An engineering education is built on a solid foundation in the basic sciences and mathematics. The core of fundamental courses in science and mathematics is divided into two groups—the required courses and the basic science and mathematics electives. The purpose of both course groups is to provide a strong background for the continuing education of the student throughout his or her academic and professional life.

The elective courses in the basic sciences and mathematics allow the student some selectivity in the choice of fundamental courses. For example, students interested in agricultural, biomedical, or environmental engineering can select fundamental courses in the life sciences, and a student planning on a career

related to the earth sciences can elect courses in geology. Most other career objectives normally are best served by courses in chemistry, physics, or mathematics.

The purpose of the basic science and mathematics electives differs from the purpose of the technical electives. The former develops a fundamental base in the sciences, whereas the technical electives provide a direct opportunity for specialization.

The following courses are acceptable. They must be taken for a letter grade.

Bacteriology 2	Geology 1, 1L
Biological Sciences 1	Mathematics 22A, 24
Botany 2	Physics 4B, 4D
Chemistry 1C or 4C, 5, 8A, 8B	Physiology 2
Genetics 100A	Zoology 2

Humanities-Social Sciences Electives. Engineers apply the knowledge of science and technology to the improvement of the human condition. If wise decisions are to be made the engineering graduate must be conversant with the humanistic components of the decision. The humanities and social science electives further the student's general education both as an engineer and as an individual.

Each program must include a minimum of 31 quarter units of humanities-social science subjects which must include English 1 and either Rhetoric 1 or 3. Credit for English 1 and 6 additional units of the humanities-social sciences electives is given for a score of 5, 4, or 3 on the CEEB Advanced Placement Examination. A wide latitude of choice is allowed in the selection of the remaining units, enabling either specialization or diversification. However, subjects that are vocationally oriented, such as management and accounting, or which contain a preponderance of scientific or mathematical content are not considered to be humanities, even though they are offered by a department ordinarily classified as a humanities or social science department.

All courses in the following subject areas are suitable as humanities-social sciences electives:

Afro-American (Black) Studies	History
Agrarian Studies	Human Development
American Studies	Integrated Studies
Art	Linguistics
Asian American Studies	Native American Studies
Classics	Political Science
Foreign Languages	Rhetoric

Courses in the following subject areas are, with some exceptions (listed in parentheses), suitable as humanities-social sciences electives:

- Anthropology (except 13)
- Applied Behavioral Sciences (except 141)
- Dramatic Art (except 30, 124A, 124B, 124C, 124D)
- Economics (except 11A, 11B, 12, 103)
- Education (except 100, 114)
- English (except 25, 26)

Geography (except 1, 3, 4, 102, 105, 106, 107, 108, 110, 111, 112, 162)
 Music (except 1)
 Philosophy (except 12A, 12B, 134)
 Psychology (except 103, 107, 108, 129, 131)
 Sociology (except 46A, 46B, 106)

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.

Technical Electives. The technical electives permit a student to tailor a program to his or her own academic and career objectives. For some students the technical electives offer an opportunity to prepare for a specific occupation; for others it is an opportunity to broaden their background in the sciences and engineering.

All upper division courses in engineering, physics, chemistry and mathematics (except 101) are suitable as technical electives. A student interested in expanding his or her knowledge of the basic sciences can also choose technical electives from the lower division courses in the list of Basic Science and Mathematics Electives. Many upper division courses in the agricultural, earth, and life sciences as well as a few in the humanities qualify as technical electives.

As a guide to the student, the description of the upper division programs contains lists of suggested technical electives pertaining to specific areas of interest. A student may choose a program of technical electives spanning or overlapping more than one area. The student should seek the help of an adviser and the faculty in developing his or her program of electives. Technical elective credit is allowed for individual study courses (199) and internships (192) up to a maximum of 5 units for each separate project. A total of not more than 6 units of course 192 may be counted toward technical elective credit.

Unrestricted Electives. Any course for which University credit is allowed is acceptable as an unrestricted elective in the Engineering curricula.

GRADING

Passed/Not Passed Option

A student registered in the College of Engineering may elect to enroll in not more than one course each quarter in which he or she shall be graded Passed (P) or Not Passed (NP). 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 the Passed/Not Passed Option. (See also page 38.)

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/Not Passed basis. All others (including required courses and basic science and mathematics electives) must be taken on a letter-grade basis.

The following conditions must be met for the use of the Passed/Not Passed 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 a designated representative.

The units earned in courses taken Passed/Not Passed 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/NP grade, receives a grade of P if the student's work in the course is of quality equivalent to a grade of C- or better and a grade of NP if the work would otherwise be graded D or F. A course in which a grade of D or F has been recorded may not be repeated with the Passed/Not Passed option.

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 ten of the twelve curricula — Aeronautical, Agricultural, Civil, Electrical, and Mechanical Engineering, Materials Science and Engineering, and four of the formal double majors — are the same with minor exceptions which are noted. The Lower Division Programs for Chemical Engineering and the formal double major of Chemical Engineering/Materials Science and Engineering are different because students who plan to graduate under these curricula 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
Engineering 4 (Engineering Graphics in Design)**	3
Engineering 5A (Applications of Computers)	3
Engineering 17 (Circuits)	3
Engineering 35 (Statics)	3
Engineering 45 (Properties of Materials)	4
English 1 (Expository Writing)	4
Rhetoric 1 (Introduction to Public Speaking) or 3 (Group Communication)	4
Mathematics 21A†-21B-21C (Calculus)	12
Mathematics 22B (Differential Equations)	3
Mathematics 22C (Vector Analysis)	3
Physics 4A-4C-4E (General Physics)	12
Basic science and mathematics electives	12
Humanities-social sciences electives	8
Unrestricted electives‡	3
Total	90

Sample Lower Division Program

(Aeronautical, Agricultural, Civil, Electrical, and Mechanical Engineering, and Materials Science and Engineering curricula and double majors containing any of these majors)

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 3 or 4	3	Engineering 4 or 5A	3
Mathematics 21A	4	Mathematics 21B	4
Electives††	5	Physics 4A	4
		Electives††	4
	<hr/> 12		<hr/> 15
<i>Sophomore Year</i>			
Chemistry 1A or 4A	5	Chemistry 1B or 4B	5
Engineering 35	3	Engineering 17	3
Mathematics 22C	3	English 1	4
Physics 4C	4	Mathematics 22B	3
	<hr/> 15		<hr/> 15
		Engineering 3 or 5A	3
		Mathematics 21C	4
		Electives††	10
			<hr/> 17

* 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.

†† Elective courses must include 12 units of natural sciences electives and 8 units of humanities or social sciences electives.

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 - social sciences electives	11	
Total	92	

Sample Lower Division Program

(Chemical Engineering and Chemical Engineering/Materials Science and Engineering curriculum)

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 4A	5	Chemistry 4B	5
Engineering 3	3	Rhetoric 1	4
Mathematics 21A	4	Mathematics 21B	4
		Physics 4A	4
	12		17
<i>Sophomore Year</i>			
Engineering 35	3	Engineering 5A	3
Mathematics 22C	3	Engineering 17	3
Physics 4C	4	Mathematics 22B	3
Humanities-social sciences elective ..	4	Physics 4D	4
		Humanities-social sciences elective ..	4
	14		17
			15

† 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.

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 the student 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
Systems	4	Mechanical Engineering 171
Structures	6	Engineering 104B, 104C
Vehicle stability	4	Mechanical Engineering 134
Vehicle design	4	Mechanical Engineering 128A, 128B
Laboratory	8	Engineering 102L, 103L, 105L; Mechanical Engineering 124, 176
Mathematics	3	Engineering 180
Humanities-social		
sciences electives	15	
Technical electives*	16	
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 102L ...	1
Engineering 103A ..	3	Engineering 102B ...	3	Engineering 103L ...	1

* At least 12 units of technical electives must be chosen from the following list: Mechanical Engineering 121, 161, 162, 165, 166, 172; Engineering 106, 148, 190; Civil Engineering 131B; Electrical Engineering 150. Only six units of 199 courses may be used to satisfy the technical elective requirement for the Aeronautical Engineering curriculum.

Engineering 104A .. 3	Engineering 103B ... 3	Engineering 105L ... 1
Engineering 105A .. 3	Engineering 104B ... 3	Engineering 104C ... 3
Humanities-social sciences elective .. 3	Engineering 105B ... 3	Engineering 180 3
		Humanities-social sciences elective ... 3
		Technical elective ... 3
—	—	—
15	16	15
<i>Senior Year</i>		
Mechanical	Mechanical	MechanicalEngineering-
Engineering 127 .. 3	Engineering 124 .. 2	ing 128B 2
Mechanical	Mechanical	Mechanical Engineer-
Engineering 176 .. 3	Engineering 128A . 2	ing 134 4
Humanities-social	Mechanical	Humanities-social
sciences elective .. 3	Engineering 171 .. 4	sciences elective ... 3
Technical electives . 6	Humanities-social	Technical elective ... 3
	sciences elective ... 3	Unrestricted elective . 2
	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.

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, 161, 162, 165, 166, 172; Civil Engineering 131A, 131B, 138; Electrical Engineering 150, 157A, 157B; Applied Science 115; Engineering 148, 190.

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, 161, 162, 172; Civil Engineering 131A, 131B; Electrical Engineering 157A, 157B; Applied Science 115; Engineering 106, 160, 190; 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 and agricultural processing*, *forest engineering*, *packaging and handling engineering*, *power and machinery*, *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, 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 and agricultural processing* option. A course in statistics (e.g., Mathematics 130A), taken during the sophomore year, 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 and Agricultural Processing

This area of specialization is for students concerned with the conversion of agricultural products into food, feed, or fiber. The engineering sciences of fluid mechanics and heat and mass transfer, together with an understanding of biological materials, are applied in the analysis, design, and development of operations and systems for food manufacturing and agricultural processing. Concepts of sorting, cleaning, size reduction, handling, storage, refrigeration, drying, food manufacturing, and others are studied.

Forest Engineering

This area of study is the application of engineering principles and silvicultural knowledge for the management of forests and forest land. Ecological,

**A ten-week summer field program offered by the Department 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.

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 co-operation of the Department of Forestry and Conservation at Berkeley. Two or three quarters of the junior year are spent on the Berkeley campus.

Packaging and Handling Engineering

This area of specialization is concerned with the study of the design of systems and packages to preserve product quality during handling, shipment, and storage from origin to point of use. Subjects studied include properties of foods, environmental conditions, properties of packaging materials, behavior of both the products and the packages under dynamic, static, and long-term loading, economic use of materials and shipping and storage volumes, and analysis and design of systems.

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.

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

	<i>Units†</i>	<i>Courses</i>
<i>Courses Common to all Agricultural Engineering Options:</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 150A
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 boldface 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	

Forest Engineering Option:

Required subjects		
Silviculture	5	General Forestry 125*
Forest regulation and planning	4	General Forestry 113*
Forest utilization facilities	3	General Forestry 103*
Summer field courses	15	General Forestry 100A,* 100B,* 100C*
Technical electives	37	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
Total	105	

*Offered by the Berkeley campus.

†Units in parentheses are for equivalent courses taken at the Berkeley campus.

must include General Forestry 110A, 110B, or 114. In addition, one course in engineering design, such as Agricultural Engineering 112, 114, 115, 118, 119, 125, 132, or 150 must be selected.

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**	
		6	
	—	—	—
	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

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Electrical Engineer- ing 100A*	3	Civil Engineer- ing 165A*	Civil Engineer- ing 130*
General		3	4
Forestry 125*	5	Forestry 103*	Electives**
Mechanical Engi- neering 104A*	3	General	11
Mechanical Engi- neering 105A*	4	Forestry 113*	
		4	
		Electives**	
		5	
	—	—	—
	15	15	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.

Senior Year

Mechanical Engineer- ing 150† 3	Electives** 15	Engineering 190 3
Electives** 12		Electives** 12
—	—	—
15	15	15

Suggested Technical Electives:

Agricultural and Biological Sciences—Agronomy 100; Animal Science 2; Biochemistry 101A, 101B; Biological Sciences 1; Botany 2; Physiology 149; Plant Science 2, 112; Soil Science 2; Vegetable Crops 100, 101.

Food Engineering and Agricultural Processing—Agricultural Engineering 111, 132, 150; Applied Science 115; Biochemistry 101A, 101B; Chemistry 5, 8A, 8B, 107A, 107B, 110A; Chemical Engineering 151; Electrical Engineering 150; Engineering 103B, 105B; Epidemiology and Preventive Medicine 150; Food Science and Technology 108A, 111, 131; Mathematics 105A; Mechanical Engineering 165, 166.

Forest Engineering—Agricultural Economics 176; Agricultural Engineering 111, 112, 114, 115, 117, 118, 119, 125, 132, 150; 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; Water Science 2, 120, 141; Wood Science 131.*

Packaging and Handling Engineering—Agricultural Engineering 118, 125, 132, 150, 199 (Special Problems); Applied Science 115, 116; Chemistry 4C, 8A, 8B, 107A, 107B; Chemical Engineering 153; Civil Engineering 131A, 131B; Engineering 122, 140, 180; Food Science and Technology 111, 113, 131; Mathematics 32, 130A, 130B; Mechanical Engineering 155.

Power and Machinery—Agricultural Economics 140; Agricultural Engineering 111, 112, 114, 115, 117, 118, 119, 150; Applied Science 115; Civil Engineering 131A, 131B, 132A; Engineering 105B, 122, 140, 184; Mathematics 105A; Mechanical Engineering 114, 115, 121, 151, 155.

Soil and Water—Applied Science 115; Civil Engineering 141, 142, 144; Water Science 2, 110A, 110B, 141, 160.

Structures and Environment—Agricultural Engineering 125, 150; Agricultural Engineering Technology 111; Applied Science 115; Atmospheric Science 20, 123, 124; Civil Engineering 131A, 131B, 132A, 132B, 132C, 134, 142, 147, 148; Mechanical Engineering 166; Water Science 120.

* 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.

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 knowledge of fundamental chemical and transport phenomena, that is, chemical reaction processes coupled with fluid mechanics, heat transfer, and mass transfer. Such a foundation is 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 government. For this option six courses should be selected from the following list:

Air Environment—Atmospheric Science 121A, 121B, 122, 123; Civil Engineer-

ing 149, 242, 244; Environmental Toxicology 131; *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 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 the student's 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: Mathematics 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		Chemical		Chemical	
Engineering 151 ..	3	Engineering 150A .	3	Engineering 150B .	3
Chemistry 110A	3	Chemical		Chemical	
Chemistry 128B	3	Engineering 152A .	3	Engineering 152B .	3
Engineering 102A ..	3	Chemistry 110B	3	Chemical	
Humanities-social		Technical elective ..	3	Engineering 153 ..	4
sciences elective ..	4	Humanities-social		Chemistry 110C	3
		sciences elective ..	4	Technical elective ..	3
	—		—		—
	16		16		16
<i>Senior Year</i>	<i>Fall</i>		<i>Winter</i>		<i>Spring</i>
Chemical		Chemical		Chemical	
Engineering 154A .	3	Engineering 154B .	3	Engineering 155B .	2
Chemical		Chemical		Chemical	
Engineering 157 ..	4	Engineering 155A .	2	Engineering 156B .	3
Engineering 100	4	Chemical		Chemical	
Technical elective ..	3	Engineering 156A .	3	Engineering 158 ..	3
		Technical electives .	6	Technical elective ..	3
				Humanities-social	
				sciences elective ..	4
	—		—		—
	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 (1) Civil Engineering Planning, (2) Environment Engineering, (3) Structural Engineering, Structural Mechanics and Soil Mechanics, (4) Transportation Planning and Engineering, and (5) 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, Structural Mechanics, and Soil Mechanics

These programs are concerned with the conception, design, analysis, economics, and construction of man-made structures such as buildings, bridges, highways, and dams. Structures must resist not only gravity loadings but also the actions of earthquake, wind, and blast. The principles of *structural* analysis and design are applicable to all types of structures and all sources of loadings. *Structural mechanics* emphasizes the more analytical aspects of structural engineering. Special emphasis is placed on the mathematical theories of elasticity, plasticity, and viscoelasticity and on finite element methods of analysis. *Soil mechanics* emphasizes the application of the laws of solid and fluid mechanics and hydraulics to predict the performance of foundations, embankments, etc. Special topics include physico-chemical properties of soils, soil stabilization, stress, and deformation characteristics of soils.

Transportation Planning and Engineering

In the past, civil engineers have played a central role in the planning, design, and construction of transportation systems. Today the transportation needs and environmental problems of society are expanding and demand increasing attention. Transportation planners must blend knowledge of the basic concepts of engineering, economics, and planning with an awareness of social, political, and environmental processes. This program is concerned with providing a general knowledge of this planning process for engineers.

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 131A
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; Engineering 180, or Electrical Engineering 118.
Technical electives	21	12 units must be selected from Engineering courses
Humanities-social sciences electives	15	
Unrestricted electives	4‡	
Total	90	

‡Transfer students not having credit for Civil Engineering 10 (or the equivalent) must take it in place of 3 units of unrestricted electives.

		Sample Sequence of Courses*		
<i>Junior Year</i>	<i>Fall</i>		<i>Winter</i>	<i>Spring</i>
Engineering 100	.... 4	Engineering 103A	... 3	Civil
Engineering 102A	... 3	Engineering 104B	... 3	Engineering 131A
Engineering 104A	... 3	Engineering 105A	... 3	Civil
Elective**	..... 5	Elective**	..... 6	Engineering 132B
				Civil
				Engineering 171
				Engineering 103B
				Elective**
	—		—	—
	15		15	15
<i>Senior Year</i>				
Civil		Civil		Electives**
Engineering 142	... 3	Engineering 132A	. 3	..... 15
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 engineers for the quality of human life, civil engineering majors are encouraged to include courses such as Economics 125A and 125B, Environmental Studies 133, 160, and 166, Political Science 108, 109A, 109B, and 186, and Sociology 143 among their technical electives. Other technical electives of possible interest to majors in all four of the programs include Applied Science 115 and 116, Engineering 160 and 180. Additional suggested courses for students in each of the options are as follows:

Civil Engineering Planning—Agricultural Economics 147, 148, 176; Civil Engineering 137, 143, 161, 162; Economics 125A, 125B, 130, 131; Electrical Engineering 118; Engineering 106; Environmental Studies 112, 133, 160, 166, 168; Geography 106, 155, 162; Geology 134; Mathematics 130A, 130B; Political Science 181; Water Science 150.

Environment Engineering—Applied Science 115; Atmospheric Science 120, 121A, 121B, 122, 123; Bacteriology 102, 130A; Biochemistry 101A, 101B; Chemical Engineering 154A, 154B, 156A, 156B; Chemistry 8A, 110A, 110B; Civil Engineering 141, 145, 146, 147, 149; Engineering 160; Environmental Studies 140, 150A, 150B, 150C, 162, 166.

Structural Engineering and Mechanics—Agricultural Engineering 125; Applied Science 115; Civil Engineering 131B, 132C, 134, 137, 138, 139, 162, 173, 174; Engineering 104C, 122, 148, 180; Mathematics 128A, 128B, 128C; Art 121A, 121B, 121C.

*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 45 units of electives are to be distributed among humanities-social sciences, mathematics, technical and unrestricted electives as indicated in the Upper Division Program.

Transportation Planning and Engineering—Agricultural Economics 148, 155; Agricultural Engineering 112, 119; Applied Behavioral Sciences 151A; Civil Engineering 137, 149, 152, 153, 161, 162; Economics 125A, 125B, 130, 131; Electrical Engineering 112A, 112B, 157A; Engineering 106, 115, 160; Environmental Planning and Management 110; Environmental Studies 112, 160, 162; Geography 106, 155, 156; Geology 134; Mathematics 131A, 131B, 131C; Mechanical Engineering 134; Political Science 102, 182, 186; Sociology 143.

Water Resources—Agricultural Economics 148, 176; Chemistry 5; Civil Engineering 141, 143, 144, 145, 146, 177; Electrical Engineering 112A, 150; Environmental Studies 140, 185; Geography 162; Political Science 108; Water Science 103, 110A, 150, 160, 170.

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 applied to medicine, communications, transportation, education, and business.

The variety of course offerings in the department permits the student to prepare for graduate study in electrical engineering, or for a career as a practicing engineer. In the electrical engineering curriculum close correlation between theory and practice is emphasized.

The course of study in electrical engineering allows the student maximum flexibility to pursue studies in a special technical area of his or her choice or in a wide range of topics. Required courses insure 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 or her 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 (1) Biomedical Engineering, (2) Computer Science, (3) High-Frequency Phenomena and Devices, (4) Information and Control, (5) Solid-State Devices and Physical Electronics, and (6) 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, computer organization, digital system design, theory of automata, programming languages, system programming, 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, including those at optical frequencies, 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 bipolar and field effect transistors, diodes, vacuum tubes, lasers, masers, traveling wave tubes, and superconducting Josephson junctions.

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:

Required subjects	<i>Units</i>	<i>Courses</i>
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
<hr/>	
Total	39

All Electrical Engineering Options (Except Computer Science):

Required subjects	Units	Courses
Electronic circuits and systems	2	Electrical Engineering 111B
Electromagnetics	3	Electrical Engineering 130B
Technical electives†	29	
Humanities-social sciences electives	15	
Unrestricted elective	2	
<hr/>		
Total	90	

Computer Science Option:

Required subjects		
Computer structure	3	Electrical Engineering 170
Computer organization	3	Electrical Engineering 174
Programming	3	Electrical Engineering 177
Technical electives†		
Unrestricted	19	
Computer science	6	Choice of Electrical Engineering 173, 175, 176, 178, 270-279, Human Physiology 151, 252
Humanities-social sciences electives	15	
Unrestricted electives	2	
<hr/>		
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 or her area of interest. A typical upper division program, showing a suitable ordering of the required courses, is shown below.

*Students who have taken Mathematics 22A to satisfy the basic science and mathematics elective requirement for the Lower Division Program must substitute 3 units selected from any mathematics course with a number higher than twenty except for Mathematics 101. Since Mathematics 24 is a 2-unit course, it will only partially satisfy this requirement.

†The technical electives must include: (1) 3 units of upper division mathematics or physics; (2) one technical elective course, taken after completion of Engineering 100, which includes work in an electrical laboratory.

		Sample Sequence of Courses			
Junior Year	Fall		Winter		Spring
Engineering 100	.... 4	Engineering 102A	.... 3	Engineering 190	.... 3
Engineering 105A	... 3	Electrical		Electrical	
Electrical		Engineering 112A	... 3	Engineering 112B	. 3
Engineering 130A	. 3	Electrical Engineering 130B**	.... 3	Electrical	
Mathematics 22A†	... 3	Electrical		Engineering 140B	. 3
Elective **	..... 2	Engineering 140A	... 3	Electives	..... 6
		Elective	..... 3		
	—		—		—
	15		15		15
Senior Year		Electrical		Electives*	..... 15
Electrical		Engineering 110B	.. 3		
Engineering 110A	. 3	Electrical Engineering 111B**	.... 2		
Electrical		Electives*	..... 10		
Engineering 111A	. 2				
Electives*	..... 10				
	—		—		—
	15		15		15

There are three kinds of electives in the Electrical Engineering curriculum: technical electives, humanities or social sciences electives, and unrestricted 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 or her program of technical electives with an adviser to insure that it will meet his or her educational objectives. The technical elective offerings corresponding to the major option of electrical engineering are given in the following list. A student may sample a number of these areas, or may prefer to specialize.

*Students in the computer science option take 19 units of technical electives plus 6 units of computer science electives.

**A student in the computer science option takes Electrical Engineering 170 in the Fall Quarter of the junior year, and takes Electrical Engineering 174 in place of Electrical Engineering 130B. Electrical Engineering 174 is taken in place of Electrical Engineering 111B but may be substituted for electives during the junior year.

†Students who have taken Mathematics 22A to satisfy the basic science and mathematics elective requirement for the Lower Division Program must substitute 3 units selected from any mathematics course with a number higher than twenty except for Mathematics 101. Since Mathematics 24 is a 2-unit course, it will only partially satisfy this requirement.

Biomedical Engineering—Anatomy 100; Chemistry 5, 8A, 8B (or 128A, 128B, 128C, 129), 107A, 107B; Physiological Sciences 101A, 101B; Biological Sciences 1; Zoology 2; Physiology 101, 101L; Physical Education 104A, 104B; Human Physiology 151; Engineering 103A; Electrical Engineering 118, 150, 157A, 157B, 161, 170, 184A, 184B.

Computer Science—Mathematics 108A, 125, 128A, 128B, 128C, 129A, 129B, 131A, 131B, 131C, 168; Applied Science 115, 116; Electrical Engineering 113, 119, 173, 175, 176, 178; 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, 148; Physics 104A, 104B.

Information and Control—Mathematics 118C, 131A, 131B, 131C, 151A, 151B, 151C, 185A, 185B; Applied Science 115; Electrical Engineering 118, 157A, 157B, 170, 174, 184A, 184B.

Solid-State Devices and Physical Electronics—Mathematics 118C; Applied Science 115; Engineering 130, 142, 148; Electrical Engineering 115, 131A, 131B, 131C, 145A, 145B, 145C, 148, 175; Physics 104A, 104B.

Systems and Circuits—Applied Science 115; Mathematics 118C, 127A, 127B, 127C, 128A, 128B, 128C, 185A, 185B; Electrical Engineering 113, 114, 116, 117, 118, 157A, 157B, 184A, 184B; Physics 104A, 104B; Engineering 115.

MATERIALS SCIENCE AND ENGINEERING CURRICULUM

Minimum units required: 180.

Materials engineering is directed towards an understanding of the structure, properties and behavior of materials. The demand for materials for high-speed transportation systems, for surgical and dental implants, for new generation of power plants, for solid-state electronic devices in computer and communication technology, etc., has broadened the search for new and improved materials with capabilities far surpassing those attainable with common metals, alloys, and ceramics. The development of new materials and the understanding of materials presently in use demand a thorough knowledge of the basic engineering and scientific principles, such as crystal structure, elastic and plastic behavior, thermodynamics, phase equilibria 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 the design of materials. The services of materials engineers are required in a diverse array of engineering operations, 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 design and perfection of semiconductors. Materials engineers are also increasingly involved in the development of new materials needed to attain

higher efficiencies in existing and proposed energy conversion schemes.

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 fundamental concepts in engineering. The third and fourth years are primarily devoted to the study of subjects in the materials sciences. Technical electives, selected from various other engineering and physical and natural science disciplines are provided so as to give some degree of specialization at the B.S. degree level, and to prepare the student for research in a selected area at the graduate level.

UPPER DIVISION PROGRAM—MATERIALS SCIENCE AND ENGINEERING

Required subjects	<i>Units</i>	<i>Courses</i>
Electronic circuits	4	Engineering 100
Applied mechanics	9	Engineering 102A, 103A, 104A
Applied thermodynamics ...	7	Engineering 105A, 130
Materials in design	4	Engineering 140
Laboratory	5	Mechanical Engineering 124, 176
Materials science	14	Engineering 142, 144, 145, 148
Applied mathematics	3	Engineering 180
Humanities-social sciences electives	14	
Technical electives	29	
Unrestricted elective	1	
	—	
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 180	4
Engineering 104A ..	3	Engineering 130	4	Engineering 140	3
Engineering 105A ..	3	Technical Electives .	6	Humanities-social	
Technical Electives .	6	Unrestricted		sciences elective ..	3
		elective	1	Technical elective ..	4
	—		—		—
	15		15		14
<i>Senior Year</i>					
Engineering 103A ..	3	Engineering 145	3	Engineering 148	4
Engineering 142	4	Mechanical Engineer-		Humanities-social	
Engineering 144	3	ing 124	2	sciences elective ..	4
Mechanical Engineer-		Humanities-social		Technical electives .	7
ing 176	3	sciences electives .	7		
Technical elective ..	3	Technical elective ..	3		
	—		—		—
	16		15		15

Suggested Technical Electives:

Twenty-nine units of technical electives may be selected in order to complete the undergraduate materials science and engineering program. By the selec-

tion of appropriate technical electives and humanities and social sciences electives, a student may orient the program to suit his or her interests and career objectives, e.g., 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 the student's educational objectives will be met, he or she is strongly encouraged to select these electives only after reviewing the program with an adviser. The following technical elective courses and the suggested areas of specialization are guidelines to assist the student and adviser in the preparation of study lists. A student may elect to take courses from a number of these areas or he or she may wish to specialize.

Electronic Materials—Electrical Engineering 130A, 140A, 140B, 145A, 145B, 145C, 148; Physics 121; Geology 180.

Materials Design and Processing—Engineering 104B, 104C, 106; Mechanical Engineering 121, 150, 151, 152, 155; Civil Engineering 136, 137.

Automatic Control and Systems Analysis—Mechanical Engineering 155, 171, 172; Electrical Engineering 118, 150, 157A, 157B.

Physics of Solids—Physics 115A, 115B, 140A, 140B; Electrical Engineering 145A, 145B, 145C, 148; Engineering 145; Geology 180.

Environmental Engineering—Engineering 160; Atmospheric Science 120, 122, 123; Biochemistry 101A, 101B; Water Science 120; Chemistry 8A, 8B; Civil Engineering 149.

Chemical Corrosion—Chemistry 110A, 110B, 110C, or 107A, 107B; Chemical Engineering 151, 152A, 152B.

Heat Transfer—Engineering 105B; Mechanical Engineering 166; Chemical Engineering 150A, 153.

Biomedical Engineering—Chemistry 107A, 107B; Biological Sciences 1; Zoology 2; Physiology 110A, 110B, 111A, 111B; Electrical Engineering 161; Physical Education 104A, 104B.

Computers—Applied Science 115; Electrical Engineering 173, 174, 175, 176, 177; Mathematics 129A, 129B, 130A, 130B, 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 students may tailor their studies to their 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 for graduate study in mechanical engineering, or obtain a broad background for entering engineering practice at the bachelor's level.

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. He or she faces a challenge now more than ever, because the solutions to such major social concerns as environmental pollution, mass transportation, raw material shortages, and the energy crisis will depend heavily on the engineer's ability to create new types of machinery and mechanical systems. 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 the design and such factors as possible impact on the environment, product safety, reliability, and economics.

Energy Systems

This option is specifically designed for students who would like to work in the fields of power generation, propulsion for transportation, and energy conversion, where the increased efficiency of systems and 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 topics as combustion engines, gas turbines, heat exchangers, nuclear reactors, MHD power generators, solar energy systems, and others.

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 the 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.

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.

Transportation Systems

An important aspect of mechanical engineering has traditionally involved the planning, design, and operation of transportation systems. As society recognizes the increasing importance of optimizing transportation systems to minimize environmental degradation and energy expenditure, engineers will need to consider major innovations in the ways in which people and goods are moved. This will require competence in vehicle dynamics, propulsion, and control, and an understanding of the problems caused by present-day modes of transportation.

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	Engineering 102L, 103L, 105L; Mechanical Engineering 124, 176
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 102L .. 1
Engineering 103A ..	3	Engineering 102B .. 3	Engineering 103L .. 1
Engineering 104A ..	3	Engineering 103B .. 3	Engineering 105L .. 1
Engineering 105A ..	3	Engineering 104B .. 3	Engineering 180 3

Elective	2	Engineering 105B ..	3	Mechanical En-	
				gineering 121	3
				Humanities-social	
				sciences elective ..	4
				Technical elective ..	3
	—		—		
	14		16		16
<i>Senior Year</i>					
Mechanical En-		Engineering 190	3	Humanities-social	
gineering 150	3	Mechanical En-		sciences electives .	7
Mechanical En-		gineering 124	2	Technical electives .	9
gineering 171	4	Humanities-social			
Mechanical En-		sciences elective ..	4		
gineering 176	3	Technical electives .	6		
Technical elective ..	4				
	—		—		—
	14		15		16

Electives may be distributed among technical, humanities-social sciences and unrestricted electives as indicated in the Upper Division Program. A minimum of 12 units of technical electives must be selected from engineering courses listed under the five options: (1) Creative Design, (2) Energy Systems, (3) Environmental Technological Systems, (4) System Dynamics and Control, and (5) Transportation Systems.

Suggested Technical Electives:

Creative Design—Mechanical Engineering 128A, 128B, 151, 152, 155, 162, 163, 165, 166, 172; Applied Science 115; Civil Engineering 131A, 132A; Agricultural Engineering 111, 118, 119, 132; Engineering 104C, 122, 140, 142, 160.

Energy Systems—Engineering 160; Mechanical Engineering 161, 162, 163, 165, 166.

Environmental Technological Systems—Mechanical Engineering 165, 166, 172; Engineering 115, 144, 145, 160; Civil Engineering 147, 149; Electrical Engineering 112A, 112B, 184A, 184B; Environmental Studies 100; Zoology 116, 155.

System Dynamics and Control—Mechanical Engineering 134, 152, 165, 166, 172; Electrical Engineering 112A, 112B; Engineering 122, 140, 160.

Transportation Systems—Engineering 122, 160; Mechanical Engineering 127, 128A-128B, 134, 152, 161, 162, 172; Civil Engineering 131A, 149, 160.

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 or her adviser, propose an Individual Engineering Major. The student, on approval of the adviser, must submit a 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 or her anticipated graduation date, preferably no later than the second quarter of the 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

Double Majors

Five formal double majors have been established: (1) Agricultural Engineering/Materials Science and Engineering, (2) Chemical Engineering/Materials Science and Engineering, (3) Civil Engineering/Materials Science and Engineering, (4) Electrical Engineering/Materials Science and Engineering, and (5) Mechanical Engineering/Materials Science and Engineering. Degree requirements for each of these majors can be completed in four academic years.

In addition, engineering students who can afford the time may enroll in other combinations of engineering majors or in an engineering major and a non-engineering major of their own choosing. Such double-major students must satisfy the requirements for both majors. Recent informal double majors have included: Civil Engineering/Mechanical Engineering, Electrical Engineering/Mechanical Engineering, Chemical Engineering/Chemistry, Civil Engineering/Geology, Electrical Engineering/Mathematics, Electrical Engineering/Philosophy, and Electrical Engineering/Physics. Degree requirements for informal double majors ordinarily cannot be completed within four academic years.

The Upper Division Programs for the formal double majors are listed below:

UPPER DIVISION PROGRAM—AGRICULTURAL ENGINEERING/MATERIALS SCIENCE AND ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required subjects		
Applied mechanics	15	Engineering 102A, 103A, 104A, 104B; 102B or 103B
Applied thermodynamics ...	7	Engineering 105A, 130
Design	7	Civil Engineering 132A or 145, or

Electronic circuits	4
Engineering economics	3
Materials science	10
Applied mathematics	3
Professional responsibilities	3
Technical electives	23

Mechanical Engineering 150;
Engineering 140
Engineering 100
Engineering 106
Engineering 148 and two chosen
from Engineering 142, 144, 145
Engineering 180
Engineering 190

15 units must be selected from the Agricultural Engineering and Water Science courses in the list of suggested technical electives under the Agricultural Engineering Upper Division Program. These 15 units must include one course listed in **boldface** 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.

Humanities-social sciences
electives 15

Total 90
Sample Sequence of Courses

<i>Junior Year</i>	<i>Fall</i>		<i>Winter</i>		<i>Spring</i>
Engineering 102A ..	3	Engineering 102B or		Civil Engineering	
Engineering 103A ..	3	103B	3	132A or 145	3
Engineering 104A ..	3	Engineering 104B ..	3	Engineering 140	4
Humanities-social		Engineering 105A ..	3	Humanities-social	
sciences elective ..	3	Engineering 130	4	sciences electives .	5
Elective*	4	Agricultural technical		Agricultural technical	
		elective**	3	elective**	3
	—		—		—
	16		16		15
<i>Senior Year</i>					
Elective*	3	Engineering 100	4	Engineering 190	3
Humanities-social		Engineering 106	3	Engineering 148	4
sciences electives .	7	Agricultural technical		Engineering 180	3
Agricultural technical		electives**	7	Agricultural technical	
electives**	6			elective**	3
	—		—		—
	16		14		13

* Upper division electives must include two courses chosen from Engineering 142, 144, and 145.

** The Agricultural Engineering curriculum is chosen in accordance with departmental guidelines for technical electives (see above).

UPPER DIVISION PROGRAM—CHEMICAL ENGINEERING/MATERIALS SCIENCE AND ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required subjects		
Engineering*	7	Engineering 100, 102A
Chemical engineering	42	Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 158
Chemistry	12	Chemistry 110A, 110B, 110C, 128B
Materials science	22	Engineering 130, 140, 142, 144, 145, 148
Humanities-social sciences electives	12	
	—	
Total	95	

Sample Sequence of Courses

<i>Junior Year</i>			<i>Winter</i>			<i>Spring</i>
<i>Fall</i>						
Engineering 102A ...	3	Chemical		Chemical		
Chemical		Engineering 150A .	3	Engineering 150B .	3	
Engineering 151 ...	3	Chemical		Chemical		
Chemistry 110A	3	Engineering 152A .	3	Engineering 152B .	3	
Chemistry 128B	3	Chemistry 110B	3	Chemical		
Engineering 144	3	Engineering 130	4	Engineering 153 ...	4	
		Humanities-social		Chemistry 110C	3	
		sciences elective ...	4	Engineering 140	4	
	—					
	15		—			
			17			—
						17

<i>Senior Year</i>			<i>Winter</i>			<i>Spring</i>
<i>Fall</i>						
Chemical Engineering		Chemical Engineering		Chemical Engineering		
154A	3	154B	3	155B	2	
Chemical Engineering		Chemical Engineering		Chemical Engineering		
157	4	155A	2	156B	3	
Engineering 100	4	Chemical Engineering		Chemical Engineering		
Engineering 142	4	156A	3	158	3	
		Engineering 145	3	Engineering 148	4	
		Humanities-social		Humanities-social		
		sciences elective ...	4	sciences elective ...	4	
	—					
	15		—			
			15			—
						16

UPPER DIVISION PROGRAM—CIVIL ENGINEERING/MATERIALS SCIENCE AND ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required subjects		
Electronic circuits	4	Engineering 100
Applied mechanics	9	Engineering 102A, 103A, 104A

* Engineering 3 is to be substituted by Engineering 45 in the lower division program.

Applied thermodynamics	7	Engineering 105A or Chemistry 110A; Engineering 130
Structures	6	Engineering 104B; Civil Engineering 131A
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; 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
Materials science	14	Four courses chosen from Engineering 140, 142, 144, 145, 148
Humanities-social sciences electives	15	
Technical electives	6	Civil Engineering 137 recommended
Unrestricted elective	1	

—
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	Civil Engineering 131A 3
Engineering 102A . . . 3		Engineering 104B . . . 3	Civil Engineering 132B 3
Engineering 104A . . . 3		Engineering 105A . . . 3	Civil Engineering 171 3
Elective** 4		Elective** 3	Engineering 103B . . . 3
		Elective* 5	Elective** 4
	—		—
	14	17	16
<i>Senior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Civil Engineering 142	3	Civil Engineering 132A 3	Elective** 4
Civil Engineering 172	2	Civil Engineering 148 3	Electives* 11
Electives* 7		Engineering 106 3	
		Engineering 130 4	
		Elective* 3	
	—		—
	12	16	15

* Upper division electives must include 15 units of humanities-social sciences electives and 5 units of mathematics as indicated in the Civil Engineering Upper Division Program. Civil Engineering 137 is recommended.
 ** Four courses to be chosen from Engineering 140, 142, 144, 145, 148.

UPPER DIVISION PROGRAM—ELECTRICAL ENGINEERING/MATERIALS SCIENCE AND ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required subjects		
Electronic circuits and systems	14	Engineering 100; Electrical Engineering 110A, 110B, 111A, 111B
Applied mechanics	3	Engineering 102A
Applied thermodynamics	7	Engineering 105A, 130
Electromagnetics	6	Electrical Engineering 130A, 130B
Linear systems	6	Electrical Engineering 112A, 112B
Physical electronics	6	Electrical Engineering 140A, 140B
Solid-state electronics	9	Electrical Engineering 145A, 145B, 145C
Laboratory	2	Electrical engineering courses with a total of 2 units of laboratory in the physical electronics area
Materials science	14	Engineering 142, 148 and two courses chosen from Engineering 140, 144, 145
Mathematics	3	Mathematics 22A†
Professional responsibilities .	3	Engineering 190
Technical elective	3	One upper division mathematics or physics course
Humanities-social sciences electives	15	
Total		91

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*	3	Elective*	3
16		15	
<i>Senior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Electrical Engineering		Electrical Engineering	Engineering 190
			3

* At least two of these courses must be from courses in Materials Science and Engineering (e.g., Engineering 140, 144, 145).

† Students who have taken Mathematics 22A to satisfy the basic science and mathematics elective requirement for the Lower Division Program must substitute 3 units selected from any mathematics course with a number higher than twenty except Mathematics 101. Mathematics 24 (2 units) will only partially satisfy the requirement.

110A 3	110B 3	Electrical Engineering ·
Electrical Engineering	Electrical Engineering	145C 3
111A 2	111B 2	Engineering 148 4
Electrical Engineering	Electrical Engineering	Elective* 5
145A 3	145B 3	
Engineering 142 4	Engineering 130 4	
Elective* 3	Elective* 3	
—	—	—
15	15	15

The Electrical Engineering curriculum has 29 units of technical electives. The above sample has: required (i.e., explicitly stated) materials science courses (12 units); electives to be chosen from materials science courses (6 units); and electives from Electrical Engineering (145A, 145B, 145C), and Electrical Engineering 133 (11 units).

UPPER DIVISION PROGRAM—MECHANICAL ENGINEERING/MATERIALS SCIENCE AND ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required subjects		
Electronic circuits	4	Engineering 100
Applied mechanics	12	Engineering 102A, 102B, 104A, 104B
Applied thermodynamics	10	Engineering 105A, 105B, 130
Fluid mechanics	6	Engineering 103A, 103B
Mechanical design	10	Mechanical Engineering 121, 150;
		Engineering 140
Controls and systems analysis .	4	Mechanical Engineering 171
Materials science	10	Engineering 148 and two courses
		chosen from Engineering 142,
		144, 145
Laboratory	8	Mechanical Engineering 124, 176;
		Engineering 102L, 103L, 105L
Applied mathematics	3	Engineering 180
Professional responsibilities .	3	Engineering 190
Humanities-social		
sciences electives	15	
Technical elective	3	
Unrestricted elective	2	

Total 90

Sample 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 102L ...	1
		Engineering 103L ...	1
		Engineering 105L ...	1

* At least two of these courses must be from courses in Materials Science and Engineering (e.g., Engineering 140, 144, 145).

Engineering 105A ... 3	Engineering 104B ... 3	Engineering 180 3
Elective* 3	Engineering 105B ... 3	Mechanical Engineering 121 3
		Humanities-social sciences elective ... 4
—	—	—
15	16	13
<i>Senior Year</i>		
<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Mechanical Engi- neering 150 3	Engineering 190 3	Humanities-social sciences elective ... 3
Mechanical Engi- neering 171 4	Mechanical Engi- neering 124 2	Engineering 140 4
Mechanical Engi- neering 176 3	Humanities-social sciences elective ... 4	Engineering 148 4
Humanities-social sciences elective ... 4	Engineering 130 4	Elective* 5
	Elective* 3	
—	—	—
14	16	16

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 the master and doctoral levels the student plans a course of study with the help of an adviser or guidance committee. He or she is permitted wide latitude in the selection of courses and thesis subjects so long as the student's program is purposeful and well integrated.

The graduate courses offered in the College of Engineering are described in the departmental listings (pages 300-328).

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 *College of Engineering Bulletin* which can be obtained from the College of Engineering.

Graduate Certificate Program

For engineers who already have a degree, the College of Engineering offers a

* Upper division electives must include two courses from Engineering 142, 144, and 145.

Graduate Certificate Program. This program consists only of course work in selected engineering subjects and requires fewer units than the degree programs. The purpose of the Graduate Certificate Program is to provide practicing engineers with an opportunity to develop additional expertise in specific areas and to explore new fields of technical interest. Many courses in these programs are available on the campus's television network at certain receiving sites in Livermore, Sacramento, Marysville-Yuba City, and the Diablo Valley.

The general requirements for the Graduate Certificate Program are: 15 units of courses not specifically required of undergraduate engineering majors at UCD, with at least 9 of these 15 units in formal graduate courses. Participants in this program must be accepted by the Graduate Division. Further information on the Graduate Certificate Program may be found in the *College of Engineering Bulletin* which can be obtained from the College of Engineering.



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 man's 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 a major field, prepares the graduate for a satisfying life whatever his or her 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 or her 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 or she 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 stay informed about the quality of his or her performance by means of consultation with 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; and

3. regular UC courses taken on a concurrent enrollment basis through University Extension.

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 42-44):

Subject A

American History and Institutions

Scholarship

Residence (for additional College stipulations, see page 173)

Policies governing maximum unit credit from community colleges (see page 24)

Application for Degree Candidacy (see filing deadlines, page 8)

COLLEGE OF LETTERS AND SCIENCE REQUIREMENTS

Breadth Requirements

1. *English Reading and Composition Requirement, A.B. and B.S. degrees:* satisfied after fulfilling the Subject A Requirement by either

- a. passing an essay examination in English composition (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*); or
- b. completing with passing grades (a grade of P, C- or better) two of the following courses: English 1, 2, 3, 4A, 4B, 20, 45, or 103. One of these courses must be taken after completion of 84 units.

2. *Foreign Language Requirement* (for details of this requirement, see page 179).

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 182 for classification of courses).

* For students electing this option, examination dates for this academic year are: Saturday morning, October 18, 1975, January 24, April 10 and May 15, 1976. The May examination is not open to seniors graduating in June or September. No examinations are given during the summer period. Sign-up rosters are posted on the Letters and Science bulletin board, opposite Room 175, Mrak Hall, Monday through Thursday of the week an examination is administered. Blue books are required. (Engineering and graduate students may sign up in Room 2132, Bainer Hall, and Room 174, Academic Office Building III, respectively.)

<i>A.B. degree:</i>	<i>Units</i>	<i>B.S. degree:</i>	<i>Units</i>
Humanities		Natural Sciences	90
Natural Sciences	52	Humanities	
Social Sciences		Social Sciences	20
(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)	

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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 or programs in the College of Letters and Science (page 184) or included on the "Letters and Science List of Approved Courses in Other Colleges" (page 184).

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 (applicable to departmental and interdepartmental majors but not to individual majors).

3. A combined total of 30 units may be offered toward the bachelor's degree from the following categories:

- Units other than those (1) offered by teaching departments or programs in the College of Letters and Science (see page 184), and (2) included on the "Letters and Science List of Approved Courses in Other Colleges" (page 184).
- Units taken in all military science courses.
- Physical Education 5 and not more than 6 units in Physical Education 1.
- Not more than 9 units in 300-400 series courses subject to (5) below.
- 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 219). A student is eligible to take the upper division courses, 194H and 199, for credit, only after he or she has accumulated 84 units.

5. Courses in the 200, 300, and 400 series.

Special study courses, such as those numbered 299, 399, and 499, may not be offered toward the degree.

Students must petition the Dean of the College, upon recommendation of the appropriate instructor and department chairperson, to take the following courses for elective credit toward the degree:

- graduate courses numbered 200-298;
- postgraduate professional courses numbered 400-498 offered by professional schools; (courses in this series which are offered by the College of Letters and Science do not require the Dean's approval);

c. all variable-unit courses in the 200, 300, and 400 series.

Minimal conditions that must be met before enrollment in courses listed under (a), (b), and (c) above may be approved are: an overall UC grade-point average of 3.3, and 18 units of upper division instruction in the subject matter basic to the course. Exceptions may be considered if preparation warrants.

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 lower and upper division courses required for the major and (2) all upper division courses required for the major. To obtain a C average in the major a student may, with the approval of his or her adviser, repeat courses graded D or F. (The Dean's approval is required in order to repeat any course more than once.)

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

Probation or disqualification may follow as a result of an unsatisfactory grade-point average or failure to make minimal progress toward the bachelor's degree. Refer to page 40 for more complete details regarding minimum scholastic requirements and required progress to avoid academic probation or disqualification.

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/Not Passed 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) may take courses each quarter on a Passed/Not Passed basis. Not more than one-fourth of a student's units taken at the Davis campus and presented for graduation may be taken on a Passed/Not Passed basis. Courses which are graded Passed/Not Passed only (which includes most variable-unit courses) are *not included* in this limitation. Unit limitations printed on page 38 also apply.

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 the P nor the NP grade 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. Courses in which a grade of D or F has been earned may not be repeated on a P/NP basis.

Passed/Not Passed Enrollment Procedure: Passed/Not Passed petitions are available in the Dean's Office, 150 Mrak Hall, on 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 or her enrollment in a particular course from the letter-grade basis to the Passed/Not Passed 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/Not Passed option in this instance, the student files a petition in the first quarter of the sequence.

File petitions in the Dean's Office between the following dates.

Fall Quarter 1975: October 30 through Wednesday, November 5

Winter Quarter 1976: February 4 through Tuesday, February 10

Spring Quarter 1976: May 3 through Friday, May 7

Graduating seniors as well as any other student planning to undertake graduate or professional studies should consult an adviser before enrolling on a Passed/Not Passed basis in a course required in the major program.

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 and the major department before undertaking such work. The student 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. In addition, 27 of the 35 units must be in upper division course work, including 18 units in the major. (This option is available only to students who graduate immediately upon completion of the EAP.)

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.

The Major

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. See page 172 for details regarding the C-average scholarship requirement for the major. A student who fails to maintain this average may be required to withdraw from his or her major program.

Types of Programs

There are three types of programs which 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 in the courses section of the *Catalog*. The number of upper division units a student must complete in the subject of his or her major ranges from 36 to 45 units for A.B. degree candidates, and from 45 to 54 for B.S. degree candidates. 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*	Geology*	Physics*
Art History	German	Political Science
Art Studio	Greek	Political Science:
Bacteriology*	History	Public Service
Botany*	Italian	Psychology*
Chemistry*	Latin	Rhetoric
Dramatic Art	Mathematics*	Russian
Economics	Music	Sociology
English	Philosophy	Spanish
French	Physical Education	Zoology*
Geography		

A Bachelor of Science degree is offered in Biochemistry (see page 96), Genetics (see page 110), Physiology (see page 116).

B. Interdepartmental Majors. These programs are intended for students interested in broader scope than that provided by a departmental major. The number of upper division units required in the major program ranges from 36 to 54 for A.B. degree candidates, and from 45 to 54 for B.S. degree candidates.

Interdepartmental major programs leading to a Bachelor of Arts degree are offered in:

- American Studies (see page 232)
- Biological Sciences (see page 261)
- Black Studies (see page 222)
- Comparative Literature (see page 277)
- East Asian Studies (see page 288)
- Humanities (see page 388)
- International Relations (see page 391)
- Liberal Arts (see page 403)
- Linguistics (see page 405)
- Mass Communication (see page 407)
- Medieval Studies (see page 438)
- Mexican-American (Chicano) Studies (see page 440)
- Physical Sciences (see page 462)
- Religious Studies (see page 491)
- Russian Literature and History (see page 501)

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 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 of which at least 30 must be from Letters and Science teaching departments or programs. No more than 10 upper division units in courses numbered 194H, 198 and 199 may be counted toward satisfaction of major requirements.

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.

The final proposal is prepared with the assistance of faculty advisers of the student's choice. The principal adviser must, however, be a faculty member in a teaching department or program in the College of Letters and Science. It is then 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 fourth quarter before graduation.

Declaration or Change of Major

All new students, regardless of class level, are admitted to the College in Undeclared major status. Once registered, any student with at least 24 units may officially declare a major. A new transfer student with 88 or more units must do so by the end of his or her first quarter in residence. A continuing

student must declare a major by the time he or she has completed 100 units.

If a student fails to declare a major according to the above schedule, a hold will be placed on the student's further registration. It will be removed only when his or her *Petition for Declaration or Change of Major* is on file in the Dean's Office. Petitions are available in the offices administering respective major programs. Office locations are printed in the *Class Schedule*.

As part of the petitioning procedure, a student must, in consultation with an adviser, prepare a projected plan of study. A student is accepted into the major only after the adviser has signified, approved and endorsed the petition. Advisers are assigned by the department or committee supervising the major program.

A student may change from one major to another within the College with the approval of the Dean and consent of the department or committee in charge of the new major. Admission into a major program may be denied if the student's grade-point average in courses required for the proposed major is less than C (2.0). Students in good academic standing who desire to transfer into the College must petition to do so sometime within the first five weeks of the quarter. Petitions, which are available at the Registrar's Office, must be endorsed by the new faculty adviser, signed by the dean of the student's former college or school, and submitted to the Letters and Science dean for consideration and approval. 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 except under unusual circumstances.

Multiple Majors

The Dean, after faculty adviser endorsement, may approve the declaration of more than one major when significant differences exist between the requirements of the programs involved. Requests must be based upon sound educational considerations. Approval assumes the student will complete all degree requirements before the accumulation of 195 units, and does not imply nor guarantee permission to continue beyond this unit limitation.

Ordinarily, a petition for a multiple major is not approved (1) if one of the majors is an individual major, or (2) if a cross-college major is requested and both programs are available in a single college.

Frequently, an individual major, a departmental or an interdepartmental major, supplemented with a carefully selected program of courses which supports and amplifies the student's special interest, serves a student's educational goals better than a collection of two or more major programs in their entirety.

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 or she plans to graduate. The filing deadlines are published on page 8 of this catalog.

Senior Degree Check. During the final quarter of the junior year or no later than the first quarter of the 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. To insure receipt of this statement before the beginning of the succeeding term, a student must file the request during the first five weeks of a quarter. 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 the 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.

Study List Requirements

1. *Unit minimums to satisfy progress requirements*; see page 39.
2. *Unit limitations* (also see *Class Schedule*):
 - a. maximum of 17 units for freshmen and transfer students in first quarter of residence;
 - b. maximum of 21 units for all other Letters and Science students (these unit limitations include Subject A, other noncredit remedial courses, and repeated courses; not included is make-up work to remove incomplete grades.)
3. *Enrollment beyond the 195-unit limitation*:

A minimum of the 180 units is required for a bachelor's degree, and ordinarily, students are expected to complete all their requirements within the 180-195 unit range.

The 195-unit limitation is a strict one, and permission to register after 195 units have been accumulated may be granted occasionally under exceptional circumstances for a limited time only. *Approval must be obtained before course enrollment materials can be made available for the quarter following completion of 195 units.* Students who receive approval are expected to adhere to the specific program of courses agreed upon and to meet other conditions that may have been set, e.g., minimal academic performance levels.

Uncertainties regarding the future practicality of registering as an undergraduate after the accumulation of 195 units make it difficult to plan ahead for more than a year with any degree of certainty. Students are counseled, therefore, to be sure they can at least graduate before reaching the 195-unit limitation.

The pursuance of multiple majors or cross-college majors alone is not sufficient justification for enrollment beyond 195 units. Students who wish to change their major or who enter as transfer students in fairly advanced standing must realize there is no guarantee that continued registration is a viable option once they reach 195 units.

4. *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 or her 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 or her 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, and (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 insure 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 the first three quarters of 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 are urged, however, to maintain regular contact with an adviser in their major to avoid schedule errors which may delay graduation.

Peer Advising. The Academic Advising Intern Program (AAIP) provides academic peer advising in specific departmental and subject areas. (Also see page 55.)

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. *The First Resort* maintains office hours Monday through Friday during the quarter; longer hours are scheduled 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 a first-year program satisfactorily by keeping in mind the following points.

1. After the Subject A requirement has been met, students who do not feel confident with their writing skills should consider taking English 1 in their freshman year.

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 or her knowledge of a foreign language by earning a satisfactory score on this examination. (Further information given below.)
- b. *College Entrance Examination Board Achievement Test*:* Earn a qualifying score of at least 500 on a CEEB Foreign Language Achievement Test taken prior to July 1, 1976.† This test may be taken at any time during a prospective student's high school career. A student whose score is on file at the Admissions Office should petition for satisfaction of the Requirement at the Letters and Science Dean's Office.
- c. *College Entrance Examination Board Advanced Placement Examination:* Earn a score of 5, 4, or 3 on any foreign language examination taken in high school.
- d. *Course Completion in College (or the equivalent):* A.B. degree—12 units in one language (i.e., course 2). B.S. degree—as required in the major program.
- e. *Proficiency Examination:* A student who has not completed the required level language course, but assumes he or she has attained equivalent knowledge, may elect to satisfy the language requirement by passing this

* Up to and including Spring Quarter 1977, students who entered a post-secondary institution prior to Fall, 1975, may elect to satisfy the following additional option: complete in high school (tenth, eleventh or twelfth grade) one year's work beyond the second-year level with a B average. 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 Mraz Hall.

† If the qualifying level is altered due to current analysis of test scores, the revision will be published in next year's Catalog.

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 183 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 the adviser and thoughtful selection from each of the three groups will help the student to determine his or her 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 with the exception of course 1, or its equivalent, in a foreign language. No credit will be granted for course 1 if a student has completed the first two years of high school-level work in that language.

A student with advanced standing credit in a language does not qualify to take the Placement Examination. He or she should consult the 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 become aware of the requirements for the prospective professional school early in his or her career in order to plan a proper program (see page 202). The student should follow the procedures governing declaration of major outlined on page 175. Further assistance may be obtained from the Health Sciences Advising Office or the Pre-Law Advising Office, located in 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 government, business, social services, and the arts, in a variety of public and private agencies with emphasis on the humanities, social, and behavioral sciences. 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 American Studies 192, Economics 189A-189B, Education 100, History 196, Psychology 181A-181B, and Rhetoric 192 or, in some cases, courses 198 or 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, in South Hall.

FINAL EXAMINATIONS

Following are the procedures by which final examinations are administered in the College of Letters and Science.

A. Except under certain specified circumstances, Senate Regulation 772 requires that final examinations be given in all undergraduate courses.

B. At the instructor's option, a final examination in any undergraduate course in the College may be wholly or in part of the take-home type. In accordance with Senate Regulation 772(A), the writing time of a take-home and an in-class final examination together may not exceed three hours.

C. In all undergraduate courses of the College for which a final examination is required, any student shall have the right to take a final examination (or, when the instructor has so opted, to submit a take-home examination) at the time and on the date published in the *Class Schedule*.

D. Any change of examination time (including an early deadline for submission of a take-home examination) requires the mutual consent of the instructor and the students in the course. Any student who does not consent in writing to the change in time must be permitted to take the final examination (and/or to submit the take-home examination) at the officially scheduled time. A student who consents in writing to a change of examination time waives the right cited in (C) above.

E. A student who is improperly denied the right cited in (C) may file a petition with the Executive Committee of the College by the end of the next regular term for appropriate action.

THE TEACHING CREDENTIAL

The teacher education program is administered by the Graduate Division (see page 215). For additional information, inquire at the Department of Education, Room 174, Academic Office Building III.

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 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 two categories of honors at graduation is based on the following minimum criteria:

	Honors	Highest Honors
	<i>Average of All College Work</i>	
	3.3	3.7
<i>Total units completed at UC</i>	<i>Average of UC Work</i>	
45- 89	3.5	3.9
90-134	3.4	3.8
135 and over	3.3	3.7

Recommendation from the major department, requested by the Dean's Office, is also required for students eligible for highest honors.

No student may be awarded honors with the bachelor's degree if more than 8 units of grade I (incomplete) appear on his or her transcript. A student may request an exception to this regulation by contacting the Dean's Office.

Awards for Academic Excellence

In addition to eligibility for the University Medal (see page 44), 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

Only the undergraduate courses listed below will be accepted in fulfillment of the area requirement of the College. A maximum of 10 units of *special study* courses, (99, 194H and 199) can be offered toward the area requirement; courses 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 a *maximum* of 16 units between humanities and social sciences.

B.S.: 12 units allowed toward social sciences/humanities requirement.

Art.

Asian American Studies 1C-6C. (See Foreign Language Requirement above).

Black Studies 10.

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, 5F, or 5P) completed. All subsequent courses in English counted toward humanities requirement.

Foreign Language (see above).

History.

Linguistics 105, 106, 107, 196.

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. All courses except 12.

Botany.

Chemistry.

Entomology 1, 10.

Genetics.

Geography 1, 3.

Geology.

Human Anatomy 100, 102, 102L.

Mathematics.

Physical Education 103, 104A, 104B, 115.

Physics.

Physiology.

Psychology 2A, 108, 129, 131, 150, 180B, 180D, 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.

Black Studies 100A, 100B, 101, 110A, 110B, 120A, 120B.

Chicano Studies 10.

Economics. All courses except 12.

Education. All courses except 114.

Geography. All courses except 1, 3, 105, 161.

Political Science.

Psychology. All courses except 2A, 103, 107, 108, 129, 131, 150, 165, 180A, 180B, 180D, 180K.

Sociology. All courses except 46A, 46B, 106.

TEACHING DEPARTMENTS IN COLLEGE OF LETTERS AND SCIENCE

Animal Physiology*	Education	Philosophy
Anthropology	English	Physical Education
Art	French and Italian	Physics
Bacteriology	Genetics	Political Science
Biochemistry and Biophysics	Geography	Psychology
Botany	Geology	Rhetoric
Chemistry	German and Russian	Sociology
Dramatic Art	History	Spanish and Classics
Economics	Mathematics	Zoology
	Music	

A minimum of 54 upper division units (courses numbered 100-199) must be completed in courses offered by the above departments, included in other Letters and Science programs, or on the "Letters and Science List of Approved Courses in Other Colleges." Courses in American Studies, Biological Sciences, Black Studies, Chicano Studies, Comparative Literature, Integrated Studies, Linguistics, Medieval Studies, 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 171).

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. A total of 150 of the 180 units required for the degree must be completed in courses given by Letters and Science Teaching Departments or programs, *or included* on this list.
2. Courses below which are numbered 100-199, may be counted toward the 54 upper division unit 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 171).
4. These courses do not satisfy the area requirements (natural sciences/humanities/social sciences) with the exceptions of Entomology 1, 10, and Human Anatomy 100, 102, 102L which may be offered toward the natural sciences requirement.

*Courses offered by the Department of Animal Physiology are listed under Physiology.

- Agricultural Economics** 147, 176.
Agricultural Engineering Technology 111.
Anatomy (VM) 100, 170.
Animal Science 123.
Applied Behavioral Sciences 17, 172.
Asian American Studies 1C, 2C, 3C, 4C, 5C, 6C, 30, 31, 110.
Atmospheric Science 20, 20L.
Avian Sciences 13, 13L, 100.
Clinical Pathology (VM) 101, 101L, 102.
Consumer Economics 141, 142.
Design 6A-6B, 142A-142B, 143, 144.
Engineering 3, 10, 17, 100, 102A-102B, 102L, 103A-103B, 103L, 104A-104B, 105A-105B, 105L, 110, 115, 122, 180.
Engineering: Applied Science 115, 135A.
Engineering: Civil 141, 148, 149.
Engineering: Electrical 112A-112B, 118, 130A-130B, 131A-131B-131C, 140A-140B, 145A-145B-145C, 155A-155B, 157A-157B, 170, 173, 174, 175, 176, 177, 184A-184B.
Engineering: Mechanical 127, 161, 165, 166, 171, 172.
Entomology 1, 10, 101, 102, 103, 104, 106, 109, 116, 117, 119, 119L, 121, 123, 125, 127, 153.
Environmental Horticulture 105, 107, 115.
Environmental Planning and Management 1.
- Environmental Studies** 10, 100, 101, 102, 110, 116, 117, 133, 140, 140L, 150C, 168, 180, 192.
Environmental Toxicology 10, 101, 131.
Epidemiology and Preventive Medicine (VM) 150.
Family Practice (Med) 127.
Food Science and Technology 1.
Human Anatomy (Med) 100, 102, 102L.
Human Development 100A, 100B.
Medical Microbiology 107.
Native American Studies 106.
Nematology 110.
Nutrition 10, 102A-102B, 102L, 110, 111, 111L, 114.
Pharmacology 100.
Physiological Sciences (VM) 101A-101B.
Plant Pathology 120, 130.
Plant Science 101, 102, 103, 109.
Range Management 100.
Resource Sciences 2, 10, 12, 100, 100L, 101, 110.
Soil Science 2, 88, 102, 107, 120, 120L, 121.
Textiles and Clothing 161.
Veterinary Microbiology 126, 126L, 127, 127L, 128, 130.
Viticulture and Enology 3.
Water Science 2, 10, 120, 141.
Wildlife and Fisheries Biology 108, 120, 121, 135, 140, 151.

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT EXAMINATION CREDIT

Students earn 10 quarter units credit toward the 180-unit bachelor's degree requirement for each CEEB Advanced Placement Examination satisfactorily passed, usually during the junior 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				Humanities	
English	5, 4, 3	English 1 and 3		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	
	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	
Art Studio	5	Art 2, 5	Art 3	8 units	
	4	Art 2	Art 3 or 4	4 units	
Art History	5, 4	Art 1A, 1B, 1C		10 units	Satisfies American History and Institutions Requirement.
	3	Art 10		4 units	
American History	5, 4, 3	History 17A, 17B		8 units	
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, Bacteriology 2, Zoology 2	Any appropriate upper division course in the biological sciences, Bacteriology 2, Botany 2 or Zoology 2.	10 units	Student has option of taking Bacteriology 2, Botany 2 and Zoology 2 for full credit.
	3	Biological Sciences 1	Bacteriology 2, Botany 2 or Zoology 2.	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	Students who achieve a score of 5 or 4 may, with the consent of the instructor, enroll in 21C.
Physics	BC 5, 4, 3	Mathematics 11, 21A, 21B	Mathematics 21C.	10 units	No credit for laboratory parts of Physics 5, 4 or 3. Course equivalents may be used as prerequisites for succeeding courses of same series by consent of instructor. Any course equivalent may be taken for full credit with consent of instructor and curriculum committee, but probably disallowed if high score achieved on examination.
	B 5	Physics 10, 2A, 2B, 2C, or 5A, 5B, 5C	Determined by consultation with Physics adviser.	10 units	
	B4, 3	Physics 10		10 units	
	CI 5	Physics 2A, 4A, or 5A		4 units	
	CII 5	Physics 2B, 4C, or 5B		4 units	
	CI 4	Physics 2A or 5A		4 units	
	CII 4	Physics 2B or 5B		4 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 and Institutions

College Breadth Requirements

Bachelor of Arts Degree

- English Composition Examination or two acceptable English courses.
- 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 or two acceptable English courses.
- 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.*
{	May include a maximum of 5 units of special study courses in any one quarter (99, 194H, 199).	{	May include a maximum of 9 units in courses numbered 300-498.
{	May include 30 units in courses outside L & S Teaching Depts. and not from L & S List of Approved Courses in Other Colleges.	{	May include P.E. 5 and maximum of 6 units of P.E. 1.

Major Requirements

Consult major adviser and appropriate departmental section of the *General 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:

- 1) 35 of the final 45 units. No more than 18 of the 35 units may be in UCD Summer Session courses.
- 2) 27 upper-division units in courses offered in Letters and Science Teaching Departments, including 18 units in the major program.
- 3) Education Abroad Program participants see page 61.

* All units must be in Letters and Science teaching departments or programs, or on the "Letters and Science List of Approved Courses in other Colleges" (see pages 184-185).

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 or counselors 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 or her enrollment.
3. It prepares a statement of remaining College requirements, on request, for senior students. To insure receipt of this statement before the beginning of the succeeding term, a student must file a request during the first five weeks of a quarter. (A student inquires about completion of major requirements with his or her 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 1975 will see the school enroll its tenth 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. Assistance in program planning may be obtained from the Pre-Law Advising Office, Room 216, South Hall.

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.

All applications are reviewed by the School of Law Admissions Committee. Students are admitted only on a full-time basis *and only in September*. The Committee is seeking students of demonstrated academic ability, as evidenced by LSAT scores and the undergraduate grade-point average (GPA). The Admissions Committee is seeking students of diverse backgrounds, taking into consideration ethnic and economic factors, advanced degrees or other advanced studies, significant work experience, and extracurricular and community activities during and after college years. The growth and maturity of the applicants and their commitment to law study are major concerns.

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 postmarked at least 30 days before the date of the test to insure being registered.

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 non-refundable application fee* in the form of a check or money order made payable to The Regents of the University of California. The last date for filing completed application forms, together with all supporting documents, including LSAT scores, LSDAS reports, and letters of recommendation, 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 should register with the Law School Data Assembly Service (LSDAS) no later than December 15 (to allow LSDAS sufficient time for processing) by completing and mailing the registration form supplied with each LSAT/LSDAS 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.

3. 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. Successful applicants will be required to submit directly to the School of Law a final transcript, showing the award of a bachelor's degree.

4. 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.

5. 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.

6. 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.

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. The deadline for transfer applications is *July 1* of the year for which transfer is sought. 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.

Minority Recruitment

The students and faculty of the UCD School of Law recognize the desperate need for minority lawyers. The School, therefore, actively solicits applications from Native American, Black, Pilipino, Asian, and Chicano students interested in coming to King Hall. Obviously, a legal career is neither the only nor, in many instances, the most desirable way to deal with racism, poverty, and

the myriad of social, political, and economic problems which besiege this country . . . but it is one way to approach their solution.

The Davis campus School of Law, in cooperation with the Association of American Law Schools (AALS) and the Council on Legal Education Opportunity (CLEO), participates in programs designed to increase the number of minority law students. During the summers of 1971 and 1972 the California CLEO pre-law institutes for minority students were conducted at Martin Luther King Hall. CLEO applications may be obtained by writing to CLEO, 818 Eighteenth Street, N.W., Suite 940, Washington, D.C. 20006.

Applications for the special summer program for Native American students may be obtained from the School of Law, University of New Mexico, 1117 Stanford Drive, N.E., Albuquerque, New Mexico 87106.

The Mexican-American Legal Defense and Education Fund has monies available for Chicano students who have applied to law school. Applications can be obtained by writing to: MALDEF, 145 Ninth Street, San Francisco, California 94103.

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 pages 373-382.

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 eighth class to a course of professional instruction commencing Fall Quarter 1975.

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. A Medical Science building is under construction on the Davis campus on a site dedicated to the health sciences.

Admission Policies

The class entering in the fall of 1975 will be limited to 100 students selected on the basis of academic achievement and promise as well as personal characteristics that 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 nonresident tuition. Further information may be obtained by communicating with this Commission at Post Office Drawer P, Boulder, Colorado 80302.

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-identified 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 openings may be available for students from 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 must be submitted by January 31. 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 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 may request letters of recommendation and a nonrefundable 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 or her 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 the necessary supporting items reach the Committee as soon as possible after notification by the School of Medicine of receipt of the applicant's completed 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 application for admission as early as possible. The majority of accepted applicants will be notified on December 15, January 15, February 15, or March 15.

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 the Admissions Committee 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 October.

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.

Although a specific major in science is not necessary, the following course content at college level is required:

- a. English, one year or the equivalent;
- b. Biological Science, one year or the equivalent;
- c. General Chemistry, one year or the equivalent;
- d. Organic Chemistry, one year or the 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 the 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 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, 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 completion of a course of study usually requiring eight years. The final four years must be spent in the professional veterinary medical curriculum. Most students planning for a career in veterinary medicine

broaden their educational experience by completing the baccalaureate degree before applying to the professional school.*

Preprofessional Training and Requirements

Applicants must have completed the equivalent of at least three full academic years in an accredited college or university before entering the School of Veterinary Medicine. This work must include at least 45 of the 58 quarter units of required science courses listed below at the time of application. At least 28 units of restricted electives in social sciences, humanities, and agriculture are required.

Students should plan their preveterinary medical education carefully. The required courses should be spaced over a three-year period to permit maximum scholastic achievement. The undergraduate program should include plans for obtaining a baccalaureate degree. An undergraduate major should be selected on the basis of individual interest and aptitude; there is no advantage gained toward admission by selecting one major over another.

Many students planning to enter veterinary school have definite areas of interest within the general field of veterinary medicine. These individuals are encouraged to take courses which will broaden their background in these areas. Some specialized areas include laboratory animal medicine, exotic animal medicine, public health, food animal diseases, and biomedical research. Animal experience is considered an important part of the preprofessional training.

Subject Requirements

	<i>Quarter Units</i>
Chemistry (general, qualitative, organic, and biochemistry)	24
Genetics	3
Physics (general)	9
Physiology (systemic)	5
Biology, zoology, embryology	17
English composition and additional English or rhetoric	8
Restricted electives in social sciences, humanities, and agriculture (no more than 12 units in agriculture)	28
Recommended: physiology and biochemistry	

* For additional information prospective students should write the Associate Dean of Student Services, School of Veterinary Medicine, University of California, Davis 95616.

Following is a list of the courses taught at the UCD campus which fulfill the above subject requirements.

	<i>Total Units</i>
Biological Sciences 1	(5) 5
Biochemistry 101A	(3) 3
Chemistry 1A, 1B, 1C, 8A, 8B	(5,5,5,4,3,3) 21
English 1 and additional English or rhetoric	(4,4) 8
Genetics 100A	(3) 3
Physics 2A, 2B, 2C	(3,3,3) 9
Physiology 101	(5) 5
Zoology 2, 100 including laboratory	(6,4,2) 12
Restricted electives in social sciences, humanities, and agriculture (no more than 12 units in agriculture)	28
	94

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.

Application Procedures

Students are admitted to the School of Veterinary Medicine only in the fall of each year. Completed applications must be filed with the School by *November first* in order to be considered for the beginning class in the fall of the following year. All required courses must be completed prior to the time the applicant plans to begin the professional curriculum. Application forms may be obtained any time after August 15 from the Admissions Office, School of Veterinary Medicine, University of California, Davis 95616.

Admission to the School of Veterinary Medicine

The evaluation of applicants is based on their academic and nonacademic records. The academic record is divided into required science grade-point average, accumulative grade-point average, and the grade-point average for the last year of undergraduate studies. The scores from the Graduate Record Examination are included in the evaluation of the applicant's academic record. The principal nonacademic criteria are animal experience, the applicant's narrative statement, and letters of evaluation. Other criteria considered beneficial by the Faculty Committee and Dean of the School of Veterinary Medicine may be used in the selection process. Because of the competition for admission an applicant with a grade-point average lower than 2.5 is unlikely to be admitted and is discouraged from applying.

Since scholastic achievement, particularly in the required courses, is a very important criterion for admission to the School of Veterinary Medicine, students in this University are cautioned to use the Passed/Not Passed option sparingly.

Work experience with animals and a familiarity with the veterinary medical profession are considered important factors for demonstrating motivation and

sincere interest in the profession. Comprehensive letters of evaluation are an important consideration in the review of an application.

In view of the demand from residents of the State of California for admission to the School of Veterinary Medicine (i.e., there are 8 to 10 applications from California residents for admission to each of the 94 first-year places 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. The criteria for determining California residency are explained in University of California general catalogs. Specific questions should be addressed to the Attorney-in-Residence Matters, 590 University Hall, University of California, Berkeley 94720. No other persons are qualified to give rulings on residency. In cases where exceptions are made, first preference is given to residents of states participating in the Western Interstate Commission for Higher Education (WICHE). For this reason, an application form will be available only to residents and students from WICHE states. Students residing in WICHE states that do not have a school of veterinary medicine and who wish to participate in this program must be certified by their home state. For the address of state certifying officers, write to the Western Interstate Commission for Higher Education, University East Campus, 30th Street, Boulder, Colorado 80300.

Men and women are considered on an equal basis. Socially and economically disadvantaged students are encouraged to apply. Applicants will be notified by April 15 regarding their admission status.

Requirements for the Degree Bachelor of Science

Any student in the School of Veterinary Medicine who does not hold a baccalaureate degree, but has satisfactorily completed the first two years of the professional curriculum and has satisfied the general University requirements (see pages 42-44) is eligible to receive a Bachelor of Science degree in Veterinary Science.

Requirements for the Degree Doctor of Veterinary Medicine

The candidate for the degree of Doctor of Veterinary Medicine

1) must have fulfilled the academic standards set forth by the Faculty of the School of Veterinary Medicine.

2) must possess good moral character;

3) 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 School of Veterinary Medicine, University of California, Davis);

4) must maintain a grade-point average of 2.0 (a C average), computed on the total of all courses taken in the School; and 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 equiva-

lent 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 45 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, and disease control and eradication. Program options are available for specialization in food hygiene, avian medical practice, and in other areas of 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 Chairperson of the departments 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 pre-professional 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)
- Curriculum in Education (B, D, I, LA, R, SB, SC)
- School of Engineering (I)
- School of Engineering and Applied Science (LA)
- School of Forestry and Conservation (B)
- School of Journalism (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)
- Schools 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 and Information Science (LA)
Graduate School of Public Policy (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
(SB) University of California, Santa Barbara, California 93106
(SC) University of California, Santa Cruz, California 95060
(SD) University of California, San Diego, La Jolla, California 92037
(SF) University of California, San Francisco, California 94122

Direct inquiries 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: Health Sciences and Law

Students interested in career opportunities in the health sciences may wish to consult the Health Sciences Advising Office. 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 and training programs. (See

also page 56.)

Students interested in legal careers should consult the Pre-Law Advising Office. Information is available relating to career possibilities in law, law school admission procedures, and academic program planning. (See also page 56.)

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. Interested students should communicate directly with personnel at the professional school to which they 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 published announcements of schools of business administration and the Economics Department Office, Room 380, Academic Office Building III, UC Davis, phone 752-0741.

Forestry

Preparation for study. Consult this catalog (pages 140-144) and school announcement.

Preforestry advisers. E. H. Stanford, Department of Agronomy and Range Science, Room 267, Hunt Hall, UC Davis, phone 752-1702 or 752-1703 and Jack Major, Botany Department, Room 7, Robbins Annex, phone 752-0621 or 752-0617.

Law

Preparation for study. Consult this catalog (page 190) 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.

Pre-law advisers for counseling about general law school admission requirements, exclusive of program planning: Naomi Sakai, Coordinator, Pre-law Advising Office, Second Floor, Room 216, South Hall, UC Davis, phone 752-3000; C. E. Jacobs, Department of Political Science, Room 271, Voorhies Hall, UC Davis, phone 752-2637 or 752-0966.

School of Law, UC Davis. Consult this catalog (pages 190-194), *Announcement of the School of Law*, and Dean's Office, Room 1011, Martin Luther King, Jr. Hall, phone 752-0243.

Medicine

School of Medicine, UC Davis. Consult this catalog (pages 195-197). For more

detailed information contact the Office of Student Affairs, School of Medicine, UC Davis, phone 752-3171.

Veterinary Medicine

Preparation for study. Consult this catalog (pages 198-201) and Dean's Office, College of Agricultural and Environmental Sciences, Room 228, Mrak Hall, UC Davis, phone 752-0107 or 752-0108.

School of Veterinary Medicine, Davis campus. Consult this catalog (pages 198-201), School announcement, and Office of the Assistant Dean—Student Services, Room 1024, Haring Hall, UC Davis, phone 752-1383.

Allied Health Sciences

Preparatory course work only is offered at the Davis campus, so that professional training for all fields must be completed elsewhere. Degree work is offered at Davis for the fields of medical technology and dietetics, but students must apply elsewhere for the required postgraduate internships. Consult the Office of Allied Health Sciences, School of Medicine (phone 752-0230) or the Health Sciences Advising Office, South Hall (phone 752-2672) regarding curricula and schools for all allied health fields.

Suggested Curricula. As specific school requirements vary, students should contact either the schools directly, the Office of Allied Health Sciences, or the Health Sciences Advising Office for more detailed information. Elective units for all programs must include course work in the social sciences and humanities; a foreign language is recommended. Students transferring into a professional program offered at the undergraduate level must complete that school's general education requirements.

Students are advised that in California most professional programs are unable to accommodate all applicants so that students may wish to consider applying also to out-of-state programs. Professional school admissions committees evaluate applicants on the basis of their course work and grades, work experience in health care and community activities, and letters of recommendation.

Dental Hygiene

Two years minimum preparation is required prior to transfer into a professional curriculum offering a baccalaureate degree. Professional training is also available in community colleges. Students should take the Dental Hygiene Aptitude Test in May or November, one year prior to projected date of admission. Some schools may require tests of manual dexterity.

English 1, 3.

Biological sciences (one year with laboratory). Recommended: Zoology 105 or 106 or Anatomy (Vet Med) 100; Zoology 100, 100L; Bacteriology 2, 3; Physiology 2-2L or 101-101L; Human Anatomy 102, 102L.

Chemistry 1A, 1B, 8A, 8B. Required by UCSF: Chemistry 1C; Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: two courses.

Rhetoric 1.

Recommended: Nutrition 10, Sociology 1, Anthropology 2, Pharmacology 101, Physical Education 5.

Dentistry

Students complete three to four years of preprofessional course work prior to admission to the three- or 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.

Biological sciences (one year with laboratory). Recommended: Zoology 100; Zoology 105 or 106 or Anatomy (Vet Med) 100.

Chemistry 1A, 1B, 1C, 8A, 8B. Required by many schools: 8 to 12 units of organic chemistry.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: two courses.

Recommended: Mathematics 13 or 16A-16B-16C; Genetics 100 or 115; Biochemistry 101 or Physiological Sciences 101; sculpture course.

Health Care Administration

A public administration or business management orientation is recommended for the baccalaureate and master's degree work. Schools of public health and graduate school programs in administration offer professional training. Elective courses may be selected from the following:

Agricultural economics (e.g., course 112).

Applied Behavioral Sciences 151, 152, 162.

Community Health 101 or 404.

Economics (introductory and accounting).

Engineering 5A, 5B.

Epidemiology and Preventive Medicine 102, 103.

History (e.g., courses 171C, 174, 185).

Mathematics 13, 19.

Medical Learning Resources 155.

Political science (e.g., courses 100, 101, 102, 180, 182, 183, 187).

Rhetoric 1, 3.

Sociology (e.g., courses 154, 180).

Medical Laboratory Technology

Students need to complete a baccalaureate degree including the following course work, in order to qualify for the required twelve-month medical technology internship in California.

Biological sciences: 27 units, including instruction in hematology (Clinical Pathology 101), immunology (Veterinary Microbiology 127).

Chemistry: 24 units, including courses 1A, 1B, 1C, 5, 8A, 8B and Biochemistry 101A or Physiological Sciences 101A.

Physics 2A, 2C. Recommended: Physics 3A, 3C.
Suggested: Electrical Engineering 155.

Nursing

Two years minimum preparation is required prior to transfer into a two- or three-year clinical nursing curriculum.

English 1, 3.

Chemistry 1A, 1B, 8A, 8B.

Human Anatomy 102, 102L.

Physiology 2-2L or 101-101L.

Bacteriology 2, 3.

Psychology 2B, 2C, or 10.

Sociology 1 or 3.

Human Development 100A-100B or Psychology 112.

Recommended: Nutrition 10, Anthropology 2, Family Practice 404, Psychiatry 223, Pharmacology 100 or 101, Behavioral Biology 151.

Occupational Therapy

Basic professional training may be taken either at the undergraduate or graduate levels. Students must transfer to another school. Applicants are expected to be proficient in some arts and crafts activities and preferably knowledgeable in some industrial arts and recreational skills.

English 1, 3.

Human Anatomy 102, 102L.

Physiology 2-2L or 101-101L.

Psychology: introductory and course 168.

Sociology: one course.

Human Development 100A-100B or Psychology 112.

Recommended: Biological Sciences 1, Human Development 100C and 102, Chemistry 1A, Rhetoric 3, Anthropology 2, Physics 10, Physical Education 103, Physical Medicine and Rehabilitation 470.

Suggested: Behavioral Biology 151, 268; Family Practice 404; Human Anatomy 402.

Optometry

Two years minimum preparation is required prior to transfer into a four-year Doctor of Optometry degree curriculum. Students must take the Optometry College Admission Test in April or October, one year prior to projected date of admission.

English 1, 3.

Biological sciences (one year with laboratory). Recommended: Bacteriology 2 and 3; Zoology 105 or 106 or Anatomy (Vet Med) 100 or Human Anatomy 102 and 102L.

Chemistry 1A, 1B, 8A, 8B.

Mathematics 13, 16A. Required by some schools: 16B, 16C.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: two courses.

Pharmacy

One to two years minimum preprofessional course work is required prior to transfer to a three- or four-year clinical pharmacy program. Students should take the Pharmacy College Admission Test in May or November, one year prior to projected date of admission.

English 1, 3.

Biological sciences (one year with laboratory); may include botany.

Recommended: Bacteriology 2 and 3.

Chemistry 1A, 1B, 1C, 5 and one year of organic chemistry. (Required by some schools: 12 units of organic chemistry.)

Economics: one course; a second course is required by a few schools.

Mathematics 16A, 16B, 16C.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: one course.

Recommended: Rhetoric 1; sociology or anthropology.

Physical Therapy

Basic professional training is available at both undergraduate and graduate levels; students must transfer to another school.

English 1, 3.

Biological Sciences 1.

Chemistry: one year. Recommended: Chemistry 1A, 1B, 8A, 8B.

Human Anatomy 100 or 102-102L.

Physics 2A, 3A. Strongly recommended: Physics 2B, 2C, 3B, 3C.

Physiology 2-2L or 101-101L.

Psychology: two courses; Psychology 168 recommended.

Suggested: Human Development 100A or Psychology 112 and other Human Development courses; Zoology 2, 106; Physical Education 103, 104A; Physical Medicine and Rehabilitation 470; Mathematics 13; Bacteriology 2 and 3; Rhetoric 1, 3; Sociology 1, 3; Behavioral Biology 151, 268.

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. Nursing in the practitioner role offers an alternative.

Recreational Therapy

Students may elect to transfer for optional professional training, offered through both baccalureate and master's degree programs. Elective courses may be selected from the following:

Behavioral Biology 151.

Dramatic art.

Education 150A, 150B, 150C.

Environmental planning and management (e.g., courses 116, 134).

Human anatomy (e.g., courses 100 or 102, 102L, 402).

Human development (e.g., courses 100A-100B-100C, 101, 102, 103, 130, 131).

Music (e.g., course 300).

Physical education (e.g., courses 5, 45, 103, 105, 110, 115, 140, 171; activity including dance).

Physiology 2-2L or 101-101L.

Psychiatry (e.g., courses 222, 473).

Psychology (e.g., courses 108, 112, 129, 168, 181A-181B).

Rhetoric 1, 3.

Zoology 106.

Speech Therapy

Students must transfer to another school by the graduate level for professional training through a master's degree or special teaching credential program. Elective courses may be selected from the following:

Anthropology (e.g., courses 109, 110, 111, 114; these courses are fundamental to speech therapy).

Behavioral Biology 151, 268.

Education (e.g., courses 110, 117, 119, 151, 163, 164).

Foreign language.

Human anatomy (e.g., courses 100 or 102, 102L, 402).

Human development (e.g., courses 100A-100B-100C, 101, 102, 121, 130, 131).

Linguistics (e.g., courses 35, 107, 138, 150).

Physical Medicine and Rehabilitation 470.

Physiology 2-2L or 101-101L.

Psychology (e.g., courses 108, 112, 129, 132A-132B, 150).

Rhetoric 1, 3.

Speech fundamentals.

Zoology 106.

Reference Books

Books, school catalogs, and reference texts are available in the Reference Room of the Shields Library, the Health Sciences Library, the Office of Allied Health Sciences, or the Health Sciences Advising Office. Several recommended publications are as follows:

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.)	Entomology (M.S., Ph.D.)
Agricultural Economics (M.S., Ph.D.)	Family Nurse Practice (M.H.S.)
Agricultural Education (M.Ed.)	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 Sciences (M.S., Ph.D.)	History (M.A., M.A.T., Ph.D.)
Avian Sciences (M.S.)	History of Art (M.A.)
Biochemistry (M.S., Ph.D.)	Horticulture (M.S.)
Biomedical Engineering (Ph.D.)	International Agricultural Development (M.S.)
Biophysics (Ph.D.)	Law (J.D.)—refer to School of Law
Botany (M.S., Ph.D.)	Linguistics (M.A.)
Chemistry (M.S., Ph.D.)	Mathematics (M.A., M.A.T., Ph.D.)
Child Development (M.S.)	Medicine (M.D.)—refer to School of Medicine
Classics (M.A.)	Microbiology (M.A., Ph.D.)
Clinical Psychology (Ph.D.)	Music (M.A., M.A.T.)
Comparative Pathology (M.S., Ph.D.)	Nutrition (M.S., Ph.D.)
Computing Science (M.S., Ph.D.)	Pharmacology and Toxicology (M.S., Ph.D.)
Consumer Science (M.S.)	Philosophy (M.A., Ph.D.)
Dramatic Art (M.A., M.F.A., Ph.D.)	Physical Education (M.A.)
Ecology (M.S., Ph.D.)	Physics (M.A., Ph.D.)
Economics (M.A., Ph.D.)	Physiology (M.S., Ph.D.)
Education (M.A.)	Plant Pathology (M.S., Ph.D.)
Endocrinology (M.A., Ph.D.)	Plant Physiology (M.S., Ph.D.)
Engineering (M.Engr., D.Engr., M.S., Ph.D.)	
English (M.A., Ph.D.)	

Political Science (M.A., Ph.D.)	Sociology (M.A., Ph.D.)
Preventive Veterinary Medicine (M.P.V.M.)—refer to School of Veterinary Medicine	Soil Science (M.S., Ph.D.)
Psychology (M.A., Ph.D.)	Spanish (M.A., Ph.D.)
Range Management (M.S.)	Vegetable Crops (M.S.)
Rhetoric (M.A.)	Veterinary Medicine (D.V.M.)—refer to School of Veterinary Medicine
Russian (M.A.)	Water Science (M.S.)
	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 Chairperson of the Graduate Group for more information.

- Agricultural Chemistry—Donald G. Crosby, Ph.D., Chairperson, 109 Environmental Toxicology
- Anatomy—Doris B. Wilson, M.D., Ph.D., Chairperson, Temporary Building 171
- Atmospheric Science—John J. Carroll III, Ph.D., Chairperson, 239 Hoagland Hall
- Avian Sciences—Wilbur O. Wilson, Ph.D., Chairperson, 102 Asmundson Hall
- Biochemistry—Lloyd L. Ingraham, Ph.D., Chairperson, 115 Briggs Hall
- Biomedical Engineering—Antone F. Salel, M. D., Chairperson, Temporary Building-172
- Biophysics—Richard S. Criddle, Ph.D., Chairperson, 555 Hutchison Hall
- Botany—Norma J. Lang, Ph.D., Chairperson, 217 Robbins Hall
- Child Development—Louise M. Bachtold, Ed.D., Chairperson, 211 Walker Hall
- Comparative Pathology—Walter S. Tyler, D.V.M., Ph.D., Chairperson, 1017 California Primate Research Center
- Computing Science—Herschel H. Loomis, Jr., Ph.D., Chairperson, 3004 Bainer Hall
- Consumer Science—Sylvia Lane, Ph.D., Chairperson, 222 Voorhies Hall
- Ecology—R. Merton Love, Ph.D., Chairperson, 255 Hunt Hall
- Endocrinology—Thomas C. Lee, Ph.D., Chairperson, Temporary Building 139
- Engineering—Warren H. Giedt, Ph.D., Chairperson, 2006 Bainer Hall
- Food Science—W.D. Brown, Ph.D., Chairperson, Temporary Building 189
- Genetics—Robert W. Allard, Ph.D., Chairperson, 201B Hutchison Hall
- Horticulture—Kay Ryugo, Ph.D., Chairperson, 3021 Wickson Hall
- International Agricultural Development—William J. Chancellor, Ph.D., Chairperson, 2048 Bainer Hall
- Linguistics—Wayne Harsh, Ph.D., Chairperson, 111 Sproul Hall
- Microbiology—John L. Ingraham, Ph.D., Chairperson, 260 Hutchison Hall

- Nutrition—James G. Morris, Ph.D., Chairperson, 160 Animal Science
 Pharmacology and Toxicology—Wendell W. Kilgore, Ph.D., Chairperson, 111
 Environmental Toxicology
 Physiology—Irving I. Geschwind, Ph.D., Chairperson, 220 Animal Science
 Plant Physiology—Ray C. Huffaker, Ph.D., Chairperson, Plant Growth
 Laboratory
 Preventive Veterinary Medicine—Walter W. Sadler, D.V.M., M.P.H., Chair-
 person, 2079 Haring Hall
 Range Management—R. Merton Love, Ph.D., Chairperson, 255 Hunt Hall
 Soil Science—Robert M. Carlson, Ph.D., Chairperson, 3061 Wickson 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 or her scholastic record or 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 since many departments effectively close applications well in advance of these deadlines, early filing (preferably eight 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, registration may be delayed, thus making the student liable for the late registration fee of \$10, or the student 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 at-

tended. **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 or her possession an official record for 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 eight 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, registration may be deferred until the student 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.

General Requirements for Advanced Degrees

A graduate degree is awarded in recognition of a student's command of a wide range of knowledge in an academic field. It is not awarded merely for the fulfillment of technical requirements such as residence or the completion of specific courses.

Master's Degree. Students working toward a master's degree must be registered in residence for at least three quarters. Two regular six-week Summer Sessions may be counted as the equivalent of one quarter. Usually, all work for the master's degree is done in residence on the Davis campus. However, with the consent of the graduate adviser and the Dean of the Graduate Division some work taken elsewhere may be credited toward the degree. The normal limit for such transfer credit is 6 units from another institution or 18 units from another campus of the University, if the units were not used in satisfaction of the requirements for another degree.

A master's degree may be awarded upon completion of one of two basic plans in which either a thesis or a comprehensive examination is required.

Doctor's Degree. Students working toward a doctorate must be registered and in University residence for a minimum of six regular quarters. Experience indicates that most students take considerably longer than this minimum to complete a degree program. Two consecutive regular Summer Sessions may be counted as the equivalent of one regular quarter.

There is no University unit requirement for the doctor's degree. However, individual programs have course requirements which must be completed prior to the student's admission to the Qualifying Examination.

The Qualifying Examination is administered by a committee appointed by the Dean of the Graduate Division. The Examination is intended to demonstrate the student's critical ability and powers of imagination and synthesis, as well as to display his or her broad knowledge of the field of study. Upon recommendation of the Qualifying Examination Committee, and with the approval of the Graduate Council, a student may repeat the Examination one time.

After successful completion of the Qualifying Examination, the student is advanced to Candidacy for the degree. At this time a committee is appointed to direct the student in his or her research problem and to guide the student in the preparation of the dissertation.

Program of Study

When the student reports to a department or group he or she will be assigned to the appropriate adviser, who will plan a program of study with the student. 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 or her graduate adviser, the chairperson of the department or group in which the student 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 the student's home campus. The grades obtained in courses on the host campus are transferred to the student's home campus and entered on his or her 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 chairperson 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 the various 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

The teacher education program is administered by the Graduate Division. Recent legislation, however, mandates that this program be made available to

upper division students. With careful planning it is possible for some students to complete requirements for a preliminary credential as undergraduates. Specific requirements are available from the Education Department.

Acceptance to the *multiple-subject teaching credential (elementary) program* does not require any specific major. Students accepted to this program can meet the State requirement for a diversified major through one of the following alternatives: (1) through the newly-designed diversified major in American Studies; or (2) by completing a regular University major and achieving a passing score on the National Teachers Examination (Common Section). For further information on these possibilities consult the Department of Education, Room 174, Academic Office Building III.

Single-subject teaching majors (secondary) for which Davis students can qualify are art, life science, English (including drama and speech), foreign languages, government, history, mathematics, music, physical education, physical sciences, and social sciences. For information concerning University majors which satisfy these teaching majors and/or State-approved examinations available to prove competence in these teaching majors, students should consult the appropriate adviser in the Education Department.

Admission to the teacher education program is by the Graduate Division. Eligibility requires a scholarship record of B or better in all upper division work undertaken. Application for the 1976-77 program should be made in Room 174, Academic Office Building III, for the Education Department, and at the Graduate Division for the Department of Applied Behavioral Sciences (home economics and agricultural education). Information on filing deadlines should be obtained from the two departments.

Since requirements for all credentials are set up both by the State Commission for Teacher Preparation and Licensing and by the University, all students who intend to work toward a credential are urged to consult one of the departments named above early in their undergraduate career (preferably by the end of their freshman year).

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 or her career a reasonably accurate evaluation of the student's 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 or her 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, students will be able to plan their work more systematically.

Course Designations. Class hours and room numbers are published each quarter in the *Class Schedule and Room Directory*.

The quarter in which a course is intended to be 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 (July to September) 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 1974 would be an even-numbered year and Winter and Spring Quarters 1975 would be odd-numbered years).

A course number followed by two or three letters from the first part of the alphabet (for example, Spanish 101A-101B-101C) is continued through three successive quarters, ordinarily from September to June; occasionally, how-

ever, a course of more than one quarter may begin in the Winter or Spring Quarters. 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 prerequisites.

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 or she may be displaced by a student who does have the necessary prerequisites. If a student can demonstrate that his or her 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 and Directed Group Study Courses. A student who finds that he or she shares with an instructor an academic interest that cannot be accommodated within the formal course structure may find it possible to arrange an independent study course. A special study form may be obtained from the instructor who agrees to give such a course. The regulations of the Academic Senate limit to 5 the number of units of "special study" courses that a student may take in any given quarter. On the Davis campus, courses numbered 99, 194H, and 199 fall into this category.

Subjects for which no regular course has been established may be offered to groups of students as "directed group study" courses numbered 98 and 198. These courses generally are taught in a manner similar to regularly scheduled courses and are offered on a one-time-only basis.

A course proposal for special and group study courses must be approved by the chairperson of the department involved, and is subject to review by the appropriate committees of the Academic Senate. Courses 98 and 99 are *primarily for lower division students* and courses 198 and 199 are open to *students who are judged to have an adequate background in the subject proposed for study*. The subject matter in these courses must fall within the instructor's professional competence, and for the 199 (and 194H) courses, students must have at least a junior standing (84 units or more) in order to qualify.

Some departments offer special Honors courses (194H). Students who are interested in such courses should consult the chairperson of the department concerned.

Grading in Variable-Unit Courses. The regular basis for grading in undergraduate variable-unit courses, generally those indicated previously as "special or group study courses," shall be *Passed or Not Passed*. Letter grades may be given in such classes upon request by the department or group offering the course and the subsequent approval by the Committee on Courses of Instruction. Grading in graduate variable-unit 299 and 299D courses shall be *Satisfac-*

tory or Unsatisfactory.

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 circumstance 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 8); (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 an 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, normally 18 units of upper division work basic to the subject matter of the course. Admission is subject to the approval of the instructor in charge. Individual study and individual research courses (numbered 299 and 299D) shall be graded on a *Satisfactory* or *Unsatisfactory* basis only.

Professional teacher-training courses in the Department of Education and courses in other departments that are especially 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.

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. 87), the College of Engineering (p. 160) and the College of Letters and Science (p. 175).

SYMBOLS

The following numerical footnotes and the accompanying symbols are used throughout the courses section:

¹Absent on leave, 1975-76.

²Absent on leave, Fall Quarter 1975.

³Absent on leave, Winter Quarter 1976.

⁴Absent on leave, Spring Quarter 1976.

³In residence at President's Office, Berkeley campus.

⁴In residence at Irvine campus.

*Not to be given, 1975-76.

†Not to be given, Fall Quarter 1975.

‡Not to be given, Winter Quarter 1976.

§ Not to be given, Spring Quarter 1976.

AFRO-AMERICAN AND BLACK STUDIES

—, Program Director

Program Office, 467 Academic Office Building III

Committee in Charge:

Albert J. McNeil, M.S. (*Music*); *Committee Chairperson*

Cynthia L. Brantley, Ph.D. (*History*)

*Walter J. Hicks, Ph.D. (*English*)

James R. King, M.A. (*Black Studies*)

James J. Murphy, Ph.D. (*ex officio*; *Rhetoric*)

*G. Thomas Sallee, Ph.D. (*Mathematics*)

Joe L. Singleton, M.A. (*Physical Education*)

Faculty:

James R. King, M.A. (*Black Studies*)

§ § §

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 are recommended: Anthropology 102, 107B, 139A, 139B, 140, 148, 152, 153; Applied Behavioral Sciences 151, 152, 159A,

172; Asian American Studies 110; Black Studies 101; Economics 125A-125B; History 102M, 175A-175B, 176A-176B-176C; Political Science 101, 146, 151, 152, 174, 178; Psychology 145, 147, 198; Sociology 118, 140, 143, 144.

Teaching Credential Subject Representative: —. See page 215 for the Teacher Education Program.

Afro-American Studies

Professional Course

300. Afro-American Studies for Teachers. (4) III.

Lecture—4 hours. Prerequisite: consent of instructor. Methods of establishing, organizing, and teaching Afro-American and Black Studies. Designed for professional and preprofessional students who will be teaching black and/or ethnic studies in elementary and secondary schools. The Staff

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. King

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

Upper Division Courses

100A. Ethnic Studies. (3) II.

Lecture—3 hours. The history, culture philosophy, and current problems of groups considered ethnic minorities in the United States as viewed by the groups themselves. The Staff

100B. Ethnic Studies. (3) III.

Lecture—3 hours. Prerequisite: course 100A or consent of instructor. Continuation of course 100A. The Staff

101. Introduction to Black Studies. (4) I.

Lecture—4 hours. Prerequisite: Sociology 1 or Anthropology 2; History 27A-27B or History 17A-17B; Psychology 2C. Problems and methodology in Black Studies. King

110A. The Ancestral Homeland. (4) I.

Lecture—4 hours. Prerequisite: course 101 or consent of instructor. Ecology, population, social organi-

zation, and survival culture of West Africa in the pre-colonial, colonial, and post-colonial periods.

King

110B. The Ancestral Homeland. (4) II.

Lecture—4 hours. Prerequisite: course 110A or consent of instructor. Continuation of course 110A.

King

120A. Afro-America: Pre-Emancipation. (4) II.

Lecture—4 hours. Prerequisite: course 101 or consent of instructor. Ecology, social organization, and survival culture of Afro-America. Historical and comparative study of Afro-American populations in relation to other groups.

King

120B. Afro-America: Post-Emancipation to World War II. (4) III.

Lecture—4 hours. Prerequisite: course 120A or consent of instructor. Continuation of course 120A.

King

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Chairperson 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. (P/NP grading only.)

The Staff (Chairperson in charge)

AGRARIAN STUDIES

Major Adviser.—See *Class Schedule* listing.

Major Program.—See page 88.

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. R. J. 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.

R. J. Romani

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Major Advisers.—See *Class Schedule* listing.

Secondary Teaching Credentials—Agriculture: J. K. Baker, 204E Walker Hall.

Secondary Teaching Credentials—Home Economics: B. A. Adams, 203B Walker Hall.

Community College Credentials—Agriculture: J. K. Baker, 204E Walker Hall.

Major Program and Graduate Study.—See pages 90, 111, and 210.

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 206 Walker Hall.

Professional Courses

300. Curriculum and Instruction: Home Economics. (3) II.

Lecture—3 hours. Prerequisite: Applied Behavioral Sciences 191A. Examination of basic concepts underlying the determination of objectives; selection and organization of learning experiences, materials and resources; and the evaluation process.

Adams

306A. Instruction in Secondary Schools: Agriculture. (3) I, II.

Lecture—1 hour; discussion—1 hour; Laboratory—2 hours. Prerequisite: acceptance into the Teacher Education Program; course 306B (concurrently). Planning and organizing an effective curriculum. Selection, organization and evaluation of instructional materials. Use of audio-visual aids and appropriate methods of teaching in the micro-teaching laboratory.

Baker

306B. Teaching in Secondary Schools: Agriculture. (5-15) I, II.

Student teaching (corresponds with public school session) and related field work. Prerequisite: Applied Behavioral Sciences 191C or the equivalent; acceptance into the Teacher Education Program; course 306A (concurrently). Directed teaching including supervision of occupational experience programs and youth activities in secondary schools or community colleges.

Baker

307A. Instruction in Secondary Schools: Home Economics. (3) I, II.

Seminar—3 hours. Prerequisite: acceptance into

NOTE: For key to footnote symbols, see page 220.

Teacher Education Program; course 307B (concurrently). Techniques for developing, implementing and evaluating classroom teaching strategies and curriculum directions. (Deferred grading only, pending completion of sequence.) Adams

307B. Teaching in Secondary Schools: Home Economics. (5-15) I, II.

Student teaching (corresponds with public school session) and related field work. Prerequisite: Applied Behavioral Sciences 191C or the equivalent;

course 300; acceptance into the Teacher Education Program; course 307A (concurrently). Directed teaching in home economics programs in secondary schools. (Deferred grading only, pending completion of course.) Adams

323. Resource Development: Agricultural Education. (3) II.

Lecture—3 hours. Prerequisite: courses 306A, 306B. Selection and implementation of community resources in teaching. Baker

AGRICULTURAL CHEMISTRY (A Graduate Group)

Donald G. Crosby, Ph.D., *Chairperson of the Group*

Group Office, 109 Environmental Toxicology

Related Courses. See *Biochemistry 205 (Biochemical Mechanisms); Environmental Toxicology 203 (Environmental Toxicants); Environmental Toxicology 220-220L (Analysis of Toxicants); Food Science and Technology 211 (Chemistry of Food Lipids); Food Science and Technology 250A-250B, 251A-251B (Isolation and Identification of Trace Volatiles); Soil Science 215 (Physical Chemistry of Soils); Viticulture and Enology 219 (Plant Phenolics).*

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 knowledge of importance to the area of agricultural chemistry.

The Staff (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 (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. (S/U grading only.) The Staff (Crosby in charge)

AGRICULTURAL ECONOMICS

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 89 and 210.

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; Economics.*

Lower Division Courses

*1. Economic Basis of the Agricultural Industry. (4) II.

Lecture—4 hours. Agriculture and man; the agricultural industry in U.S. and world economies; 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.

18. Business Law. (4) I.

Lecture—4 hours. Prerequisite: sophomore standing. Instruction in the background, history and procedure of law; introduction to business law in the

field of contracts, business organization operation and termination, real property, employment and agency concepts; present applications by the courts and legislature. (P/NP grading only.) 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. Cooperatives and private businesses will be visited. Prior pre-enrollment with department required. (P/NP grading only.)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Carter in charge)

Upper Division Courses

100A. Economic Analysis in Agriculture. (3) I, II.

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. Students having completed Economics 100 or the equivalent may not receive credit for this course.

I. Kushman; II. Paris

100B. Economic Analysis in Agriculture. (3) II, III.

Lecture—3 hours. Prerequisite: course 100A. Pricing, output determination, and employment of resources under conditions of monopoly, oligopoly, and monopolistic competition. Students having completed Economics 100 or the equivalent may not receive credit for this course.

II. Sosnick; III. McCalla

100C. Economic Analysis in Agriculture. (3) III.

Lecture—3 hours. Prerequisite: course 100B or the equivalent. Theory of regional specialization, location, and trade for agricultural products; general economic equilibrium.

Rochin

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.)

Roemer

106A. Quantitative Methods in Agricultural Economics. (3) I, II.

Lecture—3 hours. Prerequisite: Mathematics 13 or the equivalent. Statistical methods for analyzing quantitative agricultural economics data: descriptive statistics, probability, hypothesis testing, statistical inference, and sampling.

I. Kushman; II. Zoloth

106B. Quantitative Methods in Agricultural Economics. (3) II, III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 106A or the equivalent. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis.

Foytik

112. Fundamentals of Business Management (4) I, II.

Lecture—4 hours. Forms and organization of businesses; management principles and applications: planning, organizing, motivating, staffing, and controlling; corporate objectives, goals, and policies; long-range planning; introduction to financial statements; information systems for decision making. Some case studies, group discussions, guest lecturers.

I. Logan; II. _____

113. Introduction to Marketing Management. (4) II, III.

Lecture—4 hours. Prerequisite: course 112 recommended. Background of modern marketing; con-

cepts of markets; consumers and market demand; performance of the modern marketing system; products and product promotion; international markets and marketing effort; market planning and evaluation. Case studies, guest lecturers, gaming.

II. Cothem; III. Jesse

114. Production Management. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 recommended. Principles and procedures for efficient use of resources in processing and handling of agricultural and other products; work scheduling; inventory control; coordination of production and sales.

Carman

117. Managerial Accounting. (4) III.

Lecture—4 hours; field trip. Prerequisite: Economics 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.

Carlson

120. Agricultural Policy. (3) III.

Lecture—3 hours. Analytical treatment of recent and current economic problems and governmental policies and programs affecting American agriculture.

125. Comparative Agriculture. (4) II.

Lecture—4 hours. Agriculture on all continents and in the principal countries; resources, organization, and operation; productivity and earnings in the farm versus the nonfarm sector, and development economics.

Hansen

130. Agricultural Marketing. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A or the equivalent. The nature, function, organizational structure, and operation of agricultural markets; prices, costs, and margins; market information, regulation, and controls; cooperative marketing.

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.

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.

147. Natural Resource Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: students who have taken course 100A,

NOTE: For key to footnote symbols, see page 220.

Economics 100, or the equivalent must enroll in course 198, section 17 (Natural Resources) for 2 units of credit. 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. Johnston

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; regional and national planning by both centralized and decentralized governments. Howitt

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. Rochin

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 establish minimum income levels. Rochin

155. Quantitative Analysis for Business Decisions. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 13 and 16A. Introduction to selected topics in operations research, including mathematical programming, applied decision theory, game theory, and inventory models. French

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. Carlson

176. Economic Analysis in Resource Use. (3) III.

Lecture—3 hours. Prerequisite: Economics 1A, 1B; course 100B or the 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. Johnston

190A-190B. Senior Research Project.

(2-2) I-II, II-III.

Lecture—1 hour; discussion—1 hour. Prerequisite: completion of courses 100A and 106A, or consent of instructor. Supervised individual research. The research report begun in 190A will be revised and completed in 190B. (Deferred grading only, pending completion of sequence.)

I-II. King, Snyder; II-III. King, Snyder

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Carter in charge)

198. (Section 17). Natural Resources. (2) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: students who have taken course 100A, Economics 100, or the equivalent must enroll in this course instead of course 147. 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. Johnston

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. (P/NP grading only.) The Staff (Carter 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 Economics 200A.) French

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.)

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.)

221. Agricultural Policy in Developed Countries. (3) I.

Lecture—3 hours. Economic policy, its nature, formation and analysis; characteristics of agricul-

tural 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. Carter

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. Hansen

240A. Econometric 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.) Green

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 Economics 240B.)

240C. Advanced Econometrics: Applications. (4) II.

Lecture—3 hours; discussion—1 hour. 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 Economics 240C.) Green

252. Applied Linear Programming. (3) I.

Lecture—3 hours. Applied linear programming methods emphasizing uses for business decisions: production, diet, blending, network and related problems. Non-theoretical course designed for master's degree students. Foytik

253. Linear Programming Analysis of Operational Problems. (3) I.

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. Howitt

254. Quantitative Analysis of Operational Problems. (3) II.

Lecture—3 hours. Nonlinear and dynamic programming methods with application to production, consumption, inventory, replacement market equilibrium, and competitive decision problems. Paris

55. Systems Analysis and Simulation. (3) III.

Lecture—3 hours. Dynamic model formulation and computer simulation of economic systems. Green

56. 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. King

257. Production Planning and Market Analysis. (3) II.

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. Kushman

260. Administrative Organization. (3) I.

Lecture—3 hours. Concepts and techniques of administrative and organizational behavior in the business firm; the role of personnel relations and leadership characteristics in achieving organizational goals and objectives. Logan

261. Case Problems in Management. (3) III.

Lecture—1 hour; discussion—2 hours. Case problem analyses 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. (S/U grading only.) 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. Carlson

271. Financial Management. (3) III.

Lecture—3 hours. Prerequisite: course 171 or the equivalent. Sources and costs of capital; optimal capital structure; project evaluation; investment policy; risk management; dividend policy; management of working capital; mergers and reorganizations. Sosnick

280. Analysis of Research in Production Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Current problems and methods of analysis in agricultural production economics research. Emphasizes both firm and industry. Paris

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. French

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. Howitt

298. Directed Group Study. (1-5) I, II, III.

Advanced study through special seminars, informal group studies, or group research on problems for analysis and experimentation. Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Re-

sources; (5) Human Resources; (6) Research Methods and Quantitative Analysis.

The Staff (Carter in charge)

299. Individual Study. (1-12) I, II, III.

Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Resources; (5) Human Resources; (6) Research Methods and Quantitative Analysis; and (7) Field Research Essay. (S/U grading only.)
The Staff (Carter in charge)

299D. Special Study for Doctoral Dissertation.

(1-12) I, II, III.

(S/U grading only.) The Staff (Carter in charge)

AGRICULTURAL EDUCATION

Major Advisers.—See *Class Schedule* listing.

Secondary Teaching Credentials—Agriculture: J. K. Baker, 204E Walker Hall.

Secondary Teaching Credentials—Home Economics: B. A. Adams, 203B Walker Hall.

Community College Credentials—Agriculture: J. K. Baker, 204E Walker Hall.

Major Program and Graduate Study.—See pages 90 and 210.

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 206 Walker 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. Thompson

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Thompson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (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.)

Thompson, Regan

299. Research. (1-12) I, II, III.

Research in agricultural education, home economics education, vocational education, agricultural extension, or adult education. (S/U grading only.)
The Staff (Thompson in charge)

Supervised Teaching Course**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 aids. Preparation of teaching materials; collecting, organizing, processing, and evaluating community resources. Baker

AGRICULTURAL ENGINEERING—See Engineering: Agricultural, Agricultural Engineering Technology and Consumer Technology**AGRICULTURAL ENGINEERING TECHNOLOGY**

Courses listed below are in the College of Agricultural and Environmental Sciences and are intended primarily for students not majoring in Engineering.

For course offerings for students majoring in en-

gineering, see page 303. For the Bachelor of Science major program and graduate study for the College of Engineering, see pages 141 and 210.

Questions pertaining to the following courses

should be directed to the instructor or to the Office of the Department of Agricultural Engineering, 2030 Bainer Hall.

Lower Division Courses

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Primarily for lower division students. (P/NP grading only.)

The Staff (Fridley in charge)

99. Special Study for Lower Division Students.

(1-5) I, II, III.

(P/NP grading only.) The Staff (Fridley in charge)

Upper Division Courses

101. Orchard and Vineyard Machinery. (1) I.

Lecture—1 hour; field trips. 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. (P/NP grading only.) Studer

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. Kepner

102L. Farm Tractors Laboratory. (1) II.

Laboratory—2 hours. Prerequisite: course 102 (concurrently). Directed laboratory exercises to augment the study of course 102. Kepner

103. Hydraulic Power and Controls. (1) II.

Lecture-laboratory—2 hours. Principles of operation and construction of hydraulic systems. Function and application of pumps, motors, and valves for controlling machines. Studer

104. Field Machinery. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing or consent of instructor. Principles, performance, and operating characteristics of machines for tillage, planting, cultivating, and harvesting field crops. Laboratory may include one or more field trips, field studies, laboratory studies of specific machines, and lecture discussions. 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; systems analysis; machinery selection; effective use of human skills. Chancellor

106. Vegetable and Small-Fruit Mechanization. (1) III.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Interrelationships of machines, harvest mechanization, and subsequent handling to the production, quality, and industry acceptability of vegetables and small fruits. (P/NP grading only.) Kepner

106L. Vegetable and Small-Fruit Mechanization Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 106 (concurrently). Primarily field trips to observe harvest mechanization, handling, processing, and marketing of vegetables and small fruits. Includes one all-day trip equivalent to three laboratory periods. (P/NP grading only.) 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 windbreaks. Probabilities of temperatures, rainfall, and climatic hazards to agriculture (risk figures). Akesson

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. 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. Morrison

121. Heat Transfer 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 radiation, convection, and conduction. Emphasis on applications with examples drawn from food processing, heating, refrigeration, cooling, and drying. Morrison

121L. Heat Transfer Processes Laboratory. (1) I.

Laboratory—2 hours. Prerequisite: course 121

(concurrently). Directed laboratory exercises to augment the study of course 121. Morrison

123. Food Products Handling. (1) I.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Concepts of handling food products with emphasis on equipment and systems for handling perishable commodities. Offered in odd-numbered years. O'Brien

131. Clean Air in the Rural Environment. (1) II.

Lecture—1 hour. Prerequisite: upper division standing. Types, sources and strengths of rural air contaminants arising from food and feed processing, burning of wastes and use of agricultural chemicals. Effects of industrial, transport and agricultural contaminants on ornamentals, crops and forests; economics of improving air quality. Akesson

131L. Clean Air in the Rural Environment Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 131 (concurrently). Directed laboratory studies on instruments, measuring techniques and data analysis of air contaminants. Field trips and special projects to augment course 131. Akesson

132. Management of Agricultural Wastes. (1) III.

Lecture—1 hour. 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. Horsfield

132L. Laboratory Studies in Management of Agricultural Wastes. (1) III.

Laboratory—3 hours. Prerequisite: course 132 (concurrently). Directed laboratory exercises, field trips and special projects to augment the study of course 132. (P/NP grading only.) Horsfield

AGRICULTURAL PRACTICES

Questions pertaining to the following courses should be directed to the instructor or to the Office of the Department of Agricultural Engineering, 2030 Bainer 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 man-

133. Aircraft and Ground Equipment for Crop Protection, Nutrition and Vector Control. (1) III.

Lecture—1 hour. 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. (P/NP grading only.) Yates

133L. Laboratory for Equipment for Crop Protection. (1) III.

Laboratory—3 hours. Prerequisite: course 133 (concurrently). Directed laboratory exercises and field trips to augment study in course 133. (P/NP grading only.) Yates

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Fridley in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Fridley in charge)

Graduate Courses

298. Group Study. (1-5) I, II, III.

The Staff (Garrett in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Garrett in charge)

Professional Course

317. Problems in Teaching Farm Mechanics. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Physics 2A or 4A and consent of instructor. Demonstrations of and practice in the methods of teaching farm mechanics in secondary schools. School-shop planning including selection, arrangement, and management of equipment, curriculum planning, including the relation of teaching materials, references, safety and visual aids. O'Brien

agement. Essentials of safe equipment operation, the fundamentals of preventive maintenance, field adjustments and trouble shooting are presented. (P/NP grading only.) 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.) Hanna

AGRICULTURAL SCIENCE AND MANAGEMENT

Major Advisers.—See Class Schedule listing.

Major Program and Graduate Study.—See pages 91 and 210.

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

150. Applied Statistics in Agricultural Sciences. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 13 and/or 16A recommended. Ap-

AGRONOMY

Related Undergraduate Majors and Graduate Study.—See pages 117, 118, and 210.

Related Courses. See *Plant Science and Range Management*.

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 nonmajors in agronomy. Peterson

111. Cereal Crops of the World. (4) II.

Lecture—3 hours; laboratory—3 hours (includes four field trips). 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. 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. Raguse

112L. Forage Crops Ecology Laboratory. (1) III.

Laboratory—3 hours (includes four half-day field trips). Prerequisite: course 112. Greenhouse experiments and problem sets to supplement course 112. Field trips related to forage plant breeding, management, and utilization. Raguse

113. Fiber, Oil and Sugar Crops in a Changing World. (4) I.

Lecture—3 hours; laboratory—3 hours (includes four field trips, one on Saturday.) 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

applications of statistical methods to analysis and interpretation of research data in agronomic, animal, behavioral, food, and nutritional sciences. Lectures cover concepts and basic statistical theory. Specialized laboratory sections cover procedures, data processing and interpretation. The Staff

political forces that shape crop production, and utilization practices. Mikkelsen

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Qualset in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: 6 upper division units of agronomy. (P/NP grading only.) The Staff (Qualset 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. Qualset, 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 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. 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. Allard

NOTE: For key to footnote symbols, see page 220.

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. Jain, 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. 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. 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. Huffaker

290. Seminar in Crop Growth, Production and Utilization. (1-2) I, II.

Seminar—1-2 hours. Topics of current interest related to plant growth processes, production and management systems, and utilization of cultivated food, feed and fiber crops. I. Mikkelsen; II. Peterson

291. Seminar in Plant Breeding and Evolution of Cultivated Plants. (1-2) I, III.

Seminar—1-2 hours. Topics of current interest related to plant breeding systems and the origins of evolution of cultivated plants. I. Schaller; III. Jain

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 (Qualset in charge)

299. Research. (1-12) I, II, III.

Original research involving plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of field crops. (S/U grading only.) The Staff (Qualset in charge)

AMERICAN STUDIES

Robert Merideth, Ph.D., *Program Director*
Program Office, 822 Sproul Hall

Committee in Charge:

—————; (*Committee Chairperson*)
Vincent A. Crockenberg, Ph.D. (*Education*)
Bruce M. Hackett, Ph.D. (*Sociology*)
Paul D. Johnson, Ph.D. (*English*)
C. Roland Marchand, Ph.D. (*History*)
Dale R. Marshall, Ph.D. (*Political Science*)
Robert Merideth, Ph.D. (*American Studies*)
David S. Wilson, Ph.D. (*American Studies*)

Faculty:

¹Jay E. Mechling, Ph.D.
Robert Merideth, Ph.D.
Merline A. Williams, M.A.
David S. Wilson, Ph.D.

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Major Advisers.—R. Merideth, M. A. Williams, D. S. Wilson.

The Major Program

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 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 or she 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 the student 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, 1D, 1E) 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) Choose one from the following three emphases (student's plan to be approved in advance by 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) Choose 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 Credential Subject Representative: M. A.

Williams. See page 215 for the Teacher Education Program.

Lower Division Courses

*1A. Technology, Science and American Culture.

(4) II.

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.). Mechling

1B. Magic and Religion in American Culture. (4) II.

Lecture—3 hours; discussion—1 hour; tutorial conferences, short projects, field exercises. Introduction to competing reality constructs; adept and popular wisdom, behavior; sacred communities, past and present; American faiths, "civil religion," secularism, occult and wisdom associations; classwork, directed independent projects, practice in learning from informants and documents (written, pictorial, musical, architectural, artifactual). Wilson

1D. Tradition and Revolution in American Culture.

(4) III.

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. Merideth

1E. Nature and Culture in America. (4) I.

Lecture—3 hours; discussion—1 hour; tutorial conferences, short projects, field exercises. Uses and abuses of nature in America; Indian and non-Indian approaches to nature contrasted; attention to institutions and individuals (artists, scientists, naturalists, farmers, etc.); survival theory and practice; classwork, field study, directed independent projects, individual or collective. Wilson

30. Fieldwork in American Civilization. (4) III.

Lecture—2 hours; fieldwork—2 hours; evaluation of written, visual, and aural field reports and conferences with individual students. A practical introduction to the multi-disciplinary techniques of gathering, organizing, and interpreting the data of American experience; exercises in participant observation, interviewing, above-ground archaeology, photographic anthropology, and in the application of these techniques to the study of a literate, post-industrial civilization. Williams

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 Sociol-

ogy I 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. Williams, Wilson

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)
The Staff (Chairperson in Charge)

99. Individual Study for Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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, representativ models and importance of cross-cultural comparison and contrast; historical and nonhistorical approaches. Williams

140A. Events and Institutions 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, 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. Merideth

140B. Value and Meaning 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, approached thematically, multidisciplinary but integrated for the purpose of comprehending the period's character and meaning. Emphasis on qualitative theory and methods. Merideth

140C. Problems in American Culture. (4) III.

Lecture—3 hours; reports and tutorial conferences. Prerequisite: courses 45, 140A, 140B. Multi- and interdisciplinary analysis in depth of a selected problem in American culture. Emphasis on the selection and application of appropriate concepts, methods, and techniques. Wilson

190A. Senior Proseminar. (4) I.

Seminar—3 hours; individual conferences and written report evaluations. Prerequisite: consent of Chairperson of American Studies Program. Individual research on American Studies topics. (Deferred grading only, pending completion of sequence.)
The Staff (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 (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 (Merideth in charge)

192. Internship in American Institutions.

(1-15) I, II, III.

Prerequisite: enrollment dependent on availability of intern positions, with priority to American Studies majors and those completing course 30. Supervised internship and study within and about key organizations in American civilization at archives, museums, schools, historical societies, governmental and social agencies, etc. with attention to the techniques of participant observation and the collection of ethnographical data. May be repeated for credit up to 15 units. (P/NP grading only.)
The Staff (Merideth in charge)

197T. Tutoring in American Studies. (1-5) I, II, III.

Tutorial—1-5 hours. Prerequisite: consent of Chairperson 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. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Merideth in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor and Chairperson of American Studies Program. (P/NP grading only.)
The Staff (Merideth in charge)

ANATOMY

Leslie J. Faulkin, Jr., Ph.D., *Chairperson of the Department*
Department Office, 1072 Haring Hall

Professors:

Benjamin L. Hart, D.V.M., Ph.D.
 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:

George H. Cardinet III, D.V.M., Ph.D.
 Leslie J. Faulkin, Jr., Ph.D.

Assistant Professor:

Carleton L. Lohse, D.V.M., Ph.D.

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Upper Division Courses**100. Systematic Anatomy. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2. Lectures, dissections, and demonstrations emphasizing the typical structure of the anatomical systems of the dog, chicken, and subhuman primate. Julian

***170. Principles of Normal and Abnormal Animal Behavior. (3) III.**

Lecture—3 hours. Prerequisite: Veterinary Medicine 121 or Psychology 2A or the equivalent. 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. Hart

198. Directed Group Study. (2-5) I, II, III.

Laboratory—6-15 hours. Prerequisite: consent of instructor. (P/NP grading only.)
 The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Laboratory—3-15 hours. Prerequisite: consent of instructor. (P/NP grading only.)
 The Staff (Chairperson in charge)

Graduate Courses**201. Advanced Systematic Anatomy. (5) II.**

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 100 or consent of instructor. Detailed dissections comparing the anatomy of the dog, sheep, chicken and primate. Emphasis placed on the unique aspects of each species and their use in research. Julian

202. Organology. (2) III.

Lecture—2 hours. Prerequisite: course 100 or the 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 even-numbered years. The Staff (Julian in charge)

202L. Organology. (1) III.

Laboratory—3 hours. Prerequisite: course 202 (should be taken concurrently). Anatomical demonstrations of principles of organology.
 The Staff (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 management 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.)

205. Ultramicroscopic Anatomy. (3) II.

Lecture—3 hours. Prerequisite: Zoology 107 or the 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. Tyler, 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. 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. 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.) Tyler

215. Veterinary Histology. (6) III.

Lecture—3 hours; laboratory—9 hours. Prereq-

NOTE: For key to footnote symbols, see page 220.

quisite: Zoology 2. The microscopic anatomy of tissues and organs of mammalian and avian species of veterinary significance. The Staff

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)
Julian in charge

297. Advanced Group Study in Surgical Anatomy. (2-4) I, II, III.

Laboratory—6-12 hours. Prerequisite: Veterinary Medicine 107 or consent of instructor. Selected top-

ics in topographical, radiological, or regional anatomy as they apply to the clinical sciences. Lohse

298. Group Study. (2-5) I, II, III.

Laboratory—6-15 hours. Prerequisite: consent of instructor. The Staff (Chairperson in charge)

299. Research. (2-12) I, II, III.

Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)
The Staff (Chairperson in charge)

ANESTHESIOLOGY—See Medicine

ANIMAL BIOCHEMISTRY—See Biochemistry

ANIMAL GENETICS

Major Adviser.—See Class Schedule listing.

Major Program.—See page 110.

Related Courses. See Agronomy 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).

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, Room 228, Mrak Hall.

Upper Division Courses

107. Animal Breeding and Genetics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Genetics 100B; Mathematics 13. Qualitative and quantitative inheritance in relation to animal breeding. Principles involved in utilization of selection and heterosis in livestock and poultry improvement. Gall

108. Methods in Quantitative Animal Breeding. (3) II.

Lecture—3 hours. Prerequisite: course 107. 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. Rollins

109. Mammalian Genetics Laboratory. (2) I.

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 107 (may be taken concurrently); consent of instructor. 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. Bradford

110. Animal Breeding Laboratory. (2) II.

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 107. Practice in application of principles of selection to livestock improvement, using computer generated herd records. Each student has a herd of animals in which selection is practiced for several generations, and the effects on phenotypic and genetic trends are computed. Laben

112. Seminar on Animal Breeding Experiments and Methods. (1) III.

Seminar—1 hour. Prerequisite: course 107. Review and discussion of literature relating to breeding experiments and programs for livestock and companion animals. Rollins

131. Genetics of Animal Adaptation. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: upper division course in genetics or equivalent background knowledge. Consideration of the dynamic behavior of genes in natural populations; estimation of effects of inbreeding, random drift, population subdivision; effects of migration mutation, selection. Laboratory consists of self-study exercises using interactive, simulation programs available on computer terminals. Gall

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Selected topics relating to animal genetics. (P/NP grading only.)
The Staff (Bradford in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Bradford in charge)

Graduate Courses

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. Abplanalp

299. Research in Animal Genetics. (1-12) I, II, III. (S/U grading only.) The Staff (Bradford in charge)

ANIMAL NUTRITION—See Nutrition

ANIMAL SCIENCE

Major Advisers.—See Class Schedule listing.

Major Program and Graduate Study.—See pages 92 and 210.

Related Courses. See Food Science and Technology 120 (Muscle as Food).

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. Smith

2. Introductory Animal Science. (3) II, III.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 1; Biological Sciences 1, recommended. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals; the application of sciences to animal production. Anderson

21. Livestock and Dairy Cattle Judging. (2) III.

Laboratory—6 hours. Prerequisite: course 1 or 2 recommended. Evaluation of type as presently applied to light horses, meat animals and dairy cattle. Relationship between form and function, form and carcass quality and form and milk production. Carroll

31A. Perspectives in Animal Science. (1) I.

Lecture—1 hour; occasional discussion. Consideration of the present-day scope of the broad field of animal science and its role in modern society. Course of special interest to students new to the campus. (P/NP grading only.) Ronning

31B. Current Topics in Animal Science. (1) II.

Lecture—1 hour; occasional discussion. Lectures, assigned reading and discussion of topics of current concern in the broad area of animal science. Topics may include land utilization; livestock, poultry and

game production; nutritional, genetic, physiological and health management. (P/NP grading only.) Ronning

31C. Prospects in Animal Science. (1) III.

Lecture—1 hour; occasional discussion. Examination of factors which may influence future relationships between man and other animals; competition for food, space and environment; animal and animal product analogs. (P/NP grading only.) Ronning

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 (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. (P/NP grading only.) The Staff (Bradford in charge)

Upper Division Courses

111. Meats and Meat Animal Evaluation. (2) I.

Laboratory—6 hours. Prerequisite: course 2 or 21. Correlation of live meat animal conformation and degree of finish with carcass traits, yield of red meat, criteria for grading carcasses and indicators of meat palatability. Carroll

114. Dairy Cattle Production. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; course 124 and Nutrition 103 or 110, or the 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. Laben, Smith

NOTE: For key to footnote symbols, see page 220.

115. Horse Production. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 100B; Nutrition 103 or 110; Physiology 101. Feeding, breeding, and management of horses; application of the principles of basic animal sciences to problems of production of all classes of horses.

Evans

116. Meat Animal Production. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; Nutrition 103 or 110; Physiology 101. 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.

Bradford, Garrett

117. Physiological Aspects of Animal Production from Tropical and Arid Areas. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: a course in nutrition; Physiology 101. 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.

Morris

118A. Range Livestock Production. (3) I.

Lecture—3 hours. Prerequisite: Nutrition 103 or 110; courses 1, 2, and Genetics 100B recommended. 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.

Carroll, Torell

118B. Intensive Livestock Production. (3) II.

Lecture—3 hours. Prerequisite: Nutrition 103 or 110. Recommended: courses 1, 2, and 118A; Genetics 100B. 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.

Carroll, Heitman, Laben

123. Animal Growth. (4) II.

Lecture—2 hours; special reports and discussions—2 hours. Prerequisite: upper division course in genetics, physiology and nutrition or the 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.

Garrett, Ashmore, Gall

124. Lactation. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Physiology 101 and Nutrition 110 or the 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.

Laben, Geschwind

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.

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.)

The Staff (Bradford in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Selected topics relating to the animal sciences. (P/NP grading only.)

The Staff (Bradford 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. (P/NP grading only.)

The Staff (Bradford in charge)

Graduate Courses**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.

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 (Bradford 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 (Bradford in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Bradford in charge)

ANTHROPOLOGY

Delbert L. True, Ph.D., *Chairperson 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*)
 *⁴David L. Olmsted, Ph.D.
 Delbert L. True, Ph.D.

Associate Professor:

William G. Davis, Ph.D.

Assistant Professors:

- *Richard T. Curley, Ph.D.
 Henry McHenry, Ph.D.
¹Jerry A. Moles, Ph.D.
 Melvin K. Neville, Ph.D.
 Peter S. Rodman, Ph.D.
 Henry J. Rutz, Ph.D.
¹Lenora Timm, Ph.D. (*Linguistics*)
 Carol F. Wall, Ph.D.

§ § §

Departmental Major Advisers for Bachelor of Arts Degree.—R. T. Curley, H. J. Rutz.

Departmental Major Adviser for Bachelor of Science Degree.—P. S. Rodman.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Anthropology 1, 2, 3, and Anthropology 13 or Mathematics 13, Geography 1 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, 5; 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 2A-2B; 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.—12 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; Botany 140; Epidemiology 103A, 103B, 103C; Genetics 100A, 100B, 103, 105, 115; Geology 106, 107; 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 Credential Subject Representative: H. J. Rutz. See page 215 for the Teacher Education Program.

Related Courses. See *Native American Studies 20*.

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.

Rodman, 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.

Davis, Crowley, Rutz

3. Introduction to Archaeology. (4) I.

Lecture—3 hours; discussion—1 hour. Development of archaeology as an anthropological study; objectives and methods of modern archaeology. True

*4. Introduction to Linguistic Anthropology. (4) III.

Lecture—3 hours; discussion—1 hour. Language in its interrelationships with man's biology, his culture, and his society.

Wall

NOTE: For key to footnote symbols, see page 220.

5. Proseminar in Biological Anthropology. (4) II.

Seminar—4 hours; research paper. Prerequisite: course 1 and consent of instructor. Course primarily for majors. Integration of related disciplines in the study of biological anthropology through discussion and research projects. Principal emphasis on the evolution of man's adaptations to the environment. (P/NP grading only.) Neville

13. Quantitative Method in Anthropology. (4) II.

Lecture—3 hours; discussion—1 hour. Baumhoff

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (True in charge)

Upper Division Courses**101. Principles of Human Ecology. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 or 10 and Sociology 1 or Anthropology 2 recommended. An examination of the critical variables in the social processes that relate man to his environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Environmental Studies 101.) Davis, P. J. Richerson

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. Rutz

103A. Archaeological Theory and Method. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 3, and 13. Theory and methods of prehistoric archaeology. True

***103C. New World Prehistory: The First Arrivals. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Early man in the New World. Cultural adaptation and development of early hunting and gathering peoples in North and South America. True

103D. New World Prehistory: Archaic Adaptations in New World Prehistory. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The collectors: cultural diversification in post Pleistocene settings. True

***103E. New World Prehistory: Formative Lifeways in North and South America. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The farmers: the transition from a hunting and gathering subsistence to sedentary farming in the American Southwest, Mississippi Valley, and Andean South America. True

***103F. New World Prehistory: The High Cultures: Mesoamerican and Andean South America. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Urban developments and the rise of civilization in Mexico and Peru. True

***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. Forbes

***105A. Indians of North America. (4) II.**

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. 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. Moles

106. Native Peoples of California and the Great Basin. (4) I.

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. Forbes

***107A. Old World Prehistory. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The beginnings and development of cultural phenomena during the Pleistocene epoch. A critical and comprehensive survey of known cultural phenomena beginning some 2 million years ago and extending through the terminal stages of the last glacial period. Will include material from Africa, Asia and Europe. The Staff

107B. Old World Prehistory. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The first farmers. Development of a new way of life following the end of the Pleistocene. A critical and comprehensive survey of cultural developments during the period of time from the end of the Pleistocene through Neolithic times in Africa, Asia and Europe. Baumhoff

***107C. Old World Prehistory. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The development of civilization. Bronze and Iron age cultures in Africa, Asia and Europe. A survey of the archaeological evidence un-

derlying currently accepted models relating to urban developments and the growth of civilization.

The Staff

***108. Native Americans in Contemporary Society. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. An introduction to the sociocultural 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. (Same course as Linguistics 109.) Wall

110. Elementary Linguistic Analysis. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. An introduction to phonemic theory, morphophonemics, morphemes, and tactics. (Same course as Linguistics 110.)

***111. Intermediate Linguistic Analysis. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Continuation of course 110. Advanced work in phonemics, morphophonemics, morphemes, and tactics. (Same course as Linguistics 111.) Olmsted

112. Comparative Linguistics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction. (Same course as Linguistics 112.) Olmsted

***114. The Ethnography of Speaking. (4) II.**

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. (Same course as Linguistics 114.) Timm

***116. Introduction to Ethnographic Research. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 102. Guidelines for the proper conduct of ethnographic research; standards for evaluating ethnographic literature. Moles

***118. Ethnosemantics. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or the 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. 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) 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. Wall

121. Folklore. (4) III.

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. 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. 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. Rutz

124. The Anthropological Study of Religion. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Major theories concerning religion in non-literate societies. Survey of shamanism, magic and witchcraft, rituals and symbols, and religious movements. Extensive discussion of ethnographic examples and analysis of social functions of religious institutions. Curley

128. Kinship and Social Organization. (4) II.

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. Davis

NOTE: For key to footnote symbols, see page 220.

139A. Peoples of Africa. (4) I.

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.
Crowley

***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.
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.
Crowley

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.
Rutz

***147B. Peoples of the Pacific. (4) II.**

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.
Rutz

***148. Ecological Anthropology. (4) I.**

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.

150. Primate Evolution Laboratory. (3) III.

Lecture—1 hour; laboratory—5 hours. Prerequisite: course 155 or 151 (may be taken concurrently). Osteological, dental, and neuroanatomical studies of living and fossil primates. Limited enrollment.
Rodman

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.
Neville

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.
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.
Neville

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.
Rodman, 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. Continuation of course 154A for students interested in practical methods of studying, describing and analyzing the behavior and ecology of primates. Laboratories will consist of direct observation of captive primates and local birds with appropriate quantitative analysis of observations.
Rodman

155. Comparative Primate Anatomy. (4) II.

Lecture—2 hours; laboratory—4 hours. Prerequisite: Zoology 2. The functional anatomy of monkeys, apes, and man. Emphasis on the anatomical evidence for human evolution.
McHenry

156. Human Osteology. (4) I.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or the equivalent. Introductory study of the human skeleton, including bone growth, pathology, radiology, evolution, dentition, and variations in race, sex, and age.
McHenry

***162. Peasant Society and Culture. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Comparative study of peasant communities, utilizing historical and ethnographic sources; analysis of urban-rural relations; problems of economic development and cultural change.

163. Anthropology of Complex Societies. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Examination of local-level social organization in state-organized societies. Major topics include patron-client relations and brokers; regional systems; ethnicity; interrelation of formal institutions and informal social relations. Examples are taken from urban areas and peasant groups.
B. S. Orlove

***165. Culture Change. (4) II.**

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.

***172. Culture and Environmental Perception. (4) II.**

Lecture—3 hours; individual research project. An examination of man's relationship to the environment through the study of culture. The nature of subjective models and their impact upon environmentally oriented behavior. Focuses upon classification and decision making. (Same course as Environmental Studies 172.)

***190. Cultures of China and Korea. (4) III.**

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.

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.

***192. Peoples and Cultures of Southeast Asia. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or the 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. 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 (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. 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. 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 Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.) The Staff (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. (P/NP grading only.) The Staff (True in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (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. 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. 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. 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) I.

Seminar—3 hours. Techniques for analyzing archaeological data; application to various prehistoric cultures. Baumhoff

***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. True

220. Field Course in Linguistics. (4) II.

Seminar—2 hours; laboratory—2 hours. Prerequisite: courses 110, 111. Techniques of eliciting, recording, and analyzing; work with a native speaker. Wall

221. Rural Transformation in Post-Colonial Societies. (4) II.

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. 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. Davis

***224. Problems in Comparative Religion. (4) III.**

Seminar—3 hours. Advanced study of current problems in the anthropological study of religion. Curley

***239. Problems in African Society and Culture. (4) I.**

Seminar—3 hours. Diachronic analyses of traditional institutions in sub-Saharan Africa. Curley

***240. Problems in Afro-American Studies. (4) III.**

Seminar—3 hours. Comparative studies of selected Black communities in the New World. Crowley

***242. Problems in African Prehistory. (4) I.**

Seminar—3 hours. Baumhoff

***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.

***246. Ethnology of Europe. (4) II.**

Seminar—3 hours. Prerequisite: reading knowledge of a European language other than English. Supervised study of the primary and secondary sources dealing with the ethnography and ethnology of the peoples of Europe. Emphasis upon folk, peasant, and minority groups. Olmsted

***248. Concepts and Problems in Ecological Anthropology. (4) I.**

Seminar—3 hours. Prerequisite: course 148 or the equivalent, or consent of instructor. Advanced study of theories, methods, and applications of the ecological perspective to cultural and physical attributes of human population.

***250A. Theory and Method of Anthropology. (4) I.**

Seminar—3 hours. Measurement, research design, field methods, data analysis, and theory construction in anthropological research.

***250B. Theory and Method of Anthropology. (4) II.**

Seminar—3 hours. Prerequisite: course 250A. The application of symbolic analysis to anthropological materials.

250C. Theory and Method of Anthropology. (4) III.

Seminar—3 hours. Prerequisite: course 250B. Continuation of course 250B. Baumhoff

253. Concepts and Problems in Physical Anthropology. (4) II.

Seminar—3 hours. McHenry

254. Primate Behavior. (4) III.

Seminar—3 hours. Prerequisite: course 154B or the equivalent. Analysis of primate behavior, with particular emphasis on preparation for field studies. Neville

***265. Concepts and Problems in Applied Anthropology. (4) II.**

Seminar—3 hours. Prerequisite: course 165 or the 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.

***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. Forbes

292. Seminar in Anthropological Linguistics. (4) II.

Seminar—3 hours. Wall

299. Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

299D. Dissertation Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

APPLIED BEHAVIORAL SCIENCES

Major Advisers.—See Class Schedule listing.

Major Program and graduate study.—See page 93.

Related Courses. See *Environmental Planning and Management I* (Environmental Quality); *Environmental Studies 10* (Introduction to Environmental Studies), *101* (Social Processes), *111* (Cultural Ecology).

Lower Division Courses

17. Population Problems. (2) II.

Lecture—2 hours. An assessment of relevant aspects of overpopulation to determine man's chance of survival. Howard

18. Scientific Myth and Social Bias. (3) 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. Fujimoto, Regan

19. The Community. (3) I.

Lecture—2 hours; discussion—1 hour. Exploration of ways in which people come together, and how this is reflected in the expression of community; examination of the dynamics of community change. MacCannell

47. Orientation to Community Resources.

(2) I, II, III.

Field trip—3 days; seminar—three 2-hour sessions. (Course 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.) Hawkes

99. Special Study for Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Thompson in charge)

Upper Division Courses

151. Community Research and Analysis. (4) I.

Lecture—4 hours. 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. Fujimoto

152. Community Development. (4) II.

Lecture—4 hours. Prerequisite: course 151 recommended. Introduction to 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. Blakely

153. Community Organizations, Institutions and Resources. (4) II.

Lecture—4 hours. Prerequisite: course 151 or 152. Analysis of resources, organizations, institutions, agencies, and groups in the community, and how

each affects the development process.

The Staff (Thompson in charge)

154. Theories in Community Change. (4) II.

Lecture—4 hours. Prerequisite: course 151, plus one other course in Applied Behavioral Sciences. Consideration of the concepts and theories of the social change process pertinent to community development. Blakely

155. Communication Skills for Community Development. (4) II.

Lecture—4 hours. Prerequisite: course 151 or 152. Communication skills and techniques in community development programs, to include group process and human relations methods useful in community development. Blakely

159A. Field Experience in Community Development. (12) III.

Prerequisite: course 153 or consent of instructor. Field assignment-internship with community and grassroots groups, analysis of resources and alternatives for resolution of community development needs. Fujimoto

159B. Field Problems. (3) III.

Seminar—3 hours. Prerequisite: course 159A and consent of instructor. Developing, implementing and evaluating field research and problems. The Staff (Thompson in charge)

160A. Institutional Research Methods in Applied Behavioral Sciences. (4) I.

Lecture—4 hours. Prerequisite: upper division status; courses 162 and 163 highly recommended. Application of behavioral science research methodology to multidisciplinary problems confronting organizations. Students electing this course may not receive credit for Native American Studies 140. Regan, Thompson

160B. Research Design and Analysis for Institutions. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 160A or either Education 114, Mathematics 13, or consent of instructor. Applied behavioral science research design and analysis for organization. Methods of data analysis, tests of significance, and use of computer in data processing. Regan

162. People, Work and Technology. (4) I.

Lecture—3 hours; discussion—1 hour. Use of human resources in all types of work. Emphasis is on the motivation to work, structure of organizations, and the impact of technology on human beings in work situations. The transition from college to the work force is considered. The Staff (Thompson in charge)

163. Behavior of Community Organizations. (4) II.

Lecture—4 hours. Prerequisite: course 162 or consent of instructor. How community organizations function and how members of organizations interact to each other, the organization, and those people who are clients of the organization. Effects of leadership, motivation, group dynamics, communications, and power are considered.

The Staff (Thompson in charge)

164. Theories in Institutional Change. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 162. The institution as an open system which changes in response to the internal and external environment. Emphasis on structural, technological and humanistic approaches to change.

Regan

171. Housing (4) I.

Lecture—4 hours. Exploration of the shelter aspects of family environment. Study of technological, social, economic, and aesthetic factors affecting the nature and organization of family and community housing.

Hawkes

172. The Disadvantaged: Issues and Innovations. (3) I.

Lecture—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.

173. The Continuing Learner. (3) II.

Lecture—3 hours. Prerequisite: Education 110 (may be taken concurrently) or consent of instructor. 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.

The Staff (Thompson in charge)

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.)

Yoshioka

191A-191B. Introduction to Teaching. (1-1) I-II.

Lecture—1 hour; field observations in public schools. Observations of programs and classes in public schools, community colleges and public agencies. Observations begun in 191A will be continued in 191B. (Deferred grading only, pending completion of sequence.)

Adams, Baker

191C. Field Experience in Teaching. (1-3) III.

Discussion—1 hour; teacher assistant assignments

in public schools. Prerequisite: course 191B. Field experience for students working as teacher assistants in agriculture or home economics programs in public schools. (P/NP grading only.)

Adams, Baker

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. (P/NP grading only.)

The Staff (Thompson in charge)

197T. Tutoring in Applied Behavioral Sciences. (1-5) I, II, III.

Prerequisite: consent of instructor. Leading of small voluntary discussion groups. (P/NP grading only.)

The Staff (Thompson in charge)

197TC. Community Tutoring in Applied Behavioral Sciences. (1-5) I, II, III.

Prerequisite: consent of instructor. Supervised tutoring in the community. (P/NP grading only.)

The Staff (Thompson in charge)

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Thompson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Thompson in charge)

Graduate Courses

201. Planning Processes in Applied Behavioral Sciences. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor; course 201L (must be taken concurrently). Systematic approach to planning, including new concepts, theories, and methods for planning with application to educational institutions, agencies and the community at large.

Thompson

201L. Laboratory in Planning Processes. (1-3) I.

Seminar—1 hour; laboratory—3-9 hours. Prerequisite: course 201 (must be taken concurrently). Supervised practice in planning.

Thompson

202. Systems for Change. (3) II.

Lecture—3 hours. Prerequisite: courses 201, 201L, and 202L (concurrently). Study of institutional processes, resource allocations, communication network, program priorities and destruct mechanisms needed for change.

Regan

202L. Laboratory in Systems for Change. (1-3) II.

Seminar—1 hour; laboratory—3-9 hours. Prerequisite: course 202 (must be taken concurrently). Supervised practice in an institution or agency studying the process of change.

Regan

203. Evaluation and Decision Making. (3) III.

Lecture—3 hours. Prerequisite: courses 202, 202L, and 203L (must be taken concurrently). The study of decision-making behavior, theoretical formulations of evaluation and decision making, value conflicts, multiple information requirements at different organizational levels, research techniques, and the role of evaluation in programs in change.

Adams

203L. Laboratory in Evaluation and Decision Making. (1-3) III.

Seminar—1 hour; laboratory—3-9 hours. Prerequisite: course 203 (must be taken concurrently).

Supervised practice in evaluation and decision making. Adams

290. Seminar. (1) I, II, III.

Seminar—1 hour. Analysis of research in applied behavioral sciences. (S/U grading only.)

The Staff (Thompson in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Thompson in charge)

299. Research. (1-6) I, II, III.

(S/U grading only.)

The Staff (Thompson in charge)

ART

Richard D. Cramer, M.F.A., *Chairperson of the Department*
Department Office, 101 Art

Professors:

Robert C. Arneson, M.F.A.

³ Richard D. Cramer, M.F.A. (*Acting Director, Laboratory for Research in the Fine Arts and Museology*)

Daniel J. Crowley, Ph.D. (*Art and Anthropology*)

*Roy R. DeForest, M.A.

*Seymour Howard, Ph.D.

Ralph M. Johnson, M.A.

*Daniel Shapiro

Wayne Thiebaud, M.A.

William T. Wiley, M.F.A.

Associate Professors:

Manuel J. Neri

Roland C. Petersen, M.A.

Assistant Professors:

³ *L. Price Amerson, M.A. (*Acting*)

Sherwood A. Fehm, Jr., Ph.D.

Robert J. Griggs, Ph.D.

William Henderson, M.F.A.

³ *Harvey Himelfarb, M.A.

Cornelia S. Hudson, M.F.A.

Lecturers:

Joseph A. Baird, Ph.D.

Gerald R. Hoepfner, B.F.A.

*Lynn Matteson, M.A.

§ § §

Departmental Major Advisers.—See the *Class Schedule*.

Preparation for the Major:

Art Studio: *three courses from the following list:

Art 2, 3, 4, 5, 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 additional 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.

Transfer Students.—Before enrolling in Art courses at Davis, ask your faculty adviser to evaluate transfer courses in art.

*Students interested in drawing and painting should take courses 2, 3, 4; course 5 is recommended.

Students interested in sculpture should take courses 2, 3, 5; course 4 is recommended.

Students preparing for graduate work in any of the environmental design professions should take courses 2, 5, 16, 121A, 121B, 121C, 149, 168, 184.

NOTE: For key to footnote symbols, see page 220.

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 Credential Subject Representative: Department Chairperson. See page 215 for the Teacher Education Program.

Lower Division Courses

1A. Ancient Art. (4) I.

Lecture—3 hours; discussion—1 hour. Art of the pagan Mediterranean world from the prehistoric caves to the fall of the Roman Empire. Howard

1B. Medieval and Renaissance Art. (4) II.

Lecture—3 hours; discussion—1 hour. Christian, Barbarian, Moslem, and Classical traditions in European Art from the fourth through the sixteenth centuries. Fehm

1C. Baroque and Modern Art. (4) III.

Lecture—3 hours; discussion—1 hour. Major styles and masters of the Western world after the Counter Reformation. Matteson

1D. Oriental Art. (4) III.

Lecture—3 hours; discussion—1 hour. The art of India, South East Asia, China, and Japan. Crowley

2. Drawing I. (4) I, II, III.

Laboratory—8 hours; to be arranged—4 hours. Form and composition in black and white. The Staff

3. Drawing II. (4) I, II, III.

Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form and composition in color. The Staff

4. Life Drawing. (4) I, II, III.

Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form in composition using the human figure as subject. The Staff

5. Sculpture. (4) I, II, III.

Laboratory—8 hours; to be arranged—4 hours. Form in space using plaster and other media. The Staff

10. Introduction to Art: History and Appreciation. (4) I.

Lecture—4 hours. The understanding and appreciation of painting, sculpture, architecture, and industrial art. Illustrated lectures. Intended for students not specializing in art. (P/NP grading only.) Thiebaud

11. Introduction to Art: Practice. (4) I, II, III.

Lecture—2 hours; laboratory—4 hours; 3 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, 5, or 16. (P/NP grading only.) The Staff

16. Descriptive Drawing. (4) I, II, III.

Laboratory—8 hours; to be arranged—4 hours. Objective drawing and rendering; representations of space. The Staff

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Restricted to lower division students. (P/NP grading only.) The Staff (Cramer in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Cramer in charge)

Upper Division Courses

Group A: Practice of Art

101. Painting: Materials and Carriers. (4) I.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Experimentation in media and their supports. DeForest, Hoepfner

102. Painting. (4) I, II, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 101 or consent of instructor. Advanced drawing; painting in various media including oil and polymers. May be repeated twice for credit. The Staff

104. Figure Painting. (4) I, II, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 101 or consent of instructor. Advanced figure drawing; painting using the human figure as subject. May be repeated once for credit. The Staff

110. Photography I. (4) I, II, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Photography as an art form. Experiments with the camera and light sensitive materials. Himelfarb, Petersen

111. Photography II. (4) II.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 110 or consent of instructor. The art of the camera and light sensitive materials: tonal control, multiple exposure, synthetic negatives, etc. May be repeated twice for credit. Himelfarb

112. Ceramics I. (4) I, II, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Ceramic forms and processes. Arneson

113. Ceramics II. (4) II, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 112 or consent of instructor. Ceramic color and glaze; kiln firing. Arneson

115. Film-making I. (4) I, II, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Film-making as an art form; 8 and 16 mm. cameras and sound track. Henderson

116. Film-making II. (4) II, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 115 or consent of instructor. The art of film-making; shooting, editing and sound. Emphasis on the 16 mm. camera. May be repeated twice for credit. Henderson

121A. Architectural Design. (4) I.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 5, 16, or compensating backgrounds in design or engineering. Small buildings as art forms, visualized in cardboard, balsa, or plaster models. Cramer

121B. Architectural Design. (4) II.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 121A or consent of instructor. Small buildings as expressions of climate, site, structure, function, and culture, visualized in architectural drawings. Cramer

121C. Architectural Design. (4) III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 121B or consent of instructor. Buildings as integrations of the influences of natural, social and aesthetic phenomena; drawings and models. May be repeated once for credit. Cramer

125. Printmaking: Relief. (4) I.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Woodcut, linocut, metal-plate relief and experimental uses of other materials. May be repeated twice for credit. Shapiro, Himelfarb

126. Printmaking: Intaglio. (4) I, III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Metal plate etching, aquatint, hard and soft-ground, burin engraving and related methods. May be repeated twice for credit. Shapiro, Petersen

127. Printmaking: Lithography. (4) III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Stone and metal-plate lithography and other planographic methods. May be repeated twice for credit. Shapiro, Thiebaud

128. Printmaking: Serigraphy. (4) II.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Silkscreen and related stencil methods. May be repeated once for credit. Shapiro, Himelfarb

129. Printmaking: Photo-Graphics. (4) II.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Traditional printmaking methods using photographically derived images: photolithography, photo-silkscreen, photo-etching, etc. May be repeated once for credit. Shapiro, Himelfarb

141. Sculpture: Non-Metal Materials. (4) I.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Sculpture in compliant materials, e.g., wood, plaster, plastics, etc. May be repeated twice for credit. The Staff

142. Sculpture: Metallic Materials. (4) III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Pieces made from welding processes. May be repeated once for credit. Johnson

143. Sculpture: Metallic Materials. (4) II.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Pieces made from casting processes. May be repeated once for credit. Johnson

144. Figure Sculpture. (4) III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Sculpture in various media using the human figure as subject. May be repeated once for credit. Neri

146. Ceramic Sculpture. (4) III.

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 113 or one of the following: courses 141, 142, 143, or 144. Clay sculpture in relief and round. May be repeated twice for credit. Arneson

*Group B: Theory and Criticism***147. Theory and Criticism of Photography. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 2 or 5 and one art lecture course. The development of camera vision, ideas, and aesthetics and their relationship to the fine arts from 1839 to the present. Himelfarb

148. Theory and Criticism: Painting and Sculpture. (4) II.

Lecture—3 hours; term paper required. Prerequisite: course 2 or 5, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces. Thiebaud

149. Theory and Criticism: Architecture. (4) III.

Lecture—3 hours; seminar paper. Prerequisite: course 2 or 5; one art lecture course. Aesthetic theories of design styles, historic and contemporary. 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. 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. 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. 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. 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. Howard

154C. Hellenistic Art. (4) III.

Lecture—3 hours; term paper or gallery studies and review. Greek Art from Alexander to Julius Caesar. Howard

155. Roman Art. (4) I.

Lecture—3 hours; term paper or gallery studies and review. The art of Republican and Imperial Rome. 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. 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 center; Rome, Paris, London, New York, etc. Relation of European and American town planning. Baird

176A. Art of the Middle Ages: Early Christian and Byzantine Art. (4) I.

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of the early Christian era and Byzantine Empire: through the later Roman Empire in the West and to the final capture of Constantinople in the East. Griggs

176B. Art of the Middle Ages: Early Medieval and Romanesque Art. (4) II.

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of western Europe in the early medieval era: from the rise of the barbarian kingdoms through the twelfth century. _____

176C. Art of the Middle Ages: Gothic. (4) III.

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture in northern Europe from the twelfth through the fifteenth centuries. 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 Durer 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. Fehm

178B. Italian Renaissance Painting. (4) II.

Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the fifteenth century. Amerson

178C. Italian Renaissance Painting. (4) III.

Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the sixteenth century. 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. 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. 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. 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. Art in the Age of Revolution. (4) I.

Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. Development of themes in European painting from 1750 to 1850 and their political implications. Artists to be studied include Goya, David, Delacroix, Constable, Turner, and Courbet. Matteson

183B. Painting from Manet to 1900. (4) II.

Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. Later nineteenth century developments. Emphasis on France (Impressionism, Post-Impressionism, etc.). Matteson

183C. Painting in the Twentieth Century. (4) III.

Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. Modern and contemporary developments. Emphasis on Europe and America (Cubism, Surrealism, etc.). Matteson

183D. Modern Sculpture. (4) III.

Lecture—3 hours; term paper or gallery studies and review. Sculpture from Neo-Classicism to the present. Howard

184. Architecture in the Twentieth Century. (4) III.

Lecture—3 hours; term paper and field trip. Sub-styles of modern architecture, with emphasis on the development of organicism by Frank Lloyd Wright and of the international style by Le Corbusier and Mies van der Rohe, etc. Subsequent developments since 1960. 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. 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. Baird

188C. Painting of the United States. (4) III.

Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. American pictorial development from 1650 to the present, with emphasis on twentieth-century developments. Fehm

*Group D: Special Study Courses***198. Directed Group Study. (1-5) I, II, III.**

(P/NP grading only.) The Staff (Cramer in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (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

248. Problems in Representation and Iconology. (4) II.

Seminar—3 hours; term paper. Research into the symbolic meanings of historic motifs in art, and their visual representations. Howard

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 inter-campus 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 Prehistoric Europe; in certain years, study of the Indians of the Americas, pre-Conquest to contemporary. Crowley

254. Seminar in Ancient Art: Greece. (4) II.

Seminar—3 hours. Selected areas of special study in Greek art from Hellenic to later Hellenistic. Howard

255. Seminar in Ancient Art: Rome. (4) II.

Seminar—3 hours. Selected areas of special study in Roman art from Republican to late Imperial. 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. 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. 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. Baird

283. Seminar in Modern European Art. (4) II.

Seminar—3 hours. Selected areas of special study in art since 1800 in Europe. 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. 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.

(S/U grading only.)

The Staff (Chairperson 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**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. 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. 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. 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. Hoepfner

ASIAN AMERICAN STUDIES

Related Courses. For other Asian languages, see course offerings in Oriental Languages.

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. 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. 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. Leung

30. Race, Nationality, and the Asian American. (4) II.

Lecture—3 hours; discussion—1 hour. Asian American experience, 1850 to the present with focus on Chinese, Japanese, and Pilipino. Kagiwada

31. Contemporary Asian Experience in America. (4) I, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 30 recommended. Analysis of ethnicity, race, and culture as it relates to the identity and growth of the Asian American. Yoshioka

Upper Division Courses

100. Asian American Communities. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 30 or 31 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. Kagiwada

110. Institutional Racism and the Asian American. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 30 or 31 or consent of instructor. Historical and contemporary effects of institutional patterns on Asian Americans. Kagiwada

111. Alienation and the Asian American. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 30 or 31 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. Yoshioka

121. Asian American Foods: A Cultural Phenomenon. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course in cultural anthropology or Asian American studies recommended.

Multi-disciplinary approach to Asian American cultural roots, i.e., food as symbol, as origin, in ritual celebration and as an acculturative mechanism. 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.

150A. Pilipino Experience. (4) I.

Lecture—3 hours; discussion—1 hour. Culture and history of the Philippines from pre-Hispanic to the present.

150B. Pilipino Experience. (4) II.

Lecture—3 hours; discussion—1 hour. Pilipinos in America with emphasis on the changing structure of the community.

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Kagiwada in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Kagiwada in charge)

ASTRONOMY—See Physics

ATMOSPHERIC SCIENCE

Major Advisers.—See Class Schedule listing.

Major Program.—See page 94.

Related Courses. See Agricultural Engineering Technology III (Microclimatology); Environmental Toxicology 131 (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. Coulson

20L. Introduction to Meteorology Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: course 20 (pre-

ferably 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. 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 (Coulson in charge)

99. Special Study for Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Coulson in charge)

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

NOTE: For key to footnote symbols, see page 220.

taken concurrently). Treatment of thermodynamic variables and processes as an integral part of atmospheric dynamics. Introductory cloud and precipitation physics. Analysis of weather systems, using vertical cross sections and thermodynamic diagrams.

110B. Weather Analysis and Forecasting. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 110A, 121A; knowledge of Fortran (Engineering 5A). Application of dynamic theory to weather systems. Numerical techniques and their application to numerical forecasting. Carroll

110C. Weather Analysis and Forecasting. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 110B. Operational forecasting techniques including operational numerical forecasting, local detailed forecasts, tropical meteorology, and satellite applications. Carroll

120. Atmospheric Thermodynamics and Statics.

(3) I.

Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 4B, course 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.

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. 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. 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. Coulson

123. Micrometeorology. (3) III.

Lecture—3 hours. Prerequisite: Mathematics 16B or the 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.

124. Meteorological Instruments and Observations.

(3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 20 or the equivalent. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included.

131. Air Pollution Meteorology. (3) III.

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. Coulson

132. Cloud Physics. (3) III.

Lecture—3 hours. Prerequisite: Chemistry 1B, Mathematics 22B, Physics 2C, or consent of instructor. The processes of cloud formation and precipitation; including water vapor condensation, cloud droplet growth, germination and growth of ice crystals, formation of rain, hail and snow. Radar detection of clouds and precipitation. Evaluation of weather modification practices.

133. Biometeorology. (3) I.

Lecture—3 hours. Prerequisite: course 123, Biological Sciences 1, one additional course in botany or zoology, or consent of instructor. The study of interactions of atmospheric and biological processes. Effects of vegetation on mass and energy transfers at the earth's surface; energy budgets of animals. Approaches to modeling atmosphere-biosphere interaction.

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: three upper division units in Atmospheric Science. (P/NP grading only.)

The Staff (Coulson 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. (P/NP grading only.) The Staff (Coulson in charge)

Graduate Courses

221. Advanced Atmospheric Dynamics. (3) III.

Lecture—3 hours. Prerequisite: courses 120, 121A, 121B, or the equivalent. The energetics of atmospheric flows will be examined. Particular emphasis placed on the interactions of various space and time scale phenomena on energy transfers and

transformations. Offered in even-numbered years.
Carroll

222. Radiation in Planetary Atmospheres. (3) III.

Lecture—3 hours. Prerequisite: course 122 or the equivalent. Theory and observations of radiation in planetary atmospheres. Absorption, transmission, scattering by atmospheric gases, aerosols, and clouds; gaseous emission; effects of surface reflection; radiative energy budget of the atmosphere of the planet as a whole; methods of measurement. Offered in even-numbered years. Coulson

223. Advanced Micrometeorology. (3) I.

Lecture—3 hours. Prerequisite: course 123 and 121B or the 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. Myrup

230. Atmospheric Turbulence. (3) II.

Lecture—3 hours. Prerequisite: course 223 or the

equivalent. Dynamics and energetics of turbulent motion: transition to turbulence, energy dissipation, kinetic energy and thermal variance equations, convective and mechanical turbulence, integral methods. Statistical methods: probability density function, moments, spectral analysis. The Kolmogoroff theory: spectrum, structure function and diffusion predictions. Myrup

***240. Physical Climatology. (3) III.**

Lecture—3 hours. Prerequisite: course 123 or the equivalent. Physical causes of climatic phenomena, local energy balances and their direct and indirect effects on climate. Offered in odd-numbered years. Carroll

298. Group Study. (1-5) I, II, III.

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

The Staff (Coulson in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

The Staff (Coulson in charge)

AVIAN MEDICINE — See Epidemiology and Preventive Medicine

AVIAN SCIENCES

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 95 and 210.

Related Courses. See *Food Science and Technology 121 (Birds and Their Eggs as Food)*.

Lower Division Courses

11. Applied Avian Biology. (3) II.

Lecture—3 hours. A survey of principles and practices involved in poultry production. Designed for students not specializing in avian sciences.

Ogasawara

11L. Laboratory in Applied Avian Biology. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 11 (may be taken concurrently) or consent of instructor. Laboratory studies in poultry biology; techniques and economics of poultry production. 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. Ogasawara

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.

Grau, B. W. Wilson

13L. Birds, Man, and the Environment: Laboratory. (1) III.

Laboratory—3 hours. Demonstrations and field trips for students enrolled concurrently in course 13.

Morzenti

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. (P/NP grading only.)

The Staff (Grau in charge)

Upper Division Courses

100. The Biology of Birds. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: background in general biology recommended. Aspects of biology (anatomy, physiology, behavior, nutrition, reproduction, and adaptation) that govern the life of birds. Emphasis on those features of birds, domestic, wild and experimental, which are distinctive and unique for animals with feathers.

Abplanalp, Vohra

NOTE: For key to footnote symbols, see page 220.

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. Abbott

110. Comparative Avian Microanatomy. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2 and Physiology 101. Development and aging of specific organs and tissues unique to avian species will be studied in chickens, quail, turkeys and raptors, as well as mutants available at Davis. Comparisons will be made to reptiles and mammals in many cases. Sawyer.

120. Game Bird Production. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Animal Sciences 1, 2; course 11. Introduction to husbandry of popular game bird species kept in captivity. Course will cover such basic factors as game bird identification, incubation, housing, brooding and rearing, nutrition, diseases, sanitation and marketing. Woodard

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. W. O. Wilson

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. Vohra

190. Proseminar in Avian Science. (1) I, II, III.

Seminar—1 hour. Prerequisite: senior standing in avian sciences or consent of instructor. Grau

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (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. (P/NP grading only.) The Staff (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. 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 (Grau in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. The Staff (Grau in charge)

299. Research. (1-12) I, II, III.

Prerequisite: consent of instructor. (S/U grading only.) The Staff (Grau in charge)

BACTERIOLOGY

John L. Ingraham, Ph.D., *Chairperson 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.
¹Martin W. Miller, Ph.D. (*Food Science and Technology*)
¹Herman J. Phaff, Ph.D. (*Bacteriology and Food Science and Technology*)
¹David Pratt, Ph.D.
²Mortimer P. Starr, Ph.D.

Associate Professor:

Donald M. Reynolds, Ph.D.

Assistant Professors:

- Paul Baumann, Ph.D.
Sydney G. Kustu, Ph.D.
JaRue S. Manning, Ph.D.
Mark L. Wheelis, Ph.D.

Lecturer:

Wiltraud P. Segel, Ph.D.

§ § §

Major advisers.—P. Baumann, W. P. Segel, M. L. Wheelis.

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 2 (102), 3; Biological Sciences 1; Chemistry 1A-1B-1C, 5, 8A-8B; Mathematics 16A-16B; and six units of physics. Recommended: Mathematics 13; Physics 2A-2B-2C.

Upper Division Courses.—Bacteriology 105, 106, 130A-130B; Biochemistry 101A-101B-101L; Genetics 100A-100B; and three units from one of the following courses: Bacteriology 107, 150; Biological Sciences 162; Botany 114, 118, 119; Veterinary Microbiology 127, 128.

Bachelor of Science Major Program

Lower Division Courses.—Bacteriology 2 (102), 3; Biological Sciences 1; Chemistry 1A-1B-1C, 5; Mathematics 13, 16A-16B-16C or 21A-21B-21C; Physics 2A-2B-2C or 5A-5B-5C. Recommended: a course in computer programming.

Upper Division Courses.—Bacteriology 105, 106, 107, 130A-130B-130L; Biochemistry 101A-101B-101L; Chemistry 107A-107B, 128A-128B-128C, 129A; Genetics 100A; either Biological Sciences 162 or Veterinary Microbiology 128; and either Genetics 100B or Chemistry 108.

Honors and Honors Program (see page 181).

Graduate Study (see page 210).—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 Chairperson, Graduate Group in Microbiology, Department of Bacteriology.

Teaching Credential Subject Representative: D. M. Reynolds. See page 215 for the Teacher Education Program.

Related Courses. For other courses related to Bacteriology

see course offerings in the Departments of Biological Sciences, Botany, Epidemiology and Preventive Medicine, Food Science and Technology, Medical Microbiology (Medicine), Plant Pathology, Veterinary Microbiology.

Faculty of the Department of Bacteriology also teach or participate in the following courses: Biological Sciences 1, 115 and 162; Food Science and Technology 106; Veterinary Microbiology 128 and 130.

Lower Division Courses

2. General Bacteriology. (4) I, II, III.

Lecture—3 hours; 1 hour to be arranged. Prerequisite: Biological Sciences 1. The biology of bacteria with some of its applications.

Segel, Reynolds, Marr

3. Bacteriological Laboratory Techniques.

(1) I, II, III.

Laboratory—3 hours. Prerequisite: Biological Sciences 1. 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.)

I. Reynolds; II, III. Segel

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

The Staff (Ingraham in charge)

Upper Division Courses

NOTE: The sequence of courses Bacteriology 105, 106 and 107, is designed for declared majors in Bacteriology and allied fields. Bacteriology 102 is designed for Biological Sciences majors and other upper division and graduate students who are not majors in bacteriology.

*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.

Starr

102. General Bacteriology. (4) I.

Lecture—4 hours. Prerequisite: Biological Sciences 1 and Chemistry 8B; Mathematics 16A recommended. The biology of bacteria and bacterial viruses. A survey course dealing with the physiology, genetics, and taxonomy of bacteria and their relation to man. Students who have had course 2 will receive only 2 units of credit.

Baumann, Kustu

105. Bacterial Diversity: Morphology, Systematics, Habitats. (5) I.

Lecture-discussion—3 hours; laboratory—6 hours. Prerequisite: courses 2 and 3; Chemistry 8B

NOTE: For key to footnote symbols, see page 220.

(or 128A and 129A). The major groups of prokaryotic organisms, with particular emphasis on morphology and natural history. Isolation of bacteria from various habitats by enrichment culture techniques.

Wheelis, Segel

106. Bacterial Diversity: Metabolism, Physiology. (5) II.

Lecture—3 hours; laboratory—6 hours; term projects and papers. Prerequisite: course 105; Biochemistry 101B (may be taken concurrently). Metabolic and physiological bases of prokaryote diversity with particular emphasis on aerobic and anaerobic energy-yielding metabolism, photosynthesis, and the utilization of comparative biochemistry for classification of prokaryotes. Practical experience with relevant isolation methods and analytical procedures.

Baumann

107. Bacterial Diversity: Ultrastructure and Morphogenesis. (3) III.

Lecture and discussion—3 hours. Prerequisite: course 106 or consent of instructor. Comparative approach to the morphology, function, and chemistry of prokaryotic cell ultrastructure, emphasizing cell envelopes, locomotor and other organelles, morphogenesis and life cycles.

Wheelis, Segel

130A. Bacterial Physiology and Genetics. (4) II.

Lecture—4 hours. Prerequisite: course 2 or 102; Biochemistry 101B (may be taken concurrently); Genetics 100A; Mathematics 16A. The physiology and regulation of bacterial growth including the effect of the environment. Mapping techniques and the use of mutants in problem solving.

Ingraham

130B. Bacterial Physiology and Genetics. (3) III.

Lecture—3 hours. Prerequisite: course 130A. Regulation of synthesis of bacterial enzymes; the bacterial operon. DNA synthesis and cell division. Chemistry and function of bacterial walls and membranes. Ribosome function and synthesis. Mechanism of action of antibiotics.

Ingraham, Kustu

130L. Bacterial Physiology Laboratory. (3) III.

Laboratory—6 hours. Prerequisite: courses 3, 130A. Physiology and genetics of bacteria and bacterial viruses. Isolation and characterization of mutant strains. Mapping of mutations by conjugation and transduction. Studies of control of enzyme synthesis by induction, repression and catabolic repression.

Kustu, Wheelis

150. Eukaryote Protistology: Yeasts. (3) II.

Lecture—3 hours. Prerequisite: Biological Sciences 1. Diversity among eukaryotic protists with special emphasis on yeasts and yeast-like fungi and their relationships to the higher fungi. Selected fungi pathogenic to man.

Hungate, Reynolds

150L. Laboratory in Eukaryote Protistology: Yeasts (1) II.

Laboratory—3 hours. Prerequisite: courses 3, 150

(may be taken concurrently). Observation of the morphology of cells and spores of selected yeasts and yeast-like fungi. Isolation and identification of selected yeasts from natural habitats. Nutritional experiments.

Hungate, Reynolds

197T. Tutoring in Bacteriology. (1-5) I, II, III.

Tutoring—1-5 hours. Prerequisite: courses 2 and 3; upper division standing and consent of instructor. Assistant in undergraduate laboratory courses supervised by teaching assistants or faculty; in discussion sections supervised by faculty; and staffing "drop-in" offices for individual help. (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 (Ingraham in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Ingraham in charge)

Graduate Courses

***205. Bacterial Diversity, Ecology and Systematics. (4) I.**

Lecture-discussion—2 hours; laboratory—3 hours; term projects and papers. Prerequisite: consent of instructor. Intensive study of selected morphologically unusual bacteria and extreme habitats. Diversification elements of prokaryotes. Organismic interactions. Principles and procedures of bacterial taxonomy.

Starr

230. Bacterial Physiology. (2) III.

Lecture—2 hours. Prerequisite: course 130B, Biochemistry 101B. Selected topics in bacterial physiology. Offered in even-numbered years.

Ingraham, 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.

Phaff, Miller

260. Bacterial Viruses. (2) III.

Lecture—2 hours. Prerequisite: consent of instructor. Selected topics on the structure, replication, and genetics of bacterial viruses. Offered in odd-numbered years.

Pratt

270. Advanced Animal Virology. (2) III.

Lecture—2 hours. Prerequisite: consent of instructor. Selected advanced topics on the biological and biochemical properties of animal viruses. Offered in even-numbered years.

Manning

280. Comparative Genetics of Prokaryotes. (3) II.

Lecture-discussion—3 hours. Prerequisite: know-

ledge of genetics of enteric bacteria recommended. Systems of genetic exchange and genetic mapping techniques in various groups of prokaryotes, with special emphasis upon the actinomycetes, pseudomonads, and bacilli. Offered in odd-numbered years. Wheelis

291. Seminar in General Microbiology. (1) I, II, 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.) Manning

292. Seminar in Bacterial Physiology, Genetics and Virology. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. A review and discussion of the current literature

and developments in bacterial physiology, genetics, and virology with presentations by individual students. (S/U grading only.) Ingraham, Kustu

296. Seminar in Animal Virology. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. A discussion of current topics in animal virology. (S/U grading only.) (Same course as Veterinary Microbiology 292.) Manning

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (S/U grading only.) The Staff (Ingraham in charge)

200. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Ingraham in charge)

BEHAVIORAL BIOLOGY—See Medicine

BIOCHEMISTRY (A Graduate Group)

Lloyd L. Ingraham, Ph.D., *Chairperson 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 chairperson of the group.

Graduate Courses

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.) The Staff (Ingraham in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Ingraham in charge)

BIOCHEMISTRY AND BIOPHYSICS

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 96 and 210.

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 8A or 128A. Introduction to the chemistry and metabolism of biologically important compounds; dynamic aspects of biochemistry with examples from animals, plants, and microorganisms. Segel, Etzler, Conn

101B. General Biochemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 101A. A continuation of 101A. Preiss, Doi, Segel, Conn

101L. General Biochemistry Laboratory. (5) I, II, 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. Criddle, Hedrick, Bruening

122. Plant Biochemistry. (3) II.

Lecture—3 hours. Prerequisite: course 101B. The chemistry of important plant constituents and processes such as photosynthesis and respiration; carbohydrate, fat, and nitrogen metabolism. Conn, Stumpf

123. An Introduction to Enzymology. (3) III.

Lecture—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

NOTE: For key to footnote symbols, see page 220.

stressed. Specificity and mechanism of action illustrated by consideration of selected enzymes.

Whitaker

123L. Enzymology Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 101B; course 123 (concurrently). Laboratory procedures involved in the separation and study of enzymes.

Whitaker

133. Behavior and Analysis of Enzyme Systems.

(3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 101A and 101B. Introduction to enzyme kinetics and the varieties of enzyme behavior, with an emphasis on metabolic regulation. Topics include: steady-state kinetics, patterns of feedback inhibition, control by enzyme activation, allosteric enzymes, multireactant systems, enzyme assays, and membrane transport.

Segel

143. Structure-Function Relations of Proteins.

(3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 101A, 101B; and 101L (may be taken concurrently). Correlation of structure and biological function. Molecular models of enzymes that explain their physiological functioning. Physical and chemical methods used in determining protein structure. Function as measured by kinetic and binding methods and as affected by physiological considerations.

Hedrick

153. Biosynthesis of Informational Macromolecules, Mechanisms and Regulation. (3) II.

Lecture—2½ hours; discussion—½ hour. Prerequisite: course 101B; Genetics 100A. Chromosome structure and function in prokaryotic and eukaryotic systems. Mechanisms of nucleic acid and protein synthesis with special emphasis on regulation. Regulation at the multicellular level; development, immune system and carcinogenesis.

Dahmus

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.

The Staff

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

201A-201B-201C. Advanced General Biochemistry. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 101B; Chemistry 107B-108 or 110C, 128C, 129C; or consent of instructor. Physical and chemical properties of amino acids, proteins, lipids, carbohydrates and nucleic acids; methods of isolating proteins; enzymes, including kinetics, cofactors, 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.

Preiss

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.

Bruening, Dahmus, Doi

205. Biochemical Mechanisms. (3) II.

Lecture—3 hours. Prerequisite: course 101B or consent of instructor; Chemistry 110C, 131. Bond structures of biochemical interest. Application of modern organic and inorganic chemical principles to a study of the mechanisms of biochemical reactions.

Ingraham

206. Physical Biochemistry of Macromolecules. (3) II.

Lecture—3 hours. Prerequisite: course 201C or consent of instructor; Chemistry 110C. Application of modern physical concepts and experimental methods to the problems of large molecules of biological interest. Offered in even-numbered years.

Cridle

*207. Lipids. (3) I.

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.

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. 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. 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.) Benisek, 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. 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 scien-

tists about themselves, science, and society. Science, art and creativity; scientific explanation; the organization and publication of science; basic versus applied research; axiology; antisience. Offered in even-numbered years. Hedrick

230. Biochemical Aspects of Endocrinology. (3) III.

Lecture—3 hours. Prerequisite: course 101B; a course in endocrinology or consent of instructor. 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. Geschwind

240. Selected Topics in Biochemistry. (2) II.

Lecture—2 hours. Prerequisite: course 201C or consent of instructor. (S/U grading only.) The Staff

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.) The Staff

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.) The Staff

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. (1-12) I, II, III.

(S/U grading only.) The Staff

BIOLOGICAL CHEMISTRY—See Medicine

BIOLOGICAL SCIENCES^a

E. E. Conn, 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

NOTE: For key to footnote symbols, see page 220.

^aIntercollege division.

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 pursuing the major in Agricultural and Environmental Sciences should fulfill the following breadth requirements: 20 units of social sciences and humanities, including 8 units of English.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Bacteriology 2 (or 102) 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, *a* through *e*, including one course (or course sequence) each in two of the following three areas, plant biology, microbiology, and animal biology:

a) Organismal Biology.—Bacteriology 105, 150; Biological Sciences 162; Botany 102, 105, 108, 114, 118, 119; Entomology 101, 103; Zoology 100, 105, 106, 112A, 112B, 133, 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 116, 125.

c) Evolutionary Biology.—Anthropology 151; Botany 116, 140; Genetics 103; Geology 107; Zoology 148.

d) Physiology.—Bacteriology 130A-130B; Botany 111A-111B; Entomology 102; Physiology 101; Plant Pathology 130; Zoology 142, 143, 165. (Bachelor of Arts majors may satisfy the Physiology group requirement with Biochemistry 101A-101B.)

e) Molecular and Cell Biology.—Biochemistry 133, 143, 153; Botany 130; Genetics 102; Physiology 100A-100B, 103; Zoology 121A, 121B, 166, 167.

Bachelor of Science Major Program

Lower Division Courses.—Required: Bacteriology 2 (or 102) 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 130A 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 above

groups, *a* through *e*, including one course (or course sequence) each in the following three areas, animal biology, microbiology, and plant biology:

(Same as *a* through *e* under Bachelor of Arts major program above.)

Teaching Credential Subject Representative: W. P. Segel (Bacteriology). See page 215 for the Teacher Education Program.

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. Murphy, Thornton (Botany)
II. Pratt (Bacteriology)
III. Shapiro, Wolfe (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. Ketellapper (Botany)
III. Stamps (Zoology)

12. Human Sexuality. (2) I.

Lecture—2 hours. Vocabulary; structure and function of genital system; sexual response; menstruation; fertility; birth control; pregnancy and child-birth; sex in religion and law; sex education; homosexuality; masturbation; establishing and maintaining intimacy; intimate communication; attitudes and values; sexual dysfunctions; lovemaking.

Hildebrand

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

The Staff

Upper Division Courses

115. Problems in Marine Biology. (15) III.

Full-time study at Bodega Marine Laboratory. Prerequisite: consent of instructor based on adequate preparation for the topic under consideration, i.e., appropriate laboratory courses in invertebrate zoology (normally Zoology 112A or 112B), microbiology (normally Bacteriology 105), paleontology, geology, or botany; junior standing. Lecture, laboratory and field work, and directed study of a selected focal topic in marine biology, stressing experience in original research. Offered depending upon availability of instructors; contact instructor in charge. Limited enrollment.

Starr (Bacteriology) in charge

162. General Virology. (4) II.

Lecture—4 hours. Prerequisite: course I; Genetics 100A and Biochemistry 101B recommended. An integrated presentation of the nature of animal, bacterial and plant viruses, including their structure, replication, and genetics. Shalla (Plant Pathology); Bruening (Biochemistry); Manning, Pratt (Bacteriology)

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. (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

Graduate Course

210. Colloquium in the Philosophy and Methods of Teaching College Biology. (2) III.

Informal lecture-discussion—2 hours. The teaching function of an academic career; philosophy of science; objectives, nature, and methods of effective teaching; design of curricula; innovation in teaching. (S/U grading only.) Crowe, Grey, Hildebrand

BIOMEDICAL ENGINEERING (A Graduate Group)

Antone F. Salel, M.D., *Chairperson of the Group*
Group Office, TB-148

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 chairperson of the group.

Graduate Courses

252. Advanced Information Systems. (3) II

Lecture—1 hour; seminar—2 hours. Prerequisite: Human Physiology 151; consent of instructor. Case studies of Information systems; development of system components through projects; analysis of on-line file structures; strategies for systems perfor-

mance optimization. (Same course as Human Physiology 252.)
R. F. Walters

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 (P. J. Stoll in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

BOTANY

E. M. Gifford, Jr., Ph.D., *Chairperson of the Department*
Floyd M. Ashton, Ph.D., *Vice Chairperson of Agricultural Botany*
Kenneth Wells, Ph.D., *Vice Chairperson of Botany*
Department Office, 143 Robbins Hall

Professors:

Fredrick T. Addicott, Ph.D.
Floyd M. Ashton, Ph.D.
Daniel I. Axelrod, Ph.D.
Paul A. Castelfranco, Ph.D.
Alden S. Crafts, Ph.D. LL.D. (*Emeritus*)
Herbert B. Currier, Ph.D.
Emanuel Epstein, Ph.D. (*Botany and Soils and Plant Nutrition*)
Ernest M. Gifford, Jr. Ph.D.
Hendrik J. Ketellapper, Ph.D.
Donald W. Kyhos, Ph.D.
Norma J. Lang, Ph.D.

Jack Major, Ph.D.
C. Ralph Stocking, Ph.D.
John M. Tucker, Ph.D.
Grady L. Webster, Ph.D.
T. Elliott Weier, Ph.D. (*Emeritus*)
Kenneth Wells, Ph.D.

Associate Professors:

Michael G. Barbour, Ph.D.
Bruce A. Bonner, Ph.D.
Robert F. Norris, Ph.D.
Robert M. Thornton, Ph.D.

NOTE: For key to footnote symbols, see page 220.

Assistant Professors:

*²Richard H. Falk, Ph.D.
Terence M. Murphy, Ph.D.
Steven R. Radosevich, Ph.D.
Thomas L. Rost, Ph.D.

Lecturer

David E. Bayer, Ph.D.

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Departmental Major Advisers.—K. Wells, T. L. Rost, T. M. Murphy.

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 (or 102) and 3; Biological Sciences 1; Botany 2; Zoology 2; Chemistry 1A-1B-1C and either 8A-8B or 128A-128B-128C-129A; Physics 2A-2B-2C; Mathematics 13. Recommended: Chemistry 5; Mathematics 16A-16B-16C or 21A-21B-21C (especially for those students whose major interests are ecological, biochemical, or physiological); German, French, or Russian. It is also recommended that physiologically-oriented students take Physics 5A-5B-5C rather than Physics 2A-2B-2C.

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 105 and 106 are not required to take Bacteriology 2 and 3.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Biological Sciences 1; Botany 2; Zoology 2; Chemistry 1A-1B; and 8A-8B or 128A-128B-128C-129A. Recommended: Bacteriology 2 (or 102), 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 181).—Students on the honors list may elect to substitute a maximum 5 units of 104H 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 104H.

Teaching Credential Subject Representative: K. Wells. See page 215 for the Teacher Education Program.

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. Introductory Survey of Botany. (5) I, II, III.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1, especially for mitosis, meiosis, cell structure, enzyme action, DNA, respiration, and photosynthesis. Broad survey of diversity in plant structure, function and classification. Special emphasis on flowering plants.

I. Kyhos; II Barbour; III Thornton

***90. Freshman Seminar in Plant Biology. (2) I, II, III.**

Seminar—2 hours. Prerequisite: consent of instructor. Selected topics on questions of current 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.) Castelfranco, Barbour

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP) grading only.)
The Staff (Chairperson in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP) grading only.)
The Staff (Chairperson in Charge)

Upper Division Courses**101. Survey of Plant Communities of California. (3) III.**

Lecture—2 hours; weekend field trips—4 to 8 days. Prerequisite: upper division standing and consent of instructor; course 2 recommended. The structure of selected plant communities and the relationship of the component species to the environment. Recommended for nonmajors. Barbour, Radosevich

102. California Floristics. (4) III.

Lecture—2 hours; laboratory—6 hours or field trips. Prerequisite: course 2 or an equivalent plant science course. Survey of the flora of California, with emphasis on practical identification of the important plant families, genera, and species characterizing the major floristic regions. Lectures emphasize the historical and ecological factors influencing the development of the California flora. Webster

105. Plant Anatomy. (5) I.

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: course 2. Structure in relation to function of cells, tissues and organs of higher plants; discussions of current experimental literature. 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. Norris, Radosevich

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. 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. I. Stocking; II. Currier

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. Addicott; III. Murphy

111L. Introductory Plant Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 111. Experiments designed to illustrate basic principles considered in course 111. Stocking

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 algae. Lang, Wells

116. Biology of Vascular Plants. (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; emphasis given to seed plants. Campus botanical tours; preparation of fossil "peels." Gifford

117. Plant Ecology. (4) I, III.

Lecture—3 hours; several Friday or Saturday field trips. Prerequisite: plant physiology (course 111B) and plant identification (course 102 or 108) recommended. The study of interactions between plant populations or vegetation types and their environment. Special emphasis on California. Students taking course 117 may not receive credit for course 101. I. Barbour; III. Major

118. Phycology. (5) II.

Lecture—3 hours; laboratory—6 hours; one field trip. Prerequisite: course 2. Comparative morphology, physiology and development of major phyla (including blue-green algae) with emphasis on phylogeny in Chlorophyta; laboratory exercises stress identification and culturing. Environmental significance and exploitation of freshwater and marine forms considered. Lang

119. Introductory Mycology. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2 or Bacteriology 2 and 3. Introduction to structure, ontogeny, and taxonomy of selected species of the major divisions of the fungi. 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 particulates, membranes, endoplasmic reticulum, mitochondria, 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.

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.

140. Introduction to Forest History. (5) I.

Lecture—2 hours; laboratory—6 hours; one-day or two-day weekend field trips. Prerequisite: course 101 recommended. Development of modern vegetation, with emphasis on centers of origin and radiation; rates of evolution, and the factors controlling them. Axelrod

141. Plant Geography. (3) II.

Lecture—3 hours. Prerequisite: course 108 or 116; or consent of instructor; course 117 recommended. 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. Webster

142. Evolution of Plant Ecosystems. (4) II

Lecture—2 hours; one-day or two-day weekend field trips. Prerequisite: courses 101, 140, or 141 recommended. Evolutionary history of mixed mesophytic forest, conifer-hardwood forest, boreal forest, rainforest, and others. Axelrod

155. Plant Microtechnique. (4) III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 105 or 116. Practical laboratory methods in preparing plant materials for microscopic examination; special emphasis given to paraffin and chromosome squash techniques; introduction to cryostat sectioning, histochemistry and photomicrography. Gifford

180. Biological Evaluation of Herbicides. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 107 and 111B. Principles of the physical, chemical and physiological aspects of herbicides. Laboratory, greenhouse and field studies. Emphasis on biological assays and the interpretation of biological data. Bayer

***190. Proseminar in Plant Biology. (2) II.**

Seminar—2 hours. 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.)

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. (P/NP grading only.)

The Staff (Chairperson in charge)

197T. Tutoring in Botany. (1-5) I, II, III.

Prerequisite: upper division standing and consent of instructor. Designed for undergraduate students who desire teaching experience. Student contact will be primarily in laboratory or discussion sections. (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 (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

Graduate Courses**201A. Ecological Theory. (3) II.**

Lecture—3 hours. 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.)

Salt, Major, Valentine

201B. Analysis of a Selected Ecosystem. (3) I.

Lecture—3 hours; One field trip—to be arranged. 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

201C. The Changing Biosphere. (3) III.

Lecture—3 hours. Prerequisite: graduate standing and course 201A 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 Ecology, Geology, and Zoology 201C.)

The Staff

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. Carrier

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. Castelfranco

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. 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. 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. Castelfranco

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. 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. 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. Stocking

212. Physiology of Herbicidal Action. (3) I.

Lecture—3 hours. Prerequisite: courses 107, 111B. Study of the fundamental processes involved in the physiological action of herbicides. Detailed consideration of the fate of herbicides in plants. Ashton

215. Light and Plant Growth. (3) II.

Lecture—3 hours. Prerequisite: courses 205A, 205B, 205C; Physics 2C. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis. 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. 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. Barbour

220. Plant Morphogenesis. (3) III.

Lecture—3 hours. Prerequisite: course 105 or 116. 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. 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. Rost

221. Special Topics in Plant Physiology. (2) I, II, III.

Seminar—2 hours. Analysis in depth of recent advances in plant physiology. Lectures and discussions by research specialists. Students prepare an abstract/summary in the area of one or more lectures. May be repeated for credit. (S/U grading only.)

I. Bonner; II. Thornton; III. Bayer

231. Biological Electron Microscopy. (1) II.

Lecture—1 hour. Prerequisite: consent of instructor. An introduction to biological microscopy. Areas covered are: electron optics, electron specimen interactions, and vacuum systems.

231L. Biological Electron Microscopy Laboratory. (3) II.

Laboratory—9 hours. Prerequisite: consent of instructor, course 231 (may be taken concurrently). An introduction to biological electron microscopy. Areas covered are: specimen preparation and microscope operation. Limited enrollment.

245. Pollination Ecology. (4) III.

Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: consent of instructors. Theory of ecological relationships between plants and their pollinators with emphasis on insect pollination. Review of adaptations of both flowers and insects, and survey of the coevolution of pollination relationships. Offered in even-numbered years. (Same course as Entomology 245.) R. W. Thorp, Webster

***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. Tucker

***256A. Experimental Plant Taxonomy. (2) II.**

Lecture—1 hour; laboratory—3 hours. Prerequisite:

NOTE: For key to footnote symbols, see page 220.

site: course 108; course 117 and Genetics 103 recommended. Application of experimental techniques to the elucidation of taxonomic problems and evolutionary relationships in higher plants. 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. 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. Major

258. Plant Synecology. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 108, 117; Soil Science 120 recommended. Theories and techniques involved in the study of structure, composition, boundaries, ecology, and classification of vegetation, with particular emphasis on California plant communities. Major

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)
I. Lang; II. Radosevich; III. Addicott

291. Seminar in Plant Morphology. (1) I, II.

Seminar—1 hour. (S/U grading only.)
I. Tucker; II. Kyhos

292. Seminar in Plant Physiology. (1) I, III.

Seminar—1 hour. (S/U grading only.)
I. Norris; III. Currier

293. Seminar in Weed Science. (1) II.

Seminar—1 hour. (S/U grading only.) Bayer

294. Seminar in Cytology and Cytochemistry. (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.) 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. E. E. Butler; III. Wells

297T. Tutoring in Botany. (1-5) I, II, III.

Prerequisite: graduate standing and consent of instructor. Designed for graduate students who desire teaching experience, but are not teaching assistants. (S/U grading only.) The Staff

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III.

Prerequisite: consent of instructor. (S/U grading only.)
The Staff (Chairperson in charge)

CANTONESE—See Asian American Studies

CHEMISTRY

David H. Volman, Ph.D., *Chairperson of the Department*
Department Office, 108 Chemistry Building

Professors:

- Thomas L. Allen, Ph.D.
Lawrence J. Andrews, Ph.D.
*²Albert T. Bottini, Ph.D.
Robert K. Brinton, Ph.D.
Hakon Hope, Cand. real
*Raymond M. Keefer, Ph.D.
Richard E. Kepner, Ph.D.
*³Gerd N. LaMar, Ph.D.
August H. Maki, Ph.D.
Charles P. Nash, Ph.D.
Edgar P. Painter, Ph.D.
Harold G. Reiber, Ph.D. (*Emeritus*)
Leo H. Sommer, Ph.D.
James H. Swinehart, Ph.D.
David H. Volman, Ph.D.

George S. Zweifel, Sc.D.

Associate Professors:

- Alan L. Balch, Ph.D.
*¹William H. Fink, Ph.D.
*²Edwin C. Friedrich, Ph.D.
W. Kenneth Musker, Ph.D.
Peter A. Rock, Ph.D.
John W. Root, Ph.D.
Dino S. Tinti, Ph.D.

Assistant Professors:

- Donald E. Bergstrom, Ph.D.
Kenneth G. Hancock, Ph.D.
Daniel C. Harris, Ph.D.
*¹Joel E. Keizer, Ph.D.
*²Claude F. Meares, Ph.D.

R. Bryan Miller, Ph.D.
Carl W. Schmid, Ph.D.

§ § §

Major Subject Advisers.—W. H. Fink, K. G. Hancock, J. E. Keizer, R. E. Kepner, E. P. Painter, D. S. 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 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 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 181).—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 Credential Subject Representative: C. P.

Nash. See page 215 for the Teacher Education Program.

*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.

(I. Keefer and Allen in charge;

II. Tinti 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.

(II. Keefer and Swinehart in charge;

III. Balch 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.

(I. Musker in charge;

III. Musker and Rock 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 primarily for students majoring in the physical sciences.

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.

Maki

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

NOTE: For key to footnote symbols, see page 220.

will emphasize qualitative analysis and preparative techniques. Hope

5. Quantitative Analysis. (4) I, III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1C with grade of C or higher. Not open to students who have received credit for course 4B. An introduction to the principles and methods of quantitative chemical analysis, with emphasis on the application of equilibrium theory to analytical problems. I. Brinton; III. _____

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. Sommer; II. Friedrich; 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. Sommer; III. Bottini

10. Concepts of Chemistry. (4) I.

Lecture—4 hours. A survey of basic concepts and contemporary applications of chemistry. Designed for nonscience majors and not as preparation for Chemistry 1A. Course not open to students who have had course 1A; but students with credit for course 10 may take course 1A for full credit. _____

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Directed study of a special topic. (P/NP grading only.) The Staff (Volman in charge)

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. Nash, Schmid

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. Meares, Schmid

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. 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. Keizer, Volman; III. Volman

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. Maki; II. Root

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. Keizer; III. Maki

111A. Physical Chemistry: Methods and Applications. (4) I, II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107B or 110C (may be taken 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. Hope; II. 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 electric projects. II. Hope; III. Tinti

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. 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. Balch

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. Swinehart

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. 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. Bergstrom; II. Painter; III. Andrews

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. Zweifel; II. Kepner; III. Hancock

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. Kepner; II. Miller; III. 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. Miller; II. Hancock; III. Bergstrom

129B. Organic Chemistry Laboratory. (2) I, II, III.

Laboratory—6 hours. Prerequisite: courses 128B (may be taken concurrently) and 129A. Continuation of course 129A. Emphasis is on methods used for synthesis and isolation of organic compounds.

I. Zweifel; II. Kepner; III. Hancock

129C. Organic Chemistry Laboratory. (2) I, II, III.

Laboratory—6 hours. Prerequisite: courses 128C (may be taken concurrently) and 129B. Continuation of course 129B.

I. Kepner; II. Miller; III. 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. Friedrich

131. Modern Methods of Organic Synthesis. (4) II.

Lecture—4 hours. Prerequisite: courses 107B or 110B, 128C, or consent of instructor. Introduction to modern synthetic methodology in organic chemistry with emphasis on stereoselective reactions and application to multistep syntheses of organic molecules containing multifunctionality. 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. 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. (P/NP grading only.) The Staff (Volman in charge)

197. Projects in Chemical Education. (1-4) I, II, III.

Discussion and/or laboratory. Prerequisite: consent of instructor. Participation may include development of laboratory experiments, lecture demonstrations, auto-tutorial modules or assistance with laboratory sessions. May be repeated for credit up to 12 units. (P/NP grading only.)

The Staff (Volman in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics. (P/NP grading only.)

The Staff (Volman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor based upon

NOTE: For key to footnote symbols, see page 220.

adequate preparation in chemistry, mathematics, and physics. (P/NP grading only.)

The Staff (Volman 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. Rock

210B. Advanced Physical Chemistry: Quantum Chemistry. (4) II.

Lecture—3 hours; discussion—1 hour 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. Allen

210C. Advanced Physical Chemistry: Kinetics. (4) III.

Lecture—3 hours; discussion—1 hour 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. Root

219. Spectroscopy of Organic Compounds. (4) III.

Lecture—4 hours. Use of spectroscopy in organic chemistry for the identification of compounds and the investigation of stereochemical and reaction mechanism phenomena. Miller

221A-H. Organic Chemistry. (3) II, III.

Lecture—3 hours. Selected topics of current in-

terest 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

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. 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. 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. (4) I.

Lecture—4 hours. Modern concepts of substitution, elimination, and addition reactions, rearrangements, and stereochemistry. Hancock

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.) Allen, Musker, Painter

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson 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. (S/U grading only.) The Staff (Chairperson in charge)

CHICANO STUDIES — See Mexican-American (Chicano) Studies

CHINESE — See Oriental Languages

CLASSICS

Department Office, 616 Sproul Hall

Professor:

Wesley E. Thompson, Ph.D.

Associate Professors:

Richard E. Grimm, Ph.D.

Frederick H. van Doorninck, Jr., Ph.D.

Assistant Professor:

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 Credential Subject Representative: R. E. Grimm. See page 215 for the Teacher Education Program.

Classics

Lower Division Courses

*4A. Classical Civilization. (3) III.

Lecture—3 hours. An introduction to the literature, art, and institutions of classical Greece.

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.

Thompson

17A. Greek Archaeology. (3) I.

Lecture—3 hours. Greece, Crete, and the Aegean world during the Bronze Age with emphasis on the Minoan and Mycenaean civilizations. Consideration of certain aspects of Homeric civilization in light of the archaeological remains.

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.

van Doorninck

*17C. Roman Archaeology. (3) III.

Lecture—3 hours. The development of Rome and its Empire as illustrated by the monuments.

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.

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.

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.

Thompson

*141. Greek and Roman Comedy. (4) II.

Lecture—3 hours; conference—1 hour. Readings in Aristophanes, Menander, Plautus, and Terence; lectures on the development of ancient comedy. Offered in odd-numbered years.

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*.

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.

Thompson

*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.

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.

van Doorninck

197TC. Community Tutoring in Classical Languages. (1-5) I, II, III.

Prerequisite: consent of instructor. Supervised instruction of Greek or Latin in nearby schools by qualified students in department. May be repeated for credit up to 5 units. (P/NP grading only.)

Grimm

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.

Thompson

NOTE: For key to footnote symbols, see page 220.

202. Homer. (4) III.

Seminar—3 hours. Readings in the *Iliad* and *Odyssey*: the origins and transmission of the poems.
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.
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.
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.
Traill

***206. Greek Historiography. (4) III.**

Seminar—3 hours. Development of historical writing in Greece. May be repeated for credit.
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.
Grimm

Greek

Departmental Major Adviser.—W. E. Thompson.

Lower Division Courses**1. Elementary Greek. (5) I.**

Lecture—4 hours. Not open for credit to students who have completed the first two years of high school Greek.
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. (P/NP grading only.)
The Staff

Upper Division Courses***100. Attic Orators. (4) I.**

Lecture—3 hours. Prerequisite: course 3.
Thompson

***101. Plato. (4) I.**

Lecture—3 hours. Prerequisite: course 3.
Thompson

102. Euripides. (4) II.

Lecture—3 hours. Prerequisite: course 101.
Grimm

103A. Homer: Iliad. (4) I.

Recitation—3 hours; term paper. Prerequisite: course 3.
van Doorninck

***103B. Homer: Odyssey. (4) II.**

Recitation—3 hours; term paper. Prerequisite: course 3.
van Doorninck

***104. Menander. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 3.
Thompson

***105. Demosthenes. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 3.
Thompson

***111. Sophocles. (4) III.**

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.
Grimm

112. Aristophanes. (4) III.

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.
Grimm

***113. Thucydides. (4) I.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.
Thompson

***114. Lyric Poetry. (4) III.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.
Thompson

***115. Aeschylus. (4) II.**

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.
Grimm

***116. Herodotus. (4) II.**

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.
van Doorninck

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Thompson in charge)

Latin

Departmental Major Adviser.—R. E. Grimm.

Lower Division Courses**1. Elementary Latin (4) I.**

Lecture—4 hours. Not open for credit to students who have completed the first two years of high school Latin.
The Staff

1X. Intensive Latin. (5) II.

Lecture—5 hours. An intensive course designed

primarily for graduate students and advanced undergraduates wishing to acquire rapidly a rudimentary knowledge of Latin. Covers the same material as Latin 1 and 2. Traill

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 1. 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. Thompson

Upper Division Courses

***101. Livy. (4) III.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Thompson

***102. Roman Comedy. (5) I.**

Lecture—4 hours; term paper. Prerequisite: course 3. Offered in even-numbered years. Thompson

***103. Vergil: Aeneid. (4) I.**

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years. Traill

***104. Sallust. (4) I.**

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years. Thompson

105. Catullus. (4) II.

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Grimm

***106. Horace: Odes and Epodes. (4) I.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Grimm

***108. Horace: Satires and Epistles. (4) II.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Grimm

***109. Roman Elegy. (4) III.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. 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. The Staff

***112. Cicero: Political Writings. (4) I.**

Recitation—3 hours; term paper. Prerequisite: course 3. Thompson

114. Cicero: Philosophical Works. (4) I.

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Traill

***115. Lucretius. (4) II.**

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years. Traill

116. Vergil: Eclogues and Georgics. (4) III.

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years. Traill

121. Prose Composition. (5) III.

Lecture—4 hours; term paper. Traill

199. Special Study for Advanced Undergraduates. (2-5) I, II, III.

(P/NP grading only.) The Staff (Grimm in charge)

Graduate Courses

299. Research. (2-5) I, II, III.

(S/U grading only.) The Staff (Chairperson in charge)

CLINICAL PATHOLOGY

Jiro J. Kaneko, D.V.M., Ph.D., *Chairperson of the Department*

Department Office, 1165 Haring Hall

Professors:

- ¹Donald 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:

Nemi C. Jain, M.V.Sc., Ph.D.

Assistant Professor:

Kerry S. Keeton, D.V.M., Ph.D.

Lecturer

Edward J. Carroll, Ph.D.

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NOTE: For key to footnote symbols, see page 220.

Upper Division Courses

101. Comparative Hematology. (2) II.

Lecture—2 hours. Prerequisite: Biological Sciences I, Physiology 110B, introductory biochemistry or consent of instructors. Principles, interpretations and applications of clinical hematology; comparative blood cellular morphology and function.

Kaneko, Jain, Schalm

101L. Comparative Hematology Laboratory. (1) II.

Laboratory—1 hour; to be arranged—3 hours. Prerequisite: course 101 (may be taken concurrently) and consent of instructors. Introduction to laboratory methods and procedures of clinical hematology. Limited enrollment.

Kaneko, Jain, Schalm

102. Clinical Biochemistry. (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: Physiology 110A-110B; Physiological Sciences 101A-101B or Biochemistry 101A-101B; or consent of instructor. Principles and methods of clinical biochemistry; determination and interpretation of the biochemical constituents of the blood, urine and other body fluids. Offered in even-numbered years.

Kaneko

199. Special Study for Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

204. Normal and Abnormal Bone Marrow Cytology. (1) II.

Lecture-laboratory — 2 hours. Prerequisite: Veterinary Medicine 135 or course 101. Normal maturation of hematopoietic cells followed by a study of the cytology of blood and bone marrow in selected diseases of domestic animals including infections, anemias, myeloproliferative disorders and leukemias.

Schalm

***205. Physiology and Pathology of Leukocytes.**

(2) II.

Lecture—2 hours. Prerequisite: course 101,

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.

Jain

206. Immunohematology. (2) II.

Lecture—2 hours. Prerequisite: course 101, Veterinary Microbiology 126, or consent of instructor. Immunologic aspects of hematology; blood cell antigens and antibodies; autoimmune hematologic diseases; reactions to blood transfusions; transplantation mechanisms. Offered in odd-numbered years.

Jain, Carroll, Lewis, M. MacKenzie

207. Clinical Cytology. (2) II.

Lecture—1 hour; laboratory—2 hours. Prerequisite: third-year standing in the School of Veterinary Medicine or consent of instructor. Cytology of serous effusions (benign and malignant, inflammatory and noninflammatory), joint fluids, cerebrospinal fluids and other body fluids. Impressions and aspiration smears of various tissues and organs. Methodology, interpretation, and their applications in disease.

Keeton

261. The Bovine Mammary Glands in Health and Disease. (1) II.

Lecture—1 hour. Prerequisite: consent of instructor. 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.

Jasper, Carroll

290. Seminar in Clinical Pathology. (1) I, II, III.

Seminar—1 hour.

The Staff

298. Directed Group Study. (1-3) I, II, III.

The Staff

299. Research in Clinical Pathology. (1-12) I, II, III.

(S/U grading only.) The Staff (Kaneko in charge)

CLINICAL SCIENCES—See Medicine, Radiological Sciences, Reproduction and Surgery

COMPARATIVE LITERATURE

Program Office, 724 Sproul Hall or 4208 Storer Hall

Committee in Charge:

Roland W. Hoermann, Ph.D. (*Comparative Literature and German*); *Committee Chairperson*
Max Bach, Ph.D. (*French*)

³ Ruby Cohn, Ph.D. (*Comparative Literature and Dramatic Art*)
Winfried Schleiner, Ph.D. (*English*)
Hugo J. Verani, Ph.D. (*Spanish*)

Faculty:

- Carlota B. Cannon, Ph.D. (*Spanish*)
 Ruby Cohn, Ph.D. (*Comparative Literature and Dramatic Art*)
 Richard E. Grimm, Ph.D. (*Classics*)
 Roland W. Hoermann, Ph.D. (*Comparative Literature and German*)
 Michael J. Hoffman, Ph.D. (*English*)
 Manfred Kusch, Ph.D. (*French*)
 David A. Robertson, Ph.D. (*English*)
 Isaiah Smithson, M.A. (*English*)
 Marian B. Ury, Ph.D. (*Comparative Literature and Religious Studies*)

§ § §

Major Advisers.—R. E. Grimm (Classics); D. A. Robertson, G. Isaak (English); M. Kusch (French); K. Menges (German); A. De Petris (Italian); A. G. Comings (Russian); D. T. 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 66 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) 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) at least one quarter of Comparative Literature 100 (Majors Colloquium), with initial enrollment no later than the junior year; and e) two literature courses exclusive of first and second literatures of concentration (may include foreign literature in translation or additional Comparative Literature courses).

Teaching Credential Subject Representative: R. W. Hoermann. See Page 215 for the Teacher Education Program.

Lower Division Courses**10A-L. Masterpieces of World Literature. (2) I, II, III.**

Lecture—1 hour; discussion—one 2-hour evening session. A representative series of courses designed primarily to acquaint the non-literature major with a cross section of the world's most important literature; readings in English translation are discussed. Content will alternate among the following segments; A. *Gilgamesh*, *Ramayana*, *Beowulf*, *Nibelungenlied*; B. *Metamorphoses*, *Decameron*, *Arabian Nights*, *Canterbury Tales*; C. *Chanson de Roland*, *El Cid*, *Igor's Campaign*, *Morte D'Arthur*; D. *Sakuntala*, *Tristan and Isolde*, *Aucassin and Nicolette*, *Gawain and the Green Knight*; E. Swift, Rabelais, *La Celestina*, *Simplicissimus*; F. Cervantes, Saikaku, Fielding, Voltaire; G. Machiavelli, Shakespeare, Lope de Vega/Calderón, Molière/Racine, Lessing/Schiller; H. Goethe, Byron, Stendhal, Pushkin, Lermontov; I. Hoffman, Gogol, Poe, Hawthorne, Maupassant, Chekhov, Melville; J. Flaubert, Twain, Turgenyev, Galdós, Ibsen; K. Balzac, Dostoevski/Tolstoi, Hardy, Shaw, Strindberg; L. Unamuno, Svevo, Conrad, Gide, Kafka, Faulkner. May be repeated for credit in different subject area. Limited enrollment. (P/NP grading only.) The Staff (Chairperson in charge)

40. Introduction to Comparative Literature. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Survey of the methods of comparatist investigation; analysis of the literary work of art; genres, structures, and literary devices; archetypes and transformations in representative models. Cannon

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. May be repeated once for credit with consent of instructor. (P/NP grading only.) Smithson

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. May be

NOTE: For key to footnote symbols, see page 220.

repeated once for credit with consent of instructor. (P/NP grading only.) Curry

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. May be repeated once for credit with consent of instructor. (P/NP grading only.) Lewis

52A-52B. Intermediate Seminar: The Orient and the West. (2) II.

Seminar—2 hours; seminar reports. Knowledge of an Oriental language not required. Seminar lectures and discussion will focus on a few selected longer works of literature and explore their meaning for both East and West. Content will alternate among the following segments: A. *The Tale of Genji* as English literature; B. "Family Novels," such as *The Dream of the Red Chamber* and *Buddenbrooks*. May be repeated for credit in different subject area. (P/NP grading only.) Ury

98. Directed Group Study. (1-5) I, II, III.

Restricted to lower division students. (P/NP grading only.) The Staff (Chairperson in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Chairperson in charge)

Upper Division Courses

100. Majors Colloquium. (1) III.

Seminar—1 hour. Weekly presentations and discussions of topics appropriate to the comparative study of literature. Enrollment required for at least one quarter of all majors and no later than their junior year. May be repeated for credit up to 4 units. (P/NP grading only.) The Staff (Chairperson in charge)

140. The Comparative Study of Literature. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. Interpretation of selected works illustrating the historical evolution of themes, as well as of formal and structural elements.

The Staff (Chairperson in charge)

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. Hoffman

***142. Critical Reading and Analysis. (4) 1.**

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 (Chairperson in charge)

159A-G. Special Topics in Comparative Literature. (4) I, II, III.

Lecture—2 hours; discussion—1 hour; term paper. Intensive study of selected subjects: A. The Play Within the Play; B. The Lyrical Novel; C. Women in Literature; D. The Role of Philosophy in Literature; E. The Role of Psychology in Literature; F. The Religious Experience in Literature; G. Literary Attitudes and Judgment.

The Staff (Chairperson in charge)

160A. The Modern Novel. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. The changing image of man and his world as seen in the novels by such writers as Dostoevski, Svevo, Kafka, Faulkner, and Robbe-Grillet.

Lindsay

160B. The Modern Drama. (4) III.

Lecture—2 hours; discussion—1 hour; term paper. Readings in representative authors such as Ibsen, Strindberg, Chekhov, Pirandello and Brecht.

Cohn

161A-D. Varieties in 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; D. The Mythological Perspective. May be repeated for credit in different subject area.

The Staff (Chairperson in charge)

***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. The Staff

163A-E. 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; D. The Role of Imagination and the Creative Process in Litera-

ture and other Arts; E. Cinema as Narrative Literature. May be repeated for credit in different subject area. 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. 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. The Staff

166A-I. Longer Narrative Forms: The Epic and the Novel. (4) III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in standard epic and novelistic forms; analysis of national and individual variations to show convergence or divergence in the evolving narrative consciousness. Readings in English except for majors in this concentration area. Content will alternate among the following segments: A. Arthurian Romance; B. Heroic; C. Picaresque; D. Confessional; E. Novel of Maturation (*Entwicklungsroman*); F. Artist Novel (*Künstlerroman*); G. War Novels; H. Stream-of-Consciousness Mode; I. Utopian/Dystopian Novels. May be repeated for credit in different subject area.

The Staff (Chairperson in charge)

***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. 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. Gilbert

***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. The Staff

170A-D. The Literary Imagination of China and Japan. (4) III.

Lecture—2 hours; discussion—1 hour; term project. Knowledge of an Oriental language not required. Selected topics in Chinese and Japanese literature, drawing on a broad range of literary works from both cultures, including comparison with Western literary examples. Content will alternate among the following segments: A. Man, Time, and Nature; B. Fantasy and Reality; C. Love and War; D. Literary Convention and Lyric expression. May be repeated for credit in different subject area. Ury

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. (P/NP grading only.) Hoermann

198. Directed Group Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff

CONSUMER ECONOMICS

Related Undergraduate Major.—See page 99.
Related Graduate Study.—See page 210.

Related Courses. See *Agricultural Economics*.

Questions pertaining to the following courses

NOTE: For key to footnote symbols, see page 220.

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. Zoloth

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. Shepard

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Carter in charge)

CONSUMER SCIENCE

Major Advisers.—See *Class Schedule listing.*

Related Major Program and Graduate Study. See pages 98, 111, and 210.

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.

Lower Division Course

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. Course given between Winter and Spring Quarters and considered a Spring course for preenrollment. Advance enrollment with instructor required. (P/NP grading only.) Schutz

Upper Division Courses

100. Consumer Behavior. (3) I.

Lecture—3 hours. Prerequisite: preparation in areas of psychology or sociology and economics recommended. 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. The Staff (Schutz in charge)

135. Principles of Food Product Development. (3) I.

Lecture—3 hours. Prerequisite: one course in in-

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Carter in charge)

Graduate Courses

247. The Economics of Consumption. (4) III.

Lecture—4 hours. Prerequisite: course 141. An analytical treatment of household consumer behavior, consumption patterns and consumption trends; the effects of income, prices, and household characteristics on expenditures; levels of consumption; economic theory of consumer behavior. Uhl

290. Seminar. (1) I, II, III.

Seminar—1 hour. Current issues in consumer economics and the economics of consumption. Uhl

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Carter in charge)

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. Schutz

140. Management for the Consumer. (4) III.

Lecture—4 hours. Prerequisite: Psychology 2B or 10; Consumer Economics 142, senior or graduate status recommended. Application of the theories of management and decision making for the consumer. Emphasis on the effect of consumer decisions on the home, community, and society. Bruhn

145. Concepts and Problems in Management for the Consumer. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: senior or graduate status, course 140 (may be taken concurrently). An in-depth study of a management problem encountered by the consumer with emphasis on management issues related to the home, community or society. Emphasis is on the application of theory to problem definition and solution. Students will complete an independent project in management. Bruhn

198. Directed Group Study. (1-5) I, II, III.

Group study or experimentation on consumer related topics. (P/NP grading only.)

The Staff (Schutz in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Individual student reading, library research or ex-

NOTE: For key to footnote symbols, see page 220.

perimentation. (P/NP grading only.)
The Staff (Schutz in charge)

Graduate Courses

200. Consumer Research Methods. (3) II.

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. 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. Needles

201B. Consumer Product Quality, Standards and Labeling: Textile Products and Hard Goods. (2) II.

Lecture—2 hours. Prerequisite: course 201A and Textiles and Clothing 160 recommended. Consumer product quality and standards for textile products; shelter, transportation, appliances, and repair are given more limited coverage. Zeronian

201C. Consumer Product Quality, Standards, and Labeling: Food and Nutrition Practices and Problems. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 201A and upper division courses in Foods

(100A, 100B or equivalent) and Nutrition (102A, 102B or equivalent) recommended. 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; identity standards; labeling for regulation and for information; fortification and enrichment of foods; nutritional supplements and substitutes; food additives.

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 (Schutz in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: graduate standing.
The Staff (Schutz in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing. (S/U grading only.)
The Staff (Schutz in charge)

CONSUMER TECHNOLOGY

Questions pertaining to the following courses should be directed to the instructor or to the Department of Agricultural Engineering, 2030 Bainer Hall.

Lower Division Courses

15. Experiments in Creative Woodworking. (1) I, II.

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. O'Brien

16. Experiments in Creative Metalworking. (1) III.

Laboratory—2 hours. Prerequisite: Chemistry 1A and Physics 2A recommended. 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.) 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. Dobie

17L. Laboratory Exercises for Electrical Appliances and Systems. (1) III.

Laboratory—2 hours. Prerequisite: course 17 (concurrently). Directed laboratory exercises, field trips, and special projects to augment the study of course 17. (P/NP grading only.) Dobie

22. Characteristics of Land Vehicles. (1) I.

Lecture—1 hour. Comparative study of the stability, control, performance and safety of various vehicles including automobiles, bicycles and motorcycles. Chancellor

22L. Land Vehicles Laboratory. (1) I.

Laboratory—2 hours. Prerequisite: course 22 (concurrently). Directed laboratory exercises, field

trips, and special projects to augment the study of course 22. (P/NP grading only.) Chancellor

31. Using Calculators and Computers for Records and Problems. (1) I, II, III.

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. (P/NP grading only.) Chen, Goss

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Restricted to lower division students. (P/NP grading only.)

The Staff (Fridley in charge)

99. Special Study for Lower Division Students. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Fridley 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. Offered in even-numbered years. O'Brien

101. Engines for Automotive, Agricultural, Residential, and Recreational Use. (3) II.

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 sys-

tems.

Burkhardt

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. O'Brien

111L. Home Design Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 111 (concurrently). Directed laboratory exercises, field trips, and special projects to augment the study of course 111. (P/NP grading only.) O'Brien

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. Miller

113L. Laboratory Studies in Sanitation and Water Supply for Remote Locations. (1) III.

Laboratory—3 hours. Prerequisite: course 113 (concurrently). Directed laboratory exercises, field trips, and special projects to augment the study of course 113. (P/NP grading only.) Miller

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. (P/NP grading only.) Garrett, O'Brien

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Fridley in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Fridley in charge)

DESIGN

Major Advisers.—See Class Schedule listing.
Major Program.—See page 99.

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 Department of Applied Behavioral Sciences, 206 Walker 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. Berteaux; II. Huckins; III. Gotelli

20A. Drawing. (4) I, II, III.

Studio—8 hours. Drawing for the designer as an aid to perception and communication of ideas, objects, and plans. Gotelli, Rossbach

20B. Media. (4) I, II, III.

Studio—8 hours. Introduction to the tools, materials, and techniques used in the designer's studio. Gotelli, Butler

21. Drafting and Perspective. (4) I, II, III.

Studio—8 hours. Prerequisite: course in drawing recommended. Creation of three-dimensional designs on two-dimensional surfaces. Olsen

22. Lettering and Type Design. (4) II.

Studio—8 hours. Understanding of the forms and spacing of the Latin alphabet: hand-lettering, constructed letters, basic type styles, type measures, and layout. Butler

23. Personal Adornment. (4) III.

Studio—8 hours. Exploration of man's image altered through ornament and its relation to the human structure. Stabb

24. Non-loom Textiles. (4) I.

Studio—8 hours. Contemporary approach to non-loom textile techniques; netting, plaiting, knotting, and basketry. Huckins

25. Reproduction Graphics. (4) II.

Studio—8 hours. Basic studio and photographic skills for the designer; continuous tone, line and halftone films, mechanical and four-color screen separations. Butler

26. Visual Presentation. (4) I.

Studio—8 hours. Exploration of communication through display and exhibition design. Gotelli

60. Concepts in Textile Dyeing and Printing. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Textiles and Clothing 6 recommended. Basic principles and relationships in dyeing and printing processes on textiles; dye classification; fiber receptiveness; effect of physical variables and additives on dyeing and printing, and fixation of dye are considered. Relative dye colorfastness, dyebath and printing compositions, and common colloquialisms are considered. Needles

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Thompson in charge)

Upper Division Courses**130. Model Construction. (4) III.**

Studio—8 hours. Prerequisite: preparation in drafting and perspective recommended. Construction and presentation of working models from draw-

ings of furniture, interiors, exteriors, and playground equipment. Olsen

131. Layered Textiles. (4) III.

Studio—8 hours. Prerequisite: background in drawing, personal adornment and non-loom textiles recommended. Exploration of multi-pieced and multi-layered textiles: applique, patchwork, quilting, stump work. The individualized influences of materials and techniques on contemporary textiles. Rossbach

132. Loomed Textiles. (4) I, II, III.

Studio—8 hours. Prerequisite: course in non-loom textiles recommended. Influences of material and techniques of the woven form of tapestry weaving and frame loom weaving, natural dyeing and simple loom construction. Huckins

133. Graphic Communication Design. (4) III.

Studio—8 hours. Prerequisite: course 22 recommended. Study and practice of layout skills in poster, book, magazine, and TV design. Exploration of the social impact and application of communication media. Butler

134. Environmental Design. (4) I, II.

Studio—8 hours. Prerequisite: courses 21, 130 recommended. Exploration of specific problems in interior form and exterior space such as: design for the disabled; and contemporary urban problems. Berteaux, 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. Rossbach

142B. World Textiles: Middle East, Europe, and United States. (4) III.

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. Rossbach

143. History of Costume Design. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in art history. The history of costume design from the earliest times to the present with emphasis on both aesthetic and functional aspects. 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.

Studio—8 hours. Prerequisite: courses 20A and 20B recommended. Exploration of the design and appreciation of hand printed textiles; emphasis on the unique qualities of the individual as producer. Rossbach, Huckins

170A-170B-170C. Costume Design. (4) I-II-III.

Studio—8 hours. Prerequisite: courses 20A and 23 recommended. Studio projects in costume design;

consideration of functional and aesthetic factors influencing the historic, contemporary, and projected image of man as expressed through costume.

Huckins, Stabb

180A-180B-180C. Interior Design. (4) I-II-III.

Studio—8 hours. Prerequisite: Design 21 recommended. 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. Olsen; II. Berteaux; III. Gotelli

190. Proseminar. (2) II.

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. (P/NP grading only.) The Staff (Thompson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Thompson in charge)

DRAMATIC ART

Robert A. Fahrner, Ph.D., *Chairperson of the Department*
Department Office, 222 Dramatic Art Building

Professors:

³ *Ruby Cohn, Ph.D. (*Dramatic Art and Comparative Literature*)

*Everard d'Harnoncourt, Ph.D.

² Theodore J. Shank, Ph.D.

Daniel E. Snyder

Alan A. Stambusky, Ph.D.

Associate Professors:

Robert A. Fahrner, Ph.D.

³ *Alfred Rossi, Ph.D.

*Robert K. Sarlos, Ph.D.

Assistant Professors:

Harry C. Johnson, M.A.

William E. Kleb, D.F.A.

Lecturers:

Gene A. Chesley, M.A.

Jerry W. Helm

Phyllis J. Kress, M.F.A.

§ § §

Major Advisers.—G. A. Chesley, T. J. Shank.

The Major Program

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 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); 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 during the undergraduate career to participate in at least

NOTE: For key to footnote symbols, see page 220.

eight dramatic productions (exclusive of student or classroom projects). Participation must include work in acting, scene construction, costume construction, lighting, and stage managing or directing. Transfer students should see the major adviser for an evaluation of their experience. Major students are also expected to attend theatre performances.

Teaching Credential Subject Representative: G. A. Chesley, T. J. Shank. See page 215 for the Teacher Education Program.

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 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. Johnson

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. d'Harnoncourt

20. Introduction to Dramatic Art. (4) I.

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. Fahrner, Kleb

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. 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. The Staff

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. Kleb

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

70. Performance and Criticism. (4) II.

Lecture-seminar—3 hours. Contemporary relationships among theory, practice, and criticism of dramatic art. Field trips, readings, and discussions; practice in performance documentation, analysis, and critical writing. The Staff

Upper Division Courses

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. d'Harnoncourt, W. 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. Johnson

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.

Johnson

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 drawings, rendering techniques, scale models, methods and materials of scenery construction.

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.

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.

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.

Kress

***125. History of Scene Design and Staging Methods. (4) II.**

Lecture—4 hours. Study of scenic developments from the Renaissance to the present.

Sarlos

126. Production Management. (3) III.

Lecture—3 hours. Prerequisite: course 25. Theoretical study of backstage operation from audition through performance: techniques of stage management, technical direction, cueing procedures and audience control.

Chesley

127A. Principles of Directing. (4) I.

Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: courses 21A, 21B, 156, 157, 158, and senior standing or consent of instructor. The director's creative approach to the play and to its staging. (Deferred grading only for students taking 127A-127B sequence.)

Stambusky

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.)

Stambusky

150. American Theatre and Drama. (4) III.

Lecture—4 hours. The history of the theatre from Colonial times to the present. Readings of selected plays.

Sarlos

155. Black Theatre and Drama. (4) III.

Lecture—4 hours. Black Theatre and drama today: the history, impact and current direction of the work of Blacks in the theatre.

Johnson

156. European Theatre and Drama: Greek to Renaissance. (4) I.

Lecture—4 hours. Selected plays and the history of the theatre from ancient Greece through the Italian and Spanish Renaissance.

Sarlos

157. European Theatre and Drama: Renaissance to Romantic. (4) II.

Lecture—4 hours. Selected plays and the history of the theatre from the English Renaissance through German and French Romanticism.

Sarlos

158. European and American Theatre and Drama: Romantic to the Present. (4) III.

Lecture—4 hours. Selected plays and the history of the theatre from English Romanticism to the present.

Fahrner

159. Contemporary Experimental Theatre and Drama. (4) III.

Lecture—4 hours. Examination and evaluation of the "New Theatre." Course includes attending theatre events.

Kleb

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.

Shank

161. Collective Theatre. (4) I.

Workshop—4 hours. Prerequisite: experience in at least two of the following areas: playwriting, directing, design, acting, kinetic or environmental sculpture; or consent of instructor. Participation in the collective creation of a theatre piece. May be repeated twice for credit.

Shank

160. 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 playwriting. Participation in departmental productions. May be repeated for credit. The Staff

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

197T. Tutoring in Dramatic Art. (1-4) I, II, III.

Prerequisite: upper division or graduate standing with major in dramatic art; consent of department chairperson. Leading of small voluntary groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)
The Staff (Chairperson in charge)

198. Directed Group Study. (1-4) I, II, III.

Lecture—1-4 hours. Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Chairperson 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.
Fahrner

211. Advanced Voice and Speech. (2) I, II, III.

Laboratory—4 hours. Open to advanced undergraduates with consent of instructor. Voice production and speech related to specific acting problems in classical plays, particularly in verse. The Staff

212. Advanced Stage Movement. (2) I, II, III.

Laboratory—4 hours. Open to advanced undergraduates with consent of instructor. Rhythmic movement patterns relating to acting problems in classic and modern plays.
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.
Rossi

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.
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.
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. 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.
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.
Chesley

228. Seminar in Directing Theory. (4) I.

Seminar—3 hours. Development of directorial conceptions for contemporary productions of selected plays from the Greek to the present.
Kleb

229A. Special Problems in Directing. (5) I.

Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Specialized directorial procedures in styles of drama. Projects in directing scenes selected from plays of the Greek to Renaissance periods.
Stambusky

229B. Special Problems in Directing. (5) II.

Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Projects in directing scenes selected from plays from the Renaissance to the Romantic periods.
Stambusky

229C. Special Problems in Directing. (5) III.

Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. The direction of a full-length play from a classical period.
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.)
Fahrner, Sarlos

***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 (may be taken separately) includes readings and discussion; 235B emphasizes research culminating in a scholarly paper. (Deferred grading only, pending completion of sequence, can be in effect.)
Fahrner, 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 dis-

cussion; 240B emphasizes research culminating in a scholarly paper. (Deferred grading only, pending completion of sequence, can be in effect.)

Fahrner, 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.

d'Harnoncourt

259. Contemporary Theatre. (4) III.

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.

Cohn

260. Advanced Playwriting. (4) I, II, III.

Seminar—3 hours. Dramatic structure, character, and dialogue. Advanced projects in playwriting.

Shank

***265. Theory of Dramatic Art. (4) I.**

Seminar—3 hours. Theory and aesthetic principles of dramatic art as a fine art.

Fahrner

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 (Chairperson in charge)

299. Individual Study. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

299D. Dissertation Research. (1-6) I, II, III.

(S/U grading only.)

The Staff (Chairperson 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.

The Staff

***421. Dance for Actors. (2) I.**

Lecture-laboratory—1½ hours. Prerequisite: consent of instructor. Principles of choreography and dance for the stage performer.

J. H. Curry

EAST ASIAN STUDIES

Program Office, 371 Voorhies Hall

Committee in Charge:

Don C. Price, Ph.D. (*History*); *Committee Chairperson*

Gary G. Hamilton, M.A. (*Sociology*)

Richard J. Miller, Ph.D. (*History*)

Tsung-yuen Shen, Ph.D. (*Economics*)

Marian B. Ury, Ph.D. (*Comparative Literature and Religious Studies*)

§ § §

Major Advisers.—J. K. Kallgren (*China*), R. J. Miller (*Japan*).

The Major Program

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, government 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 six quarters of language work is required, the interested student should apply to this program normally in 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 either Political Science 9C (normally taken in freshman year), or History 90.

Language Requirements.—Required: Two years (30 units) of Chinese or Japanese to be satisfied by course work or examination, normally to be started no later than the beginning of the junior year.

NOTE: For key to footnote symbols, see page 220.

Upper Division Courses.—Required: History 192B-192C 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, 192A, 192B, 192C, 194A, 194B; Oriental Languages 100, 101, 111, 121; Political Science 132, 137, 142, 145, 148A, 148B; Sociology 118, 141, 170; Religious Studies 170, 172.

Other appropriate courses as approved by the Committee in charge.

ECOLOGY (A Graduate Group)

R. Merton Love, Ph.D., *Chairperson of the Group*
Group Office, 258 Hunt Hall

The Graduate Group in Ecology offers the M.S. and Ph.D. degrees in three broad areas of study: biological, human, and physical and chemical ecology. Several areas of specialization are possible in each of the three.

Appropriate preparation is undergraduate work in any of the biological, social or behavioral, and physical sciences, mathematics or engineering. But note that all applicants will normally be expected to have completed a one-year sequence in basic biology, in elementary chemistry, in elementary physics; a course in statistics; calculus and computer programming or other suitable mathematical training; and a course in ecology. Each of the three broad areas requires certain advanced preparation appropriate to the area.

The Group includes faculty from 36 departments in five schools and colleges. Details of the program may be obtained from the Chairperson of the Group.

Related Courses. Many departments offer such courses. A list of these courses is available at the Group Office.

Breadth Requirement.—All degree candidates are required to take a course from each of the following three study areas. Recommended:

- a. Biological Ecology courses. Environmental Studies 100 (General Ecology), Zoology 125 (Animal Ecology), Entomology 104 (Insect Ecology), or Botany 117 (Plant Ecology).
- b. Human Ecology courses. Environmental Studies 101 (Principles of Human Ecology), 111 (Cultural Ecology), Anthropology 148 (Ecological Anthropology), or Geography 171 (Cultural Ecology).
- c. Physical and Chemical Ecology courses. Environmental Studies 117 (Principles of Environmental Science), Geology 150A (Physical and Chemical Oceanography), or Atmospheric Science 123 (Micrometeorology).

Graduate Courses

201A. Ecological Theory. (3) II.

Lecture—3 hours. 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.)

Salt, Major, Valentine

201B. Analysis of A Selected Ecosystem. (3) I.

Lecture—3 hours; one field trip—to be arranged. 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

201C. The Changing Biosphere. (3) III.

Lecture—3 hours. Prerequisite: graduate standing and course 201A 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

290. Seminar in Ecology. (1-3) I, II, III.

Seminar—1-3 hours. Topics in biological, human, physical, and chemical ecology. (S/U grading only.)

The Staff (Chairperson in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: graduate standing and consent of instructor. Perception, definition, and attack on a selected ecological problem, drawing on the expertise of faculty from different departments in the Graduate Group in Ecology. (Section 1, letter grading; all other sections, S/U grading only.)

The Staff (Chairperson in charge)

ECONOMICS

Frank C. Child, Ph.D., *Chairperson of the Department*

Department Office, 380 Academic Office Building III

Professors:

Andrzej Brzeski, Ph.D.
 Frank C. Child, Ph.D.
 Bruce Glassburner, Ph.D.
 Hiromitsu Kaneda, 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.
 Victor P. Goldberg, Ph.D.
 Martin P. Oettinger, Ph.D.
 Ross M. Starr, Ph.D.

Assistant Professors:

William G. Moss, Ph.D.
 Alan L. Olmstead, Ph.D.
 John E. Roemer, Ph.D.
 James A. Roumasset, Ph.D.

Lecturer:

W. Eric Gustafson, Ph.D.

§ § §

Departmental Advisers.—R. R. Cornwall, J. A. Roumasset, J. E. Roemer, W. E. Gustafson, A. L. Olmstead, T. M. Lenard.

Graduate Advisers.—H. Kaneda, T. Y. Shen, W. G. Moss, E. H. Tuma, L. L. Wegge.

The American History and Institutions requirement may be satisfied in part by Economics 111. (See also page 42.)

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; 130, 131; 135A-135B-135C; 150-151, or 150-152; 160-161.

It is highly recommended, but not required, that students take Economics 100 prior to 101; and the Department also 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 Credential Subject Representative: A. Brzeski. See page 215 for the Teacher Education Program.

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 chairperson of the departmental graduate committee.

Lower Division Courses

1A. Principles of Microeconomics. (5) I, II, III.

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. The Staff

1B. Principles of Macroeconomics. (5) I, 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

NOTE: For key to footnote symbols, see page 220.

income, employment, and prices; money and banking, economic fluctuations, international trade, economic development; the role of public policy.

The Staff

***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. Gustafson

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, II, 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.

Brzeski and staff

49. Lower Division Seminar. (1-3) II.

Seminar—1-3 hours. Prerequisite: lower division standing and consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

98. Group Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.) The Staff (Chairperson in charge)

99. Individual Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Chairperson 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

102. Advanced Macro Theory. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 12, 101; Mathematics 16A-16B or consent of instructor. Selected topics in macroeconomic theory.

103. Theory of Economic Optimization. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100, 101; Mathematics 16A-16B. Analytic 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.) Roemer

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. Shen

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. 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. 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. 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. Glassburner, 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. 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. Brzeski

118. Political Economy of Agrarian Reform. (4) II.

Lecture—3 hours; discussion—1 hour to be arranged. Prerequisite: courses 1A and 1B or the 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. 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. 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.

123. Ecology and Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Economies 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. 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. Moss

130. Public Microeconomics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or consent of instructor. Public expenditures: theory and applications. Efficiency and

equity of competitive markets; externalities, public goods, and market failure; positive and normative aspects of public policy for expenditure, including benefit-cost analysis. Topics include consumer protection, pollution, education, poverty, and crime. Roumasset

131. Public Finance. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or consent of instructor; course 101 recommended. Financing government expenditures. Efficiency and equity aspects of taxes, including personal income tax, property tax, and sales tax; tax loopholes and tax reform; revenue sharing; macroeconomic effects of taxation vs. debt financing. Roumasset

134. Corporation Finance. (4) III.

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. Hoff

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.

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.

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, and the problem of inflation.

*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. Oettinger

NOTE: For key to footnote symbols, see page 220.

***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.

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. 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. 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. Shen

***189. Field Work in Economics. (5) III.**

Seminar—1 hour; 4 hours—working with a unit of state or local government or local agency. 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.

190. Topics in Economics. (4) I, II, III.

Lecture-discussion-seminar—4 hours. Prerequisite: consent of instructor. Selected topics in economic analysis and public policy. Variable content. May be repeated for credit. The Staff

194HA-194HB-194HC. Special Study for Honors Students. (3-2-2) I-II-III.

Seminar—2 hours. Prerequisite: major in Economics with senior standing; consent of instructor. A program of research culminating in the writing of a senior honors thesis under the direction of a faculty adviser. (Deferred grading only, pending completion of course.) The Staff

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. (P/NP grading only.)

The Staff (Chairperson in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson 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.)

B. C. French

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.)

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.)

Cornwall

200D. Macroeconomic Theory. (4) II.

Lecture—3 hours. Macro static theory of income, employment, and prices. 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.

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. Shen

***202. Topics in Economic Theory. (4) I.**

Seminar—4 hours. Prerequisite: courses 200A-200E or consent of instructor. Recent developments in economic theory. Wegge, Shen

203A. Advanced Economic Theory. (4) I.

Seminar—4 hours. Prerequisite: course 200C. Advanced topics in the theory of the firm; distribution theory; welfare economics. Cornwall

203B. Advanced Economic Theory. (4) II.

Seminar—4 hours. Prerequisite: courses 200C and

200E. General equilibrium theory; capital theory; growth theory.

204. Microeconomic Analysis. (5) II.

Lecture—4 hours; discussion—1 hour. Prerequisite: course 100 or Agricultural Economics 100A, 100B and Mathematics 16A, 16B. Open to advanced undergraduates with consent of instructor. Economic reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. Moss

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. 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. 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. 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. 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. 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.

Kaneda, 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.

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. Brzeski

217. Economics of Planning. (4) III.

Lecture—4 hours. Theories and principles of economic planning under various economic systems. 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. 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. Goldberg

***222. Law and Economics. (4) III.**

Lecture—2 hours; seminar—2 hours. Prerequisite: one year of law school; course 200A or consent of instructor. Studies the effects of legal rules on resource allocation and applies economic analysis to explicate problems in torts, property, and contracts. 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. Moss

230A. Public Finance. (4) I.

Lecture—2 hours; seminar—2 hours. Welfare economics, externalities, public and merit goods, local public goods, transactions costs and market failure, benefit-cost analysis, politics of collective choice, topics (e.g., economics of education, transfers in income and in-kind, consumer protection, pollution, transportation and congestion).

Roumasset

230B. Public Finance. (4) II.

Lecture—2 hours; seminar—2 hours. Taxation and stabilization; distributional equity, shifting and incidence, theory of optimal taxation, analysis of personal income tax, corporation income tax and other taxes, tax reform, revenue sharing, monetary and fiscal policy, debt management, burden of debt.

Roumasset

***235A-235B. Monetary Theory. (3-3) I-II.**

Lecture—3 hours. Prerequisite: course 200D (may be taken concurrently) or the equivalent. The quantity theory, post-Keynesian monetary theory, the portfolio approach. The main focus is on the conflict between monetarism and Keynesianism. Mayer

***235C. Monetary Policy. (3) III.**

Lecture—3 hours. Goals and problems of im-

plementation of monetary policy. Impact of monetary changes on income; resource allocation effects, and lags. The problem of rules vs. authorities; monetary aspects of the Great Depression. 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 240A.)

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 240B.)

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 240C.)

250A. Labor Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 150 and 151 or the equivalent. Philosophy, theory and history of American and foreign labor movements; union structure and organization under changing labor market conditions; human resources, manpower policy and other labor market issues.

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.

260A. International Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Theory of trade determinants; gains from trade; tariffs and effective protection; economic unions. Child

260B. International Economics. (4) II.

Lecture—3 hours; discussion—1 hour. Balance of payments adjustment mechanisms; foreign exchange markets; theories of balance of payments policy and international monetary mechanisms.

Kaneda

260C. International Economics. (4) III.

Seminar—4 hours. Prerequisite: courses 200C, 200E, 240A, and 260A. Survey of current literature in International Trade theory.

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 (Chairperson in charge)

299. Individual Study. (1-12) I, II, III.

Prerequisite: consent of instructor and graduate standing. (S/U grading only.)

The Staff (Chairperson in charge)

299D. Dissertation Research. (1-12) I, II, III.

(S/U grading only.)

The Staff

EDUCATION

Julius M. Sassenrath, Ph.D., *Chairperson of the Department*

Douglas L. Minnis, Ed.D., *Head of Teacher Education*

Department Office, 174 Academic Office Building III

Professors:

- Donald G. Armstine, Ph.D.
- ²Hugh 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.
- ³Linnea C. Ehri, Ph.D.
- Richard A. Figueroa, Ph.D.
- Judith Forcada, M.A. (*Acting*)
- Jonathan H. Sandoval, 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 Garrison, 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.

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Credentials Counselors:

Elementary.—H. G. Bacon, J. Garritson, M. E. Gatheral, R. E. Hapworth, S. A. Ostergard, S. J. Skinner, D. R. Wampler.

Secondary.—W. A. Davis, L. D. Estes, B. Liebert, J. E. Lowry, W. T. Mara, V. A. Perkes.

Community College.—W. T. Mara.

Curricula for Teacher Education.—(See page 215). 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.

Upper Division Courses**100. Field Experience in Education. (2) I, II, III.**

Discussion—1 hour; field work—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 enrollment. 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 2A, 2B, 2C, 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. Ehri, Figueroa, Sandoval, 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. Some considerations of procedures suited to digital computers. Yonge

116. Chicano Children: Psychological Issues. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: courses 110 and 120. Examination of psycho-educational literature on Chicano children within the framework of Erik Erikson's theories towards development of an assessment-intervention capability. Figueroa

117A. Psychology of Reading. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: Psychology 2B or the equivalent; upper division or graduate standing. Application of verbal learning and motivational principles to the design of a curriculum for the word-identification stage of beginning reading. Spring

117B. Psychology of Reading. (3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite:

Psychology 2B or the equivalent; upper division or graduate standing. Consideration of theory and research on the psychological structures and processes involved in achieving reading proficiency, with emphasis on comprehension and a psycholinguistic approach to reading. Ehri

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. Black, Troutner

121. The Romantic Tradition in Educational Thought. (4) I, II.

Lecture—4 hours. Prerequisite: upper division or graduate standing. A critical philosophical examination of the assumptions about the educative process and the prescriptions for educational reform of such writers as Rousseau, Tolstoy, Counts, Dewey, Goodman, and Illich. Crockenberg, Armstine

122. The Politics of the Schools. (4) I.

Lecture—4 hours. Prerequisite: upper division or graduate standing. The school as a social and political institution: the structure of school government, the role of teachers' organizations, the civil rights and responsibilities of teachers and students, and the processes of institutional change. Crockenberg, Armstine

123. John Dewey and the Foundations of Education.

(4) II, III.

Lecture—4 hours. Prerequisite: upper division or graduate standing. The philosophical and social foundations of education as interpreted by Dewey. While focusing on his critique of American education and his systematic proposals of reform, attention will also be given to criticisms of Dewey. Armstine, Crockenberg

150A. Educating and Tutoring Minority Children and Youth. (2) I.

Lecture—1 hour; field work—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. (P/NP grading only.) Davis

150B. Educating and Tutoring Minority Children and Youth. (2) II.

Lecture—1 hour; field work—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. (P/NP grading only.) Davis

150C. Educating and Tutoring Minority Children and Youth. (2) III.

Lecture—1 hour; field work—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. (P/NP grading only.)

Davis

151. Language Problems of the Mexican-American Child. (4) I.

Lecture—3 hours; field work—2 hours. Prerequisite: upper division standing. Problems of phonology, syntax, and lexicon encountered by the Mexican-American child in English-speaking public school systems.

Forcada

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.

Figueroa, Sandoval

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.)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

The Staff (Chairperson 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.

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.

Black, Crockenberg

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.

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.

Armstine

206. Social Theory and the American School. (3) II.

Seminar—3 hours. Prerequisite: consent of instructor. A study of social institutions from the perspective of modern social theories: Weber, Durkheim, Marx, Dewey, Sorokin, Pareto, Parsons, and others. Focus on social change and the role of educational institutions in promoting or hindering change.

Armstine, Crockenberg

207. Concepts of the Curriculum. (3) III.

Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Development of the skills of philosophical analysis in the examination of curriculum theory and practice, including the conceptual analyses of purposes, of the organization of subject matters, and the methods of instruction.

Armstine, Crockenberg

210. Cognitive Learning. (3) I.

Seminar—3 hours. Prerequisite: consent of instructor. A critical analysis of selected problems and procedures in the study of cognitive learning processes.

Sassenrath

211. Thinking and Problem Solving. (4) II.

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.

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.

Ehri

215. Social Learning. (3) II.

Seminar—3 hours. Prerequisite: consent of instructor. Theory and research on behavior modification; analyses of modeling, reinforcement, punishment, and extinction; implications for education.

Spring

219. Educational Testing, Evaluation, and Differences. (3) III.

Seminar—3 hours. Prerequisite: course 114 or consent of instructor. A study of test theory as it applies to research, evaluation, and human differences in education.

Sassenrath

270A. Reading Diagnosis and Prescription. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 300 or the equivalent. The diagnosis and treatment of reading disabilities and the recognition of reading abilities. Analysis of clinical techniques, testing, use of material and teaching procedures.

Bacon, Gatheral

270B. Reading Instruction in Secondary Education. (3) II.

Seminar—3 hours. Prerequisite: course 301 or the equivalent. Causal factors and diagnosis of reading disabilities. Principles of reading instruction in secondary education, including phonic, whole word, and other approaches. Liebert

270C. Research in Reading Instruction. (3) III.

Seminar—3 hours. Prerequisite: course 270A or 270B or the equivalent. Examination of pertinent research in phonetic analysis, comprehension, testing, oral fluency, and dialect. Bacon

271. Recent Developments in Social Studies Education. (3) I.

Lecture—2 hours; field work—2 hours. Prerequisite: consent of instructor. An analysis of the rationales, goals, objectives, and assumptions about learning and teaching strategies, and evaluation techniques in selected social studies curriculum projects. Wampler

272. Recent Developments in Science Education. (3) III.

Lecture—3 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. 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. Mara, Ostergard

274. Analysis of Teacher Behavior. (2) II.

Seminar—2 hours. Prerequisite: teaching credential 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. Minnis

276. Instructional Strategies. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. Analysis of instructional variables as they relate to diverse types of teaching strategies. Problems in instructional decision-making. Minnis

290. Seminar. (2) I, II, III.

Seminar—2 hours. Prerequisite: graduate standing. The Staff (Chairperson in charge)

299. Research. (1-6) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

Professional Courses***300. Reading and Language Arts in the Elementary School. (4) I, II, III.**

Lecture—3 hours; field work—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. Bacon, Gatheral, Skinner

***301. Reading in the Secondary School. (4) I, II, III.**

Discussion—4 hours. Prerequisite: must be teaching or student teaching. Principles, procedures, and materials to help secondary school teachers improve the reading competence of their students. The teaching of phonics, structural analysis, and alternative methods of coping with the problem reader in the classroom. Liebert

303. Art Education. (3) III.

Lecture—1 hour; discussion—1 hour; laboratory—2 hours. Prerequisite: admission to multiple subject credential program. Understanding the principles of education in the arts through participation. Development of concepts, introduction to media and techniques suitable for the elementary school with emphasis on cross-discipline exploration. Garritson

***304A. Teaching in the Elementary Schools. (5-8) I.**

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: acceptance into a Teacher Education Program. Supervised teaching in preschool or elementary schools. Selection and organization of teaching materials. Introduction to techniques of diagnosing school achievement of children. The Staff

***304B. Teaching in the Elementary Schools. (5-8) II.**

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 304A. Supervised teaching in preschool or elementary schools. Current conceptions of elementary school curriculum, emphasis on contributions from the social, biological, and physical sciences. Emphasis on effective teaching methods. The Staff

*Students must make their own transportation arrangements for observations and student teaching.

*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, 1975, will begin on or about September 2. For the Spring Quarter, 1976, they will end on or about June 2. Students should make arrangements accordingly.

NOTE: For key to footnote symbols, see page 220.

***304C. Teaching in the Elementary Schools. (5-8) III.**

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 304B. Supervised teaching in preschool or elementary schools. Evaluation of teaching materials including audio-visual aids. Current elementary school curriculum with emphasis on contributions from fine arts and humanities. The Staff

***305A. Teaching in the Middle Grades. (5-8) I.**

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: acceptance into a Teacher Education Program. Supervised teaching in the middle grades. Current conceptions of the middle-grades curriculum with emphasis on social, biological, and physical sciences. Effective teaching methods. The Staff

***305B. Teaching in the Middle Grades. (5-8) II.**

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 305A. Supervised teaching in intermediate grades. Selection, organization, and evaluation of teaching materials including audio-visual aids. Effective teaching methods in grades 4-9. The Staff

***305C. Teaching in the Middle Grades. (5-8) III.**

Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 305B. Supervised teaching in a departmentalized junior high school. Current conceptions of the junior high school with emphasis on effective teaching methods, and selection of curriculum materials. Alternative programs. The Staff

***306A. Introduction to Secondary Education.**

(3) I, II, III.

Lecture—1 hour; discussion—1 hour; field work—2 hours. Prerequisite: acceptance into a Teacher Education Program. Skills and techniques for developing and analyzing classroom communications; identifying and constructing goals and objectives of instruction; assessment of learning; special problems of adolescents; audio-visual materials and techniques. The Staff

***306B. Teaching in Secondary Schools. (5-10) I, II, III.**

Student teaching plus conferences with supervisor—15-30 hours per week. Prerequisite: course 306A (may be taken concurrently). Supervised teaching in secondary and departmentalized schools. Undergraduates must repeat for a total of 15 units; graduates must repeat for a total of 18 units. (Deferred grading only, pending completion of

course at end of public school session.) The Staff

***309. Early Childhood and Kindergarten Education. (2) II.**

Lecture—2 hours. Prerequisite: consent of instructor. Methods, materials, and history of nursery school and kindergarten education. Skinner

322. Methods in Secondary Social Studies. (3) I.

Lecture—2 hours; field work—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. (Deferred grading only, pending completion of course at end of public school session.) Lowry

***323. Secondary School Curriculum: Science. (3) I.**

Lecture—2 hours; field work—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. (Deferred grading only, pending completion of course at end of public school session.) Perkes

***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.) Mara

341. Teaching in the College and University. (2) I.

Lecture—2 hours; laboratory—1 hour. Prerequisite: graduate or faculty standing and consent of instructor. Analysis of course aims and objectives. Teaching techniques for college-level instruction with emphasis on lecture and discussion. Evaluation of instruction and student performance. Designed for teaching assistants and graduate students. Taught by a team of faculty from a variety of disciplines. Minnis

* Students must make their own transportation arrangements for observations and student teaching.

* 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, 1975, will begin on or about September 2. For the Spring Quarter, 1976, they will end on or about June 2. Students should make arrangements accordingly.

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

Professor:

G. Worden Waring, Ph.D. (*School of Medicine*)

Assistant Professor:

Antone F. Salel, M.D. (*School of Medicine*)

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Lower Division Courses

1. Plane Surveying. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: plane trigonometry; Consumer Technology 31 recommended. Not open to students in Engineering. Principles of measurement of horizontal distances, horizontal and vertical angles, elevations and differential levels, including stadia methods. Field problems with special reference to agricultural, forestry and landscaping applications. 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.) Larock

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. J. M. Henderson

5A. Applications of Computers. (3) II, III.

Discussion—1 hour; lecture—2 hours. Prerequisite: Mathematics 16A or 21A. Introduction to digital computation and computer programming. Algorithms and their description. Basic programming; debugging of programs. Problems in approximate computing accuracy and significance. Practice with an algebraic language (FORTRAN) in solving simple numerical and nonnumerical problems. Students who have had Mathematics 29 may not receive credit for this course. Hatfield

5B. Applications of Computers. (3) I.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 5A. Introduction to B6700 hardware and system software. Operation of a computer system. Additional features of FORTRAN; input/output techniques. Programming techniques, data structures, data handling. ALGOL and its advantages.

Numerical techniques. Extensive programming practice. Hatfield

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 society's energy needs. Effects of technology on society: population control, personality development, technology and the economy. (P/NP grading only.) Tardiff

15. Computers and People. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: high school algebra. An introduction to computers for those not majoring in the physical sciences. The applications of computers in society. History, nature and use in business, education, government and the arts. Cybernetics, artificial intelligence and the social consequences of computers. Basic programming. Dorf

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. The Staff

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 (Larock in charge)

45. Properties of Materials. (4) I, II, 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 materials. Mukherjee, 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 (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. (P/NP grading only.)

The Staff (Brush in charge)

Upper Division Courses

100. Electronic Circuits and Systems. (4) I, II.

Lecture—3 hours; laboratory—3 hours. Prerequisite:

NOTE: For key to footnote symbols, see page 220.

site: course 17. Introduction to the theory and applications of analog and digital circuits and systems.

Mitra, Gardner

102A. Dynamics. (3) I, II, III.

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. Beadle, Brewer

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.

Beadle, Munir

102L. Dynamics Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 102B (may be taken concurrently). Experimental laboratory to demonstrate fundamental principles of dynamics and their application to engineering problems. Introduction to instrumentation for dynamic motion measurement.

J. M. Henderson

103A. Elementary Fluid Mechanics. (3) I, II, III.

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.

Baughn, Brandt

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.

Brandt

103L. Fluids Mechanics Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 103B (may be taken concurrently). The basic principles and devices which are common in fluid mechanics are illustrated with a series of experimental demonstrations. The experiments are concerned with flow, pressure and viscosity measurement.

White

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 (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 (Herrmann in charge)

104C. Mechanics of Materials. (3) III.

Lecture—3 hours. Prerequisite: course 104B.

Selected topics including the analysis of plates, shells, curved beams, rings and arches. Torsion of noncircular shafts and thin-walled sections. Discussion of the buckling of plates and shells and the concept of local buckling of thin sections.

Hutchinson

105A. Thermodynamics. (3) I, II, III.

Lecture—3 hours. Prerequisite: Mathematics 22B and 22C. Thermodynamic systems and properties, equilibrium state surfaces, tables and graphs of equilibrium properties; perfect gas equation; work and heat; application of first law to analysis of engineering systems and processes. Introduction to entropy and second law.

Baughn, Giedt

105B. Thermodynamics. (3) II, III.

Lecture—3 hours. Prerequisite: course 105A. Vapor and gas power cycles; gas and vapor mixtures; general thermodynamic relations; real gases, reactive-processes; chemical equilibrium.

McKillop

105L. Thermodynamics Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 105B (may be taken concurrently). Demonstrations and experiments to illustrate the first and second laws of thermodynamics as well as to show how various state variables such as temperature, pressure, etc., are measured and used to develop the state equations.

Hoffman

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.

Horsfield

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.

Hubbard

***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.

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.

Brandt

130. Thermodynamics of Materials Processes.**(4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Engineering or consent of instructor. Application of the principles of thermodynamics to solid engineering materials with emphasis on solving problems associated with materials processes, e.g., alloying, phase stability, surface properties, semiconduction, thermoelectric power and thermionic energy conversion. 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. Shackelford

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., are discussed. Typical results expected from these tests and their application in material characterization, flaw detection, crystallographic information, chemical inhomogeneity, residual stress analysis, etc., are emphasized. Shackelford

144. Corrosion and Oxidation of Engineering Materials. (3) I.

Lecture—3 hours. Prerequisite: upper division standing in Engineering. Principles governing the interaction between engineering materials and their environment; corrosion in aqueous media, soils and biological systems. Oxidation of structural materials in high temperature applications; design and selection criteria for the prevention and control of corrosion. Munir

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. Munir

148. Engineering Applications of Materials Principles. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Engineering. The physical principles in metallic, polymeric and ceramic materials are discussed with emphasis on

microstructure and engineering applications. The strengthening processes, mechanical failure modes and service stability of materials systems are outlined. Mukherjee

160. Energy, Society, and the Environment. (3) I.

Lecture—3 hours. Overview of energy; uses, resources, energy conversion, technology and environmental problems. Interactions of society with technology, politics and economics are considered. Current and future energy systems are studied: nuclear, fossil fuel, geothermal, solar and others. For engineering and nonengineering students. Lower division students are referred to Environmental Studies 20. Baughn

162. Advanced Energy Technology. (3) III.

Lecture—3 hours. Prerequisite: course 105A. Broad coverage of the basic features of the new energy technologies. Recovery of oil from oil shale, coal conversion, gas stimulation, hydrogen production, solar power, fission power, laser fusion, synthetic fuels, geothermal power, energy from bioconversion. Bloom, Wooten

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. Brewer, Margolis

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. (P/NP grading only.) Kemper

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 (Brush in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. (P/NP grading only.) The Staff (Brush in charge)

Graduate Course**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.) J. M. Henderson, Baughn

ENGINEERING: AGRICULTURAL†Robert B. Fridley, Ph.D., *Chairperson 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, Ph.D.
 Roger E. Garrett, Ph.D. (*Engineering and Agricultural Engineering*)
 John R. Goss, M.S.
 S. Milton Henderson, M.S.
 Robert A. Kepner, B.S. (*Engineering and Agricultural Engineering*)
 Coby Lorenzen, Jr., M.S. (*Agricultural Engineering, Emeritus*)
 Stanton R. Morrison, Ph.D. (*Agricultural Engineering*)
 Loren W. Neubauer, Ph.D. (*Engineering and Agricultural Engineering, Emeritus*)
 Michael O'Brien, Ph.D. (*Agricultural Engineering*)
 Wesley E. Yates, M.S. (*Engineering and Agricultural Engineering*)

Associate Professors:

- Thomas H. Burkhardt, Ph.D. (*Engineering and Agricultural Engineering*)
 R. Larry Merson, Ph.D. (*Engineering and Agricultural Engineering*)

Assistant Professors:

- Brian Horsfield, Ph.D. (*Engineering and Agricultural Engineering*)
 R. Paul Singh, Ph.D. (*Agricultural Engineering*)

Lecturers:

- Pictiaw (Paul) Chen, Ph.D.
 Henry E. Studer, M.S.

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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.) Goss

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 (Fridley in charge)

99. Special Study for Lower Division Students. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Fridley in charge)

Upper Division Courses**111. Characteristics and Applications of Electric Motors. (1) III.**

Lecture-demonstration—one 2-hour session. Prerequisite: Engineering 17; Physics 4C. Principles of operation, selection, and control of DC and AC electric motors. Construction features, performance characteristics, and typical agricultural and industrial applications. Chancellor

112. Engines for Agriculture, Industry and Transportation. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 105A. Operational and performance characteristics of internal combustion engines with emphasis on combustion and emission control. Engineering comparison of alternative power units with conventional engines. Design criteria for engines used in agriculture, industry, and transportation. Burkhardt

114. Principles of Field Machinery Design. (3) III.

Lecture—2 hours; discussion-laboratory—3 hours. Prerequisite: Engineering 102B. Functional requirements, basic principles of operation and elements of field machinery design; use of instrumentation and computer techniques for analysis of specific machines. Offered in even-numbered years. Yates

115. Forest Engineering. (3) II.

Lecture—3 hours. Prerequisite: upper division standing. Applications of engineering principles to problems in the forestry industry including consideration of nursery operations, reforestation, harvesting, road layout, log transport and milling operations. Goss

117. Stability and Traction of Off-Road Vehicles. (2) I.

Lecture—2 hours. Prerequisite: Engineering

†Courses listed here are in the College of Engineering. For further course offerings, see *Agricultural Engineering Technology*, page 228; *Agricultural Practices*, page 230; and *Consumer Technology*, page 281.

102A and 104A. Mechanics of interactions between paved or soil surfaces and tires or tracks. Vehicle response to external and dynamic forces during pulling, turning, lifting and transport. Effects of design parameters and component characteristics on vehicle performance and safety. Chancellor

118. Testing and Evaluation of Engineering Designs. (3) II.

Lecture—3 hours. Prerequisite: Mechanical Engineering 150. Test design and analysis of test data to evaluate design attributes such as functional adequacy, failure modes, reliability, maintainability and safety. Students may also gain experience with fabrication techniques by taking an optional noncredit laboratory. 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. 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. Morrison

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. Offered in odd-numbered years. Henderson

150. Engineering Design Projects for Agriculture and Forestry. (2) II.

Laboratory-discussion—two 2-hour sessions. Prerequisite: senior standing in engineering and one course from the following: courses 114, 125, 132, Civil Engineering 132A, 145, Mechanical Engineering 150. Individual or group projects in design of equipment and facilities for agriculture and forestry. Projects related to cultural equipment; harvesting, handling, food engineering, and processing equipment; water and waste management systems; structures and environmental control facilities. Garrett.

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Fridley in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only). The Staff (Fridley in charge)

Graduate Courses

215. Soil-Machine Relations in Tillage and Traction. (3) I.

Lecture—3 hours. Prerequisite: courses 114 or 117. 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. Chancellor

235. Advanced Unit Operations in Agricultural and Food Processing. (3) III.

Lecture—3 hours. Prerequisite: course 132 or the equivalent. Basic procedures applicable to agricultural and food engineering. Heat and mass transfer applications to drying, dehydration, and freezing; flow of food and semi-fluid materials; size reduction; respiration of bio-materials, etc. Henderson

245. Agricultural Waste Management. (3) I.

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 public concern; coordination with municipal and industrial wastes management. Offered in even-numbered years. Horsfield

250. Design of Mechanical Systems. (2) I.

Lecture—2 hours. Prerequisite: mechanical design and economics recommended. Experience with design; evaluating design concepts and establishing design criteria; analysis and synthesis in design; optimization techniques; human factors in design. Fridley

255. Environmental Engineering in Agriculture. (3) I.

Lecture—3 hours. Prerequisite: Mechanical Engineering 166. The description, methods of measurement and effect on man, animals and plants of physical environmental factors, and the design of systems for their control. Offered in odd-numbered years. 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. Burkhardt

275. Physical Properties of Agricultural Materials. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Selected topics on physical properties, such as mechanical, optical, rheological, and aerodynamic properties, as related to the design of harvesting, handling, sorting, and processing equipment. Techniques for measuring and recording physical properties of agricultural materials. Offered in odd-numbered years. Chen

290. Seminar. (1) III.

Seminar—1 hour. (S/U grading only.)
The Staff (Fridley in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Garrett in charge)

299. Research. (1-12) I, II, III.

(S/U grading only). The Staff (Garrett in charge)

ENGINEERING: APPLIED SCIENCE

Frederick O. Wooten, Ph.D., *Chairperson of the Department*

Stewart D. Bloom, Ph.D., *Vice-Chairperson of the Department*

Department Office, 228 Walker Hall

Professors:

- Stewart D. Bloom, Ph.D.
- Richard J. Borg, Ph.D.
- William G. Hoover, Ph.D. (*Adjunct*)
- John Killeen, Ph.D.
- Richard F. Post, Ph.D. (*In Residence*)
- Harold P. Smith, Jr., Ph.D.
- Wilson K. Talley, Ph.D.
- Edward Teller, Ph.D. (*Professor at Large*)
- Frederick O. Wooten, Ph.D.

Associate Professors:

- John S. DeGroot, Ph.D.
- Yin Yeh, Ph.D.

Assistant Professor:

- C. Peter DeNeef, Ph.D.

Lecturers:

- Berni J. Alder, Ph.D.
- Kellogg S. Booth, M.S.
- Sidney S. Fembach, Ph.D.
- Joseph A. Fleck, Ph.D.
- John G. Fletcher, Ph.D.
- John C. Garrison, Ph.D.
- Alexander Glass, Ph.D.
- Michael W. Guinan, Ph.D.
- Laurence S. Hall, Ph.D.
- Robert J. Harrach, Ph.D.
- Edwin B. Hooper, 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.
- George A. Michael, B.S.
- William A. Newcomb, Ph.D.
- John E. Ranalletti, M.S.

- Jacques B. J. Read, Ph.D.
- Charles K. Rhodes, Ph.D.
- Harry L. Sahlin, Ph.D.
- Michael Schwab, Ph.D.
- Peter C. Stevenson, 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.

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Davis

Upper Division Courses

115. Introduction to Numerical Methods for Computers. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. 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. DeGroot

135A. Introductory Nuclear Science and Technology. (3) I.

Lecture—3 hours. Prerequisite: Physics 121 or the 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. DeGroot

180. Introduction to Plasma Physics and Controlled Fusion. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite:

site: Physics 110B and 112A, or Engineering 105A and Electrical Engineering 130B, or consent of instructor. Thermonuclear reactions, possible approaches to controlled fusion, equilibrium plasma properties—plasma sheaths; plasma sources, plasma diagnostics, magnetohydrodynamics; kinetic theory; plasma stability; confinement systems.

DeNeef

198. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Students may enroll in one or more separate sections. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Chairperson 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.

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.

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.

DeNeef, DeGroot

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.

Wooten

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.

DeNeef, DeGroot

290. Seminar. (1-2) I, II, III.

Seminar—1-2 hours. (S/U grading only.)

The Staff (Chairperson 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 (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only)

The Staff (Chairperson in charge)

Livermore

Upper Division Courses

112A. Introduction to Computing Science. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5A or the equivalent or consent of instructor. Basic computing machine organizations and languages are analyzed. The concept of language hierarchies is introduced and assemblers are examined in detail. Several machines are presented to illustrate different computer and memory structures. For the whole course, very heavy emphasis is placed on learning by actual programming.

Michael

112B. Introduction to Computing Science. (3) II.

Lecture—3 hours. Prerequisite: course 112A or consent of instructor. Basic computing machine organizations and languages are analyzed. The concepts of list processing and symbolic computing are studied. Investigation of interpreters is begun as a special introduction to simulation languages.

Michael

115. Introduction to Numerical Methods for Computers. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.

Alder

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 dia-

grams; chemical equilibrium; phase transitions; partition functions. Hoover

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. Hoover

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. Hoover

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. Hooper

135A. Introductory Nuclear Science and Technology. (3) I.

Lecture—3 hours. Prerequisite: Physics 121 or the 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. Smith

135B. Introductory Nuclear Science and Technology. (3) II.

Lecture—3 hours. Prerequisite: course 135A or the equivalent. Techniques of radiation and particle detection; nuclear instrumentation techniques; pulse height analysis, coincidence measurement; technology of charged particles and neutrons. Smith

135C. Introductory Nuclear Science and Technology. (3) III.

Lecture—3 hours. Prerequisite: course 135B or the 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. Smith

198. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Students may enroll in one or more separate sections. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

Graduate Courses

201. Computational Algorithms. (3) I.

Lecture—3 hours. Prerequisite: Electrical Engineering 177 or the 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. Fletcher

202. Computer Languages. (3) I.

Lecture—3 hours. Prerequisite: course 201 (may be taken concurrently); Electrical Engineering 176 or the 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. 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. Killeen

205C. Mathematical Methods. (3) III.

Lecture—3 hours. Prerequisite: course 205B or the equivalent. Eigenvalue problems; solution of linear differential and integral equations by expansions in orthonormal functions; Green's functions; approximation methods; applications to physical systems. Killeen

207A-207B. Software Systems. (3-3) I-II.

Lecture—3 hours. Prerequisite: course 201 or the 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. 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. 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. Zosel

212A-212B. Compilers and Interpreters. (3-3) II-III.

Lecture—3 hours. Prerequisite: courses 201 and 211 or the equivalent. Theory and practice of designing and writing compilers and interpreters. Offered in even-numbered years. 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 the equivalent. 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. Fletcher

216. Infinite Automata. (3) III.

Lecture—3 hours. Prerequisite: courses 201 and 211 or the equivalent. Ideal computing machines, including Turing machines. Limitations of finite machines; regular sets. Computability and decidability. Godel's proof. Offered in odd-numbered years. Fletcher

219. Computer Science Applications. (3) III.

Lecture—3 hours. Prerequisite: courses 201 and 211 or the equivalent. 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. Fletcher

220A-220B-220C. Solid State Chemistry.

(3-3-3) III-I-II.

Lecture—3 hours. Prerequisite: course 121B; Chemistry 215. Crystallography, equations of state, potential functions, phase transformations, ther-

modynamics of surfaces, order-disorder, thermodynamics of point defects in metals, semi-conductors and insulators, diffusion in solids, solid-state reactions, mineralogy. Applications of foregoing concepts and facts to materials and geoscience and semi-conductor technology. 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. 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. The Staff

233A-233B-233C. Theory and Applications of Solid State Physics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 230C or the equivalent. Structure and properties of crystals; theory of dielectrics, metals and alloys; magnetism, superconductivity, and semiconductors. Applications to various solid-state devices. Schwab, _____

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. Hoover

235A-235B. Nuclear Physics. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 230C. Basic properties of nuclei; radioactive decay; nuclear models; low energy nuclear reactions; neutron physics. Interaction of particles and radiation with matter. 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. Bloom

237A-237B. Neutron Physics. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 135A.

NOTE: For key to footnote symbols, see page 220.

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. Smith

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 transactinides, radiolysis, "hot atom" chemistry, and mechanisms of biological radiation damage. Offered in even-numbered years. The Staff

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. 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. 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. 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. Hoover

265A-265B-265C. Theory and Applications of Lasers. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 230C or the equivalent and 234B or the 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. Glass

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. Hooper

285A-285B-285C. Advanced Plasma Physics. (3-3-3) 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. Post

290. Seminar. (1-2) I, II, III.

Seminar—1-2 hours. (S/U grading only.) The Staff (Chairperson 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 (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Chairperson in charge)

ENGINEERING: CHEMICAL

Richard L. Bell, Ph.D., *Chairperson of the Department*

Department Office, 3092 Bainer Hall

Professors:

- Richard L. Bell, Ph.D.
- J. M. Smith, Sc.D.
- Stephen Whitaker, Ph.D.

Associate Professor:

- Benjamin J. McCoy, Ph.D.

Assistant Professors:

- Ruben G. Carbonell, Ph.D.
- Alan P. Jackman, Ph.D.

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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 (Chairperson 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 (Bell in charge)

99. Special Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (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. The Staff

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. The Staff

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. The Staff

152A. Chemical Engineering Thermodynamics.

(3) II.

Lecture—3 hours. Prerequisite: course 151; Chemistry 110A. Application of principles of thermodynamics to chemical processes. The Staff

152B. Chemical Engineering Thermodynamics.

(3) III.

Lecture—3 hours. Prerequisite: course 152A. Continuation of course 152A. The Staff

153. Chemical Engineering Heat Transfer. (4) III.

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. The Staff

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. The Staff

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. The Staff

155A. Chemical Engineering Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 154A. Laboratory experiments in heat, mass, and momentum transfer and in chemical kinetics. The Staff

155B. Chemical Engineering Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: courses 154B and 155A. Continuation of course 155A. The Staff

156A. Chemical Engineering Kinetics. (3) II.

Lecture—3 hours. Prerequisite: courses 152B, 154A; and Chemistry 110C (may be taken concurrently). Chemical kinetics and introduction to homogeneous and heterogeneous reactor design.

156B. Chemical Engineering Kinetics. (3) III.

Lecture—3 hours. Prerequisite: course 156A. Continuation of course 156A.

157. Chemical Engineering Process Dynamics.

(4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 152B and 153. A study of stability and the transient state of chemical processing systems. The Staff

158. Chemical Engineering Process Design. (3) III.

Lecture—3 hours. Prerequisite: courses 154B and 156A. Chemical Engineering process design; optimization and economics. The Staff

159. Chemical Engineering Analysis. (3) I.

Lecture—3 hours. Chemical engineering applications of partial differential equations, tensors, systems of linear equations, and operational calculus. The Staff

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 (Bell in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Bell in charge)

Graduate Courses

252. 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.

The Staff

253A. Advanced Transport Phenomena. (4) I.

Lecture—4 hours. Prerequisite: course 153. 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.

The Staff

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.

The Staff

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.

The Staff

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.

The Staff

256. Applied Kinetics and Reactor Design. (3) II.

Lecture—3 hours. Prerequisite: courses 156B and 252. Application of kinetics and molecular transport rates to the design of chemical reactors with emphasis on homogeneous systems.

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.

The Staff

260. Separation Processes: Particulate Systems.

(3) I.

Lecture—3 hours. Prerequisite: course 154A. Analysis of particle systems in pollution abatement and chemical process equipment. Microorganisms, crystallization, aerosols, hydrosols, colloids. Distribution functions, population balances, rarefied gas phenomena, concentration polarization in reverse osmosis and filtration.

McCoy

261. Separation Processes: Column Operations.

(3) III.

Lecture—3 hours. Prerequisite: course 154B. Analysis and design of chemical separation processes: distillation, extraction, chromatography, adsorption. Finite difference equations, unified design methods, axial dispersion models, probability and random walk theories, method of characteristics, moment analysis, optimization.

McCoy

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

The Staff (Chairperson in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

ENGINEERING: CIVIL

Leonard R. Herrmann, Ph.D., *Chairperson of the Department*

Department Office, 2092 Bainer Hall

Professors:

Jaime Amoroch, 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.

James R. Hutchinson, Ph.D.

Ray B. Krone, Ph.D.

James 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)

Theodor S. Strelkoff, Ph.D. (*Civil*

Engineering and Water Science and

Engineering)

Associate Professors:

Kandiah Arulanandan, Ph.D.

¹James A. Cheney, Ph.D.
 Tenny N. Lam, Ph.D.
 Bruce E. Larock, Ph.D.
 Melvin R. Ramey, Ph.D.
 Karl M. Romstad, Ph.D.
 Edward D. Schroeder, Ph.D.
 Chih-Kang Shen, Ph.D.
 Michael A. Taylor, Ph.D.
 George Tchobanoglous, Ph.D.

Assistant Professors:

Daniel P. Y. Chang, Ph.D.
 Yannis F. Dafalias, Ph.D.
 Miguel A. Marino, Ph.D. (*Civil Engineering
 and Water Science and Engineering*)
 Timothy J. Tardiff, Ph.D.

Lecturers:

David A. Crane, M.S.
 William K. Johnson, M.S.
 Patrick J. McCabe, M.S.

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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 (Romstad 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.
 Tchobanoglous

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 (Chairperson 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 (Chairperson in charge)

Upper Division Courses

131A. Structural Analysis: Elastic. (3) I, III.

Lecture—3 hours. Prerequisite: Engineering

104B (may be taken concurrently). Elastic structural analysis of determinate and indeterminate trusses, beams and frames. Analysis by virtual work, moment distribution and matrix force and displacement methods.
 Romstad

131B. Structural Analysis: Inelastic. (3) II.

Lecture—3 hours. Prerequisite: course 131A. Moment distribution, matrix formulation and computer solution of statically indeterminate structures in the elastic and plastic ranges; influence lines.
 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.
 Ramey

132B. Structural Design: Concrete Elements.

(3) I, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Elastic and ultimate strength design procedures for columns and rectangular beams, T-beams and beams of general cross-section. Building code requirements for bending, shear, axial load, combined stresses and bond.
 Taylor

132C. Structural Design: Timber Elements. (3) III.

Lecture—3 hours. Prerequisite: course 132A. Elements of timber structures and laminated structures, including connection design.
 Ramey

134. Analysis and Design of Buildings. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 131A, 132A; 132B (may be taken concurrently). Dead and live loading; earthquake and wind forces. Approximate analyses of building frames; concrete building design. Plastic analysis of metal frames.
 Taylor

137. Construction Principles. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: senior standing in Engineering. A 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.
 The Staff

138. Earthquake Loads on Structures. (3) II.

Lecture—3 hours. Prerequisite: course 131A; Engineering 102A. Determination of loads on structures due to base motions. Methods of static lateral forces, approximate dynamic analysis (response spectrum), and time history. Concepts of mass,

damping, and stiffness for typical structures. Design for inelastic behavior. Consideration of wind and blast loading. Romstad

139. Prestressed Concrete. (3) II.

Lecture—3 hours. Prerequisite: course 132B. Prestressing systems. Analysis and design of prestressed concrete structures; statically determinate and indeterminate structures; principles and applications of ultimate strength; applications to buildings, bridges, and tanks. Taylor

141. Engineering Hydromechanics. (3) I.

Lecture—3 hours. Prerequisite: a first course in fluid mechanics or hydraulics. 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. 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 groundwater yields; water requirements; water supply and distribution systems including dams, reservoirs, wells, pumping plants, open channels, and pipe lines; water treatment methods and processes. Schroeder

143. Water Resources Engineering. (3) II.

Lecture—3 hours. Prerequisite: course 142 or consent of instructor. Concepts in water resources planning; water inventories, use, and control; water conservation measures and legislation; multiple-purpose project planning; introduction to simulation, optimization, and dynamic programming. Scott

144. Groundwater and Seepage. (3) I.

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. Luthin

145. Hydraulic Systems 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. Amorcho

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. 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. Tchobanoglous

148. Waterborne Waste Management. (3) II, III.

Lecture—3 hours. Prerequisite: Engineering 103B. Introduction to industrial and domestic waterborne waste collection and treatment systems; methods of treated waste release. Tchobanoglous

149. Air Pollution Control. (3) II.

Lecture—3 hours. Prerequisite: Engineering 103A. Origins, characteristics, and amounts of air pollutants; atmospheric reactions and behavior of airborne wastes; methods of control. Chang

152. Introduction to Civil Engineering Planning. (3) II.

Lecture—3 hours. Prerequisite: upper division standing. Basic planning concepts; role of engineering, economic, environmental and social information; institutional, political and legal aspects. Case studies will illustrate planning of water regulation and distribution systems, waste treatment and disposal systems, land and water transportation systems. Romstad

153. Analytical Methods in Planning. (3) III.

Lecture—3 hours. Prerequisite: senior standing. Role and purpose of analytical methods in planning and design of civil engineering systems. Basic theory and principles of mathematical, statistical and operations research methods. Applications in planning transportation, water resource wastewater and other civil engineering facilities. Romstad

161. Transportation Systems Engineering. (3) II.

Lecture—3 hours. Prerequisite: Engineering 102A; Engineering 106 or Agricultural Economics 148 (may be taken concurrently) recommended. Planning, design, and operation of transportation systems. Introduction to comprehensive transportation planning, system models, and methods of evaluating alternatives. Conceptual design of multi-modal systems. Automation and control of transportation system operations. Lam

162. Transportation Facilities Design. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 10 and 171; course 161 recommended. Geometric and structural design of transportation facilities. Alignment design of travelways. Capacity and functional design of travelways and terminals. Pavement design and construction. Economic and other design considerations. Lam

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. Arulanandan

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. 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. 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. 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.) Shen, Matthews

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Directed group study of special topics with sections in (1) environment engineering, (2) hydraulics and hydrologic engineering, (3) engineering planning, (4) soil mechanics, (5) structural engineering and mechanics, (6) transportation engineering, (7) water resources engineering; (8-15) other topics. (1-7, letter grading; 8-15, P/NP grading only.)

The Staff (Chairperson 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 (Chairperson 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. Hutchinson

202. Buckling of Columns and Plates. (3) II.

Lecture—3 hours. Prerequisite: course 201. Analysis of the buckling behavior of structural members; flexural and torsional buckling of columns, lateral buckling of beams, nonlinear bending and lateral-torsional buckling of beam-columns, stability of structural frames, buckling strength and ultimate strength of plates. Brush

203. Inelastic Behavior of Solids: Plasticity. (3) III.

Lecture—3 hours. Prerequisite: course 201. Fundamentals of plasticity, the concept of yield, strain-hardening and the associated constitutive equations for elastic-plastic solids. Solution of selected practical problems involving elastic-plastic, strain-hardening materials. Slip line field theory and limit analysis. Offered in odd-numbered years.

Hutchinson

204. Inelastic Behavior of Solids: Viscoelasticity. (3) III.

Lecture—3 hours. Prerequisite: course 201. Fundamentals of the theory of viscoelasticity for solids, representation of linear viscoelastic behavior in integral operator and complex moduli forms; characterization of engineering materials, e.g., metals, concrete, soil, asphalts, rubbers, etc. General analysis procedures for problems in viscoelasticity, solution of selected problems. Offered in even-numbered years.

Herrmann

205. Continuum Mechanics. (3) I.

Lecture—3 hours. Prerequisite: course 203 or 204. Tensor formulation of the field equations for continuum mechanics, including large deformation effects. Introduction to nonlinear elasticity and viscoelasticity. Solution of three-dimensional problems. Offered in even-numbered years. Hutchinson

206. Buckling of Shells. (3) I.

Lecture—3 hours. Prerequisite: courses 202 and 221. Continuation of course 202. Initial-instability and postbuckling analysis of cylindrical shells and of shells of revolution. Examination of the influence of initial imperfections. Offered in odd-numbered years.

Brush

211. Advanced Matrix Structural Analysis. (3) I.

Lecture—3 hours. Prerequisite: course 131A. Analysis of indeterminate structures by displacement and force methods; development of large-capacity computer program for frames; treatment of tapered and curved members and semi-elastic con-

nections; emphasis on efficient digital-computer solutions; introduction to matrix stability analysis and structural optimization. Romstad

212A. Finite Element Procedures in Applied Mechanics. (3) II.

Lecture—3 hours. Prerequisite: Applied Science 115 or Mathematics 128A and 128B (may be taken concurrently), or consent of instructor. Approximate analysis procedures; least-squared error, Galerkin and minimum residual methods. Construction of approximate solutions by the finite element method. Applications to one-, two- and three-dimensional problems in engineering. Introduction to time dependent and nonlinear problems. Herrmann

212B. Finite Elements: Application to Structural Mechanics Problems. (1) III.

Lecture—1 hour. Prerequisite: courses 211 and 212A. Application of the finite element method to linear and nonlinear two- and three-dimensional problems in continuum mechanics, and to plate and shell problems. Herrmann

212C. Finite Elements: Application to Fluid Problems. (1) III.

Lecture—1 hour. Prerequisite: courses 212A, 141 or equivalent; courses 272 and 278 recommended. Discussion of finite element applications to a variety of flow problems. Possible topics include ground-water, viscous and inviscid flows, confined and free surface potential flows, diffusion-convection problems in lakes, estuaries or channels. Unsteady flows. Larock

213. Analysis of Structures Subjected to Dynamic Loads. (3) III.

Lecture—3 hours. Prerequisite: courses 138, 211. Analysis of earthquake, blast and wind resistant structures. Distributed, consistent, and lumped mass techniques. Solution by direct numerical integration and normal mode integration. Solution of complex systems using the computer. Current research on earthquake effects. Offered in even-numbered years. Romstad

221. Theory of Plates and Shells. (4) I.

Lecture—4 hours. Prerequisite: course 201 (may be taken concurrently). Development of plate bending theory, including orthotropic behavior; application to transversely loaded, circular, and rectangular plates. Equivalent orthotropic properties for reinforced concrete, rib and waffle slabs. Introduction to folded plate theory. Development of general shell membrane theory and cylindrical shell bending theory. Discussion of approximate analysis procedures. Herrmann

222. Design of Concrete Folded Plates and Shells. (3) II.

Lecture—3 hours. Prerequisite: course 221. Current methods used in the design of folded plate and thin shell concrete structures. Topics include the

design of spherical domes, conical shells, shells of translation, cylindrical shells and folded plate roofs. Offered in odd-numbered years. Ramey

223. Advanced Analysis of Plates and Shells. (3) III.

Lecture—3 hours. Prerequisite: course 221. Theory of thin elastic shells of general shape. Application to static, dynamic, and stability analyses of plates, cylindrical shells, and shells of revolution. Offered in odd-numbered years. Brush

232. Advanced Topics in Concrete Structures. (3) II.

Lecture—3 hours. Prerequisite: course 132B. Ductility of reinforced concrete. Torsion of structural concrete members, yield line theory for slabs, effects of shrinkage, creep and temperature. Continuity, precasting and connection details. Computer aided analysis. Taylor

233. Advanced Design of Steel and Concrete Structures. (3) III.

Lecture—3 hours. Prerequisite: courses 132A, 132B, 202. Design considerations for column and frame buckling; design for combined bi-axial bending and axial loading of concrete compression members; steel-plate girder design; steel-concrete composite design. Ramey

240. Water Quality. (3) II.

Lecture—3 hours. Prerequisite: course 141, Chemistry 110A (may be taken concurrently). Water quality requirements for domestic, industrial, agricultural, and recreational and wildlife water uses; properties of natural surface and groundwaters; transport and fates of waterborne pollutants; methods of analysis. Orlob

241. Land Quality. (3) I.

Lecture—3 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. 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. Chang

243A. Water and Waste Treatment. (3) I.

Lecture—3 hours. Prerequisite: Engineering 103B; courses 148 and 149 recommended. Characteristics of water- and airborne-wastes; treatment processes and process kinetics; treatment system design. Schroeder

243B. Water and Waste Treatment. (3) II.

Lecture—3 hours. Prerequisite: course 243A or consent of instructor. Continuation of course 243A. Schroeder

243C. Water and Waste Treatment Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 243B or consent of instructor. Laboratory investigation of the unit operations and processes used for the treatment of water and waste water. 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. Orlob, Krone

245. Applied Aqueous Solution Chemistry. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B-1C or the equivalent, Engineering 105A, and consent of instructor; Chemistry 5 or 110 recommended. The course introduces chemical principles underlying current practices in the examination and treatment of aqueous systems. Topics include: chemical equilibria, redox reactions, surface chemistry. Chang

247A. Soil Dynamics. (3) I.

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. Offered in even-numbered years. Cheney

247B. Earthquake Response of Soil Structures. (3) III.

Lecture—3 hours. Prerequisite: course 281A, and course 138 or 247A or Engineering 122. Analysis of the behavior of soils under earthquake conditions; applications to liquefaction, seismic response of soil deposits; earth dams and other structures. Offered in odd-numbered years. Arulanandan

250. Urban Transportation Planning. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. Study of urban travel demand characteristics and trends. Transportation study design, including surveys, inventories and use studies. Case studies of previous planning efforts. Lam

251. Transportation Planning Models. (3) II.

Lecture—3 hours. Prerequisite: course 250. Detailed study and application of mathematical models of urban transportation including trip generation, trip distribution, modal split, network assignment, and direct demand models. Brief discussion of land-use models. Lam

252. Transportation Systems Analysis. (3) III.

Lecture—3 hours. Prerequisite: course 250. Readings and discussion of topics of special interest in transportation planning, including evaluation techniques, citizen participation, social and envi-

ronment problems in system design, and technology of transportation. Lam

253. Advanced Urban and Regional Planning. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. The city and regional planning process including land use inventories, plan formulation, evaluation, marketing and implementation. Mathematical models of urban growth. Tardiff

254. Urban Transportation Attitudes and Behavior. (3) III.

Lecture—3 hours. Prerequisite: course 251 or consent of instructor. Recent studies of individual or household travel decisions. The role of attitudes in these decisions will be of major importance in travel demand analysis. Specific topics include transportation attitude studies and behavioral modeling. Appropriate statistical techniques. Offered in odd-numbered years. Tardiff

255. Characteristics of Urban Transportation Systems. (3) III.

Lecture—3 hours. Prerequisite: course 161 or consent of instructor. Technological, service performance, and operational characteristics of urban passenger transportation systems. Systems considered include: private automobiles, taxis, demand-responsive transit, bus and bus rapid transit, rail transit, personal rapid transit, high-speed ground transportation, elevators, ferries, STOL, and others. Offered in even-numbered years. Lam

260. Noncohesive Sediment Transportation. (3) II.

Lecture—3 hours. Prerequisite: course 146 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. Krone

261. Cohesive Particle Transportation. (3) III.

Lecture—3 hours. Prerequisite: course 146 or consent of instructor. Cohesion; cohesive particulate materials; processes of aggregation and dispersion; aggregate properties; deposition and scour; channel and harbor design and maintenance. Krone

271. Topics in Surface Water Hydrology. (2) III.

Lecture—2 hours. Prerequisite: course 142 or Water Science 141 recommended. Applications of hydrologic principles in analysis of watershed processes, evaluation of watershed responses to management and hydrologic-environmental relationships. Offered in odd-numbered years. Burgy

272. Groundwater Flow and Seepage. (3) II.

Lecture—3 hours. Prerequisite: course 144 or consent of instructor. Flow of fluids through porous media. Anisotropy. Solution of steady state prob-

lems by: mathematical analysis, models, analogs, graphical methods. Dupuit-Forchheimer assumptions. Method of images. Boussinesq's equation for transient problems, solution by Laplace transform. See page under dams. 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. 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. 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. Amorcho

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. Amorcho

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. 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. Strelkoff

278. Hydrodynamics. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 118C or 185A; course 141 or the equivalent. Equations for conservation of mass, momentum, energy. Vorticity, circulation. Stream function, velocity po-

tential. Flows by superposition and conformal mapping. Free streamline applications, gravity effects, introduction to wave motion. Offered in even-numbered years. Larock

279. Advanced Mechanics of Fluids. (4) I.

Lecture—4 hours. Prerequisite: Engineering 103B; Mathematics 24 and course 141 recommended. Rotational flows. Navier-Stokes equations and solutions for laminar, viscous flow; boundary layer equations and solution techniques. Nature of turbulence, statistical and phenomenological characterizations. Reynolds equations; isotropy simplification. Offered in even-numbered years. 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. 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. 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. 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. Arulanandan

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. Arulanandan

290. Seminar. (1) I, II, 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.) Chairperson in charge

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of special topics with separate sections in (1) environmental engineering, (2) hydraulics and hydrologic engineering, (3) engineering planning, (4) soil mechanics, (5) structural engineering and mechanics, (6) transportation engineering, (7) water resources en-

gineering, and (8-15) other topics. May be repeated for credit. (Sections 8-15, S/U grading only.)

The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

ENGINEERING: ELECTRICAL

V. Ralph Algazi, Ph.D., *Chairperson of the Department*

Department Office, 3118 Bainer Hall

Professors:

V. Ralph Algazi, Ph.D.
Richard C. Dorf, Ph.D.
Herman J. Fink, Ph.D.
Herschel H. Loomis, Jr., Ph.D.
²Sanjit K. Mitra, Ph.D.
John B. Powers, Ph.D. (*Emeritus*)
Ronald F. Soohoo, Ph.D.

Associate Professors:

³John N. Churchill, Ph.D.
Andrew J. Dienes, Ph.D.
Tien C. Hsia, Ph.D.
¹Jack W. LaPatra, Ph.D.
Earle W. Owen, D.Engr.Sci.

Assistant Professors:

George R. Branner, Ph.D.
William A. Gardner, Ph.D.
Lansing Hatfield, Ph.D.
Anne-Louise Radimsky, Ph.D.
Michael A. Soderstrand, Ph.D. (*Adjunct*)

Lecturers:

Josef Berger, Ph.D.
Hartley J. Jensen, Ph.D.
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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 (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. (P/NP grading only.)

The Staff (Chairperson in charge)

99. Special Study for Lower Division Students.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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. Churchill

110B. Electronic Circuits. (3) II.

Lecture—3 hours. Prerequisite: course 110A. Nonlinear electronic circuits; large signal amplifiers, oscillators, and switching circuits. Churchill

111A. Electronics Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 110A (may be taken concurrently). Projects on the analysis, design, and evaluation of elementary transistor circuits for amplification and nonregenerative switching. Gardner

111B. Electronics Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: courses 110B (may be taken concurrently), 111A. Projects on the analysis, design, and evaluation of amplifiers (power, tuned, differential, multistage, operational), oscillators, and regenerative switches. Gardner

112A. Linear Systems Analysis. (3) II.

Lecture—3 hours. Prerequisite: Engineering 17. Properties and classification of linear systems. Characterization and analysis of discrete and continuous time systems by direct, convolution, and state variable techniques. LaPatra

112B. Linear Systems Analysis. (3) III.

Lecture—3 hours. Prerequisite: course 112A. The formulation and analysis of continuous and discrete time linear systems by transform domain techniques. Included are Fourier transform, Laplace transform, and z-transform methods. LaPatra

113. Digital and Sampled Data Systems. (3) I.

Lecture—3 hours. Prerequisite: course 112B.

Theories and techniques essential to the analysis of discrete time models for digital and sampled data systems. Digital computer simulation and analysis are emphasized. Review of difference equation models and z-transforms. Introduction to digital filters. Hsia

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. Churchill

115. Integrated Circuits Laboratory. (3) II.

Laboratory—6 hours; discussion—1 hour. Prerequisite: course 140B. Projects in the fabrication of integrated circuit structures. Includes masking, doping, metalizing and testing. (P/NP grading only.) Churchill

116. Network Analysis. (3) I.

Lecture—3 hours. Prerequisite: course 112B. Topics in modern network analysis, including two-port networks, matrix methods, graph theory, nonlinear circuits, and computer solutions. LaPatra

***117. Network Synthesis. (3) III.**

Lecture—3 hours. Prerequisite: course 112B. An introduction to modern network synthesis techniques. Topics include one- and two-port networks, approximation problems, realization procedures, and filter theory. LaPatra

118. Probabilistic Systems Analysis. (3) I.

Lecture—3 hours. Prerequisite: upper division status in Engineering. Probabilistic concepts and models in engineering, elements of probability theory and examples of application to reliability, tolerance and other engineering problems. Introductory probability course for Engineering students, with emphasis on applications. Algazi, Gardner

119. Discrete Structures and Their Applications. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 36B or a three-quarter sequence of a lower division mathematics course; course 170. Discrete structures. Applications to various areas of computer science. Sets, proofs, graphs. Semi-groups. Introduction to Automata Theory. Groups. Their use in coding theory and computer design. Boolean algebra. Application to logic design. Radinsky

130A. Introductory Electromagnetics. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 22B and 22C; Physics 4C strongly recommended. Static electric and magnetic fields, properties of materials. Branner

130B. Introductory Electromagnetics. (3) II.

Lecture—3 hours. Prerequisite: course 130A and Engineering 17. Time-varying electromagnetic

phenomena, Maxwell's equations. Propagation of plane electromagnetic waves, guided waves, transmission lines. Branner

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. Fink, Branner, Dienes

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. Fink, Branner, Dienes

***131C. Electromagnetic Fields and Waves. (3) III.**

Lecture—3 hours. Prerequisite: course 131B or equivalent. Resonant cavities; microwave network components; antennas; ionospheric propagation. Fink, Dienes

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. Branner, Dienes

134. Radar Systems and Signals. (3) III.

Lecture—3 hours. Prerequisite: course 112B; course 118 strongly recommended. Introductory course on radar systems and signals. Emphasis on analysis of practical radar system configurations and signals. The prediction of radar range performance, accuracy and resolution is discussed for a number of radar classes including: pulse, cw and pulse doppler. Branner

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 electronics, plasmas, quantum mechanics. Churchill, Dienes

140B. Introduction to Physical Electronics. (3) III.

Lecture—3 hours. Prerequisite: course 140A. Electrons in solids, band theory, electrons and holes, semiconductors, junction device physics and models. Churchill, Dienes

145A. Solid-State Electronics. (3) I.

Lecture—3 hours. Prerequisite: course 140B. Electric and magnetic properties of solids. Topics discussed include electrical conductivity, dielectric constant, and various types of magnetism in solids. Churchill, Soohoo

145B. Solid-State Electronics. (3) II.

Lecture—3 hours. Prerequisite: course 145A. Electrical characteristics of dielectric and semi-conducting materials, with application to such solid-state electronics devices as transistors, tunnel diodes, parametric amplifiers, and their associated circuits. Churchill, 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. Churchill, Soohoo

148. Superconductivity. (3) III.

Lecture—3 hours. Prerequisite: course 130B or course 140B or equivalent. Fundamental properties of superconductors, magnetic properties of superconductors of the first and second kind, Phenomenological Landau-Ginzburg Theory, applications and devices. Fink

***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. Owen

155A. Electronic Instrumentation for Biology, Chemistry and Medicine. (3) I.

Lecture—2 hours; laboratory—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 cannot receive credit for this course. Owen

155B. Electronic Instrumentation for Biology, Chemistry and Medicine. (3) II.

Lecture—2 hours; laboratory—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. Owen

157A. Control Systems. (3) I.

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. Hsia, Owen

157B. Control Systems. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157A. Introduction to nonlinear and

sampled data systems. Applications of digital and analog computers. Hsia, 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.

170. Computer Structure and Assembly Language. (3) I.

Lecture—3 hours. Prerequisite: proficiency in at least one higher level programming language. Introduction to computer architecture. Machine language. Assembly language. Macros and conditional assembly. Input-output programming. Absolute and relocatable code. Re-entrant code. Assemblers and loaders. 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. Laboratory projects involving the design, simulation, and realization of digital subsystems. Hatfield

174. Computer Organization. (3) II.

Lecture—3 hours. Prerequisite: course 170 and Engineering 100. Introduction to logical design fundamentals, including combinational and sequential techniques; register transfer operations. Number representation and implementation of basic arithmetic operations. Comparison of different computer organizations. Memory structures, input/output systems, with emphasis on hardware. Loomis

175. Computer Devices and Systems. (3) III.

Lecture—3 hours. Prerequisite: course 140B (may be taken concurrently). 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). Soohoo

176. Programming Languages. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5A. Significant features of algorithmic languages. Business languages. List processing and character processing languages. Important concepts in the design of programming languages: program structure, data definition, choice of operations, procedures, transmission of arguments. Radimsky

177. Data Structures and Programming Techniques. (3) II.

Lecture—3 hours. Prerequisite: course 170. Ar-

rays, lists, tree structures. Searching and sorting techniques. Hash tables. Character strings. Recursion. List processing. Garbage collection. Files and file maintenance. Applications to various fields.

Radinsky

178. Operating Systems. (3) III.

Lecture—3 hours. Prerequisite: course 177. Operating systems: batch, multi-programming, time-sharing. Major components of an operating system: input/output handling, resource management (memories, processors, and I/O devices), information management (file structures, security). Practice in the preparation of system modules. Hatfield

184A. Principles of Communication. (3) II.

Lecture—3 hours. Prerequisite: course 112B. Introductory course on modern methods and basic principles of communication, with emphasis on descriptive analysis of various modulation schemes employed in analog and digital communication systems. Applications to voice, picture and data communication. Algazi, Gardner

184B. Principles of Communication. (3) III.

Lecture—3 hours. Prerequisite: courses 118 and 184A. Continuation of course 184A with emphasis on statistical analysis and evaluation of analog and digital communication systems. Gardner, Algazi

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Directed group study of special topics with sections in (1) biomedical engineering; (2) computer science; (3) high-frequency phenomena and devices; (4) information and control; (5) solid-state devices and physical electronics; (6) systems and circuits. Other topics. (From Section 7—, P/NP grading only).

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

*201. Optimization Techniques with Applications. (3) II.

Lecture—3 hours. Prerequisite: knowledge of FORTRAN programming and graduate status. Computer-aided optimization of single-variable and multi-variable functions with and without constraints. Preplanned and sequential search methods. Gradient methods. Linear and nonlinear programming. Typical applications in different disciplines. Offered in odd-numbered years. Mitra

204. Digital Processing of Signals. (3) III.

Lecture—3 hours. Prerequisite: course 112B. Theory and applications of digital processing of signals. Recursive and non-recursive digital filter design techniques, analysis of quantization effects. Homomorphic signal processing. Mitra

214. 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. Hsia, 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. Hsia, Owen

213. Signal Theory. (4) I.

Lecture—4 hours. Prerequisite: graduate standing. Unified treatment of techniques for mathematical representation of signals and signal processing operations. Emphasis on physical interpretation of linear vector spaces, linear operators, transform theory, and optimum signal design. Gardner

216. Network Theory. (3) II.

Lecture—3 hours. Prerequisite: course 112B or the equivalent. Foundations of network theory. Graph theory and network equations, network functions and representations, state equations, integral solutions, fundamentals of network synthesis, scattering matrices. Offered in even-numbered years. Mitra

217. Passive Filter Design. (3) III.

Lecture—3 hours. Prerequisite: course 117 or the equivalent. An introduction to the design of passive filters with lumped and distributed elements. Filter specification and design process, reactance transformations, approximation theory, passive filters with lumped elements, crystal and ceramic filters, mechanical filters, microwave filters. Offered in even-numbered years. Mitra

*218. Active Filter Design. (3) III.

Lecture—3 hours. Prerequisite: course 117 or the equivalent. An introduction to the design of active filters with lumped, distributed elements, and switches. Active filters with lumped RC networks, active distributed RC networks, switched filters, n-path filters. Offered in odd-numbered years. Mitra

*226A. Quantum Electronics. (3) I.

Lecture—3 hours. Prerequisite: courses 130B and 140B or the 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. Fink, Dienes

***226B. Quantum Electronics. (3) II.**

Lecture—3 hours. Prerequisite: course 226A. Laser, masers: population inversion, threshold requirement, steady-state and transient behavior, Q-switching. Interaction between radiation and phonons. Offered in odd-numbered years.

Fink, Dienes

227A. Microwave Electronics. (3) I.

Lecture—3 hours. Prerequisite: courses 130B and 140B or the 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.

Soohee, 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.

Soohee, 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.

Dienes, Branner

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.

Dienes, Branner

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.

Dienes, Branner

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.

Fink, Soohoo

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.

Fink, 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 even-numbered years.

Fink, Soohoo

251. Nonlinear Control Systems. (3) I.

Lecture—3 hours. Prerequisite: courses 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 odd-numbered years.

Owen

***252. Control System Optimization. (3) III.**

Lecture—3 hours. Prerequisite: courses 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.

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. Offered in odd-numbered years.

270. Finite-State Machines. (3) II.

Lecture—3 hours. Prerequisite: course 119. A study of finite-state sequential machine models and behavior; experiments; the Regular Algebra; algebraic structures theory of finite-state machines; completeness of sets of primitives. Offered in odd-numbered years.

Loomis

271. Advanced Digital System Design. (3) I.

Lecture—3 hours. Prerequisite: course 173. Advanced topics in the design of digital systems; high-speed and high-rate arithmetic; digital design automation; high-performance computer organizations.

Loomis

272. Advanced Switching Theory. (3) II.

Lecture—3 hours. Prerequisite: courses 119, 174. Topics in switching theory. Synchronous and asynchronous sequential circuits. Theoretical study of

Boolean functions and their transforms. Special realization techniques for combinational and sequential circuits. Offered in even-numbered years.
Hatfield

274. Advanced Computer Architecture. (3) III.

Lecture—3 hours. Prerequisite: course 271 or consent of instructor. A study of computer architectures of advanced scientific computers. CDC 6000, 7000 series architecture. Illiac IV architecture. Pipeline array processor architecture. Offered in even-numbered years.
Loomis

***275. Computer Graphics. (3) III.**

Lecture—3 hours. Prerequisite: course 177. Study of the hardware and software implementation of interactive computer graphics systems. Display devices. Display files and transformations. Interactive graphics; devices and techniques. Problems in three-dimensional graphics. Examples of current systems; applications project required. Offered in odd-numbered years.
Hatfield

277A-*277B. Advanced Programming and Data Structures. (3-3) III-I.

Lecture—3 hours. Prerequisite: course 177; course 178 recommended. Formal specification of data structures. Predicates and operators defined for classes of data structures. Data management systems: directory, data description. Data bases in large systems programming. Multiprocessing. File system organization and management. Traffic control in shared environment.

278A. Formal Languages and Related Automata. (3) I.

Lecture—3 hours. Prerequisite: course 119 or consent of instructor. Classes of formal languages and their grammars, important classes of finite and infinite automata and their properties. Correspondence between these classes and types of formal grammars. Emphasis on context-free languages.
Radimsky

278B. Translation of Programming Languages. (3) III.

Lecture—3 hours. Prerequisite: courses 176, 177 and 278A. Compilation process. Storage allocation. Object code generation. Boot strapping. Parsing techniques. Table-driven compilers. Optimization techniques.

279. Symbol Manipulation and Artificial Intelligence. (3) I.

Lecture—3 hours. Heuristic programming. Representation of knowledge. Problem solving methods. Game playing. Machine perception of three dimensional space. Theorem proving. Semantic information processing.
Radimsky

284A. Random Signals and Noise. (3) II.

Lecture—3 hours. Prerequisite: course 118. 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 spectral densities. Linear and nonlinear operations on random processes. Optimum linear filtering.
Gardner, Algazi

284B. Estimation and Detection of Signals in Noise. (3) III.

Lecture—3 hours. Prerequisite: course 284A. Application of statistical methods and models to the detection and estimation of signals in noise. Signal detection and hypothesis testing. Signal and parameter estimation. Continuous-waveform estimation. Applications to linear and nonlinear modulation.
Gardner, Algazi

***285. Information Theory. (3) I.**

Lecture—3 hours. Prerequisite: course 118. Information theory and coding. Definition of a measure of information and study of its properties. Coding of discrete sources. 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.
Gardner, Algazi

286. Advanced Topics in Statistical Communication and Control. (3) I.

Lecture—3 hours. Prerequisite: courses 212A, 213, 284B. Markov models and innovations—representations of random processes. Reproducing Kernel Hilbert spaces. Application to detection and estimation problems in communication and control. Recursive estimation and Kalman filtering. Offered in odd-numbered years.
Gardner

290. Seminar. (1) I, II, III.

Seminar—1 hour. Discussion and presentation of current research and development. (S/U grading only.)
The Staff (Chairperson in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Special topics with sections in (1) biomedical engineering; (2) computer science; (3) high-frequency phenomena and devices; (4) information and control; (5) solid-state devices and physical electronics; (6) systems and circuits; (7) superconductivity; (8) magnetic levitation; and other topics. May be repeated for credit.
The Staff

299. Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

ENGINEERING: MECHANICAL

Allan A. McKillop, Ph.D., *Chairperson 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.
¹Dean 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.
¹Harry A. Dwyer, Ph.D.
 Jerald M. Henderson, D. Engr. (*Mechanical Engineering and Food Science and Technology*)

Assistant Professors:

James W. Baughn, Ph.D.
 Mont Hubbard, Ph.D.
 Donald L. Margolis, Ph.D.
 James F. Shackelford, Ph.D.
 Irving F. Stowers, Ph.D.
 Bruce W. White, Ph.D.

Lecturers:

James B. Bergquam, Ph.D.
 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.) Shackelford

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

The Staff (McKillop in charge)

Upper Division Courses**121. Manufacturing Methods. (3) II, 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.
 Beadle, Stowers

124. Mechanical Engineering Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: consent of instructor. Performance of projects which include design, development and evaluation of a mechanical engineering system or related experiments which give the student experience in theoretical modeling and experimental evaluation.
 White

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.
 White

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.
 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 waterborne vehicles including hovercraft. Laboratory experiments illustrate response to various inputs such as gusts, surface roughness, and control deflections.
 Hubbard

150. Mechanical Design. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 4, 104B; 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.
 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.
 Beadle, Stowers

152. Mechanism Design. (3) I.

Lecture—3 hours. Prerequisite: Engineering 102A. Application of complex-number method to kinematic, static and dynamic analyses of plane mechanism and dynamic balancing of mechanisms. Design of epicyclic gear trains and intermittent mechanisms. Introduction to kinematic synthesis of mechanisms for function generation, curve tracing and body guidance.
 Yang

155. Engineering Systems Design. (3) III.

Lecture—2 hours; discussion—1 hour. The en-

engineering design process and its use; design projects; engineering case studies. Henderson

161. Gas Dynamics of Energy Systems. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B. Development of the basic methods needed to describe the compressible gas flow occurring in nozzles, engines and power generation systems. Analysis of the combustion processes occurring in various energy conversion processes with emphasis on chemical equilibrium and flame propagation. Hoffman

162. Gas Turbine and Combustion Energy Systems. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B; course 161 strongly recommended. Study of energy systems utilizing fossil fuels with emphasis on gas turbines, combustion and system performance. Analysis of cycles and components for gas turbines, steam generators, internal combustion and alternative combustion engines for such applications as power generation and transportation. Hoffman

163. Modern Power Generation. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B; course 161 strongly recommended. Study of nuclear power plants with emphasis on the fluid mechanics, heat transfer and thermodynamics of existing and future nuclear reactors. Principles and prospects of future controlled fusion power plants. Comparison with combustion power plants. Baughn

165. Convective Momentum and Energy Transfer. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103B and 105B. Fundamental concepts of energy transfer by convection: laminar and turbulent flow. Forced and free heat transfer. Boiling and condensation. Analysis of energy transfer devices: heat exchangers, heat pipes, pumps, hydraulic turbines, and flow in porous media. Baughn

166. Conductive and Radiative Energy Transfer. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103B and 105B. Fundamental concepts of energy transfer by conduction and radiation. Application to direct energy conversion and solar collector devices. Brandt

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. Hubbard

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. Margolis

176. Measurement Systems (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 102A and 180. Theory of measurements; measurement techniques for mechanical systems; transducers; data manipulation and processing; data digitization. Beadle

198. Directed Group Study. (1-5) I, II, III.

Lecture—1-5 hours. Prerequisite: consent of instructor. Group study of selected topics. (P/NP grading only.) The Staff (McKillop in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (McKillop in charge)

Graduate Courses

204. Heat Conduction. (3) II.

Lecture—3 hours. Prerequisite: Engineering 180, course 166. Steady-state and transient problems in heat conduction, using both mathematical and numerical methods of solution. Offered in even-numbered years. Brandt

205. Thermal Radiation. (3) II.

Lecture—3 hours. Prerequisite: course 166 or consent of instructor. The transfer of radiant energy. Geometrical and spectral characteristics of systems involving thermal radiation. Gaseous radiation. Applications to solar energy systems. Offered in odd-numbered years. Baughn

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. McKillop

210B. Advanced Fluid Dynamics. (4) III.

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. McKillop

210C. Numerical Methods in Boundary Layer Flows. (3) II.

Lecture—3 hours. Prerequisite: course 210A. 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. McKillop

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 bluff bodies; practical applications of turbulent jets. Offered in even-numbered years. Brandt

214. Aerodynamics. (3) III.

Lecture—3 hours. Prerequisite: courses 127, 161, 165. 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. Offered in even-numbered years. White

***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. White

216. Advanced Thermodynamics. (3) II.

Lecture—3 hours. Study of topics important to energy conversion systems, propulsion and other systems using high temperature gases. Classical thermodynamics and quantum statistical mechanics of nonreacting and chemically reacting gases, gas mixtures, and other substances. 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 Lorentz solutions. Offered in even-numbered years. Hoffman

218. Advanced Energy Systems. (4) III.

Lecture—3 hours; discussion 1 hour. Prerequisite: graduate standing. Study of advanced power generation concepts, basic energy balances, component efficiencies and overall power plant efficiencies. Comparison of gas turbines, steam turbines and magnetohydrodynamic generators, as well as power

plant concepts based on combustion nuclear fission and controlled thermonuclear fusion. 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. Beadle, Hubbard

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. Hubbard

224. Kinematic Design of Mechanisms. (3) II.

Lecture—3 hours. Prerequisite: course 152 or consent of instructor. Introduction to Bernester 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. 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. Margolis

240. Transport Phenomena in Materials Processes. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering. Phenomenological and atomistic mechanisms in transport processes in condensed and non-condensed phases. Application to heat treatment, chemical and physical vapor deposition, crystal growth, bonding, sintering, and joining of metals. Offered in odd-numbered years. Munir

241. Principles and Application of Dislocation Mechanics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering or consent of instructor; Engineering 148 recommended. Concepts in dislocation theory are applied to explain plasticity of crystalline solids. Glide and climb of 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. Mukherjee

242. Advanced Mechanical Properties of Materials. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering or consent of instructor; Engineering 148 recommended. Concepts in dislocation theory are applied to explain plasticity of crystalline solids. Glide and climb of 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. Mukherjee

site: Engineering 148 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. Mukherjee

243. Kinetics of Phase Transformations in Engineering Materials. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering or consent of instructor; Engineering 148 recommended. 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. 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. Munir

245. Advanced Microstructural Analysis of Engineering Materials. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in engineering or consent of instructor; Engineering 142 and 148 recommended. Emphasis is on applications of electron optics to microstructural analysis and testing of engineering materials. Transmission and scanning electron microscopy, electron microprobe, and Auger electron spectroscopy are covered along with selected topics in advanced techniques of nondestructive testing. Offered in even-numbered years. Shackelford

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. Henderson

255. Computer-Aided Mechanical Design. (3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: 150. The use of computer-based numerical methods including optimization techniques in mechanical design analysis and synthesis. Interactive computer-aided design. Beadle

270. Modeling and Simulation of Engineering Systems. (3) I.

Lecture—3 hours. Prerequisite: course 172 or con-

sent of instructor. Multipoint 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. Margolis

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. Brewer

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. Brewer

275. Application of Modern Systems and Control Theory to Environmental Problems. (4) III.

Lecture—2 hours; seminar—1 hour; laboratory—3 hours. Prerequisite: course 270, Engineering 160, 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. 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. Giedt

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)
The Staff (McKillop 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.) Henderson

298. Group Study. (1-5) I, II, III.

The Staff (McKillop in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (McKillop in charge)

ENGLISH

Peter L. Hays, Ph.D., *Chairperson of the Department*
Department Office, 100 Sproul Hall

Professors:

- Everett Carter, Ph.D.
 Thomas A. Hanzo, Ph.D.
³Wayne Harsh, Ph.D. (*English and Linguistics*)
 Robert H. Hopkins, Ph.D.
 Gwendolyn B. Needham, Ph.D. (*Emeritus*)
 Karl J. Shapiro
 Brom Weber, Ph.D.
 Robert A. Wiggins, Ph.D.
 James L. Woodress, Ph.D.
 Celeste T. Wright, Ph.D. (*Emeritus*)

Associate Professors:

- William E. Baker, Ph.D.
 Elliot L. Gilbert, Ph.D.
 John O. Hayden, Ph.D.
 Peter L. Hays, Ph.D.
 Michael J. Hoffman, Ph.D.
 Elizabeth R. Homann, Ph.D. (*Emeritus*)
¹Arthur E. McGuinness, Ph.D.
⁴Diane L. Murray, Ph.D.
 Daniel Silvia, Ph.D.

Assistant Professors:

- ²Arthur K. Amos, Jr., Ph.D.
 Sidney Berger, Ph.D.
 Thomas P. Campbell III, Ph.D.
 Joan C. Carr, Ph.D.
⁴Marianne Cooley, Ph.D. (*English and Linguistics*)
 Sandra M. Gilbert, Ph.D.
⁴Walter J. Hicks, Ph.D.
 Paul D. Johnson, Ph.D.
 Richard A. Levin, Ph.D.
 David A. Robertson, Ph.D.
⁴Winfried Schleiner, Ph.D.
 Kent T. van den Berg, Ph.D.

Lecturers:

- W. Georg Isaak, M.A.
 Mary A. O'Connor, M.A.
 Gwendolyn Schwabe, M.A.
 Karl F. Zender, Ph.D. (*Subject A*)

Associate in:

- Shirley A. Nelson, M.A.

§ § §

Departmental Major Advisers.—A. K. Amos, W. E. Baker, S. Berger, T. P. Campbell, J. C. Carr, M. Cooley, S. M. Gilbert, W. Harsh, J. O. Hayden, P. L. Hays, W. J. Hicks, R. H. Hopkins, R. A. Levin, D. L. Murray, D. A. Robertson, W. Schleiner, K. J. Shapiro, K. T. van den Berg, R. A. Wiggins.

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.—A total of 24 units of English required: one course from 1, 2, 3, 4A, or 4B; course 45; courses 30A-30B, 46A-46B (courses in each sequence should be taken in order). Recommended: courses in the freshman offerings other than the one chosen to meet the requirements; courses 30C and 46C (strongly recommended).

Upper Division Courses.—A minimum of 40 units (10 courses) required:

1) One course in literature from each of the five periods listed below. These five courses must be selected so that at least *three* of the following categories are represented: historical period, poetry, drama, and fiction.

- a. British Literature to 1500
- b. Renaissance (1500-1660)
- c. British Literature (1660-1800) or American Literature (1620-1800)
- d. Nineteenth Century (British or American)
- e. Twentieth Century (British or American)

Starting with period (c) above a student may, but is not obligated to, choose to concentrate in either British (all five core courses in British literature) or American literature (the final three core courses in American literature).

2) One language/linguistics course chosen from among English 105A, 105B, 105C, 105D, 107, 196.

3) One one-quarter seminar in literature to be chosen in the student's emphasis. (A student who wishes to emphasize creative writing or linguistics in his or her major may substitute a creative writing course or a linguistic course for this requirement.)

4) Three electives from any other courses offered by the English Department.

A student may elect the general major requirements outlined above *or*, if he or she wishes to specialize, may choose one of the following emphases:

Teaching—A student who wishes to prepare for a teaching credential must take the five literature courses required above under (1), including among the five: English 117A or 117B; the senior seminar in either British or American literature as required under (3); and the following courses: English 103, 105A, 105B, 181 or an ethnic literature course from outside the English Department. (English 300, normally taken in the fourth or fifth year, is required for certification and counts as 3 units of credit in Education.)

Teaching Credential Subject Representatives: W. Harsh, M. Cooley. See also page 215 for more on the Teacher Education Program.

Writing—Core requirements of 20 distributed

units of British and/or American literature; 4 units of English language/linguistics; also, three creative writing courses from English 100F and/or 100P, plus either a 198 seminar in writing techniques or a 199 in writing.

Linguistics—The 40 upper-division units required for the major must include the core requirements of five courses distributed in British and/or American literature, and at least 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 181.

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 Chairperson 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 30A, 30B, 30C, 43, 44, 45, 46A, 46B, 46C, 47, and all upper-division courses. A course from courses 43, 44, and 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 (Chairperson in charge)

1. Expository Writing. (4) I, II, III.

Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. Composition, the essay, paragraph structure, diction, and related topics. Frequent writing assignments will be made.

The Staff (Isaak in charge)

2. Language and Stylistics. (4) I, II, III.

Lecture-discussion—4 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 (Harsh in charge)

3. Introduction to Literature. (4) I, II, III.

Lecture-discussion—4 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 (Isaak in charge)

4A, 4B. Backgrounds for English Literature.

(4,4) A: I, II, III; B: I, II, III.

Lecture-discussion—4 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 (Isaak in charge)

5F. Introduction to Creative Writing: Fiction.

(4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing fiction. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

The Staff (Isaak in charge)

5P. Introduction to Creative Writing: Poetry.

(4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing poetry. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

The Staff (Isaak in charge)

*9A. Communication and Composition. (4) I.

Lecture-discussion—4 hours. Introduction to verbal and nonverbal communication. Exercises in oral and written composition in conjunction with theoretical study of natural and artificial communication processes ranging from animal behavior to culturally controlled human symbolic action. Includes both individual and small group activities. (Same course as Rhetoric 9A.)

The Staff (Chairperson in charge)

*9B. Communication and Composition. (4) II.

Lecture-discussion—4 hours. Prerequisite: course 9A or consent of instructor. Introduction to several culturally conditioned modes of communication and how each serves to inhibit and foster individual expression; attention to mass media, literature, oral traditions and written argument—their formal conventions and inherent opportunities; practice in speaking and writing. (Same course as Rhetoric 9B.)

The Staff (Chairperson in charge)

*9C. Communication and Composition. (4) III.

Lecture-discussion—4 hours; laboratory—3 hours. Prerequisite: courses 9A and 9B. Extended and concentrated work in an area of special interest pursued individually and in small groups under the guidance of instructor. Emphasis on application of theories, techniques and knowledge gained earlier to extended, concrete problems of communication. (Same course as Rhetoric 9C.)

The Staff (Chairperson in charge)

*20. Intermediate Composition. (4) I, II, III.

Lecture-discussion—4 hours. Prerequisite: one

course from courses 1, 2, 3, 4A, 4B. Designed primarily for non-majors who wish to improve their skills in expository and/or technical writing; includes basic principles of rhetoric and rules of usage in present-day English. The Staff (Chairperson in charge)

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. Schwabe

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. (4) I, II.

Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature from the seventeenth century to 1830. Wiggins, Johnson

30B. Survey of American Literature. (4) II, III.

Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature from 1830 to 1900. Wiggins, Weber

30C. Survey of American Literature. (4) II, III.

Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature of the twentieth century. Wiggins

43. Critical Reading of Drama. (4) I, II, III.

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. An introduction to the forms of drama and the development of critical abilities through directed close reading. Frequent written exercises. The Staff

44. Critical Reading of Fiction. (4) I, II, III.

Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. An introduction to the forms of prose fiction and the development of critical abilities through directed close reading. Frequent written exercises. The Staff

45. Critical Reading of Poetry. (4) I, II, III.

Lecture—4 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 (Chairperson in charge)

46A. Masterpieces of English Literature. (4) I.

Lecture—4 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 (Chairperson in charge)

46B. Masterpieces of English Literature. (4) II.

Lecture—4 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 (Chairperson in charge)

46C. Masterpieces of English Literature. (4) III.

Lecture—4 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 (Chairperson in charge)

***47. Introduction to Modern Literature. (4) III.**

Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Chief twentieth-century writers of England and America.

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. (P/NP grading only.)

The Staff (Chairperson in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Upper Division Courses

The upper-division courses are classified as follows:

- a) *Period Courses*: 111, 112, 116, 120, 123, 125, 127, 130, 132, 133, 134, 136, 137, 138, 139, 140, 141, 142, 143, 144, 146, 147.
- b) *Genre Courses*: 150A, 150B, 150C, 150D, 152, 155A, 155B, 155C, 155D, 156, 158A, 158B, 160, 170A.
- c) *Author Courses*: 113, 117A, 117B, 122, 189.
- d) *Special Subjects*: 107, 110A, 110B, 170B, 171, 175, 179, 180, 181, 182, 183, 184, 187.
- e) *Writing Courses*: 100F, 100P, 103.
- f) *Language and Linguistics*: 105A, 105B, 105C, 105D, 107, 196.
- g) *Seminars*: 187, 188, 189.

Note: courses 187, 188, 198, and 199 also will fall under one of the above categories according to course content.

100F. Creative Writing: Fiction. (4) I, II, III.

Discussion—4 hours; evaluation of written materials and conferences with individual students. Prerequisite: course 5F or 5P. Writing of fiction. May be repeated for credit with consent of instructor. No final examination. The Staff (Chairperson in charge)

100P. Creative Writing: Poetry. (4) I, II, III.

Discussion—4 hours; evaluation of written mate-

rials and conferences with individual students. Prerequisite: course 5F or 5P. Writing of poetry. May be repeated for credit with consent of instructor. No final examination. The Staff (Chairperson in charge)

103. Advanced Composition. (4) I, II, III.

Lecture—3 hours; evaluation of written materials and conferences with individual students—1 hour. 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 teaching credential candidates.

The Staff (Chairperson in charge)

105A. Language. (4) I.

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 teaching credential candidates. 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 from Old English to present-day English. Relationship of English to other languages; development of vocabulary, phonology, and grammatical patterns. Required of teaching credential candidates. Schleiner

105C. Language Change Reflected in Literature.

(4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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 linguistics periods. (Same course as Linguistics 105C.) Campbell

*105D. Linguistics, Literature, and Composition.

(4) III.

Lecture—3 hours; term paper. Prerequisite: courses 105A and 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 nonbelletristic written materials. Harsh

107. Special Topics in English Language. (4) III.

Seminar—3 hours; special project. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Investigation of varied subjects in contemporary and historical English language studies. May be repeated for credit when a different topic is studied. (Same course as Linguistics 107.) Cooley

*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. Robertson, Hayden

110B. Introduction to Principles of Criticism. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 45. Continuation of course 110A. Hayden

*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. Campbell

112. The Age of Chaucer. (4) II.

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. Berger

113. Chaucer. (4) III.

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. Silvia

*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. Carr, Amos

117A. Shakespeare. (4) I, II, III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works. Levin, Carr, Amos, Zender

117B. Shakespeare. (4) I, 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.

Levin, Berger, Wright, van den Berg

*120. Earlier Seventeenth-Century Poetry and Prose. (4) III.

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. Zender, Schleiner

***123. Milton. (4) III.**

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works, including *Paradise Lost*. Schleiner, Zender

125. Dryden and His Contemporaries. (4) II.

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. Hopkins

127. Prose and Poetry of the Later Eighteenth Century. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Readings in Johnson, Goldsmith, Boswell, and others; the poetry of the era concluding with Blake. Levin

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. 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. S. Gilbert

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. 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. E. Gilbert

136. British Literature from 1880 to 1918. (4) III.

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. 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. Hanzo

138. British Literature from 1940 to the Present. (4) II.

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. Hanzo

139. Modern Anglo-Irish Writers. (4) III.

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.

***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). Weber

141. The American Enlightenment and Its Reaction. (4) II.

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. Woodress

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. 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. Carter

144. American Literature from 1865 to 1914. (4) II.

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.

Carter

146. Modern American Literature: 1914 to 1940. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The Modernist movement, disillusionment, artistic experimentalism, classical revival, New Criticism, proletarian literature, romantic nationalism, European currents; Pound, Fitzgerald, Eliot, Frost, Hemingway, Crane, Faulkner, and Stevens.

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.

Hicks

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.

Campbell

150B. English Drama from Marlowe to 1642. (4) II.

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.

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.

150D. British Drama from 1890 to the Present. (4) I.

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, Osborne, and others.

Hays

***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.

Hays

155A. The English Novel: 1700-1770. (4) II.

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, Field-

ing, 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.

Hopkins

155C. The English Novel: 1850-1900. (4) I.

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.

Murray

155D. The English Novel: 1900 to the Present. (4) III.

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.

S. Gilbert

156. The Short Story. (4) I.

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.

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.

Woodress

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.

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.

Wright

***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.

Carr

***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) III.

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.
Robertson

175. American Literary Humor. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American humorous vision of man, nature, and the supernatural. Includes one or more of the following: colonial humor; southwestern and New England humor; pre- and post-Civil War masters; local colorists; journalistic gadflies; anti-provincialists; modernist poets and prose writers; black humor.
Weber

179. Multi-Ethnic Literature. (4) III.

Lecture—3 hours; papers. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Fiction, poetry, and other writings by Americans of ethnic minority background (Native, Black, Hispanic, Jewish, Italian, etc.) which reveal their immigrant experience, cultural diversity, and contributions to American literature.
Weber

180. Literature for the Elementary and Secondary Schools. (4) II.

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.
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.
Hicks

182. Sexuality and Sexual Experience in American Literature. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sexual expression in poetry and prose from the colonial period to the present; cultural sanctions, literary conventions, eroticism and pornography; selected readings include Byrd, Franklin, Hawthorne, Melville, Whitman, James, O'Neill, Hemingway, Miller, and Roth.
Weber

183. Film as Narrative. (4) III.

Lecture—1 hour; discussion—2 hours; film showings—2 hours. 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).
Baker

184. Advanced Filmmaking. (4) I, II.

Lecture-discussion—2 hours; laboratory—3 hours. Prerequisite: course in filmmaking. Creation of short, independent film productions. Each student will undertake to write a script, then shoot and edit a short 16mm movie. Limited enrollment.
Baker

***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 (Chairperson 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 (Chairperson in charge)

189. Study of a Major Writer. (4) I, II, III.

Seminar—3 hours; term paper. Prerequisite: junior or senior standing; a major in English or consent of instructor. The artistic development of one major writer and his intellectual and literary milieu. Limited enrollment.
The Staff (Chairperson in charge)

***196. Stylistics. (4) II, III.**

Seminar—3 hours; term paper. Prerequisite: course 105A. Analysis of linguistic stylistic variations in specific works to be selected from the corpus of writings in English. (Same course as Linguistics 196.)
Harsh

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. (P/NP grading only).
The Staff (Chairperson 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. (P/NP grading only).
The Staff (Chairperson in charge)

198. Directed Group Study. (1-4) I, II, III.

Discussion—1-4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B, 5F, 5P. (P/NP grading

only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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. Woodress

201. Literary Criticism. (4) II.

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. Hayden

***204. American English from 1600 to Present Day.**
(4) II.

Lecture—3 hours; term paper. Historical changes reflected in American writing and the study of dialect variations. Emphasis will be on patterns of development of phonology, morphology, syntax, and lexicon and on characteristics of regional writing and dialectal variants. Harsh, Cooley

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. Harsh

***206. Beowulf. (4) III.**

Lecture—3 hours. A study of the poem and the Heroic Age of Germanic literature. Campbell

207. Middle English. (4) I.

Lecture—3 hours; term paper. Study of the phonology, morphology, syntax, and lexicon between 1100 and 1500 with investigation of the regional dialects; pertinent facts on both the internal and external linguistic history; intensive reading of texts. Cooley

***208. Early Modern English. (4) II.**

Lecture—3 hours; term paper. Study of writings in the period from the Renaissance to the present day. Intensive reading of texts will include consideration of phonology, morphology, syntax, lexicon, and pertinent linguistic changes in the historical period. Harsh, Cooley

***209. Present-Day English Linguistics. (4) I.**

Lecture—3 hours; term paper. Theory and methods of structural linguistics and transformational grammar as applied to the analysis of English. Emphasis will be on recent linguistic techniques, particularly as these relate to the teaching of language, literature, and composition. Harsh, 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 (Chairperson in charge)

***215. Arthurian Romance. (4) III.**

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.

***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.

220. Study of a Major Writer. (4) I.

Seminar—3 hours; conferences with individual students—1 hour; research papers. Artistic development of one major writer and his intellectual and literary milieu. May be repeated for credit when a different writer is studied. Hopkins

222. Problems in English Literature. (4) I, II †, III §.

Seminar—3 hours; conferences with individual students—1 hour. Selected issues in the current study and critical assessment of a limited period or topic in English literature. May be repeated for credit when different period or topic is studied. Berger

223. Problems in American Literature.

(4) I †, II †, III.

Seminar—3 hours; conferences with individual students—1 hour; research papers. Selected topics for intensive investigation. May be repeated for credit when different topic or period is studied. Carter

224. Dramatic Literature. (4) I, II.

Seminar—3 hours. Historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy. R. Cohn

225. Fiction. (4) I.

Seminar—3 hours. Theories of fiction as reflected in the practice of writers from the eighteenth century to the present.

226. Poetics. (4) III.

Seminar—3 hours. Metaphor, style, and structure in English poetry from the sixteenth century to the present. Shapiro

227. Modern Critical Theory. (4) I.

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.

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.)

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.)

Schleiner, Amos, van den Berg

***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.)

Carr

***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.)

Hopkins

***250A-250B-250C. Romantic Literature.**

(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

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.)

E. Gilbert

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.)

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.)

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.)

Carter

***260A-260B-260C. 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.)

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.)

Hicks

***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.)

Hoffman

290A-290B-290C. Seminar in Creative Writing.

(4-4-4) 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 (Shapiro in charge)

298. Directed Group Study. (1-4) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

299. Individual Study. (1-4) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

299D. Special Study for the Doctoral Dissertation. (1-8) I, II, III.

(S/U grading only.)

The Staff (Chairperson 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.

Cooley

***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.) Isak

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.) Isak

ENTOMOLOGY

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 102 and 210.

Lower Division Courses**1. An Introduction to Entomology. (5) I.**

Lecture—3 hours; laboratory—6 hours. A basic study of insects: their biology, anatomy, classification and relation to human welfare. 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. An introduction to the insects detailing their great variety, structures and functions, habits, and their significance in relation to plants and animals including man. Bacon

Upper Division Courses**101. Insect Structure and Function. (4) II.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1 or consent of instructor. General principles of the evolutionary, functional and comparative aspects of insect morphology. Head and thorax as functional mechanisms, comparative and functional study of insect organ systems, cuticle, sense organs and current research topics in morphology. Birch

102. Insect Physiology. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1 or equivalent; Chemistry 8B; course 101 recommended. Basic mechanisms and processes by which insects maintain themselves and adapt to the environment. Laboratory exercises illustrate these mechanisms while introducing procedures and techniques of entomological research. Judson

103. Systematic Entomology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in zoology or entomology. The principles of animal taxonomy; speciation; introduction to classification and nomenclature. Bohart

104. Insect Ecology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: a general biology course. Principles of animal ecology with emphasis on insect population

dynamics; analysis of factors influencing distribution and abundance. Application of basic theory to management of pest insect populations with focus on biological control and related approaches. Community structure and dynamics. 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. 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. 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. Bohart

110. Economic Entomology. (4) I.

Lecture—2 hours; laboratory—6 hours. An introductory course dealing with the identification, biology, and control of insects and mites that cause economic losses. Emphasis is placed on the management of agricultural pests but includes structural, household, storage, and ornamental pest problems. Grigarick

112. Principles of Agricultural Entomology. (4) II.

Lecture—4 hours. Prerequisite: an introductory course in entomology or consent of instructor. Principles of insect pest management as they apply to various agroecosystems. The integration of all forms of control of insects and mites, the application of these controls, and the problems inherent with their use. Lange

114. Biology and Impact of Forest Insects. (3) III.

Lecture—2 hours; discussion—1 hour; one full-weekend field trip. Prerequisite: upper division standing in entomology or other biological science or consent of instructor. Introduction to forest entomology: biology of forest insects, regulatory

techniques, practices and policies. Offered in odd-numbered years. Birch

116. Biology of Aquatic Insects. (3-5) III.

Lecture—2 hours and laboratory (Saturday field trips); optional laboratory on identification and/or aquatic insect collection. Prerequisite: course I or consent of instructor. A study of the life history, ecology, and identification of insects associated with streams, ponds, and lakes. 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. Gary, Peng

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. Gary, Peng

***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. Offered in even-numbered years. 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. 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. Biological, physiological and biochemical interrelationships between insect vectors and the plant pathogens they transmit. Emphasis is placed on the insect vector interactions with plant viruses and mycoplasma. McLean

127. Acarology. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 103 or consent of instructor. The

systematics, ecology, morphology, physiology and evolution of mites; management of pest species. Offered in odd-numbered years. Ehler

130. Biological Control. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in entomology or consent of instructor. Theory and practice of biological control of arthropod pests; biology of entomophagous arthropods, role of insects in weed control, microbial control of insects and mites. Ehler

153. Medical Entomology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences 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. McClelland

155. Management of Medically Important Arthropods. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 153 or consent of instructor. Lectures and laboratory sessions to consider the practical aspects of arthropod vector control practices within the framework of a human-domestic animal disease management program. Washino

156. Biology of Parasitism. (3) III.

Lecture—3 hours. Prerequisite: Biological Sciences I or consent of instructors. Lectures on the biological and ecological aspects effecting host-parasite relationships using selected examples from the protozoan and metazoan fauna.

J. H. Theis (in charge), Lavoipierre, Maggenti, Washino

156L. Biology of Parasitism Laboratory (1) III.

Laboratory—3 hours. Prerequisite: course 156 (concurrently) or consent of instructor. Laboratory demonstrations using selected examples of protozoan and metazoan organisms along with various techniques used in parasitology to exemplify concepts presented in the lecture course.

J. H. Theis (in charge), Lavoipierre, Maggenti, Washino

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.

Doutt, Leigh, Rice, Summers

NOTE: For key to footnote symbols, see page 220.

198. Directed Group Study. (1-5) I, II, III, (Summer).

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (McLean in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, (Summer).

(P/NP grading only.)
The Staff (McLean in charge)

Graduate Courses

202. Advanced Insect Physiology. (2) III.

Lecture—2 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-numbered years. Judson

202L. Advanced Insect Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 102, or Zoology 142. Investigations of selected aspects of insect physiology. Independent projects may be undertaken. Offered in odd-numbered years. Judson

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. Gary, Peng

245. Pollination Ecology. (4) III.

Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: consent of instructors. Theory of ecological relationships between plants and their pollinators with emphasis on insect pollination. Review of adaptations of both flowers and insects, and survey of the coevolution of pollination relationships. Offered in even-numbered years. (Same course as Botany 245.) Thorp, Webster

253. Advanced Medical Entomology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: one upper division course in entomology (other than course 153) and one course in microbiology; course 153 recommended. An analysis of several arthropod-borne diseases of man with emphasis on the relationship of the biology of the vector to the ecology of the disease. Laboratory emphasis on general techniques and in depth study of a selected vector group. Offered in even-numbered years. McClelland, Lavoipierre

255. Electrical Principles Related to Entomological Research. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course in college physics; graduate standing in a biological science or consent of instructor. Basic

electrical principles of ac and dc circuits. Methods of electrical measurements, discussion of semiconductor devices, and basic circuits of power supplies, amplifiers, oscillators, and electronic switching are presented in relation to biological measurement systems. McLean

275A. Principles and Methods of Entomological Research. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Agricultural Science and Management 150, Mathematics 13 or the equivalent. Philosophy of research and principles of scientific enquiry related to entomological science with emphasis on problem selection, work planning, design of experiments, methods of observation, data collection and application of statistics. Offered in odd-numbered years. The Staff (McClelland in charge)

275B. Principles and Methods of Entomological Research. (4) II.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 275A. Principles of scientific enquiry related to entomological science with emphasis on the synthesis of research results for written and oral presentation. Development of skills in scientific communication. Offered in even-numbered years. The Staff (McClelland in charge)

290. Special Topics in Entomology. (2) I, II, III.

Seminar—2 hours. Prerequisite: graduate standing. (S/U grading only.) The Staff (Ehler 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. (S/U grading only.) McClelland, Washino

292. Seminar in Insect Physiology. (2) I.

Seminar—2 hours. Prerequisite: course 102. Critical examination of areas of current interest in insect physiology and biochemistry. (S/U grading only.) Judson, McLean, Birch

293. Seminar in Systematic Entomology. (2) III.

Seminar—2 hours. Prerequisite: course 103. Selected topics in systematics and evolution are presented and discussed. Some topics may be illustrated by laboratory sessions. (S/U grading only.) Bohart, Lange, Grigarick, Thorp

294. Seminar in Insect Ecology. (2) II.

Seminar—2 hours. Prerequisite: graduate standing and a general ecology course. Discussions of advanced topics in ecology with emphasis on analysis of factors influencing the distribution and abundance of insects. Includes consideration of applications of basic theory as in biological control and related approaches. (S/U grading only.) Cothran, Ehler, Gutierrez

295. Seminar in Agricultural Entomology. (2) I, II.

Seminar—2 hours. Prerequisite: course 110. Discussion of advanced topics relating to the principles of pest insect population management. (S/U grading only.) Bacon, Lange, Grigarick, Cothran, Ehler

296. Seminar in Bee Biology. (2) I.

Seminar—2 hours. Prerequisite: course 119 or equivalent. Discussions of behavior, ecology, management, and general biology of bees (Apoidea) with emphasis on the honeybee. (S/U grading only.) Thorp, Gary, Peng

297. Seminar in Insect Behavior. (2) II.

Seminar—2 hours. Prerequisite: course 121. Review and critical analysis of contemporary advances in insect behavior, especially interpretation and description of observations, physiological mechanisms, functional kinds of behavior, and the application of general principles to the solution of problems in the laboratory and field. (S/U grading only.) Gary, Birch

298. Group Study. (1-8) I, II, III.

(S/U grading only.) The Staff (McLean in charge)

299. Research. (1-12) I, II, III, (Summer).

(S/U grading only.) The Staff (McLean in charge)

ENVIRONMENTAL HORTICULTURE

Related Major Programs and Graduate Study.—See pages 102, 117 and 210.

Related Courses. See Plant Science.

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. Hackett

9. Environmental Plants for the Home and Community. (1) III.

Laboratory—3 hours. Recommended for non-majors. 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. 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. Kofranek

99. Special Study for Lower Division Students. (1-8) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Kofranek in charge)

Upper Division Courses**104. Landscape Construction. (3) I.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: Environmental Planning and Management 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. 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. 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 floricultural and foliage plants, garden annuals, and perennials. Offered in even-numbered years. 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. Offered in odd-numbered years. Leiser

120. Management of Container Soils. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Soil Science 2. Appropriate use of sand, mineral soil and amendments to formulate container soils. Management of container soils emphasizing irrigation, salinity control and fertilizer practices. Paul

125. Flower Crop Production and Marketing Technology. (4) II.

Lecture—3 hours; laboratory—3 hours; one all-day field trip. Prerequisite: course 120, Plant Science 2. The technology of planning, growing, and marketing flower crops, particularly greenhouse

NOTE: For key to footnote symbols, see page 220.

crops, as an application of principles. Major flower crops are considered in detail. Kofranek

126. Nursery Management. (1) III.

Lecture—1 hour. Prerequisite: Plant Science 109, senior standing in plant science. The management of woody ornamental crops in relation to propagation, other cultural practices and marketing. Emphasis on planning and scheduling nursery production. One Saturday field trip required. Hackett

130A. General Turf Culture. (2) I.

Lecture—2 hours and laboratory—3 hours (first two-thirds of the quarter). Prerequisite: Plant Science 2 or Botany 2 and Water Science 2. Principles and practices leading to successful planting, establishment, and maintenance of turf. Topics include variety selection, seed bed preparation, fertilization, irrigation, design of sprinkler systems, mowing, and pest control. Madison

130B. Fine Sporting Turf. (1) I.

Lecture—2 hours and laboratory—3 hours (last one-third of the quarter). Prerequisite: courses 120 and 130A. The installation and management of fine sporting turf areas used for golf, bowling, lawn tennis, football, etc. Madison

133. Arboriculture. (3) II.

Laboratory—3 hours; discussion-testing—2 hours. Prerequisite: Plant Science 2 or Botany 2. Principles and practices of selecting, planting and maintaining trees, shrubs and vines in urban and natural landscapes. Course given in Personalized System of Instruction format. Harris

141. Analysis of Horticultural Problems. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite—

site: senior standing in plant science. Diagnosis of plant disorders commonly seen in the landscape, home, and greenhouse. Emphasis on soil, water, nutritional, climate, disease and insect caused problems. Recognition of symptoms and how to arrive at probable causes of disorders. Paul

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. (P/NP grading only.) The Staff (Chairperson 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. (P/NP grading only.) The Staff (Chairperson in charge)

Graduate Courses

290. Seminar. (1) I, II, III.

Seminar—1 hour. Selected topics in floriculture, nursery management, and environmental horticulture. The Staff (Chairperson in charge)

298. Group Study. (1-5) I, II, III.

Group study on advanced topics in floriculture, nursery management, and environmental horticulture. The Staff (Sachs in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing. Research in floriculture, nursery management, and environmental horticulture. (S/U grading only.) The Staff (Hackett in charge)

ENVIRONMENTAL PLANNING AND MANAGEMENT

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 102.

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 Department of Environmental Horticulture, 140 Environmental Horticulture Building.

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. Hodgson

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. Thayer

22. Landscape Design. (3) I, II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 20; Design 21 recommended. Practice in analysis and design with reference to landscape problems. Thayer

Upper Division Courses

110. Urban and Regional Planning. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. The history, nature, scope and significance of planning in America with emphasis on basic definitions and concepts, the planning process and comprehensive plan, significant problems and potentials, policy issues, alternatives, the future, innovation and the profession. Gold

116. Outdoor Recreation. (4) I.

Lecture—3 hours; discussion—1 hour. History, nature, scope, and significance of outdoor recreation in American life, with emphasis on user-resource relationships, special problems, policy issues, and innovation. 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.

125. Applied Communication for Environmental Planners and Managers. (4) I.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: English 1 and Rhetoric 1 or 3. Communication principles and techniques are applied to the development and implementation of environmental plans and management programs. Major topics are: diffusion of environmental innovations, administrative communications, and citizen inputs for environmental planning and management. Hodgson

134. Recreation Planning. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 110, 116; course 122 recommended. Description of basic concepts, principles, techniques and methods used to prepare park, recreation and open space plans for urban environments. 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, 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 130A, 130B or 133 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. Harris

151. Site Planning and Design. (4) I.

Studio sessions which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: course 22; Art 16 or Design 21. Consideration of the site and the landscape architect's role. Design and working drawings of residential areas, plazas

and other open spaces.

Thayer

154. Landscape Construction Studio. (4) II.

Studio laboratories which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: Environmental Horticulture 104. Topographic and grading problems in landscape construction. Design and structural relationships; graphic and computational exercises; working drawings.

155. Plant Selection for Environmental Design. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 20; Environmental Horticulture 6. Ability, characteristics, and limitations of landscape plants and plantings to modify the environment, control traffic, reduce erosion, create amenity, etc., with emphasis on specific species. Leiser

156. Landscape Planting Design. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 22 and 155; Environmental Horticulture 105. Application of aesthetic, functional, and horticultural principles to the composition of the planted landscape and the development of planting plans. Thayer

160. Environmental Interpretation. (3) III.

Lecture—2 hours; laboratory—3 hours; two field trips. Prerequisite: course 1 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 interpretative devices and facilities. Hodgson

161. Natural Park Ecosystems. (4) III.

Lecture—2 hours; discussion—1 hour; field trips; a field project with oral and written report. Prerequisite: at least one upper division course in ecology (Environmental Studies 100, Zoology 125, Botany 117 or Entomology 104). Ecological principles are applied to selected habitats of natural parks of California. These ecosystems are contrasted in terms of productivity, mineral cycles, diversity, succession, etc. Effects of human use are stressed. Harding

183. Senior Landscape Design Problem. (4) II.

Studio sessions which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: senior standing in landscape architecture option of EPM major. Solution of an individual landscape design problem including preparation of working drawings. Thayer

184. Senior Landscape Design Problem. (4) III.

Studio sessions which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: senior standing in landscape architecture option of EPM major. Solution of a larger scale, group

landscape design problem including preparation of working drawings. Thayer

193. Internship in Environmental Interpretation.
(4) II, III.

Internship—8 hours; research and writing—4 hours. Prerequisite: senior standing and consent of instructor. Interns develop original educational programs for parks, historic landmarks, botanical or zoological gardens, museums, or schools and present these and other programs to several audiences. Usually an entire work day each week is required. Harding

196. Environmental Planning and Management Study Tour. (4) I.

Field trips—6-10 hours per day; evening seminar session (2 to 3 weeks following trip). Prerequisite: course 110 or 116; consent of instructor. Study tour, 14 to 17 days prior to the beginning of fall quarter. Observe, analyze and evaluate the planning, design, management and programs of recreation and other urban environments with emphasis on administrative processes, interpretive methods, program innovations. (Reservations required in May preceding Fall Quarter.) (P/NP grading only.) Harris

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (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. (P/NP grading only.) The Staff (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. Recreation Planning.** (4) III.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours; one Saturday field trip. Prerequisite: courses 110, 116, 122, 134 or consent of instructor. Application of basic and advanced concepts, techniques and methods used to prepare park, recreation and open space plans for urban environments. Offered in odd-numbered years. 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 (Gold in charge)

299. Research. (1-6) I, II, III.

Research—3-18 hours. (S/U grading only.) The Staff (Gold in charge)

ENVIRONMENTAL STUDIES*

Robert A. Matthews, A.B., *Associate Dean of Environmental Studies*

Leonard O. Myrup, Ph.D., *Chairperson*

Division Office, 2132 Wickson Hall

Professors:

- Charles R. Goldman, Ph.D.
- Marvin Goldman, Ph.D. (*Radiobiology*)
- William J. Hamilton III, Ph.D.
- Robert Sommer, Ph.D. (*Psychology*)
- James W. Valentine, Ph.D. (*Geology*)
- Kenneth E. F. Watt, Ph.D., LL.D. (*Zoology*)

Associate Professors:

- William G. Davis, Ph.D. (*Anthropology*)
- James A. Harding, Ph.D. (*Environmental Horticulture*)
- Jess F. Kraus, Ph.D. (*Community Health*)
- James McEvoy, Ph.D.
- Eldridge M. Moores, Ph.D. (*Geology*)
- Leonard O. Myrup, Ph.D.
- Alvin D. Sokolow, Ph.D. (*Political Science*)
- Geoffrey A. Wandesforde-Smith, Ph.D. (*Environmental Studies; Political Science*)

Assistant Professors:

- Gerard C. Bond, Ph.D. (*Geology*)
- Thomas E. Dickinson, Ph.D.
- Theodore C. Foin, Jr., Ph.D.
- Robert A. Johnston, M.S.
- Jerry A. Moles, Ph.D. (*Anthropology*)
- Benjamin S. Orlove, Ph.D.
- Thomas M. Powell, Ph.D.
- Peter J. Richerson, Ph.D.
- Paul A. Sabatier, Ph.D.
- Seymour I. Schwartz, Ph.D.
- Timothy J. Tardiff, Ph.D.

Lecturers:

- William A. Harvey, M.S.
- Harry O. Walker, Ed.D. (*Resource Science*)

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*Intercollege division.

The intercollege Division of Environmental Studies is a teaching and research unit offering courses, workshops, and directed group study classes that focus on the complex problems of man-environment relations. There is no undergraduate major in Environmental Studies. Courses offered by the Division are designed primarily to supplement major programs in a wide variety of established disciplines, although highly motivated undergraduates who find existing majors unsuited to their educational objectives are encouraged to contact the Chairperson and faculty of the Division regarding individual majors in the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Courses offered by the Division allow students to learn analytical methods useful in understanding a broad range of physical, biological and human problems relating to the environment. They also allow students to apply theories, principles and analytical skills to environmental problem-solving. Undergraduates in any college, school, or department can take these courses as electives to help establish the relevance of their discipline to environmental problems. The courses can also constitute a core program for undergraduate and graduate students developing a special competence in subjects such as ecology, resource sciences, environmental planning, engineering, or other fields important to environmental management.

Graduate Study.—The faculty of the Division offers graduate instruction through the M.S. and Ph.D. degree programs of the Graduate Group in Ecology, as well as through the graduate programs of the departments with which they are associated, such as zoology, sociology, political science, civil engineering and anthropology. Further information about graduate programs in ecology should be obtained from the Chairperson of the Graduate Group in Ecology.

Current Information.—Through its continuing contacts with many other departments and teaching divisions on the campus, the Division develops each year a variety of special courses and workshops that cannot be listed here. Students are advised to check with the Division Office and with the expanded course description handbook of the College of Agricultural and Environmental Sciences for up-to-date information about courses.

Lower Division Courses

10. Introduction to Environmental Studies. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology recommended. 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. (3) II.

Lecture—3 hours. Prerequisite: course 10 or consent of instructor. A survey of basic planning concepts. Land resource analysis, policy formation and institutional design are seen as an integrated process. Johnston

12L. Environmental Planning Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 12 (may be taken concurrently) and consent of instructor. Application of concepts learned in course 12 to a long-range regional planning problem. Small teams work on year 2000 plans for regions of California. Limited enrollment. Johnston

20. Energy, Man and the Environment. (3) I, III.

Lecture—3 hours. A comparison of energy conversion principles for nuclear, geothermal, hydro, fossil fuel, and solar generating units. Discussion of energy reserves, potential resources, environmental consequences of use, siting, demand forecasts, transmission, energy-social-GNP relationships. Upper division and graduate students should refer to Engineering 160. Walker

20L. Energy, Man and the Environment Laboratory. (2) I.

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 20 (may be taken concurrently). On-site study programs at representative types of energy conversion units, includes hydroelectric, geothermal, fossil fuel, and nuclear facilities. Saturday trips primarily. Walker

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.) 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. The Staff

100L. General Ecology Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 100 (may be taken concurrently). This course will offer laboratory and field experience in the methods of ecological investigation. Students will be taught basic methods of population measurement, community analysis, productivity measurement. Richerson

101. Principles of Human Ecology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 and/or 10; Sociology 1 or Anthropology 2 recommended. An examination of the critical variables in the processes that relate man to his environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Anthropology 101.)

Davis, 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.

Wandesforde-Smith, Schwartz

110. Social Systems of Animals and Man. (5) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or equivalent recommended. 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. 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. Orlove

112. Environmental Law. (4) II.

Lecture—4 hours; discussion—1 hour. Introduction for non-Law School students to some of the principal issues in environmental law and the judicial interpretation of some important environmental statutes, e.g., NEPA.

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.)

Powell, Valentine

117. Principles of Environmental Science. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in the biological sciences and one course in the physical sciences. Principles basic to biological ecology, human ecology, and planning. (Same course as Zoology 117.)

Powell, Watt

***121. Population Ecology. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2, Zoology 2, Mathematics 16A-16B. Development of exponential and logistic growth models for plant and animal populations, analysis of age structure and genetic structure, analysis of competition and predator-prey systems. Emphasis is on developing models and using them to make predictions and solving problems. Harding

122. Analysis of Community Dynamics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in elementary ecology (course 100, Zoology 125, Entomology 104, Botany 117, or the equivalent); elementary statistics and calculus strongly recommended. Course examines the theory of community ecology from an analytical point of view. Topics covered include energy and material flows, community organization, homeostasis, and evolution. Emphasis is placed on systems ecology and the impact of man on ecological systems. Foin

131. Environmental Health. (4) II.

Lecture—4 hours. Contemporary problems in environmentally dependent 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. Kraus

133. Population Analysis. (4) III.

Lecture—3 hours; laboratory—3 hours. A comparative and historical examination of inter-relations 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. Cramer

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. Goldman

140L. Limnology Laboratory. (3) III.

Laboratory—6 hours. Prerequisite: junior, senior, and graduate status; course 140 (may be taken concurrently). Limnological studies of lakes, streams, and reservoirs with interpretation of aquatic ecology. Goldman

145. Environmental Chemistry. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 1C and 8B, course 10, and Biological Sciences 1; or consent of instructor. The practical application of chemistry provides a basis for understanding and describing the environmental roles of physical and chemical processes and their possible ecological perturbations. Topics will include ecosystem cycling, descriptions of natural chemical

processes, and ecological effects of chemical pollutants. Fisher

150A. Physical and Chemical Oceanography. (4) I.

Lecture—3 hours; discussion—1 hour. 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, currents, waves, tides, mixing, major oceanic geo-chemical cycles. (Same course as Geology 150A.) Powell

150B. Geology of the Oceans. (3) II.

Lecture—3 hours. Prerequisite: Geology 60, 60L, 105, 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.)

Moores, Bond

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.)

Valentine, Richerson

160. Public Mechanisms for Controlling Land Use. (4) I.

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. 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. A. D. Sokolow

165. Science, Experts, and Public Policy. (4) II.

Lecture—4 hours. Factors affecting the influence of scientists, planners, and other experts in policy-making. Several cases and controversies will be examined. Sabatier, Cahill

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.

G. A. Wandesforde-Smith

168. Methods of Environmental Policy Evaluation. (4) III.

Lecture—3 hours; seminar—1 hour. Prerequisite: Economics 1A or 2A-2B or Agricultural Economics 147 or 100A or Economics 100. Investigation of applications and limitations of economic theory in solving environmental problems. Examination of systematic approaches for the formulation and implementation of environmental public policy. Discussion of externalities, irreversibilities, benefit cost analysis and multi-objective planning included.

Dickinson, Schwartz

***169. Environmental Movements and Public Policy. (4) I.**

Lecture—4 hours; term papers. Prerequisite: Political Science 107 or consent of instructor. Course will develop a conceptual framework for analyzing the historical development of social movements and their role in public policy-making. This will then be applied to the history of the environmental movement in the U. S. Sabatier

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.) Sommer

172. Culture and Environmental Perception. (4) II.

Lecture—3 hours; individual research project. Examination of man's relationship to the environment through the study of culture. The nature of subjective models and their impact upon environmentally oriented behavior. Focuses upon classification and decision making. (Same course as Anthropology 172.) Moles

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 evalua-

tion based on the predictions of the response of the most sensitive physiological systems. (Same course as Radiological Sciences 180.) Goldman

185. Analysis and Simulation of Complex Systems. (5) I.

Lecture—4 hours; laboratory—1 hour. Prerequisite: computer programming (FORTRAN or ALGOL), calculus, and statistics. Techniques for analysis, model-building, and simulation of ecological and socioeconomic systems will be explored, with emphasis on applications to environmental problem-solving. Students will be introduced to simulation languages and will apply their training in individual or team projects. Schwartz

186. The Dynamics and Simulation of Ecological Systems. (3) II.

Lecture-seminar—4 hours. Prerequisite: calculus, statistics, and elementary ecology. An advanced course in ecology. Lectures are given as needed, but are replaced with seminars prepared by all students with the emphasis on current controversies in ecology and the potential role of mathematical models to their solution. Limited enrollment. Foin

190. Workshops on Environmental Problems. (1-8) I, II, III.

Laboratory—2-16 hours. Prerequisite: consent 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. (P/NP grading only.)

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. (P/NP grading only.)

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.) 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. (P/NP grading only.) Myrup in charge

Graduate Courses

298. Directed Group Study. (1-5) I, II, III.

Myrup in charge

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing. (S/U grading only.) Myrup in charge

ENVIRONMENTAL TOXICOLOGY

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 105.

Related Courses. See *Atmospheric Science 131 (Air Pollution Meteorology)*; *Environmental Studies 10 (Introduction to Environmental Studies)*, *131 (Environmental Health)*.

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. Krieger

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Kilgore in charge)

Upper Division Courses

101. Principles of Environmental Toxicology. (3) I.

Lecture—3 hours. Prerequisite: Chemistry 8B or 128C (or equivalent); Biochemistry 101A recommended. A unified introduction to principles under-

lying the use and environmental consequences of pesticides, food additives, and other chemicals; their regulations; and their health significance.

Krieger, Byard

112A. Toxicants in the Environment. (3) II.

Lecture—3 hours. Prerequisite: course 101 or consent of instructor. Properties of toxic chemicals which influence their distribution and transformations; action of environmental forces which affect toxicant breakdown, movement, and accumulation; sources and occurrence of major classes of environmental toxicants. Burau, Seiber

112B. Toxicants in the Environment. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 112A or consent of instructor. Continuation of course 112A. Toxic chemicals—primarily pollutants—in the environment; concepts and techniques of sampling, detecting, and measuring toxicants of current concern; collection, interpretation, and use of analytical data. Burau, Seiber

114A. Biological Effects of Toxicants. (3) II.

Lecture—3 hours. Prerequisite: course 101 or consent of instructor. A lecture course designed to illus-

trate the biological effects of toxic substances in living system. Topics to be covered: environmental toxicants; types of effects; factors influencing toxicity; metabolism and mechanisms-of-action of representative toxins; symptoms and diagnosis; and antidotes and antagonists. Kilgore, Byard, Henderson

114B. Biological Effects of Toxicants: Comparative Toxicology. (4) III.

Lecture—1 hour; discussion—2 hours; laboratory—3 hours. Prerequisite: course 114A or consent of instructor. Continuation of course 114A. A lecture and laboratory course designed to illustrate basic principles of toxicology and to acquaint students with laboratory techniques for evaluating potential toxicity of chemicals. Henderson, Byard

130A-E. Selected Topics in Environmental Toxicology. (3) I, II, III.

Lecture-discussion—3 hours. Prerequisite: consent of instructor; course 101 recommended. Selected topics of current interest in environmental toxicology. Topics will vary each time the course is offered, and will emphasize such areas as the microbiology of toxic substances, poisonous plants and animals, chemical ecology, toxic substances in foods, and the safe handling of toxic substances.

The Staff (Kilgore in charge)

***131. Air Pollutants. (3) I.**

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. Hsieh

138. Legal Aspects of Environmental Toxicology. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor; courses 10 and 101 recommended. Federal and California legislation concerning air and water pollution, pesticide use, food and feed additives, consumer protection, and occupational exposure to toxic substances; roles of Federal regulatory agencies; alternatives to governmental control. Li

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Kilgore in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (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. 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. Offered in odd-numbered years. Kilgore

220. Analysis of Toxicants. (3) III.

Lecture—3 hours. Prerequisite: course 101 and consent of instructor; course 203 recommended. Principles of the microanalysis of toxicants. Theoretical considerations regarding separation, detection, and quantitative determination of toxicants using chemical and instrumental techniques. 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. Seiber

290. Seminar. (1) I, II, III.

Seminar—1 hour. Current topics in environmental toxicology. (S/U grading only.) The Staff (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 (Kilgore in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Kilgore in charge)

EPIDEMIOLOGY AND PREVENTIVE MEDICINE

Walter W. Sadler, D.V.M., M.P.H., *Chairperson of the Department*

Department Office, 2075 Haring Hall

Professors:

Henry E. Adler, D.V.M., Ph.D.

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.

NOTE: For key to footnote symbols, see page 220.

Stewart H. Madin, D.V.M., Ph.D. (*Berkeley Campus*)
 Margaret E. Meyer, Ph.D.
 Nicholas L. Petrakis, M.D. (*San Francisco Campus*)
 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:

Charles E. Franti, Ph.D.
 Constantin Genigeorgis, D.V.M., M.S., Ph.D.
 Robert Schneider, D.V.M., M.S. (*Adjunct*)
 Alvin D. Wiggins, Ph.D.

Assistant Professor:

Roger N. Ruppner, D.M.V., M.V.Sc., M.P.V.M.

Lecturers:

Robert B. Bushnell, D.V.M.
 Fred N. Cooper, B.S.P.H.
 Paul D. DeLay, D.V.M.
 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.
 Arnold S. Rosenwald, D.V.M., Ph.D.
 Patton L. Smith, D.V.M., M.P.V.M.
 George K. York, Ph.D.

§ § §

Upper Division Courses

100. Preventive Veterinary Medicine: Orientation. (4) I.

Lecture—40 hours total. Prerequisite: enrolled in M.P.V.M. degree program. An introduction to the concepts basic to biostatistics and epidemiology. Overview of veterinary preventive medicine programs. (P/NP grading only.)
 The Staff (Wiggins in charge)

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.) Schwabe

102. Biomedical Information Retrieval. (3) I.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. The use of bibliographic tools in the biomedical sciences; forms of biomedical literature;

sources of statistical and epidemiological data; computerized systems in literature retrieval; preparation of bibliographies. Kistler, Merala

103A. Medical Statistics I. (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; introductory methods in regression and correlation; normal, t-, F-, and chi-square distributions; elementary nonparametric methods. Franti, Wiggins

103B. Medical Statistics II. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103A or consent of instructor. Continuation of course 103A. Analysis of variance in biomedical sciences; time-dependent variation and trends; bioassay; introduction to mathematical epidemiology; nonparametric methods; biomedical applications of statistical methods. Franti, Wiggins

103C. Medical Statistics III. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103B or consent of instructor. Continuation of course 103B. Analysis of covariance; multiple regression; multivariate methods; life tables and cohort studies; problems in sampling and surveys; biomedical applications. Franti, 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. Howarth

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 distribution in food and food sources; exposure of man to those agents; prevention of food-borne diseases. Genigeorgis, Riemann, York

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)
 The Staff (Chairperson in charge)

Graduate Courses

210A. Advanced Epidemiology I. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: a degree in veterinary, human or dental medicine, or consent of instructor; course 103A (may be taken concurrently). Consideration of the principal approaches to the study of diseases in populations both of lower animals and of man, with critical discussions of illustrative case examples from "classical" and contemporary literature. Schwabe, Riemann

210B. Advanced Epidemiology II. (3) II.

Lecture—1 hour; seminar discussions and laboratory—6 hours. Prerequisite: courses 210A, and 103B (may be taken concurrently). Continuation of course 210A with emphasis on use of increasingly more sophisticated epidemiological and statistical methods for the study of diseases in populations.

Riemann, Schwabe, Franti, Wiggins, Schneider

210C. Advanced Epidemiology III. (3) III.

Lecture—1 hour; seminar discussions and laboratory—6 hours. Prerequisite: courses 210B, and 103C (may be taken concurrently). Continuation of courses 210A and 210B; with attention given to the development and use of mathematical models in epidemiology and to application of more advanced statistical methods to population problems in disease.

Riemann, Schwabe, Franti, Wiggins, Schneider

211A. Applied Epidemiology I. (3) I.

Lecture—1 hour; discussion—2 hours. Prerequisite: course 210A (concurrently) or consent of instructor. Application of the experimental method to solving specific epidemiological field problems involving diseases of animals. Students must identify and select a problem, and complete all work preparatory to the actual field collection of data or specimens.

Meyer

211B. Applied Epidemiology II. (1) II.

Laboratory—3 hours. Prerequisite: courses 211A and 210A. Emphasis is on decision making with respect to the type and amount of data required for solving an epidemiological problem, and the selection of appropriate statistical, computer, or other methods for processing, analyzing, and interpreting these data.

The Staff (Meyer in charge)

211C. Applied Epidemiology III. (2) III.

Laboratory—6 hours. Prerequisite: courses 211B and 210B. Completion of the exercise begun in course 211B, including consideration of alternative approaches to the presentation of data and conclusions and formulation of recommendations for further investigations. The Staff (Meyer in charge)

212. Epidemiology of the Zoonoses. (3) II.

Lecture—1 hour; discussion—2 hours. Prerequisite: course 210A or consent of instructor. Biological and ecological features of infections 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.

Meyer

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 tech-

niques 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.

Yamamoto, 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.

Bankowski

219. Avian Medicine. (1) III.

Lecture—1 hour. 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.

Adler

220. Advanced Avian Medicine. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: enrollment in MPVM program, senior standing in School of Veterinary Medicine or consent of instructor. Prevention and control of the major diseases of domestic poultry.

Adler, Bankowski, McCapes, Yamamoto

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.

Sadler, 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.

Riemann, Genigeorgis

256. Advanced Food Hygiene Laboratory. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: DVM degree (or equivalent) or consent of instructor. Techniques used in a veterinary food hygiene laboratory to detect pathogens, adulterants, contaminants, and other substances and factors affecting wholesomeness of foods of animal origin.

Genigeorgis

295. Preventive Avian Medical Practice. (3) I II, III.

Laboratory—8 hours. Prerequisite: enrollment in avian medicine option of MPVM program or consent of instructor. Clinical instruction in avian medicine in which students apply knowledge from veterinary medicine and avian husbandry in the diagnosis, pre-

NOTE: For key to footnote symbols, see page 220.

vention and eradication of disease processes in domestic poultry populations. May be repeated for credit.
The Staff (McCapes in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

FOOD SCIENCE AND TECHNOLOGY

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 108 and 210.

Related Courses. See *Biochemistry, Consumer Science, Nutrition, Viticulture and Enology: Engineering 110 (Introduction to Engineering Principles); Environmental Toxicology 101 (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).*

Lower Division Courses

1. Introduction to Food Science. (3) I, II.

Lecture—2 hours; discussion—1 hour. Development and maintenance of an adequate food quality and its measurement; scientific and technological aspects of converting raw material and plant products into a large variety of processed and preserved foods; maintenance and improvement of the acceptability and nutritional value of food. Course not open for credit to students who have completed courses 100A, 100B, or 111. Jennings, 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. Leonard

93. Public Issues in Nutrition and Food Science.

(1) II.

Seminar—1 hour. Faculty and invited guest speakers will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to nutrition and food science for students new to the campus. (Same course as Nutrition 93.) (P/NP grading only.) Weir, Schweigert

99. Special Study for Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Schweigert in charge)

Upper Division Courses

100A. Principles of Food Composition and Properties. (3) I.

Lecture—3 hours. Prerequisite: Chemistry 8A and 8B. Fundamental chemical, physical, and sensory aspects of food composition as they relate to physical properties, acceptability, and nutritional value of fresh and processed foods. Russell

100AL. Principles of Food Composition and Properties Laboratory. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100A (may be taken concurrently). Course designed to give laboratory experience with the food systems and properties described in course 100A. Bruhn

100B. Principles of Food Composition and Properties. (3) II.

Lecture—3 hours. Prerequisite: Chemistry 8B. Fundamental chemical, physical, and sensory aspects of food composition as they relate to physical properties, acceptability, and nutritional value of fresh and processed foods. Russell

100BL. Principles of Food Composition and Properties Laboratory. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100B (may be taken concurrently). Course designed to give laboratory experience with food systems and properties described in course 100B. Bruhn

102. Malting and Brewing Technology. (3) I.

Lecture—3 hours; field trips and pilot-scale brewing by arrangement. Prerequisite: preparation in biochemistry, microbiology and chemistry advised. Technology of the malting, brewing and fermentation processes is integrated with the chemistry, biochemistry, and microbiology that determines industrial practices and products quality. Lewis

102L. Malting and Brewing Science Laboratory. (3) II.

Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 102, 103, Chemistry 5. Laboratory experience in the use and application of standard brewing methods of analysis. Data collection on raw materials and application of these data in pilot-scale malting and brewing exercises. Processing studies and influence of process variables on product attributes. Lewis

103. Physical and Chemical Methods for Food Analysis. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Chemistry 5 and 8B; Biochemistry 101B (may be taken concurrently). An introduction to the theory and application of physical and chemical methods for determining the constituents of foods. Modern separation and instrumental analysis techniques are stressed. Whitaker, 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. 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.

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. Crisan, 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, and drugs. For laboratory experience in this field, students may register in course 106L.

Lewis, Phaff, Kunkee

***106L. Food and Industrial Microbiology Laboratory. (3) (Extra Session Summer).**

Laboratory—90 hours total. Prerequisite: a course in industrial fermentation (e.g., course 106). Microorganisms and their activities in relation to industrial processes such as baking; brewing; production of industrial alcohol, yeasts, solvents, vitamins, enzymes, antibiotics, and other drugs. Offered in odd-numbered years. Lewis

107. Principles of Sensory Evaluation of Foods.

(3) II.

Lecture—3 hours. Prerequisite: course 1 or Viticulture and Enology 3 or the equivalent. Nature of sensory responses with emphasis on taste, odor and texture of foods; methodology of analytical laboratory analyses and consumer acceptance; correlation of sensory with chemical and instrumental measurements. Pangborn, Schutz, Noble

107L. Principles of Sensory Evaluation of Foods: Laboratory. (2) II.

Discussion—1 hour; laboratory—3 hours. Prerequisite: Mathematics 13 and competence in applied

statistics, through analysis of variance; course 107 (must be taken concurrently). Laboratory demonstrations and student participation in the preparation and administration of experimental food samples, collection and statistical analysis of data, and interpretation of results from sensory tests. Pangborn

108. Food Processing Plant Sanitation. (3) II.

Lecture—3 hours. Prerequisite: Chemistry 8B and Bacteriology 2. Discussion of factors relating to sanitary control of food processing including water treatment, chemical and physical sanitizing agents, principles of cleaning and hard surface detergency, metal corrosion, concepts in the disposal of wastes and the pertinence of government control agencies. Lewis

Lewis

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. Merson

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. Merson

Merson

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. Miller, Nickerson

Miller, Nickerson

112. Comparative Aspects of Food Habits and Culture. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Anthropology 2 or Geography 2. Intercomparison of cultural, geographical, socio-economical, religious and psychological influences on development and maintenance of food habits of past and present cultural groups. Pangborn

Pangborn

113. Structure of Food Materials. (3) III.

Lecture—3 hours. Anatomical features and structural properties of foods; histochemical tests of food tissues; rheological characteristics; food texture. Sterling

Sterling

119. Principles of Dairy Processing. (3) III.

Discussion—1 hour; demonstrations, student-faculty conferences, quizzes—1 hour; unscheduled self-tutorial study. 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. Nickerson, 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. 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. Peterson, Brant

125. Metals and Metal Complexes in Foods. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101B; Chemistry 107B or the equivalent. Structure, reactions, and physical properties of metal complexes, particularly those of importance to food science. The biochemistry of metal ions in foods. Gruenwedel

130. Chemistry of Milk and Dairy Products. (3) II.

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. Nickerson, Smith

131. Packaging Processed Foods. (3) III.

Lecture—3 hours. Prerequisite: course 1 or 111, Chemistry 8B, Bacteriology 2 and Physics 2B, or consent of instructor. 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. Henderson, Winter

150. Thermal Processing of Foods. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 104 and 110B or consent of instructor. Theory and practical considerations of thermal processes such as canning, pasteurization and aseptic processing. Process calculations of microbial inactivation and chemical changes to safeguard public health, nutrition, and consumer acceptance. Operation and engineering analysis of retorts and heat exchangers. Merson, Leonard

160. Food Chemistry. (4) III.

Lecture—4 hours. Prerequisite: Chemistry 8B (or

equivalent); Biochemistry 101A, 101B recommended; or consent of instructor. The important classes of food constituents (water, carbohydrates, proteins, lipids, pigments, flavor and aroma constituents, toxins, etc.), their nature, occurrence, and chemical and biochemical significance in foods. Bernhard, Gruenwedel

190. Senior Seminar. (1) I.

Seminar—1 hour. Prerequisite: senior standing or consent of instructor. Selected topics presented by students on recent advances in food science and technology. Reports and discussions concerning oral and written presentations, literature sources and career opportunities. Schweigert, Nickerson

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Schweigert in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Schweigert in charge)

Graduate Courses

201. Biochemistry and Food Science. (3) I.

Lecture—3 hours. Prerequisite: Biochemistry 101B. Topics on enzymes, proteins, pigments, lipids and vitamins. Biochemical principles and methods related to food composition, preservation and processing. Includes research proposals and group problem solving. Tappel

207. Advanced Sensory-Instrumental Analyses. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 107L and consent of instructor. Basic principles of measurement of color, texture, and flavor of foods by sensory and instrumental methods. Advanced statistical analysis of relation of colorimetry, texturometry and chemistry of volatile compounds to perception of appearance, texture, flavor. Noble, Pangborn

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. Feeney

211. Chemistry of the Food Lipids. (3) II.

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. Smith

***213. Macromolecular Gels. (2) III.**

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. Sterling

235. Mycology of Food and Food Products. (2) III.

Lecture—2 hours. Prerequisite: courses 104, 104L, or their equivalents. Fungi involved in the production, destruction and quality of food. Fungi as food; deterioration and spoilage; toxins; fungal food fermentations. Crisan

235L. Mycology of Food and Food Products Laboratory. (2) III.

Lecture—1 hour; laboratory—2 hours; term paper preparation. Prerequisite: courses 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. Crisan

250. Isolation and Characterization of Trace Volatiles. (3) I.

Lecture—3 hours. Prerequisite: at least one introductory course in inorganic chemistry, organic chemistry, physics. Gas chromatographic theory; preparation, evaluation and use of columns; sample

preparations and recovery; qualitative and quantitative analysis; ultraviolet, infrared and mass spectrometry. Jennings

251. Isolation and Characterization of Trace Volatiles. (2) I.

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 250 (must be taken concurrently). Laboratory demonstrations and discussions of methods for optimizing gas chromatographic performance, treatment of retention data, preparation and evaluation of packed, SCOT and open tubular glass capillary columns, sample preparation and trapping, microreaction coupled with gas chromatography, infrared and mass spectrometry. Jennings

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.) Dunkley

298. Group Study. (1-5) I, II, III.

Directed study on food chemistry, food microbiology, food processing or sensory evaluation. The Staff (Schweigert in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing. (S/U grading only.) The Staff (Schweigert in charge)

FOOD SERVICE MANAGEMENT

Major Advisers.—See *Class Schedule* listing.

Major Program.—See pages 100 and 109.

Related Courses. See *Food Science and Technology, 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.

Upper Division Courses**125. Quantity Food Production and Service. (4) I.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: Food Science and Technology 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. Prophet

126. Quantity Food Production and Service.

(4) II, III.

Lecture—2 hours; laboratory—6 hours. Prerequisite:

site: 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. Prophet

127. Food Service Organization and Management. (4) III.

Lecture—4 hours. Prerequisite: Food Science and Technology 100B. Administration of quantity food service units, general principles of organization and management, work simplification, personnel management, planning for layout and equipment.

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Zeman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Zeman 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.

NOTE: For key to footnote symbols, see page 220.

Classics

- *139B. Greek Literature in Translation.
- *141. Greek and Roman Comedy.

Comparative Literature

- 10A-L. Masterpieces of World Literature.
- 40. Introduction to Comparative Literature.
- 49. Freshman Seminar.
- 50. Intermediate Seminar: Myths and Motifs.
- 51. Intermediate Seminar: Genres and Literary Judgment.
- 52A-52B. Intermediate Seminar: The Orient and the West.
- 159A-G. Special Topics in Comparative Literature.
- 160A. The Modern Novel.
- 160B. The Modern Drama.
- 161A-D. Varieties in Authorial Vision.
- *162A-F. The Theory and Practice of Literary Translation.
- 163A-E. 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-I. Longer Narrative Forms: The Epic and the Novel.
- *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.

French

- *39C. French Literature in English Translation: the Contemporary Period.
- 121. Twentieth-Century Novel.
- 122. Twentieth-Century Novel.
- *150. Masterpieces of French Literature.

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. The Development of Germanic Mythology.
- 113. Hermann Hesse.
- 114. Goethe's *Faust*.
- 115. German Literature of the Twentieth Century.
- 116. Literary Aspects of Schopenhauer and Nietzsche.
- 117. Kafka.
- 118. Brecht.

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

Russian

- 30. Great Russian Writers.
- 40. Survey of Russian Literature to 1800.
- 41. Survey of Nineteenth-Century Russian Literature.
- 42. Survey of Twentieth-Century Russian Literature.
- 121. The Nineteenth-Century Russian Novel.
- 123. The Twentieth-Century Russian Novel.
- 124. History of Russian Literary and Social Criticism.
- 126. The Russian Theater.

- 128. Modern Russian Poets.
- 140. Dostoevsky.
- 141. Tolstoy.
- 150. Russian Culture.
- 154. Russian Folklore.

Spanish

FRENCH

Max Bach, Ph.D., *Chairperson of the Department*
 Department Office, 515 Sproul Hall

Professors:

- Claude K. Abraham, Ph.D.
- Max Bach, Ph.D.
- Marshall Lindsay, Ph.D.
- *Nicole A. D. Marzac, Docteur ès Lettres

Associate Professors:

- Jean Marc Blanchard, Agrégé de Lettres
- Edward M. Bloomberg, Ph.D.
- *Gerald Herman, Ph.D.

Assistant Professors:

- *Larry H. Hillman, Ph.D.
- Jurate Izokaitis, Ph.D.
- Manfred Kusch, Ph.D.

Lecturers:

- Margo R. Kaufman, M.A.
- Ruth B. York, Ph.D.

§ § §

The Major Program

Students working towards the Bachelor of Arts degree in French may choose a course of study from either Plan A or Plan B. Students planning to do graduate work in French are advised to select Plan A.

Plan A: emphasis on Literature

Lower Division Courses.—French 1, 2, 3, 4, and 6; 30A, 30B and 45 (introduction to French literature).

Upper Division Courses.—At least 36 units including course 104 or 105; course 110; one course chosen from the following: 130, 131, 132; at least one separate course in three of the following periods: (a) Medieval Literature, (b) Sixteenth Century, (c) Seventeenth Century, (d) Eighteenth Century and (e) Nineteenth Century; and one course in the Twentieth Century; French 45 will normally be taken before upper division literature courses. No more than three areas of literature may be satisfied by courses taken in the Education Abroad Program.

- 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.

Recommended: French 107A, 107B and 160 for students interested in obtaining a "single subject" teaching credential in California.

Plan B: emphasis on French Language

Lower Division Courses.—French 1, 2, 3, 4, and 6; French 30A, 30B, 45 (introduction to French literature).

Upper Division Courses.—French 104, 105, 107A, 107B, 110, 138 (problems in French compositions and syntax), 159 (phonetics), 160; one literature course chosen from the following: 117A, 118A, 119B, 120B, 121, 122, 140; one additional upper division literature course. Recommended: French 108A, 108B (advanced conversation).

Honors and Honors Programs (see page 181).—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 Credential Subject Representative: R. B. York. See page 215 for Teacher Education Program.

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. Not open for credit to students who have completed the first two years of high school French.
 The Staff

NOTE: For key to footnote symbols, see page 220.

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

3. Intermediate French. (6) I, II, III.

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2 or equivalent. Continuation of course 2. The Staff

4. Intermediate French. (5) I, II, III.

Discussion—5 hours. Prerequisite: course 3. The Staff

6. Problems in Language and Style. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 4 or equivalent. Reading of selected literary texts with emphasis on problems of syntax and style and vocabulary development. Class discussion and composition. The Staff

8A. French Conversation. (2) I, II, III.

Discussion—2 hours. Prerequisite: course 3. Practice in speaking French. (P/NP grading only.) The Staff

8B. French Conversation. (2) I, II, III.

Discussion—2 hours. Prerequisite: course 4. Practice in speaking French. (P/NP grading only.) The Staff

30A. Advanced Grammar. (4) I, II, III.

Lecture—3 hours; written papers and reports. Prerequisite: course 6. Grammar review, composition, and the reading and discussion of literary texts. The Staff

30B. Advanced Grammar. (4) I, II, III.

Lecture—3 hours; written papers and reports. Prerequisite: course 30A or placement by examination. Continuation of course 30A. 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. Izokaitis

45. Introduction to French Literature. (4) I, II, III.

Lecture—3 hours; short papers. Prerequisite: course 6 or equivalent. Selected themes in French literature. The Staff

98. Directed Group Study. (1-5) I, II, III.

Primarily intended for lower-division students. Special Study. (P/NP grading only.) The Staff

99. Special Study for Undergraduates.

(1-5) I, II, III.
(P/NP grading only.)
The Staff (Chairperson in charge)

Upper Division Courses

104. Translation and Composition. (4) I.

Lecture—3 hours; essays. Prerequisite: course 30B or the equivalent. Practice in translation into French using a variety of texts illustrating different problems and styles; practice in French composition. Herman

105. Advanced Translation and Composition. (4) II.

Lecture—3 hours; essays. Prerequisite: course 30B or the equivalent. Development of skills and practice in the techniques of writing French. Herman

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. Marzac

107B. Survey of French Culture and Institutions.**(4) III.**

Lecture—3 hours; term paper or oral presentation. Prerequisite: course 6. From the eighteenth century to the present. Kusch

108A. Advanced French Conversation. (3) I, II, III.

Lecture-discussion—3 hours. Prerequisite: course 30A. Intensive conversational practice stressing accurate pronunciation and spoken fluency. Not open to native speakers. May not be counted toward the French major. (P/NP grading only.) The Staff

108B. Advanced French Conversation. (3) I, II, III.

Lecture-discussion—3 hours. Prerequisite: course 30B. Intensive conversational practice stressing accurate pronunciation and spoken fluency. Not open to native speakers. May not be counted toward the French major. (P/NP grading only.) The Staff

110. Advanced Problems in Language and Style.**(4) III.**

Lecture—3 hours; essays. Prerequisite: course 104 or 105. Analysis of style and practice in composition. Herman

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. Herman

***115B. Medieval Literature: Satiric and Didactic Poetry. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6 or equivalent. Study of the didactic, and satiric or popular literature of the twelfth and thirteenth centuries. Readings will include some of the *fabliaux*, *Aucassin et Nicolette*, and selections from the *Roman de Renart* and *Roman de la Rose*. 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*. 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. Marzac

117A. Theater of the Seventeenth Century. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6. Bloomberg

117B. Moralists of the Seventeenth Century. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 6. Bloomberg

***117C. Poetry and the Novel in the Seventeenth Century. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6. Izokaitis

118A. Les Philosophes. (4) II.

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) III.**

Lecture—3 hours; term paper. Prerequisite: course 6. Novels of Lesage, Prévost, Diderot, Rousseau, Laclos, Sade. Blanchard

***118C. The Theater in the Eighteenth Century. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6. Plays of Marivaux and Beaumarchais. Kusch

***119A. The Nineteenth Century. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6. Romanticism in the drama and novel. Bach

119B. The Nineteenth Century. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6. Realism and naturalism: Balzac, Flaubert, Maupassant, Zola. The Staff

119C. The Nineteenth Century. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 6 or the equivalent. Poetry from the Pre-Romantics to Baudelaire. Izokaitis

***119D. The Nineteenth Century. (4) I.**

Lecture—3 hours; term paper. Prerequisite: course 6 or the equivalent. Symbolism: the poetry and poetics of Baudelaire, Mallarmé, Verlaine, Rimbaud, Corbière, Laforgue, and Lautréamont. Izokaitis

***120A. Twentieth-Century Drama. (4) I.**

Lecture—3 hours. Prerequisite: course 6. Representative plays from Jarry to Giraudoux. York

***120B. Twentieth-Century Drama. (4) II.**

Lecture—3 hours. Prerequisite: course 6. Representative plays from Anouilh to Ionesco. York

121. Twentieth-Century Novel. (4) I.

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. Lindsay

122. 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. Lindsay

123. Twentieth-Century Poetry. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 6 or the equivalent. Selected poetic texts from Apollinaire to the present. Izokaitis, Lindsay

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. Lindsay

***131. Critical Reading of Fiction. (4) I.**

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. Kusch

132. Critical Reading of Drama. (4) II.

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. York

138. Problems in French Composition and Syntax. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 110. Morphological, syntactical, and stylistic aspects of English-French translation. Marzac, Bloomberg

***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. York

***150. Masterpieces of French Literature. (4) I.**

Lecture—3 hours; term paper. Prerequisite: English I. Reading, lectures, and discussion in English. May not be counted as part of the major in French. Offered in even-numbered years. Lindsay

NOTE: For key to footnote symbols, see page 220.

159. French Phonetics. (2) II.

Lecture—2 hours; laboratory—1 hour. Prerequisite: course 6 or the equivalent. Contrastive analysis of the sounds of English and French; practical exercises in the pronunciation of modern French, with special emphasis on the problems of English-speaking students. Hillman

160. Structure of the French Language. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor; course 159 recommended. Linguistic analysis of modern French. Hillman

198. Directed Group Study. (1-4) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)
The Staff (Chairperson in charge)

Graduate Courses

200A. Analyse Littéraire. (4) I.

Seminar—3 hours; term paper. Prerequisite: graduate standing. Introduction to the methodology and practice of literary criticism. Textual reading and group study of one selected work. Blanchard

200B. Analyse Littéraire. (4) II.

Seminar—3 hours; term paper. Prerequisite: graduate standing. Further introduction to methodology. Theory of literature and philosophy of criticism, writing and reading, in the context of today's controversy. Study of selected critical approaches against specific texts. Blanchard

201A. History of the French Language. (4) II.

Seminar—3 hours. Examination of earliest documents tracing the development of the language from Latin to Old French; examination of Old French texts. Latin useful, but not essential. Hillman

201B. History of the French Language. (4) III.

Seminar—3 hours. Evolution of Modern French from the Renaissance to the present, with emphasis on the relationship between language and literature and the influence of grammarians. Hillman

202A. Medieval French Literature: The Epic Tradition (4) I.

Seminar—3 hours. Prerequisite: course 201A recommended. Literary and stylistic study of selected *chansons de geste*. Readings in Old French. May be repeated for credit with consent of instructor when different topic studied. Offered in odd-numbered years. Herman

***202B. Medieval French Literature: The Romance Tradition. (4) III.**

Seminar—3 hours. Prerequisite: course 201A recommended. Chrétien de Troyes and the doctrine of

courtly love. Literary and stylistic study of Chrétien's major works. Readings in Old French. May be repeated for credit with consent of instructor when different topic studied. Offered in even-numbered years.

Herman

***202C. Medieval French Literature: Theater. (4) II.**

Seminar—3 hours. Study of French theater from its liturgical origins to fifteenth century *farces* and *soties*. May be repeated for credit when different topic studied. Offered every third year. The Staff

***202D. Medieval Literature: Allegory. (4) III.**

Seminar—3 hours; term paper. Prerequisite: graduate standing. A study of medieval allegory as an art form, with particular emphasis on Guillaume de Lorris' and Jean de Meung's *Roman de la Rose*. Readings in Old French. Herman

***203. Reading of Old French Texts. (4) III.**

Seminar—3 hours. Prerequisite: course 201A-201B or equivalent. Hillman

***204A. Fifteenth-Century Literature: Historians. (4) I.**

Seminar—3 hours. The historical scene of the period through the writings of its main memorialists, Commines, Bouchet, la Marche, Chastellain, with special attention given to their literary and artistic achievements. May be repeated for credit when different topic is studied. Offered every third year.

Marzac

***204B. Fifteenth-Century Literature: Poetry. (4) II.**

Seminar—3 hours. The poetic achievements of noblemen and rascals. New attitudes towards, and functions of poetry studied in Charles d'Orléans, Christine de Pisan, Alain Chartier, and Villon. May be repeated for credit when different topic is studied. Offered every third year.

Marzac

***204C. Fifteenth-Century Literature: Nouvelles. (4) III.**

Seminar—3 hours. An age of liberation portrayed in historical, satirical, and sociological *nouvelles*. Special study of the works of LaSalle and Jehan de Paris. May be repeated for credit when different topic is studied. Offered every third year.

Marzac

***204D. Fifteenth-Century Paleography. (4) II.**

Seminar—3 hours. Principles and techniques in French paleography. Study and critical edition of hitherto unknown texts in manuscript form. May be repeated for credit when different topic is studied. Offered in odd-numbered years.

Marzac

***205A. Sixteenth-Century Literature: The Humanists. (4) I.**

Seminar—3 hours. French humanism in its most varied forms. Although at different times Rabelais and Montaigne will be primarily studied, other leading intellectuals and religious writers will also re-

ceive attention. May be repeated for credit when different topic is studied. Offered in even-numbered years. Marzac

***205E. Sixteenth-Century Literature: Pre-Renaissance and Renaissance Poets. (4) I.**

Seminar—3 hours. The poetry of the *Ecole lyonnaise* and of the *Pléiade*. May be repeated for credit when different topic studied. Offered every third year. Marzac

206A. Seventeenth-Century Literature: Theater. (4) I, II, III.

Seminar—3 hours. The works of Corneille, Racine, Molière, and minor dramatists. One or more authors may be covered. May be repeated for credit with consent of instructor when different topics are studied. Offered in even-numbered years. Abraham

***206B. Seventeenth-Century Literature: Moralists. (4) I.**

Seminar—3 hours. Works of Méré, Descartes, Mme. de Sévigné, Pascal, La Rochefoucauld, La Bruyère, *et al.* One or more authors may be covered. May be repeated for credit with consent of instructor when different topics are studied. Offered in even-numbered years. The Staff

***206C. Seventeenth-Century Literature: Novel. (4) III.**

Seminar—3 hours. Studies of works of one or more novelists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered every third year. The Staff

***206D. Seventeenth-Century Literature: Poetry. (4) I.**

Seminar—3 hours. Studies of the works of one or more poets of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered every third year. The Staff

***207A. Eighteenth-Century Literature: Theater. (4) II.**

Seminar—3 hours. Study of one or more dramatists of the period. Examination of the new theater in the context of a changing society. Analysis of the distinctive characteristics of new genres. May be repeated for credit when different topic is studied. Offered every third year. The Staff

207B. Eighteenth-Century Literature: Novel. (4) II.

Seminar—3 hours. Rise of the novel. A study of narrative experiments in the context of the philosophical climate and new literary values. Course may treat one or more novelists of the period. May be repeated for credit when different topics are studied. Offered in even-numbered years. Kusch

***207C. Eighteenth-Century Literature: Philosophes. (4) III.**

Seminar—3 hours. Not a course in philosophy, but an examination of the role of philosophy in the design and context of literary works. Study of one or more authors. May be repeated for credit when different topics are studied. Offered in even-numbered years. The Staff

***208A. Nineteenth-Century Literature: Fiction. (4) III.**

Seminar—3 hours. Study of the works of one or several novelists and/or short-story writers of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in even-numbered years. The Staff

***208B. Nineteenth-Century Literature: Theater. (4) II.**

Seminar—3 hours. Study of the works of one or more dramatists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered every third year. The Staff

208C. Nineteenth-Century Literature: Poetry. (4) II, III.

Seminar—3 hours. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in odd-numbered years. Lindsay, Izokaitis

***209A. Twentieth-Century Literature: Fiction. (4) I.**

Seminar—3 hours. Study of the works of one or several novelists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in odd-numbered years. The Staff

***209B. Twentieth-Century Literature: Essays. (4) III.**

Seminar—3 hours. Study of the works of one or several essayists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered every third year. The Staff

209C. Twentieth-Century Literature: Theater. (4) III.

Seminar—3 hours. Study of the works of one or several dramatists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in even-numbered years. R. Cohn

***209D. Twentieth-Century Literature: Poetry. (4) II.**

Seminar—3 hours. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in even-numbered years. The Staff

***210. Studies of Narrative Fiction. (4) III.**

Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered in even-numbered years. The Staff

211. Studies in Criticism. (4) III.

Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered every third year. Blanchard

212. Studies in the Theater. (4) I.

Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered every third year. Cohn

***213. Studies in Poetry. (4) III.**

Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered every third year. The Staff

***214. Study of a Literary Movement. (4) II.**

Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered every third year. The Staff

***221. Structuralism. (4) II.**

Lecture—3 hours; term paper. Sources and development of the structuralist movement. Cross cultural and interdisciplinary approach, with emphasis on language and literary theory. Lecture and discussion in English. Readings in French or English. Blanchard

***230. Old Provençal. (4) III.**

Seminar—3 hours. Prerequisite: course 201A or the equivalent. An introduction to Old Provençal phonology and morphology, with reading and interpretation of texts. Offered every third year. Hillman

***231. Studies in French Linguistics. (4) I.**

Seminar—3 hours. Prerequisite: consent of instructor. May be repeated for credit with consent of instructor when different topic studied. Offered every third year. Hillman

***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. Marzac

290A. Teaching of French in College. (1) I.

Lecture-discussion—1 hour. 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.) The Staff

290B. Teaching of French in College. (1) II.

Lecture-discussion—1 hour. 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.) The Staff

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 (Chairperson in charge)

299. Research. (2-12) I, II, III.

(S/U grading only.) The Staff (Chairperson in charge)

299D. Individual Study. (1-12) I, II, III.

(S/U grading only.) The Staff (Chairperson in charge)

Professional Course**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. Kaufman

GENETICS

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 110 and 210.

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 can be found on page 236.

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. Examines principles

and recent developments in genetics and evolution in context of their social implications.

I. Colby; II. Hedrick

99. Special Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. Individual study for undergraduates. (P/NP grading only.) The Staff (Allard in charge)

Upper Division Courses**100A. Principles of Genetics. (3) I, II, III.**

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. Boyd; II. Edlin; III. _____

100B. Principles of Genetics. (3) II, III.

Lectures and/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. _____; III. _____

100L. Principles of Genetics Laboratory.

(1) I, II, III.

Laboratory—3 hours. Prerequisite: course 100A or 115, and Bacteriology 3. Laboratory work in basic genetics to supplement courses 100A, 100B, and 115. (P/NP grading only.) Kiger, 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. Snow, Rick

101L. Cytogenetics Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 101 (may be taken concurrently). Laboratory study of chromosome structure and behavior. Snow, 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. Edlin

103. Organic Evolution. (3) III.

Lecture—3 hours. Prerequisite: course 100B or 115. Evolutionary processes in higher organisms. Ayala

104. Developmental Genetics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 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. Boyd, Abbott, Kiger

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. 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. Prout

197T. Tutoring in Genetics. (1-5) I, II, III.

Prerequisite: upper division standing and consent of instructor. Conducting of discussion groups affiliated with one of the department's regular courses. (P/NP grading only.) The Staff (Allard 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 (Allard 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. (P/NP grading only.) The Staff (Allard 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. 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. Prout

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. Gatlin

291. Seminar in History of Genetics. (2) III.

Seminar—2 hours. Prerequisite: course 100B or 115. The development of modern genetic theories beginning with Mendel. (S/U grading only.) Rick

*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.) _____

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.)
Boyd

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.)
Prout

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 (Allard in charge)

299. Research. (1-12) I, II, III.

(S*U grading only.) The Staff (Allard in charge)

GEOGRAPHY

Frederick J. Simoons, Ph.D., *Chairperson of the Department*

Department Office, 280 Academic Office Building III

Professors:

Howard F. Gregor, Ph.D.
*³Frederick J. Simoons, Ph.D.
Kenneth Thompson, Ph.D.
Yi-Fu Tuan, Ph.D. (*Visiting*)

Associate Professor:

Stephen C. Jett, Ph.D.

Assistant Professors:

Conrad J. Bahre, Ph.D.
Dennis J. Dingemans, Ph.D.
David M. Helgren, Ph.D.
Marlyn L. Shelton, Ph.D.

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Departmental Major Adviser.—See *Class Schedule* listing.

Graduate Adviser.—See *Class Schedule* listing.

The Major Program

Lower Division Courses.—Required as preparation for the major: Geography 1, 2, 3, 5, and 6 or 7.

Upper Division Courses.—Required: 38 upper-division units in geography to include the following:

1. *Breadth.* One course in each of the following categories:

- Physical—108, 111, 112, 119, or 162.
- Cultural—143, 152, 170, 171, 172, or 173.
- Economic-Urban—141, 142, 154, 155, 156, or 161.
- Regional—121, 122A, 122B, 123A, 123B, 124, 125A, 125B, 126, or 131.

2. *Methodology.* One course in each of two of the following categories:

- Geography 102, 103, 104, or 106.
- Geography 105.
- Geography 110.

3. *History of Geographic Thought.* Geography 151.

4. *Senior Paper.* 2 units of Geography 199.

Students are encouraged to choose their upper-division geography courses with an intent toward specialization in one of the topical subfields of geography: physical, cultural, or economic-urban. These courses, as well as related courses in other departments, should be selected in accordance with a plan approved by the major adviser.

Teaching Credential Subject Representative: D. J. Dingemans. See page 215 for the Teacher Education Program.

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, II, III.

Lecture—3 hours; laboratory—2 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

Shelton, Helgren

2. Man in the Habitat: An Introduction to Cultural Geography. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Major systems of habitat use: their characteristics, origins, spread, ecology, and impact of man's use on his habitat. Principal themes in cultural geography. Emphasis on the nonindustrial world.

Bahre, Jett, Simoons

3. Climate and Weather. (3) I, II, III.

Lecture—3 hours. Composition and structure at 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.

Shelton

4. Maps and Map Interpretation. (3) I.

Lecture—3 hours. Properties and components of

maps. Major classes of projections. Types of maps, emphasizing relief, cadastral, thematic, and modern trends in mapping. History and development of cartography. Bahre

5. Introduction to Urban and Economic Geography. (4) I, II.

Lecture—3 hours; discussion—1 hour. The location of economic and urban activities. Patterns and theories of spatial organization: resource development, agricultural and manufacturing regions, urban systems, and urban structure. Dingemans, Gregor

6. Man's Role in Changing the Face of the Earth. (4) II.

Lecture—4 hours. Man's influence on world geography and ecology. The effect of human occupancy and activities on the environment, especially the landscape. 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. Shelton

***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. (P/NP grading only.)
The Staff (Chairperson in charge)

99. Independent Study. (1-5) I, II, III.

(P/NP grading only.)
The Staff (Chairperson 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.

***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.

104. Field Course in Urban Geography. (4) III.

Lecture—1 hour; full-day field trip. Field analysis of selected urban problems in California. Special attention to regional interrelationships, functional structure, and land use changes as specifically re-

lated to the core of the city, changing residential and retail patterns, and urban encroachment on agricultural lands. Dingemans

105. Cartography. (4) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 4 or consent of instructor. Compilation and generalization of base-map data; symbolization and processing of map data; cartographic design and lettering techniques; map reproduction. Bahre

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. Bahre

***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.

108. Analysis of Landforms. (4) I.

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. Helgren

***110. Statistical Methods in Geographical Research. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 13 or the equivalent. Principles of statistical reasoning illustrated with examples from the field of geography. Critical review of current applications of statistical methods in geographical research. Dingemans

111. Alluvial Morphology. (4) II.

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. Helgren

***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. Helgren

119. Arid Lands. (4) I.

Lecture—4 hours. Prerequisite: course 1 or consent of instructor. Physical characteristics and human utilization of rainfall-deficient regions. Jett

121. North America. (4) II.

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. 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. Bahre

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. 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 U.S.S.R. Dingemans

***125A. North Africa and the Middle East. (4) III.**

Lecture—3 hours; term paper. Prerequisite: courses 1 and 2 or consent of instructor. Geography of the Islamic world of North Africa and Southwest Asia: climatic and physical features; cultural areas, settlement patterns and the influence of Islam; economic patterns and development.

125B. Sub-Saharan Africa. (4) II.

Lecture—3 hours; term paper. Prerequisite: courses 1 and 2 or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara. 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. Simoons

131. California. (4) I.

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.

Gregor

141. Economic Geography. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Analysis of the economic regionalization of the earth and associated trade and transportation networks. Gregor

***142. Geography of Agriculture. (4) II.**

Lecture—3 hours; term paper. 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. 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. 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. Thompson

***152. Geographical Discovery and Exploration.**

(4) I.

Lecture—4 hours. Expansion of western world's geographical horizons from ancient through modern times. Thompson

***154. Geography of Settlement. (4) III.**

Lecture—3 hours; term paper. Prerequisite: courses 2 and 5 or consent of instructor. Evolution of settlements; morphology and function of settlements; determinants of settlement patterns; theories of settlement systems. Emphasis on rural settlement features and non-western settlements.

155. Urban Geography. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Geography of land use within cities. The processes of change and theories of economic and social organization of urban space. The urban landscape as a product of history, planning policy, transportation system and residential structure. Dingemans

156. The Urban Region. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Location and functional interdependence of cities. Relations between city and hinterland, including labor shed, service area, and economic base. Role of urbanization in regional development. 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, agriculture, mining, municipal, and recreational interests. Roles of industry, government, and society in creating and resolving resource and environmental problems. 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. Shelton

170. Cultural Ecology. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 2 or Anthropology 2. Geographic theories of environment-man relations. Ecologic relations of gatherers, fishermen, hunters, cultivators, and urbanites; their environmental impacts; their domestic plants and animals. Jett

171. Cultural Geography. (4) I.

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. Simoons

***172. Geography of Domesticated Animals. (4) II.**

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. Simoons

***173. Plants and Culture History. (4) II.**

Lecture—4 hours. Prerequisite: course 1 or 2 or consent of instructor. The cultural processes 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. —

192. Student Internship in Geography.

(2-4) I, II, III.

Internship—5-15 hours at employing agency; term paper. Prerequisite: Consent of an undergraduate Geography adviser and consent of instructor. Supervised program of student internships with public agencies dealing with geographical problems. The application and evaluation of theoretical concepts through work experience with a variety of assignments and work schedules. (P/NP grading only.) The Staff

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Tuan in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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) II.

Seminar—3 hours. Region to be announced annually. Jett

291. Seminar in Cultural Geography. (4) III.

Seminar—3 hours.

Tuan

292. Seminar in Landform Analysis. (4) II.

Seminar—3 hours.

Helgren

***293. Seminar in Political Geography. (4) I.**

Seminar—3 hours. —

***294. Seminar in Climatology. (4) II.**

Seminar—3 hours. —

***295. Seminar in Urban Geography. (4) I.**

Seminar—3 hours. —

296. Seminar in Agricultural Geography. (4) I.

Seminar—3 hours.

Gregor

***297. Seminar in Industrial Geography. (4) I.**

Seminar—3 hours.

Gregor

298. Group Study. (2-5) I, II, III.

Prerequisite: consent of instructor.

The Staff

299. Research. (2-12) I, II, III.

(S/U grading only.)

The Staff (Chairperson 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.)
Thompson

GEOLOGY

Eldridge M. Moores, Ph.D., *Chairperson of the Department*

Department Office, 175 Physics-Geology Building

Professors:

- Cordell Durrell, Ph.D.
- Charles G. Higgins, Ph.D.
- Jere H. Lipps, Ph.D.
- ¹Ian D. MacGregor, Ph.D.
- Eldridge M. Moores, Ph.D.
- ¹James W. Valentine, Ph.D.

Associate Professors:

- Richard Cowen, Ph.D.
- Harry W. Green II, Ph.D.

Assistant Professors:

- Gerard C. Bond, Ph.D.
- Wayne C. Shanks, M.S. (*Acting*)
- Robert J. Twiss, Ph.D.
- Kenneth L. Verosub, Ph.D.

Lecturers:

- Jon Branstrator, Ph.D.
- Robert A. Matthews, A.B.
- Dennis R. Ojakangas, Ph.D.
- Raymond W. Wittkopp, B.S.

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Departmental Major Advisers.—G. C. Bond, R. Cowen.

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 may 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.—Required: Biological Sciences 1 or 10; Chemistry 1A-1B-1C or preferably 4A-4B-4C; Geology 60-60L; Mathematics 21A-21B-21C and 22A or 22B or 22C; Physics 4A-4B-4C. Students electing the specialization in paleobiology must take Biological Sciences 1, and must substitute Zoology 2 and Mathematics 15 for Physics 4C and

one course from the Mathematics 22 series. Recommended: Geology 1-1L, 2-2L, 3-3L.

Upper Division Courses.—Required: Geology 102, 103-103L, 105-105L, 106-106L, 107-107L, 118, 124A-124B, and 190 (repeat course at least once). Those specializing in paleobiology must substitute appropriate courses (approved by the major adviser) for Geology 124A-124B above. Additional courses may be selected for emphasis in physical or environmental geology.

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 Credential Subject Representative: G. C. Bond. See page 215 for the Teacher Education Program.

Lower Division Courses

1. Evolution of the Earth. (3) I, III.

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.

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.

2. Landforms. (3) III.

Lecture—3 hours. Prerequisite: course 1 recom-

mended. Landforms and landscapes—the sculpture of the Earth's surface by natural processes.

Higgins

2L. Landforms Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: courses 1L and 2 (preferably taken concurrently). How to study and interpret landforms geologically; an introduction to some of the geomorphologist's tools—maps, models, aerial photographs, and the landscape around us.

Higgins

3. History of Life. (3) II.

Lecture—3 hours. Prerequisite: course 1 recommended. 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.

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.

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.

Durrell

17. Earthquakes 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.

20. Geology of California. (2) III.

Lecture—2 hours; demonstration—1 hour. Prerequisite: course 25 recommended. 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.

*25. Geologic Excursions. (2) I.

Lecture—1 hour; in the field—several Saturdays, 8-5. Prerequisite: course 1 (preferably taken concurrently). 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.

The Staff

60. General Mineralogy. (3) I.

Lecture—3 hours. Prerequisite: high school

chemistry. Crystallography; physical and chemical structure and properties of minerals; mineral genesis.

Green

60L. General Mineralogy Laboratory. (2) I.

Laboratory—6 hours; two one-day field trips. Prerequisite: course 60 (preferably taken concurrently). Morphological crystallography; stereographic projection; identification of the common rock-forming minerals.

Green

99. Special Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

The Staff (Chairperson in charge)

Upper Division Courses

102. Field Geology. (5) III.

Lecture—1 hour; field work—8 full days; final report. Prerequisite: courses 103L, 105L, and 106L. Introduction to geologic field study; tools, methods, geologic mapping, and preparation of reports.

The Staff

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.

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.

Durrell

105. Structure of the Earth. (3) I.

Lecture—3 hours. Prerequisite: course 1 or consent of instructor. Structure of the Earth's interior: variation of seismic velocity, density, composition, and temperature with depth; isostasy; introduction to plate tectonics and continental drift; crustal deformation: faults and folds; examples of regional deformation with reference to plate tectonics.

Twiss

105L. Structural Geology Laboratory. (4) I.

Lecture—2 hours; laboratory—4 hours; two full-day field trips and reports. Prerequisite: course 105 (may be taken concurrently), and working knowledge of trigonometry; course 1L recommended. Graphic solutions to structural problems; interpretation of geologic maps; structure sections; introductions to field techniques, structural analysis, concepts of stress and strain, and their application in geology.

Twiss

106. Ancient Environments. (3) II.

Lecture—3 hours. Prerequisite: course 1 or consent of instructor. Study of modern and ancient envi-

ronments; 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. Bond

106L. Ancient Environments Laboratory. (2) II.

Laboratory—6 hours; two or three one-day field trips. Prerequisite: course 106 (preferably taken concurrently), 105L or consent of instructor. Introduction to stratigraphic procedures, identification of environmentally diagnostic rocks and fossils, problems of making geologic maps, recognition of ancient environments in the field. Bond

107. Principles of Paleobiology. (3) III.

Lecture—3 hours. Prerequisite: Biological Sciences 1. The 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. The Staff

107L. Principles of Paleobiology Laboratory. (2) III.

Laboratory—6 hours (including 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. The Staff

111A. Paleobiology of Invertebrates. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of the major phyla of invertebrates. Cowen

111B. Paleobiology of Protista. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of single-celled organisms. 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. The Staff

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. Shanks

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 his-

tory, and the sea's biota; man's utilization of marine resources. (Same course as Environmental Studies 116.) Powell, Cowen

117. Physics of the Earth. (3) III.

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. Verusub

117L. Physics of the Earth Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 117 (may be taken concurrently). Introduction to field use of geophysical instruments. Field problems will be assigned to aid in development of techniques in geophysical exploration and analyses of data. Verusub

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

120. Opaque Optical Mineralogy: Ore Microscopy. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 60 and 60L. Introduction to the techniques used to identify opaque minerals. Moores, Wittkopp

124A. Optical Mineralogy. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 60L; course 103L recommended. Optical properties of crystals and techniques of mineral identification with the petrographic microscope. Green

124B. Petrography. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 103L and 124A. Use of the petrographic microscope in describing, classifying, and determining origin of igneous, sedimentary, and metamorphic rocks. Lecture emphasizes origin and distribution of major rock types; laboratory study of selected thin sections. Moores, Bond

125. Igneous Petrology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124B 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. The Staff

126. Sedimentary Petrology. (4) I.

Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: courses 106 and 106L or consent of instructor; course 124B recommended. An advanced treatment of the origin, texture, composition, diagenesis, and classification of the major sedimentary rock types. Interpretative petrographic study of selected samples. Bond

128. Metamorphic Petrology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124B or consent of instructor. Metamorphic processes. Origin and characteristics of metamorphic rocks. Laboratory study of representative rock suites in hand specimen and thin section. 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, nonmetallic, and energy-producing materials. Problems of discovery, production, and management. Estimations and limitations of reserves, and their sociological, political, and economic effects. 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, earthquake prediction. Analytic techniques, presentation of reports, and legal aspects of selected case studies. Matthews

138. Seminar in Stratigraphic Paleontology. (3) I.

Lecture—1 hour; seminar—2 hours. Prerequisite: courses 3, 3L, 106, and 106L. Introduction to zone and range concepts, geologic time, and pertinent aspects of codes of stratigraphic and zoological nomenclature. Participants analyze major evolutionary developments within animal, protistan and plant phyla as keys to geologic age determinations. Branstrator

150A. Physical and Chemical Oceanography. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Environmental Studies 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, currents, waves, tides, mixing, major oceanic geochemical cycles. (Same course as Environmental Studies 150A.) Powell

150B. Geology of the Oceans. (3) II.

Lecture—3 hours. Prerequisite: courses 60, 60L, 105, or consent of instructor. Introduction to the origin and geologic evolution of ocean basins. Composition and structure of oceanic crust; marine volcanisms; and deposition of marine sediments. Interpretation of geologic history of the ocean floor in terms of sea-floor spreading theory. (Same course as Environmental Studies 150B.) Bond, 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 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.)

Richerson, Valentine

152. Photogeology and Remote Sensing. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1 or Geography 1, stereoscopic vision; courses 1L or 2L, 102 recommended. Field use of aerial photographs: types and availability, stereoviewing, and basic geometry. Geological uses and interpretation of aerial photographs and of data obtained by remote sensing. Higgins

153. Geomorphology. (3) I.

Lecture—3 hours. Prerequisite: course 2 or Geography 1; courses 1L and 2L recommended. The processes that shape the Earth's surface and how they work. An introduction to geomorphic observation and theory. Higgins

160. Global Tectonics. (3) III.

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. 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 quadric, Mohr-circle construction; stress; strain; strain-rates, elasticity. Solution of general, three-dimensional problems with geological application. 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.) Shen, Matthews

180. 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. Laboratory sessions will be given on use of the x-ray diffractometer and electron microprobe both as a scanning electron microscope and analytical tool. Shanks

181. Geologic Applications of Computers. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite:

site: upper division standing and one upper division geology course or consent of instructor. Introduction to solution of geological and paleobiological problems by computer methods. Ojakangas

190. Seminar in Geology. (1) I, II, III.

Discussion—1 hour; seminar—1 hour. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. May be repeated for credit. (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 (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-4) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

201A. Ecological Theory. (3) I.

Lecture—3 hours. 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 Botany, Ecology and Zoology 201A.) Salt, Major, Valentine

201B. Analysis of a Selected Ecosystem. (3) I.

Lecture—3 hours; one field trip—to be arranged. 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 (Goddard in charge)

201C. The Changing Biosphere. (3) III.

Lecture—3 hours. Prerequisite: graduate standing; and course 201A 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 (Richardson in charge)

206. Stratigraphic Analysis. (3) I.

Lecture—3 hours. Prerequisite: courses 105L and 106L or consent of instructor. Advanced historical geology: analysis of stratigraphy and geologic his-

tory of North America and selected parts of other continents. Emphasis on interpreting lithologic assemblages and stratigraphic relations in terms of modern tectonic-dispositional models. Bond

209. Origin and Significance of Metamorphic Textures. (4) III.

Seminar—3 hours; laboratory—3 hours. Prerequisite: course 128 recommended. Interpretation of metamorphic textures in terms of surface energy anisotropy, growth anisotropy, crystal deformation processes, and disequilibrium phenomena. Offered in even-numbered years. Green

213. Studies in Geomorphology. (3) I.

Lecture-seminar—3 hours. Prerequisite: course 153 or Geography 108. Topics selected from: studies of landforms and landscape development and of the action of formative processes, methods of analysis of geomorphic problems, development of geomorphic theory. Higgins

216. Tectonics (3) I.

Seminar—3 hours. Prerequisite: course 160 or consent of instructor. Nature and evolution of tectonic features of the Earth. Causes, consequences, and evolution of plate motion, with selected examples from the Earth's deformed belts. Moores

***218A. Structural Analysis I: Macrofabrics. (3) II.**

Seminar—3 hours. Prerequisite: consent of instructor. Geometric and kinematic analysis and interpretation of mesoscopic and macroscopic geologic structures and fabrics; geometry of folding, superposed folding, and folded lineations; symmetry arguments in the interpretation of fabrics; determination of slip lines of deformation; regional structural synthesis. Offered in odd-numbered years. Twiss

***218B. Structural Analysis II: Microfabrics. (4) III.**

Seminar—3 hours; laboratory—3 hours. Prerequisite: consent of instructor; course 218A recommended. Microscopic structural aspects of deformed metamorphic rocks, emphasizing deformation features and the origin and significance of preferred crystallographic orientation. Offered odd-numbered years. Green

***226. Advanced Sedimentation and Sedimentary Petrology. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 126 or consent of instructor. Topical study of major sedimentary rock assemblages of stable platform areas and of regions of crustal instability in respect to depositional environments, depositional processes, and provenance. Laboratory study of selected suites of sedimentary rocks. Bond

236. Physical Geology of California. (2) I, II, III.

Seminar—2 hours.

Durrell

***254. Phase Equilibria. (3) I.**

Seminar—3 hours. Prerequisite: Chemistry 1C

and Mathematics 22A; physical chemistry recommended. Physiochemical aspects of the phase relations in silicate systems and their application to the petrogenesis of igneous and metamorphic rocks.
MacGregor

***255. Genesis of Metamorphic Rocks. (3) II.**

Seminar—3 hours. Prerequisite: course 124B; courses 125, 254 recommended. Physiochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks.

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.
Cowen

***261. Paleocoenology. (3) I.**

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.
Valentine

262. Paleosystematics. (3) I.

Lecture—1 hour; seminar—2 hours. Prerequisite: course 107, Mathematics 15. Recommended: Genetics 100B, Mathematics 13. Principles and methods of taxonomy of fossil organisms.
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.
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.
Lipps

***280. Igneous Petrology. (3) I.**

Seminar—2 hours; laboratory—3 hours. Prerequisite: course 124B. Integrated laboratory, field study, and seminar on igneous processes and products.
MacGregor

290. Seminar in Geology. (2) 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 (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

GERMAN

Clifford A. Bernd, Ph.D., *Chairperson of the Department*

Department Office, 416 Sproul Hall

Professors:

Clifford A. Bernd, Ph.D.

³ *Wolfgang W. Moelleken, Ph.D.

Associate Professors:

*John F. Fetzer, Ph.D.

Roland W. Hoermann, Ph.D.

H. Guenther Nerjes, Ph.D.

Assistant Professors:

Wilbur A. Benware, Ph.D.

Karl R. Menges, Ph.D.

Fritz Sammern-Frankenegg, Ph.D.

Lecturer:

William M. Estabrook, Ph.D.

Departmental Major Adviser.—J. F. Fetzer.

Graduate Advisers.—W. A. Benware, H. G. Nerjes.

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. Courses in translation do not fulfill major requirements.

Honors and Honors Program (see page 181).—The honors program 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

NOTE: For key to footnote symbols, see page 220.

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 Credential Subject Representative: W. M. Estabrook. See page 215 for the Teacher Education Program.

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 ½-hour sessions. Not open for credit to students who have completed the first two years of high school German. Estabrook

2. Elementary German. (6) I, II, III.

Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1. Estabrook

2X. Intensive Elementary German. (12) II.

Discussion—5 hours; laboratory—two ½-hour sessions. 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. Estabrook

3. Intermediate German. (6) I, II, III.

Discussion—5 hours; laboratory—two ½-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. 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) I.

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.) Hoermann

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.) Hoermann

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.) Hoermann

15. The Development of German Literature. (4) I, 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. 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. (P/NP grading only.) The Staff (Chairperson in charge)

99. Special Study for Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Upper Division Courses**100A. Advanced German Conversation. (4) I.**

Lecture—3 hours; instructor-student conferences.
Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency. The Staff

100B. Advanced German Conversation. (4) II.

Lecture—3 hours; instructor-student conferences.
Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency. The Staff

100C. Advanced German Conversation. (4) III.

Lecture—3 hours; instructor-student conferences.
Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency. The Staff

101. Composition and Conversation. (4) I, II, III.

Discussion—3 hours; written reports. Prerequisite: course 4 or consent of instructor. 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; written reports. 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; written reports. Prerequisite: course 102 or consent of instructor. Advanced essay writing and discussion of selected texts. The Staff

104. German Grammar and Stylistics. (4) I.

Lecture—1 hour; discussion—2 hours; written reports. Prerequisite: course 103 or consent of instructor. Exercises in grammar and stylistics; translation of selected English texts into German. The Staff

105. Linguistic Analysis of German. (4) II.

Lecture—3 hours; assigned problem sets. The descriptive study of modern German with consideration of its structural differences from English. (Same course as Linguistics 105.) Benware

106. History of the German Language. (4) III.

Lecture—3 hours; written reports. Survey of the development of the German language and study of its structure in historical perspective. (Same course

as Linguistics 106.)

Benware

109. Survey of German Culture. (4) II.

Lecture—2 hours; discussion—1 hour; written reports. Prerequisite: course 4 or its equivalent. Major developments in such areas of German life as the arts, philosophical thought, social institutions, and political history. Fetzner

110. Masterpieces of German Prose from Goethe to Kafka. (4) III.

Lecture—3 hours; written reports. Knowledge of German not required. 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. May not be counted as part of the major in German. Fetzner

111. Masterpieces of German Drama from Lessing to Brecht. (4) II.

Lecture—3 hours; written reports. Knowledge of German not required. Study in translation of works which have helped shape the European drama or were crucial in the development of German literature. May not be counted as part of the major in German. Menges

112. The Development of Germanic Mythology. (4) II.

Lecture—3 hours; written reports. Knowledge of German not required. Germanic myth, legend, and saga in the intellectual life of the German people from the Middle Ages through Romanticism, culminating in Wagner's *Gesamtkunstwerk*. May not be counted toward the major in German. Fetzner

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*. May not be counted toward the major in German. Nerjes

114. Goethe's *Faust*. (4) II.

Lecture—3 hours; conferences and reports. Knowledge of German not required. A detailed analysis and aesthetic critique in English. May not be counted toward the major in German. Nerjes

115. German Literature of the Twentieth Century. (4) I.

Lecture—3 hours; written reports. Knowledge of German not required. Readings in major German writers from the poets at the turn of the century (Hofmannsthal, Rilke, etc.) to the playwrights (Dürrenmatt, Weiss, etc.) and prose stylists (Grass, Frisch, etc.) of today. May not be counted toward the major in German. Hoermann

116. 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. May not be counted toward the major in German. Menges

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*. May not be counted toward the major in German. Hoermann

118. Brecht. (4) II.

Lecture—3 hours; written reports. Knowledge of German not required. A study of Brecht's Epic Theater and his doctrine of aesthetic alienation. May not be counted toward the major in German. Menges

119A. Survey of German Literature from the Beginnings through Classicism. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 4 or 6A-6B or consent of instructor. An integrated view of the philosophical, historical, and stylistic components in the development of German literary tradition up to Romanticism. Menges

119B. Survey of German Literature from Romanticism to the Present. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119A or consent of instructor. Continuation of course 119A. Menges

119C. Literary Interpretation. (4) III.

Lecture—2 hours; discussion—1 hour; written reports. Prerequisite: course 4 or 6A-6B; courses 119A and 119B recommended. Guided discussion of major German literary works and demonstrations of the technique of analysis. Fetzner

120. The Medieval Period in German Literature. (4) I.

Lecture—3 hours; written reports. Prerequisite; course 101 (may be taken concurrently) or consent of instructor. The literary-philosophical profile of the "Mittelhochdeutsche Blütezeit" in terms of the significant courtly and folk epics and the "Minnesang." Readings in modern German. Moelleken

123. Goethe. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Goethe's lyrics, *Werther*, *Götz* and the masterworks of his classical period such as *Iphigenie*, *Tasso* and *Faust*. Nerjes

124. Schiller. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or 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*, *Die Jungfrau von Orleans*. Nerjes

132. The German "Novelle." (4) II.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) 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. Bernd

133. The German Drama. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Readings in the works of Germany's leading dramatists from the seventeenth century to the present day, such as Lessing, Goethe, Schiller, Kleist, Hebbel, Hauptmann, Brecht. Fetzner

140. Modern German Literature. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Selections from the significant works of major twentieth-century writers, such as Hesse, Mann, Kafka, Rilke, Brecht, Grass. Menges

144A. German Literature and History to 1815. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or 6A and 6B or consent of instructor. Literature of Germany viewed in relation to such major social and political events as: the Reformation, the Thirty Years' War, the rise of Prussia, the impact of the French Revolution and the Napoleonic wars. Menges

144B. German Literature and History since 1815. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or 6A and 6B or consent of instructor. German literature viewed in relation to such major historical events as: the Revolution of 1848, the founding of the German Empire, World Wars I and II, and the establishment of the two Germanies after 1945. Menges

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) I, II, 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. (P/NP grading only.) Eastbrook

- 198. Directed Group Study. (1-5) I, II, III.**
(P/NP grading only.) The Staff (Bernd in charge)
- 199. Special Study for Advanced Undergraduates. (1-5) I, II, III.**
(P/NP grading only.) The Staff (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. Offered in even-numbered years. (Same course as Linguistics 200.) 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. Offered in odd-numbered years. Benware
- 202. Middle High German. (4) III.**
Seminar—3 hours. Outline of grammar; selections from Middle High German epic and lyric poetry. 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. Offered in even-numbered years. (Same course as Linguistics 203.) 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. (Same course as Linguistics 205.) Benware
- 209. 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. (Same course as Linguistics 209.) Benware
- 210. Techniques of Literary Scholarship. (4) I.**
Seminar—3 hours. The bibliographical, organizational, and methodological tools and resources for advanced, independent research. 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. 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. 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. 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. Bernd
- 249. Medieval Epic Literature. (4) II.**
Seminar—3 hours. Prerequisite: course 202 or consent of instructor. A critical analysis of selected epic poetry of the "Stauferzeit," such as *Parzival*, *Tristan und Isolde*, and the *Nibelungenlied*. All texts read in Middle High German. Moelleken
- 250. Medieval Lyric Literature. (4) III.**
Seminar—3 hours. Prerequisite: course 202 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. 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. 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. 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. 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. Nerjes

NOTE: For key to footnote symbols, see page 220.

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. 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. Menges

259. Studies in Kafka. (4) I.

Seminar—3 hours. Study of Kafka's narrative techniques with special emphasis in the shorter works on the existential development from its roots in expressionism. Offered in even-numbered years. 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. 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. Menges

285. Middle High German Literature. (4) III.

Seminar—3 hours. Prerequisite: course 202 or consent of instructor. An extensive reading of Middle High German texts in the original language. Examines linguistic and literary problems. 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. Bernd

289. German Literature of the Baroque. (4) III.

Seminar—3 hours. The "Elegantiadideal" and the varying methods used to portray it in seventeenth-century German literature. May be repeated for credit with consent of instructor. Bernd

290. The Enlightenment in German Literature. (4) II.

Seminar—3 hours. The revolt against the excesses of the "Elegantiadideal," and the evolution of a new literature based on reason and wit. May be repeated for credit with consent of instructor. 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. 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. 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. 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. 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. 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. Menges

298. Group Study. (1-5) I, II, III.

The Staff (Bernd in charge)

299. Research. (1-12) I, II, III.

(S/U grading only) The Staff (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**390A. The Teaching of German. (1) I.**

Lecture—1 hour. 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. (S/U grading only.) Estabrook

390B. The Teaching of German. (1) II.

Lecture—1 hour. Prerequisites: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants. (S/U grading only.) 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 (Bernd in charge)

GREEK—See Classics

HEBREW—See Religious Studies

HISTORY

Walter L. Woodfill, Ph.D., *Chairperson of the Department*
Department Office, 176 Voorhies Hall

Professors:

- ³ *William M. Bowsky, Ph.D.
David Brody, Ph.D.
- ¹ Daniel Calhoun, Ph.D.
- ³ *Paul Goodman, Ph.D.
W. Turrentine Jackson, Ph.D.
David L. Jacobson, Ph.D.
- ¹ José R. Juárez, Ph.D.
Kwang-Ching Liu, Ph.D.
Jung-Pang Lo, Ph.D. (*Emeritus*)
C. Bickford O'Brien, Ph.D. (*Emeritus*)
Rollie E. Poppino, Ph.D.
- ³ Richard N. Schwab, Ph.D.
- ¹ Morgan B. Sherwood, Ph.D.
James H. Shideler, Ph.D.
- ² *Wilson Smith, Ph.D.
- ⁵ Donald C. Swain, Ph.D.
F. Roy Willis, Ph.D.
Walter L. Woodfill, Ph.D.

Associate Professors:

- Arnold J. Bauer, Ph.D.
- ¹ Daniel R. Brower, Jr., Ph.D.
- ³ *Robert O. Crummey, Ph.D.
- ³ Manfred P. Fleischer, Ph.D.
C. Roland Marchand, Ph.D.
Richard J. Miller, Ph.D.
Don C. Price, Ph.D.
Stylianios Spyridakis, Ph.D.

Assistant Professors:

- Cynthia L. Brantley, Ph.D.
- *Peter K. Cline, Ph.D.
- William W. Hagen, Ph.D.
- Eugene Lunn, Ph.D.
- Ted W. Margadant, Ph.D.
- Ruth E. Rosen, M.A. (*Acting*)

§ § §

Departmental Advisors.—A. J. Bauer, C. L. Brantley, P. K. Cline, W. W. Hagen, D. L. Jacobson, E. Lunn, C. R. Marchand, T. W. Margadant, R. J. Miller, D. C. Price, R. N. Schwab, S. Spyridakis.

Graduate Advisers.—W. M. Bowsky, D. Brody, D. Brower, W. W. Hagen, K. C. Liu, J. H. Shideler, F. R. Willis.

Introductory Courses.—Courses 3, 4A, 4B, 4C, 5, 9A, 9B, 17A, 17B, 21A, 21B, 22, 27A, 27B, 51, 61, 72A, 72B, 78A, 78B, 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, 78A, 78B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177, 180A, 180B, 183A, 183B. Upper division courses may be taken with consent of instructor. (See also page 42.)

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.—Students majoring in history must complete at least 36 upper division units in history. The upper division requirements for the major may be satisfied by electing either Plan I or Plan II below.

For both plans, the fields for the distribution of upper division courses are: Europe, Africa, Latin America, United States, East Asia. A student may group courses from two related fields to make a field of concentration when there are not enough courses in one particular area of study. Standard groupings, which do not require an adviser's approval, include: Africa and Europe, Africa and Latin America, Africa and the United States. For other groupings, or to meet special needs, a student should obtain the written approval from an adviser. Within broad fields, a student may wish to concentrate some of the courses on a particular area or period, such as China or Great Britain or Medieval Europe. Special approval is not required.

Plan I

a) A minimum of six courses in a field of concentration, including a two-quarter sequence of courses.

b) A minimum of three courses in a field other than the field of concentration.

Plan II

a) A minimum of three courses in a field of concentration, including a two-quarter sequence of courses.

b) History 101, 102 (or the equivalent), and at least 4 units of 198 or 199 taken as a block so as to constitute the equivalent of a course. History 102 and 198 or 199 must be taken in the student's field of concentration.

c) A minimum of three courses in a field other than the field of concentration. The purpose of Plan II is to encourage interested students, including those preparing for graduate work in history, to enroll in a seminar, to undertake independent work, and to study the history of history as part of the major. Students preferring more active engagement in research and writing, are encouraged to elect Plan II.

Honors.—A student may become eligible for graduation with highest honors by meeting the minimum grade-point average required by the College of Letters and Science and by demonstrating unusually imaginative or creative work in history. Such creative work may be demonstrated in various ways: in undergraduate seminars, in independent study, in special projects, or by distinguished work in Plan II. Departmental recommendation, based on clear evidence of distinction and originality, is a prerequisite for the awarding of highest honors.

Graduate Study.—The Department of History offers programs of study and research leading to the M.A., M.A.T., and Ph.D. degrees in history. Detailed information may be obtained by writing to the Graduate Adviser, Department of History.

Teaching Credential Subject Representative: D. L. Jacobson, See page 215 for the Teacher Education Program.

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. Readings in original sources.
Willis

4A. History of Western Civilization. (4) I, III.

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.

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

5. Film Perspectives on Western Civilization. (4) III.

Lecture—3 hours; discussion—1 hour. A number of classic films will be used to explore major social, political and cultural themes from the late Middle Ages to the present. Lectures and readings will provide historical frameworks for interpretation by the students.
Lunn

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.
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.
Miller

17A. History of the United States. (4) I, II, III.

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. 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. 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. 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.

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.

***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. Cline

***61. Discovery and Settlement of Spanish America. (4) II.**

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. Poppino

63. Introduction to Brazilian History. (4) I.

Lecture—1 hour; seminar—3 hours. Reading of basic documents in English translation and extensive use of slides. Emphasis is on nineteenth century slavery, race relations and economic development. 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. Rosen

72B. Women in Twentieth-Century America. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 72A recommended. Continuation of course 72A into twentieth century. Rosen

***78A. Great Issues in American History. (4) I.**

Lecture—3 hours; discussion—1 hour. Discussion of historians' views of the nation's past, focusing upon the conflict of interpretation about key periods and events up to 1865. Jackson

***78B. Great Issues in American History. (4) II.**

Lecture—3 hours; discussion—1 hour. Discussion of historians' views of the nation's past, focusing upon the conflict of interpretation about key periods and events since 1865. Jackson

***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. Sherwood

90. Modernization of China and Japan. (4) III.

Seminar—3 hours; oral report and term paper. Prerequisite: consent of instructor; course 9A or 9B recommended. Reading and discussion of salient aspects of the modern history of China and Japan. Designed for freshmen and sophomores. Background of the contemporary scene is stressed. Enrollment limited. Liu, Miller

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.) The Staff (Chairperson in charge)

99. Special Study for Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Upper Division Courses

101. Introduction to Historical Thought and Writing. (5) III.

Lecture-discussion—4 hours; term paper. Prerequisite: consent of instructor. Study of the history of historical thought and writing, analysis of critical and speculative philosophies of history and evaluation of modes of organization, interpretation and style in historical writing. Margadant

102A-D. 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 1800; H. China since 1800; I. Britain; J. Latin America since 1810; K. American History to 1787; L. United States, 1787-1896; M. United States since 1896; N. Japan; O. Africa. 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. Spyridakis

111B. Ancient History. (4) II.

Lecture—3 hours. History of Greece, the Hellenistic kingdoms, and Rome from the fifth century B.C. to the Punic Wars. Spyridakis

111C. Ancient History. (4) III.

Lecture—3 hours. History of Rome and its empire from the Punic Wars to Constantine. Spyridakis

115A. History of West Africa. (4) II.

Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B, 4C recommended. Introductory survey of the history of West Africa and the Congo region from the earliest times to the present. Brantley

115B. History of East and Central Africa. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 115A recommended. An introductory survey of the history of east and central Africa from 1000 to the present. Brantley

115C. History of Southern Africa, Swaziland, Lesotho, and Botswana from 1500 to the present. (4) I.

Lecture—3 hours; written reports. Prerequisite: courses 115A and 115B recommended. An introductory survey of the history of Southern Africa, including South Africa, Swaziland, Lesotho, and Botswana from 1500 to the present. Brantley

***116. African History: Special Themes. (4) III.**

Lecture—3 hours; term paper. Prerequisite: courses 115A and 115B recommended. 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. Brantley

***121A. Medieval History. (5) I.**

Lecture-discussion and panel presentations—3 hours. European history from "the fall of the Roman Empire" to the eighth century. Bowsky

***121B. Medieval History. (5) II.**

Lecture-discussion and panel presentations—3 hours. European history from Charlemagne to the twelfth century. Bowsky

***121C. Medieval History. (5) III.**

Lecture-discussion and panel presentations—3 hours. European history from the Crusades to the Renaissance. Bowsky

131A. Early Modern European History. (4) I.

Lecture—3 hours. Prerequisite: courses 4A, 4B recommended. Western European history from about 1350 to about 1500. Fleischer

***131B. Early Modern European History. (4) II.**

Lecture—3 hours. Prerequisite: courses 4A, 4B, 131A recommended. Western European history from about 1500 to about 1650. Fleischer

131C. Early Modern European History. (4) III.

Lecture—3 hours. Prerequisite: courses 4A, 4B, 131B recommended. Western European history from about 1650 to about 1789. Fleischer

133. The Age of Ideas. (4) I.

Lecture—3 hours. The Enlightenment and its background in the seventeenth century. Schwab

134A. The Age of Revolution. (4) III.

Lecture—3 hours. Ideas and institutions during the French Revolution and the Napoleonic era. Schwab

***134B. The Age of Revolution. (4) III.**

Lecture—3 hours. Ideas and revolution after 1815. Offered in odd-numbered years. 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. Crumney

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. Crumney

137C. Russian History: The Empire, 1856-1917. (4) II.

Lecture—3 hours. Russian civilization from the Crimean War to the Revolution of 1917. Brower

137D. Russian History: Soviet Russia. (4) III.

Lecture—3 hours; term paper. Russia from the Revolution of 1917 to the present. Brower

141. France Since 1815. (4) I.

Lecture—3 hours; term paper. Margadant, Willis

143A. History of Eastern Europe. (4) II.

Lecture—3 hours; term paper. History, mid-

eighteenth to late nineteenth century, of the subject nationalities of the Hapsburg, Ottoman and Russian Empires (Czechs, Poles, Hungarians, Balkan, and Baltic peoples). Focus on their socioeconomic developments and movements towards cultural and political independence. Hagen

143B. History of Eastern Europe. (4) III.

Lecture—3 hours; term paper. Geographic focus as in course 143A. Concentration, late nineteenth century to the present, on the socioeconomic problems of rural society, industrialization and middle-class development; and the political problems of imperialism, nation-state formation and social revolution. 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. 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. Hagen

144C. Hitler and German National Socialism:

1889-1945. (4) I, III.

Lecture-discussion—3 hours; term paper. The origins of the National Socialist movement in German society and history and analysis of the autobiographical, biographical, and psychohistorical literature of Adolf Hitler. Hagen

145A. The Social History of Nineteenth-Century Europe. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 4C recommended. A survey of European social history during the period of industrialization. Topics include population growth, family structure, economic development, urbanization, class stratification, social protest, and ideologies of social change. Margadant

145B. The Political History of Nineteenth-Century Europe. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 4C recommended. Surveys European political history 1815-1918. Topics include the Restoration era, the Revolutions of 1848, the unification of Italy and Germany, Social Democracy, Nationalist movements, Imperialism, and World War I. Margadant

146A. Europe in the Twentieth Century. (4) I.

Lecture—3 hours; term paper. Survey of the history of Europe from 1919 to 1939. Willis

146B. Europe in the Twentieth Century. (4) III.

Lecture—3 hours; term paper. Survey of the history of Europe since 1939. Willis

147A. European Intellectual History, 1800-1870.

(4) I.

Lecture—3 hours; term paper. European thought in the early industrial era. Shifting cultural frameworks, from romanticism to scientism; liberal and socialist reactions to social change. Lunn

147B. European Intellectual History, 1870-1920.

(4) II.

Lecture—3 hours; term paper. The cultural and intellectual watershed of the late nineteenth and early twentieth century. The emergence of modern art and literature; psychoanalysis and the new social sciences. Lunn

147C. European Intellectual History, 1920-1970.

(4) III.

Lecture—3 hours; term paper. European thought and culture since World War I. The impact of Communism and Fascism; Existentialism; new currents since the late 1950's. Lunn

151A. History of England. (4) I.

Lecture—3 hours. Prerequisite: course 4A recommended. Survey of English history to the latter part of the fifteenth century. Woodfill

151B. History of England. (4) II.

Lecture—3 hours. Prerequisite: courses 4A, 4B, and 151A recommended. Survey of English history from the latter part of the fifteenth century to the latter part of the eighteenth century. Woodfill

151C. History of England. (4) III.

Lecture—3 hours. Prerequisite: courses 4B, 4C, 151A, and 151B recommended. Survey of English history from the latter part of the eighteenth century to the present. Cline

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. Woodfill

156. Social and Economic History of Great Britain since 1760. (5) I.

Lecture—2 hours; discussion—2 hours; research 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 preindustrial to post-industrial Britain. Cline

NOTE: For key to footnote symbols, see page 220.

161A. Latin American History. (4) I.

Lecture-discussion—3 hours; written reports. Pre-columbian civilization of Middle America and the Andean region (mainly Aztec and Inca); the impact of European conquest and colonization; the formation of a hybrid culture. Extensive use of photographic slides. Bauer

161B. Latin American History. (4) II.

Lecture-discussion—3 hours; written reports. Evolution of modern Latin America: export economies; oligarchic rule; reform and revolution; the difficulties of the twentieth century. Emphasis on Mexico, Cuba, the Andean region, Chile, and Argentina. Photographic slides. Bauer

162. History of the Andean Region. (4) III.

Lecture-discussion—3 hours; written and/or oral reports. History of the Andean region, the area that now comprises modern Peru, Bolivia, and Chile, from the beginning of human settlement to the present. 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. 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. Poppino

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. Poppino

***166A. History of Mexico to 1848. (4) I.**

Lecture-discussion—3 hours; written and/or oral reports. The political, economic, and social development of pre-Columbian, colonial and national Mexico to 1848. Offered in odd-numbered years. Juárez

166B. History of Mexico Since 1848. (4) I.

Lecture-discussion—3 hours; written and/or oral reports. The history of Mexico from 1848 to the present. Offered in even-numbered years. Juárez

***168. History of Inter-American Relations. (4) II.**

Lecture—3 hours; written reports. Diplomatic history of Latin America since independence, intra-Latin American relations, relations with the United States, participation in international organizations, and communism in Latin America. Poppino

169A. Mexican-American History. (4) I.

Lecture-discussion—3 hours; written and/or oral reports—1 hour. The economic, social, religious, cultural and political development of the Spanish-speaking population of the Southwestern United States from about 1800 to 1910. Juárez

169B. Mexican-American History. (4) II.

Lecture-discussion—3 hours; written and/or oral reports—1 hour. The role of the Mexican and Mexican-American or Chicano in the economy, politics, religion, culture and society of the Southwestern United States since 1910. 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. Jacobson

170B. The American Revolution. (4) III.

Lecture—3 hours; term paper. 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. Jacobson

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. 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. 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. Calhoun

171C. The Emergence of Modern America. (4) III.

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. Brody

174A. 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 1900 to the 1930s. Shideler, Swain

174B. Recent History of the United States. (4) III.

Lecture—3 hours; discussion—1 hour. Study of political, economic, and cultural aspects of American democracy from the 1930s to the present. Brody, Swain

***174C. Selected Themes in Twentieth-Century American History. (4) I.**

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.

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. 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. Smith

175C. Intellectual History of the United States.

(4) III.

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: 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. Smith

176A. Social and Cultural History of the United States. (4) I.

Lecture-discussion—3 hours; term paper. Study of social and cultural forces in American society from colonial times through the Civil War with emphasis on social structure, immigration and nativism, racial and occupational groups, social reform movements and changes in social values. Marchand

176B. Social and Cultural History of the United States. (4) II.

Lecture-discussion—3 hours; term paper and written or oral report. Study of social and cultural forces in American society since the Civil War with emphasis on social structure, immigration, urbanization, labor organizations, racial and national groups, social reform movements and changes in social values. Marchand

176C. Social and Cultural History of the United States. (4) III.

Lecture-discussion—3 hours; written and/or oral reports. Prerequisite: course 176A or 176B or consent of instructor. Theories of class structure and "mass" culture in U.S. with attention to several selected topics for the quarter, including such topics as popular religious movements, attitudes toward work and leisure, popular recreation, advertising and mass media, popular literature and class sub-cultures. 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.

***180A. Growth of American Politics to 1815. (4) I.**

Lecture—3 hours; extensive reading and supervised writing. The growth of American politics from the early settlements to 1815 focusing 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. Goodman

***180B. Growth of American Politics, 1815-1890. (4) II.**

Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180A. Goodman

***180C. Growth of American Politics, 1890 to the present. (4) III.**

Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180B. Goodman

183A. The Frontier Experience: Trans-Mississippi West. (4) I.

Lecture—3 hours; written and/or oral reports. 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. Jackson

183B. The Frontier Experience: Trans-Mississippi West. (4) II.

Lecture—3 hours; written and/or oral reports. 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. Jackson

***185A. History of Science and Technology in America. (4) II.**

Lecture—3 hours; oral and written reports. Study of science and technology in America, emphasizing the development of scientific ideas and institutions to 1890. Sherwood

***185B. History of Science and Technology in America. (4) III.**

Lecture—3 hours; oral and written reports. Study of science and technology in America, emphasizing the development of scientific ideas and institutions since 1890. Sherwood

***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.

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.

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.

Shideler

189A. History of California. (4) I.

Lecture—3 hours; written and/or oral reports. History of California to 1865. Offered in even-numbered years.

Jackson

189B. History of California (4) II.

Lecture—3 hours; written and/or oral reports. History of California since 1865. Offered in odd-numbered years.

Jackson

191A. Classical China. (4) I.

Lecture—3 hours; term paper. History of Chinese civilization from its origins through the establishment of city states and the flowering of classical philosophy, to the rise and fall of the First Empire.

Price

191B. High Imperial China. (4) II.

Lecture—3 hours; term paper. Political disunion and the influx of Buddhism; reunification under the great dynasties of T'ang, Sung, and Ming with analysis of society, culture and thought.

Price

192A. Late Imperial China: Background to Revolution. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Patterns and problems of Chinese life traced through the Ming and Ch'ing dynasties. Readings include literary materials in English translation (particularly novels) which reflect the social and intellectual scene, the elite ethos as well as popular culture.

Liu

192B. Late Imperial China: Background to Revolution. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. Internal and external pressures in China from the early nineteenth through the early twentieth century. Emphasis on the impact of the West and the beginnings of revolutionary change.

Liu

192C. Revolutionary China: The Age of Mao Tse-tung. (4) III.

Lecture—3 hours; term paper. Growth and development of the Chinese revolution from its social and intellectual origins. Analysis of such themes as the rejection of traditional culture, resistance to foreign aggression, mobilization of peasant power and the utopian dream.

Price

194A. History of Japan, I. (4) II.

Lecture—3 hours. Survey of Japanese history to the end of the Tokugawa period.

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.

Miller

196. Internship in History. (2-5) I, II, III.

Prerequisite: enrollment dependent on availability of intern positions, with priority to History majors. Supervised internship and study as historian, archivist, curator, or in another history-related capacity, in an approved organization or institution. (P/NP grading only.)

The Staff (Chairperson in charge)

197. 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 Chairperson. 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 (Chairperson in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; upper division standing.

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairperson in charge)

Graduate Courses

201A-0. 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 1800; H. China since 1800; I. Britain; J. Latin America since 1810. K. American history to 1787; L. United States, 1787-1896; M. United States since 1896; N. Japan; O. Africa.

The Staff

NOTE: For key to footnote symbols, see page 220.

***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. Calhoun

***211. Ancient History. (4) I, II.**

Seminar—3 hours. Prerequisite: courses 111A, 111B, 111C. A seminar dealing with the various aspects of Near Eastern and Greco-Roman civilization. Spyridakis

***221. Medieval History. (4) I, II.**

Seminar—3 hours. Prerequisite: courses 121A, 121B, 121C recommended. Topics in the history of medieval and early Renaissance Europe. 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.

***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. 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. Willis

251A-251B. English History. (4-4) I-II.

Seminar—3 hours. Prerequisite: courses 151A, 151B, and 151C; 154 recommended. (Deferred grading only, pending completion of sequence.) 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. Bauer, Poppino

***270. Early American History. (4) III.**

Seminar—3 hours. Jacobson

***271. History of the United States, 1760-1815. (4) II.**

Seminar—3 hours. Goodman

***272. History of the United States, 1815-1848. (4) II.**

Seminar—3 hours. Calhoun

273A-273B. Research Seminar in the Comparative History of Women and the Family. (4-4) II-III.

Seminar—3-3 hours. Research in literature, methods, and historical approaches to the area of women and the family culminating in each student completing a research paper in this field. (Deferred grading only, pending completion of sequence.) Rosen

***274. Recent History of the United States. (4) I.**

Seminar—3 hours. Topics in twentieth century American history. Swain

275. American Social and Intellectual History. (4) III.

Seminar—3 hours. Prerequisite: courses 175A, 175B and 175C, or their equivalent; or consent of instructor. Studies in the recent historiography of, or research and writing in, American social and intellectual history. May be repeated for credit. 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. Sherwood

***279. History of the United States: the Twentieth Century. (4) II.**

Seminar—3 hours. Emphasis on social and economic developments. Brody

***283. History of the United States: The Frontier. (4) III.**

Seminar—3 hours. 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. 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. 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. Price

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

299D. Individual Study. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

Professional Course**300. The Teaching of History in the Secondary School and the Junior College. (3) I.**

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—See Agricultural Economics and Home Economics Education

HUMAN DEVELOPMENT

Related Undergraduate Major.—See pages 93 and 112.

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 206 Walker Hall.

Lower Division Courses

30A-30B. Observational Techniques and Case Study of a Young Child. (2-1) I-II; II-III; III-I.

Lecture—2 hours, laboratory—2 hours (30A); seminar—1 hour (30B). Prerequisite: Psychology 2B or 10 and consent of instructor. Observational techniques. Intensive case study of an individual child aged 6 months to 5 years; analysis and use of observational data. (Deferred grading only, pending completion of sequence.)
Welker

99. Special Study for Undergraduates. (1-5) I, II, III. (P/NP grading only.)

The Staff (Thompson in charge)

Upper Division Courses

100A. Infancy and Early Childhood. (4) I, III.

Lecture—3 hours; discussion—1 hour; field observations of preschool children. Prerequisite: introductory psychology. Analysis of the biological, social, and cultural influences in the psychological growth and development of children, prenatal through age six.
Harper, Lynn

100B. Middle Childhood and Adolescence. (4) I, II.

Lecture—4 hours; field observations of school-age children. Prerequisite: course 100A. Analysis of the interplay of biological and social-cultural factors in the emotional, cognitive and social development from middle childhood through adolescence.
Harper, Horowitz

100C. Adulthood. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Biological, cognitive and social psychological aspects of adult development.
Horowitz, Hawkes

101. Cognitive Development. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Theories of cognitive development including developmental views of perception, learning, memory, concept formation, and language.
Horowitz

102. Social and Personality Development. (4) II.

Lecture—4 hours. Prerequisite: course 100B. Theories of the development of a child's personality through his interactions with children and adults. Emphasis on development of interpersonal and culturally valued skills.
Bryant

103. Cross-Cultural Study of Children. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A. Cross-cultural studies of children in developing countries and among minority groups in the U.S.
Werner

110. Contemporary American Family. (4) II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 100A. Current and future factors influencing American families including changing sex roles, changing sexual mores, and parenthood.
Hawkes, Crockenberg

120. Research Methods in Human Development. (4) I, II.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 100. Research in selected areas of human development (i.e., infancy, learning, cognition, socialization, personality).
Barton, Harper

121. Psychological Assessment of Children. (4) I, II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100B; elementary statistics. Current issues and methodology related to the process of psychological assessment with children.
Bryant, Werner

130. Emotionally Disturbed Children. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Discussion of psychosis, neurosis, behavior disorders, and learning difficulties in children.
Bryant, Bachtold

131. Developmental Disabilities. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Mental retardation and special learning disabilities; etiology, diagnosis, education and socialization. Introduction to community resources.
Barton, Werner

132. The Gifted. (3) II, III.

Lecture—3 hours. Prerequisite: course 100B. Conceptualization, identification and education of the intellectually and creatively gifted individual.
Bachtold, Horowitz

NOTE: For key to footnote symbols, see page 220.

140A-D. Laboratory in Early Childhood Education.

(4) I, II, III.

Discussion—1 hour; seminar—2 hours; laboratory—5 hours. Prerequisite: course 30A. Interaction with children 6 months to 5 years; observation of preschool program, evaluation and testing of theories of early childhood education and child development: A. Communication; B. Infancy; C. Curriculum Analysis; D. Instructional Procedures.

The Staff (Welker in charge)

141. Laboratory: Children and Their Institutions.

(4-6) I, II, III.

Discussion—2 hours; field placement—6-12 hours. Prerequisite: course 100B and consent of instructor. Study and facilitation of children's affective, cognitive, physiological and social development within context of family and school environments, counseling/clinical situations, hospitals and foster group homes.

Bachtold, Bryant

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Thompson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Thompson in charge)

Graduate Courses**210. Issues in Human Development. (3) I.**

Discussion—3 hours. An analysis of the historical, theoretical and empirical issues in human behavioral development in the context of current problems.

Harper

***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 behavioral development in children and infra-human mammals.

Harper

213. Cross-Cultural Study of Children. (3) III.

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.

Werner

214. Interpersonal Competency. (3) II.

Seminar—3 hours; laboratory—1 hour. Prerequisite: consent of instructor. Theory and research focusing on the acquisition of interpersonal skills. Individual differences in the acquisition and performance of a variety of interpersonal competencies. Interpersonal skills required for cooperative and altruistic encounters.

Bryant

***215. Moral Development. (3) II.**

Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Analysis of research on moral development in terms of conceptual and methodological adequacy. The research deals with all ages with emphasis on early childhood through adolescence.

Crockenberg

221. Psychological Assessment of Children. (4) II.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 121 or consent of instructor. Study of children's behavior through examination, analysis and evaluation of perceptual-motor, cognitive, affective and social development. Problems in assessment of exceptional children considered. Assignments focus on preparation of a comprehensive report on one child.

Barton, Bachtold

***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.

Horowitz

237. Parent-Child Interaction. (3) III.

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.

Lynn

290. Seminar. (2) I, II, III.

Discussion—2 hours. Discussion and analysis of research in human development. (S/U grading only.)

The Staff (Thompson in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Thompson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Thompson in charge)

HUMANITIES

Program Office, 4208 Storer Hall or 222 Dramatic Art Building

Committee in Charge:

Robert A. Fahrmer, Ph.D. (*Dramatic Art*);
Committee Chairperson
 Sherwood A. Fehm, Jr., Ph.D. (*Art*)
 Diane L. Murray, Ph.D. (*English*)
 Richard N. Schwab, Ph.D. (*History*)
 Richard G. Swift, M.A. (*Music*)
 Wesley E. Thompson, Ph.D. (*Classics*)
 Michael V. Wedin, Ph.D. (*Philosophy*)

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Major Adviser.—R. G. Swift and Committee.

The Humanities major leads to a Degree of Bachelor of Arts. The purpose of this program is to allow a student latitude in combining the courses offered by existing departments into a major suiting his or her individual needs. 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.

INTEGRATED STUDIES

Kenneth R. Greider, Ph.D., *Program Director*
 Program Office, 309 Voorhies Hall

Committee in Charge:

Marjorie Grene, Ph.D. (*Philosophy*);
Committee Chairperson
 Kenneth R. Greider, Ph.D. (*Physics*)
 Alan A. Stambusky, Ph.D. (*Dramatic Art*)
 Richard G. Swift, M.A. (*Music*)

Faculty:

Kenneth R. Greider, Ph.D. (*Physics*)
 William W. Hagen, Ph.D. (*History*)
 *Walter J. Hicks, Ph.D. (*English*)
 †Arthur E. McGuinness, Ph.D. (*English*)
 Robert M. Murphey, Ph.D. (*Psychology*)
 David A. Robertson, Ph.D. (*English*)
 Alan A. Stambusky, Ph.D. (*Dramatic Art*)
 †Lenora Timm, Ph.D. (*Linguistics*)

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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 pro-

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.

gram 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 but enrollments are limited in order to keep the class sizes small.

There is in addition, a program for a limited number of freshmen who take four Integrated Studies courses during the year as well as the Integrated Studies Seminar each quarter, and who live in the Tercero dormitory complex. An Integrated Studies House, "B" building, Tercero Hall, is the focal point for the freshman program activities.

Lower Division Courses**1A, 1B, 1C, 1D. Ideas and Issues in the Sciences. (4) I, II, III.**

Lecture—4 hours. Exploration of major developments in the natural sciences and social sciences. Emphasis on the interrelation of the sciences. Themes and fields vary from year to year. Theme for 1975-76: "tradition, revolution, and modern society." Fields for 1975-76: physics, psychology, social anthropology, political science.

The Staff (Greider in charge)

NOTE: For key to footnote symbols, see page 220.

2A, 2B, 2C, 2D, 2E. Ideas and Issues in the Arts.

(4) I, II, III.

Lecture—4 hours. Exploration of major themes and/or major figures in the humanities. Emphasis on the interrelation of history and the arts. Themes and fields will vary from year to year. Theme for 1975-76: "tradition, revolution, and modern society." Fields for 1975-76: history, music, literature, drama, theology.

The Staff (Greider 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 (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 (McGuinness in charge)

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 (Greider in charge)

9. Seminar. (1) I, II, III.

Conference—1 hour. Preparation of a research report. Normally to be taken with course 8. May be repeated for credit. (P/NP grading only.)

The Staff (Greider in charge)

INTERNAL MEDICINE — See Medicine**INTERNATIONAL AGRICULTURAL DEVELOPMENT**

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 113 and 210.

Related Courses. See *Agrarian Studies 2 (Culture and Science in Agriculture)*; *Agricultural Economics 125 (Comparative Agriculture)*; *Agricultural Economics 148 (Economic Planning for Regional and Resource Development)*; *Agricultural Economics 222 (Agricultural Policy and Planning in Developing Countries)*; *Agronomy 111 (Cereal Crops of the World)*; *Agronomy 210 (Agricultural Research Planning and Management)*; *Animal Science 117 (Physiological Aspects of Animal Production From Tropical and Arid Areas)*; *Anthropology 221 (Rural Transformation in Postcolonial Societies)*; *Economics 118 (Political Economy of Agrarian Reform)*; *Economics 115A-115B and 215A-215B (Economic Development)*; *Food Science and Technology 112 (Comparative Aspects of Food Habits and Culture)*; *Geography 142 (Geography of Agriculture)*; *Political Science 185A (Comparative Administration: Developing Nations)*; *Sociology 144 (Rural Society)*; *Vegetable Crops 150 (Vegetables As World Food Crops)*.

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) II.**

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.

Jolly

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.

Mikkelsen

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 (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.

Davis

195. Field Study in Mexican Agricultural Development. (3) II.

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. Prerequisite: consent of instructor. (P/NP grading only.)

Hansen

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Akesson in charge)

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

(P/NP grading only.) The Staff (Graduate Group Chairperson 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 in-

structor. 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. Tuma; III. Chancellor

299. Research. (1-9) I, II, III.

(S/U grading only.) The Staff (Graduate Group Chairperson in charge)

INTERNATIONAL RELATIONS

Joyce K. Kallgren, Ph.D., *Program Director*
Program Office, 351 Voorhies Hall

Committee in Charge:

Joyce K. Kallgren, Ph.D. (*Political Science*);
Committee Chairperson

Robert J. Lieber, Ph.D. (*Political Science*)

Elias H. Tuma, Ph.D. (*Economics*)

F. Roy Willis, Ph.D. (*History*)

Ruth B. York, Ph.D. (*French*)

Major Adviser.—See *Class Schedule*.

The major in International Relations is designed to meet the needs of students interested in an understanding of contemporary world politics and economics. The program is built around courses concerned with international relations in political, geographic, economic, and social terms, 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; select two courses from each of the following two disciplines: History 3, 4B, 4C, 9A,

9B, 17A, 17B and Political Science 1, 2 (or 2D), 3 (or 3D), 5, 9C.

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, 118, 123, 160, 161;

b) Political Science 112, 117, 118A, 118B, 118C, 121, 122, 123, 124, 125, 126, 127, 128, 129, 131, 132, 134, 137, 138, 139, 140A, 140B, 141, 142, 143, 144, 145, 146, 147, 148A, 148B, 149, 176, 177, 185;

c) History 102, 115A, 115B, 115C, 116, 137D, 141, 143A, 143B, 144B, 145A, 145B, 146A, 146B, 147B, 147C, 151C, 161B, 162, 163B, 165, 166B, 168, 169B, 174A, 174B, 174C, 185B, 191C, 192B, 192C, 194B;

d) Geography 119, 121, 122A, 122B, 123A, 123B, 124, 125A, 125B, 126, 141, 143; and/or Sociology 118, 125, 130, 141, 143, 155, 175.

Interdisciplinary seminar (listed under Political Science 192A-192B), 2 quarters of 4 units each (normally taken in the senior year).

Teaching Credential Subject Representative: J. K. Kallgren. See page 215 for the Teacher Education Program.

ITALIAN

Department Office, 515 Sproul Hall

Assistant Professors:

Alfonso De Petris, *Dottore in Lettere*

Dennis J. Dutschke, M.A. (*Acting*)

Lecturer:

Gustavo Foscari, M.A.

Departmental Major Adviser.—G. Foscari.

The Major Program

Lower Division Courses.—Required: Italian 1, 2, 3, 10A and 10B 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

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NOTE: For key to footnote symbols, see page 220.

chosen from department-approved courses in related fields.

Honors and Honors Program (see page 181).—The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination.

Teaching Credential Subject Representative: A. De Petris. See page 215 for the Teacher Education Program.

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. (6) I, II, III.

Lecture—5 hours; laboratory—1 hour. Basic Italian vocabulary and structure, aimed at enabling the student to understand and use standard Italian. Not open for credit to students who have completed the first two years of high school Italian. The Staff

2. Elementary Italian. (6) I, II, III.

Lecture—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1. The Staff

6. Intermediate Grammar and Composition. (3) III.

Lecture—3 hours. Prerequisite: courses 1 and 2 or the equivalent. Exercises in grammar and stylistics; study of the idiomatic phenomena of the language; written papers based on stylistic examples from literature. The Staff

8. Intermediate Conversational Italian. (3) I, II, III.

Lecture—3 hours. Prerequisite: courses 1 and 2. Designed for those students who wish to increase their fluency in standard Italian and whose program does not permit more than one year's study of a foreign language. Emphasis on conversation and discussion of contemporary Italian society. The Staff

10A. Intermediate Italian. (3) I, II, III.

Lecture—3 hours. Prerequisite: courses 1 and 2. Reading and discussion of Italian short stories, newspaper articles, etc., providing an introduction to contemporary Italian society and culture while strengthening the student's command of standard Italian. The Staff

10B. Intermediate Italian. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 10A. Continuation of course 10A. Considered the minimum prerequisite for participation in Education Abroad Program. The Staff

98. Directed Group Study. (1-5) I, II, III.

Primarily intended for lower-division students. (P/NP grading only.) The Staff

Upper Division Courses

101. Advanced Conversation, Composition, and Grammar. (4) I.

Lecture—3 hours; weekly essays. Prerequisite: course 10B or consent of instructor. The Staff

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. De Petris

107. Survey of Italian Culture and Institutions. (4) II.

Lecture—3 hours; term paper. An assessment of the impact of regional autonomy on Italian cultural life from the Middle Ages to the present. Special emphasis will be placed upon achievements in literature, the arts, philosophy, and socio-political institutions. To be taught in English. Dutschke

*113A. Italian Literature before the Renaissance: from St. Francis to Petrarch. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 10B 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 *Dolce Stil Nuovo*, and Petrarch. The Staff

*113B. Italian Literature before the Renaissance: Dante's *Divina Commedia* and Boccaccio. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Study of the origins of non-lyrical forms of Italian literature of the thirteenth and fourteenth centuries. The *Divina Commedia* and the development of a prose style (emphasis on Boccaccio's *Decameron*).

115A. Italian Literature of the Renaissance and the Baroque: from Humanism to Machiavelli. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. 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. The Staff

*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. De Petris

118. Italian Literature of the Eighteenth Century. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. The develop-

ment of modern Italian literature. Emphasis on the work of Goldoni, Bettinelli, Baretti, Farini, Alfieri and Vico. The Staff

119. Italian Literature of the Nineteenth Century. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Aspects of romanticism in Italy; including Manzoni, Verga and *Verismo*. The Staff

120A. Italian Literature of the Twentieth Century: The Novel. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. The development of the novel from Svevo to the present. Emphasis on the work of Svevo, Levi, Moravia, Pavese and Vittorini. The Staff

***120B. Italian Literature of the Twentieth Century: Poetry and Drama. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Italian poetry with emphasis on Hermeticism; the theater of Luigi Pirandello and its role in the development of contemporary Italian drama. The Staff

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).

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, Michelangelo, and Tasso (offered in odd-numbered years).

***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).

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 (Bach in charge)

197TC. Community Tutoring in Italian. (1-5) I, II, III.

Discussion—1-2 hours; laboratory—2-4 hours. Prerequisite: consent of instructor. Field experience as Italian tutors or teacher's aides. May be repeated for credit up to 10 units. (PNP grading only.)

Foscarini

199. Special Study for Advanced Undergraduates. (1-4) I, II, III.

Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students. (PNP grading only.)

The Staff (Bach in charge)

JAPANESE—See Oriental Languages

LATIN—See Classics

LAW, School of

Pierre R. Loiseaux, LL.B., LL.M., *Dean of the School*

¹Richard D. Lee, J.D., *Associate Dean of the School*

Richard C. Wydick, LL.B., *Acting Associate Dean of the School*

Ron L. Gordon, J.D., *Assistant Dean of the School*

Dean's Office, 1011 Martin Luther King, Jr. Hall

Professors:

¹Homer G. Angelo, J.D., LL.M.

¹John 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.
(*Emeritus*)

Carol S. Bruch, J.D. (*Acting*)

Robert N. Covington, J.D. (*Visiting*)

NOTE: For key to footnote symbols, see page 220.

- ¹Harrison C. Dunning, LL.B.
Daniel J. Dykstra, LL.B., S.J.D.
⁷August G. Eckhardt, LL.B. (*Visiting*)
G. Meade Emory, LL.B., LL.M.
Floyd F. Feeney, LL.B.
¹Daniel W. Fessler, J.D., S.J.D.
Roger W. Findley, J.D. (*Visiting*)
Susan F. French, J.D. (*Acting*)
Gary S. Goodpaster, J.D.
⁷Michael M. Greenfield, J.D. (*Visiting*)
James E. Hogan, LL.B.
John E. Huerta, J.D. (*Acting*)
Emma Coleman Jones, J.D. (*Acting*)
Friedrich K. Juenger, J.D. (*Visiting*)
Pierre R. Loiseaux, LL.B., LL.M.
Jean C. Love, J.D. (*Acting*)
Ralph Norvell, J.D., LL.M. (*Visiting*)
John B. Oakley, J.D. (*Acting*)
Raymond I. Parnas, J.D., LL.M., S.J.D.
John W. Poulos, J.D.
¹Edward H. Rabin, LL.B.
Mortimer D. Schwartz, J.D., LL.M., M.S.
(*Law Librarian*)
Delbert L. Spurlock, Jr., LL.B., LL.M. (*Acting*)
William K. S. Wang, J.D. (*Visiting*)
Richard C. Wydick, LL.B.

Lecturers:

- Charles B. Cohler, LL. B.
Stanton G. Darling II, J.D.
⁷Ann L. Diamond, LL.B.
¹Richard D. Lee, J.D.
Alfred J. Lewis, LL.B., A.M.L.S. (*Assistant Law Librarian*)
⁷Charles R. Renda, J.D., LL.M.
⁷Beverly R. Savitt, J.D.
⁷Dinah L. Shelton, J.D.
Douglas G. Sykes, M.B.A., J.D.
Wayne H. Thomas, Jr., J.D.
⁷W. Paul Von Blum, J.D.
Forrest B. Weinberg, LL.B., LL.M.

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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. (1) I.**

Discussion—1 hour. An introduction to American

Legal Process through study of how courts resolve disputes in selected areas. Emphasis will be placed upon the operation of the case law system, the law-making roles of the courts and the legislatures, and the acquisition of the skills of a lawyer. (S/U grading only.)
Poulos, Love

201A-201B. Property. (4-4) II-III.

Discussion—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. (Deferred grading only, pending completion of sequence.) Findley, French

202A-202B. Contracts. (4-4) I-II.

Discussion—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.)
Loiseaux, Weinberg

203A-203B. Pleading and Procedure in Civil Cases. (3-4) II, III.

Discussion—3-4 hours. The methodology of presenting a civil controversy for adjudication in a state or federal court, without reference, however, to the rules and tactics relating to the proof of disputed facts, which are the subject matter of Evidence and Trial Practice respectively. In addition to jurisdiction, the principal matters studied are those governing the formulation of the issues in dispute in a particular case through pleading, joinder and discovery, the resolution of these issues at or before trial, and the finality of the trial court's disposition of the case.
Goodpaster, Oakley

204A-204B-204C. Torts. (3-2-3) I-II-III.

Discussion—3-2-3 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 invasion 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.)
Dykstra, Jones, Spurlock, Huerta, Love

***205. Remedies. (4) III.**

Discussion—4 hours. This course examines legal and equitable remedies, including damages, injunctive relief, specific performance, and restitutionary remedies. Emphasis will be placed upon the existence of alternative remedies and upon the factors to be considered in choosing the most appropriate remedy (or remedies) for selected substantive causes of action.

⁷Academic year, 1974-75.

206. Criminal Law. (5) I.

Discussion—5 hours. A study of the elements and policies of selected criminal offenses. Hogan, Poulos

207A-207B-207C. Legal Research and Writing.

(2-1-1) I-II-III.

Discussion—2-1-1 hours. Small group instruction in the techniques of legal research and writing. (S/U grading only, pending completion of sequence.)

Lewis, Love

First-Year Elective. (2-3) III.

First-year students may 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***209. Legal Processes. (3) I, II, III.**

Discussion—3 hours. The focus of attention will be upon the utility and interrelationship of our law-making institutions. Careful study will be given to: 1) Private ordering (its form and complexities; the use of law by private decision makers; the role of the lawyer and his professional responsibilities); 2) Courts (the process of reasoned elaboration and judicial legislation; the growth of the common-law; the policies of statutory interpretation); 3) Legislatures (their nature and function; the peculiar problems they face in giving effect to their will). The role of Administrative Agencies and of the Executive will also be studied.

Poulos

210. Skills. (3) I.

Laboratory—3 hours. Course designed to introduce second-year students to the judgmental and practical skills exercised by the practicing lawyer. Through simulations, role-playing and the use of videotape, training will be given in interviewing and counseling, preventative law, the drafting of pleadings and other legal papers, and advocacy and negotiations skills, both in civil and criminal cases. Students will be individually required to resolve a series of legal problems generated from real fact patterns, and their work will be individually critiqued. Recommended for students planning to undertake clinical work. Enrollment limited. (S/U grading only.)

Goodpaster

213. Business Organizations I. (3) I.

Discussion—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 and its emerging status under both the decisional and statutory law of the State of California. The materials are examined in a planning context and stress the structuring of legally

effective and efficient arrangement for 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.

Weinberg

214A-214B. Business Organizations II. (3-3) II-III.

Discussion—3-3 hours. Building upon the concepts developed in Business Organizations I, the focus of this practitioner-oriented offering is upon the legal problems surrounding the dominant phenomenon of the industrial state—the public issue corporation. Comparative attention is given to the traditional statutory and judge-made legal principles as well as to the rapidly expanding "federal corporation law." Within this context emphasis is placed upon a comparison of the provisions of the California Corporations Code with the statutory law of sister states which offer the enterprise the alternative of "foreign incorporation." Among the areas studied are: the governance of the public issue corporations (its operations through a board of directors, committees and officers); 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 and sale of securities. (Deferred grading pending completion of sequence.)

Dykstra

215A-215B. Business Associations. (3-3) I-II.

Discussion—3 hours. As an alternative to the more detailed and practitioner-oriented concept of the Business Organizations I and II sequence, this course is intended primarily for those students interested in a broad survey of the legal rules and concepts applicable to corporations both closely and publicly held. Topics surveyed include the process of incorporation, the financing of corporations, the role of management, the role of shareholders and the means by which corporate structure can be rendered accountable to the socio-economics demands of the modern state. (Deferred grading pending completion of sequence.)

Wang

216. Commercial Law. (4) I.

Discussion—4 hours. The basic course in Commercial Law. Emphasis on secured commercial transactions, particularly under Article 9 of 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.

Jones

217A-217B. Constitutional Law. (4-4) I-II, II-III.

Discussion—4-4 hours. An introductory analysis of the judicial process in constitutional cases; division of powers between the national government

and the states. Constitutional limitations on governmental power, civil rights, and civil liberties. (Deferred grading pending completion of sequence.)
I-II. Barrett; II-III. Poulos

218. Injunctions and Class Actions. (3) III.

Discussion—3 hours. Examination of the law and practice relating to injunctions, declaratory judgments, and class actions, with particular emphasis on their utilization in such major areas of litigation as civil rights, environmental protection, and recovery of damages on behalf of large numbers of individuals.
Barrett

219A-219B. Evidence. (3-3) II-III.

Discussion—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. (Deferred grading only, pending completion of sequence.)
Wydick, Hogan

220A-220B. Federal Taxation I. (3-3) II-III.

Discussion—3-3 hours. A study of the statutory, judicial, and administrative material concerning federal income taxes. (Deferred grading only, pending completion of sequence.)
Emory

221. Introduction to Estate Planning I. (4) I, II.

Discussion—3 hours. The basic estate planning devices, with emphasis on wills and trusts.

I. French; II. Norvell

***222. Techniques of Negotiation. (3) II.**

Discussion—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 enrollment.

223. Introduction to Estate Planning II. (4) II, III.

Discussion—3 hours. Prerequisite: course 221, 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.

II. French; III. Norvell

224. Advanced Estate Planning Seminar. (2) II.

Seminar—2 hours. Prerequisite: courses 220A-220B, 245, and 247 (must be taken concurrently). Course is primarily a problem course emphasizing lifetime planning for income and death tax purposes.

Davenport

225. Marital Property. (3) II, III.

Discussion—3 hours. Prerequisite: course 230,

Family Law, recommended. California community property law, property consequences of marriage dissolution, and marital property settlement agreements.
II. B. Bodenheimer; III. Bruch

226. Criminal Justice Administration I. (3) I.

Goodpaster

226A-226B. Criminal Justice Administration I.

(2-2) I-II.

Discussion—3-4 hours. The police function: arrest, search, surveillance, confessions, lineups, the exclusionary rule. (Deferred grading only, pending completion of course.)
Barrett

227. Criminal Justice Administration II. (2) II.

Discussion—2 hours. Post-arrest through presentence phases of the criminal process with major emphasis on prosecutorial discretion and plea bargaining. Strongly suggested for those second-year students planning to take the Clinical Program in the Administration of Criminal Justice in their senior year.

Goodpaster

228. Legal Profession in the Humanities. (3) III.

Discussion—3 hours. Course designed to generate a broad and interdisciplinary perception of the social and ethical context of legal practice. The course will be divided into three major units during the academic quarter. Each student will be responsible for a major seminar paper in lieu of a final examination. Topics decided in consultation with instructor. First unit will focus on an historical and contemporary overview of the central defects and problems of legal practice. Second unit will proceed on the assumption that there are indeed significant ethical and related problems in the practice of law. The final unit will provide a consideration of the broader ethical responsibilities of lawyers. Limited enrollment.

229. Problems of Small Businesses. (2) I.

Discussion—2 hours. Prerequisite: open only to third-year students who have completed or are currently enrolled in a course on corporate taxation and business associations, or consent of instructor. The basic aim of the course is to provide the student who intends to practice law in a 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 theoretical.

230. Family Law. (3) I, II.

Discussion—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. I. B. Bodenheimer; II. Bruch

231. Legislation. (3) I.

Discussion—3 hours. An examination of the structure and function of the legislative branch of government with empirical reference to Congress and the California Legislature. Among related topics to be considered are: (1) the process of enacting legislation, including the drafting of bills, the committee system, and the development of legislative history, (2) the roles of other governmental institutions and of special interest groups in the formulation of legislative policy and specific legislation, and (3) judicial perspectives on the legislative branch, including the delegation of legislative power, the construction of statutes, and the constitutional hegemony of the courts. Each student will be required to submit a critical paper of substantial length assessing, in the context of a topic of contemporary legislative interest, the validity and utility of the concepts developed in the course. No examination. Oakley

*232. Land Finance. (3) I.

Discussion—3 hours. Selected problems in the acquisition, financing, and development of real estate. The course will emphasize current California law and practice. Students may elect, for an additional unit of credit, to draft notes, deeds, mortgages, contracts, and other instruments involving real property. Each instrument will be individually evaluated.

233. Philosophy of Responsibility and Punishment. (2) I.

Seminar—2 hours. Course offers an interdisciplinary approach to some basic problems of criminal justice, among them the following: (1) the relation between freedom of the human will and the imputation of legal responsibility; (2) justifications and criticisms of the notion of punishment; (3) policies of sentencing; (4) excuses from criminal responsibility, especially mental disease. E. Bodenheimer

234. Family Law Practice Seminar. (2) III.

Seminar—2 hours. Prerequisite: courses 225 and 230. This is a comprehensive treatment of family law practice using the vehicle of actual case histories. The seminar will cover all aspects of family law from the initial interview through trial, with student participation in such situations as the initial interview, settlement negotiations, and depositions. Expert witnesses, such as accountants and appraisers, will be invited to demonstrate their role in family law practice. Limited enrollment. A term paper will be required in lieu of a final examination.

235. Administrative Law. (3) II.

Discussion—3 hours. This course deals with the constitutional and statutory principles governing action by the executive branch of government (federal and state), and judicial review of those actions, in-

cluding the requirements and nature of hearings before administrative agencies acting in adjudicatory and legislative capacities; the standing of parties to intervene in administrative hearings and to seek review by the courts of administrative actions; the availability of judicial review (herein of "sovereign immunity," "exhaustion of administrative remedies," and "ripeness" of administrative action for judicial review); the scope of judicial review of findings of fact and conclusions of law reached by administrative agencies (herein of "administrative discretion"). Spurlock

236. Securities Regulation. (4) III.

Discussion—4 hours. Prerequisite: courses 213 and 214, Business Organizations I and II, or course 215, Business Associations. The primary purpose of this course is to familiarize students with laws and regulations, federal and state, relating to the issuance of and trading in corporate securities. It includes materials pertaining to the scope of the term "securities," the registration of securities, intra-state and private offerings, broker-dealer regulations and civil liability under the Securities Act of 1933 and the Securities Exchange Act of 1934. Wang

237. Commercial Paper. (3) II.

Discussion—3 hours. A course in commercial paper covering Articles 3 and 4 of the Uniform Commercial Code. This will cover concepts of negotiability, requisites of negotiable paper, transfer, liability of parties, and rights of holders. The Article 4 part of the course includes bank deposits and collections, and the relationship between banks and customers. Jones

*238. Introduction to International and Foreign Legal Systems. (4) III.

Discussion—4 hours. Examination of international and foreign legal systems and the responsibilities and opportunities for lawyers in international affairs. Basic and emerging concepts and terminology in international law and in the relations between national legal systems will be studied. The shortcomings of classic international law will be examined in the light of the rapidly changing needs of the world. Participants will be given an opportunity to learn fundamental techniques of research in international law and to look at one or more key contemporary problems such as skyjacking and other acts of terrorism; international environmental protection; the needs of developing nations in Latin America, Asia, and Africa; human rights; and efforts to regulate the use of armed force. Visiting lecturers will discuss special current topics. This course is recommended for completion prior to courses 248, 249, and 269. Open to first year students. Angelo

*239. Insurance. (3) II.

Discussion—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.

***240. Educational Policy and Law. (3) III.**

Discussion—3 hours. The focus of this course will be on the relationships 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 to first-year students.

241. Legal Accounting. (3) I.

Discussion—3 hours. Course considers the application 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. Davenport

242A-242B. Conflict of Laws. (3-2) I-II.

242A-242B. Conflict of Laws. (2-3) II-III.

Discussion—3-2 hours or 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. Juenger; II-III. Bruch

243. Debtor and Creditor. (4) III.

Discussion—4 hours. Prerequisite: Commercial Law I recommended. 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. Weinberg

244. Basic Human Physiology. (2) II.

Discussion—2 hours. An overall view of the principles of physiology with the object of giving the law student some understanding of the normal functioning of the various organ systems of the human body. Schwartz

245. Estate and Gift Taxation. (4) I.

Discussion—4 hours. This course deals with Federal and California death and gift taxes. While a general familiarity with community property and the division of interests in property is helpful, there are no prerequisites to this class. Davenport

246. Federal Jurisdiction and Federal Courts. (4) I.

Discussion—4 hours. Prerequisite: course 217A-217B, Constitutional Law. A survey of the federal court system and an examination of the sources and substance of federal jurisdiction. Attention will be devoted principally to: (1) the parameters of appellate and collateral review of state court decisions in the federal courts and of the federal question, diver-

sity, and maritime jurisdiction of the federal trial courts (2) justiciability, abstention, mootness, sovereign immunity and other constraints on the exercise of federal jurisdiction, (3) the choice of the law to be applied by federal courts (4) the dynamics of precedent and authority among the federal courts and between federal and state courts and (5) political factors in the appointment of the federal judiciary and the exercise of federal jurisdiction. Oakley

247. Federal Taxation II. (4) II.

Discussion—4 hours. Prerequisite: course 220A-220B, Federal Taxation I. Emphasis on income tax problems of corporations and their shareholders. Emory

***248. International Business Transactions. (2) III.**

Seminar—2 hours. Basic introduction to legal problems and techniques in international trade and investment. Foreign and U. S. law materials will be examined. Students will be presented with documents from 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 and branches, taxation in more than one country, antitrust, and regulation by international organizations such as the GATT, and the European Common Market. Offered in odd-numbered years. Not open to students enrolling in Professor Juenger's course Law 270, in 1975-76. Angelo

249. Comparative Law. (4) III.

Discussion—4 hours. Comparison of the methods and sources of common and civil law; background and structure of the principal civil codes; analysis and study of problems arising in the context of foreign legal systems. Juenger

250. Jurisprudence. (3) II.

Discussion—3 hours. The aim of this course is to offer a view of the legal system as a whole from a philosophical, psychological, and sociological perspective. The problems connected with the taming of power and control of aggression will receive special attention. An anatomy of the values calling for protection by the legal order will be attempted against the background of influential conceptions of natural law and justice. Various theories about the nature and functions of law will be tested as to their impact upon the legal process. The last part of the course will deal with problems of legal method particularly the various modes of legal reasoning. (S/U grading only.) E. Bodenheimer

251. Labor Relations Law. (3) I.

Discussion—3 hours. The principal concern of this course is the right to organize and to engage in collective bargaining. Emphasis will also be given to other legal developments which effect the work environment. Covington

252. Labor Relations Law II. (3) II.

Discussion—3 hours. The principal concern of this course is collective bargaining and enforcement of rights under collective agreements. Emphasis will also be given to other legal developments which affect the work environment. Covington

253. Products Liability. (2) I.

Discussion—2 hours. The civil action for harm to the consumer resulting from dangerous and defective products. —

***254. Developmental Legal History. (3) III.**

Discussion—3 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. Fessler

255. Latin American Law and Development. (2) I.

Discussion—2 hours. An examination of interactions of legal institutions and the legal process of socioeconomic development in Latin America, through the study of three problem areas: land reform; judicial protection against arbitrary government action; and, the informal legal system of marginal urban squatter communities. Huerta

256. Land Use Planning. (3) III.

Discussion—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, and city planning. Norvell

257. Law and Institutions of the European Communities. (2) III.

Discussion—2 hours. A study of legal problems of European integration, including the transfer of powers to supranational institutions, their decision making, the rule of the Court of the Communities and discussion of selected areas of Community law. Juenger

258. Legal Profession (2) I, II.

Discussion—1 hour. Study of the duties and responsibilities of the legal profession, including the

American Bar Association Code of Professional Responsibility, the ethical rules applicable to California lawyers and current professional topics such as the use of paraprofessionals, prepaid legal service, selected problems of law office management, and the duties of the professional to people who cannot afford legal services. Required of all students prior to graduation. (S/U grading only.)

I Wydick; II. Schwartz

***259. Problems in Modern Social Legislation. (2) III.**

Discussion—2 hours. An examination of selected problems in welfare and other recent legislation. Spurlock

260. Discrimination in Employment. (2-3) III.

Discussion—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 Order. Students may elect to engage in specialized skills training in this field for an additional unit of credit on consent of instructor. Spurlock

***261. Local Government—Managing the Urban Environment. (3) III.**

Discussion—3 hours. Will examine a number of recurrent issues concerning the organization and structure of local governments. Why have local governments at all? What functions are appropriate for local governments, and which can best be left to private persons? What standards are "fair" for the organization and operation of local governments? Who should pay to support them, and what should the supporters get in return? Not covered, because they are covered in separate courses, are land use control and public employee bargaining. Open to first-year students. —

262A-262B. Trade Regulations. (2-2) I-II.

Discussion—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.) —

263A-263B. Trial Practice and Procedure I. (2-1) I-II.

Meetings—32 two-hour sessions. Prerequisite: course 219A-219B, Evidence. Course features lectures, video tapes, and demonstrations aimed at exposing a student to litigational process in its entirety, but with special emphasis on the trial itself. Outside work will be minimal. Attendance will be taken and is mandatory for credit. (S/U grading only pending completion of course sequence.) Hogan

264. Water Law. (3) I.

Discussion—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, groundwater management, and water pollution. —

***265. Government Contracts. (2) II.**

Discussion—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; brief analysis of California public contracts. —

266. Law and Medicine. (3) I.

Seminar—3 hours. A seminar approach emphasizing class work, field trips, and individual projects relevant to medical education and practice, attorney-physician relations, development of human behavior, community health care, and current medico-legal problems. Enrollment limited to second-year medical students and to second- and third-year law students. (Same course as Family Practice, Medicine 266.) Schwartz and staff

***267. The Individual and the Union. (2) II.**

Discussion—2 hours. Focus on the rights and duties of union members. Topics to be covered include: problems of union membership (union security and admission), the right to fair representation, civil liberties of union members, discipline of members, and the conduct of union elections (secret ballot, eligibility for office, campaign rights of candidates). Spurlock

***268. Taxation of Foreign Income. (2) III.**

Discussion—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. Emory

***269. International Efforts to Preserve the Environment. (2) III.**

Discussion—2 hours. Open to students and faculty from other departments in the University. Course will examine the current efforts through the U.N. and other institutions to preserve the world's resources and prevent environmental degradation. The School's collection of original documents used in preparing for and those resulting from the 1972 United Nations Stockholm Conference on the Human Environment will be available as a basis for inquiry. Visiting lecturers will present basic scien-

tific analyses of problems such as population and resources. Prior international law study is recommended but not required. Offered in odd-numbered years. Angelo

270. International Transactions. (4) II.

Discussion—4 hours. Problems presented by business transactions which cross national boundaries, including conflict of regulatory laws. An introduction to transnational law and institutions. Persons who enrolled in Law 248, International Business Transactions in the academic year 1974/75 may enroll in this course for full credit. Juenger

271. Selected Problems in Tax Policy. (2) III.

Discussion—2 hours. A study of selected problems of public policy in relation to the tax law. Davenport

***272. Advanced Tax Problems. (3) II.**

Discussion—3 hours. Course is based upon 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; the allocation of stock and control; issuance of securities and capital structure; valuation; Securities Act problems; buying out of stockholders; acquisition via merger or purchase of stock or assets; redemptions and liquidations. Emory

273. The Law and the Police. (3-5) III.

Discussion—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. Feeney

274. Unfair Trade Practices. (3) III.

Discussion—3 hours. A study of unfair competition and the protection of intellectual property. Among the topics considered are: consumer fraud, misleading and false advertising, disparagement, interference with business relationships, the role of the Federal Trade Commission, trade secrets, patents, trademarks and copyrights. —

275. The Correctional Process. (3) III.

Discussion—3 hours. From pre-sentence report through disabilities of ex-offenders with major emphasis on the lawyers' role vis-a-vis sentencing alternatives. —

276. Juvenile Justice Process. (3) I.

Discussion—3 hours. Legal and philosophical bases of a separate juvenile justice process; early stages in the juvenile justice process; investigation;

apprehension; intake; detention; juvenile court hearings; juvenile corrections following disposition. Major emphasis on the emerging role of counsel at each phase of the process. Guest speakers and field trips. A paper may be required in lieu of a final examination. Course design may require enrollment limited to third-year students. Feeney

277. Corporate Finance. (4) II.

Discussion—4 hours. Prerequisite: courses 213, 214A-214B or 215A-215B. Economic and legal problems arising in connection with financing decisions of publicly held corporations, including valuation of the enterprise and its securities, determination of securities structure and dividend policy, and decisions on investment opportunities, whether by internal expansion or by merger or take-over. Consideration will also be given to the rights and remedies of senior security holders. Wang

278. Seminar in Labor Relations Law. (2) II.

Seminar—2 hours. The seminar will focus on labor standards legislation. A paper will be required. Covington

279. Public Employee Bargaining. (3) I.

Discussion—3 hours. The focus of this seminar will be on the development and operation of structured collective bargaining by public employees at the federal, state, and local levels. Covington

*280. Seminar on Legal Problems of the Disadvantaged. (2) II.

Discussion—2 hours. Legal problems of the poor are selected for intensive study through readings, class discussion, and field research. Spurlock

281. Children and the Law. (3) I.

Discussion—3 hours. This course will consider the child in relationship to the family and society. Attention will be given to paternity and legitimacy; custody, foster care, and adoption; juvenile court proceedings; rights to support, health, birth control, and education; welfare law; and legal capacity and emancipation. The course will focus on the extent to which the law recognizes the emotional needs and development of the child. Bruch

282. Sex Discrimination and Law. (3) III.

Discussion—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 criminal law; and women in the legal profession. Love

*283. African Legal Systems. (2) II.

Discussion—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. Dunning

*284. Legal Problems of Consumer Credit. (3) III.

Discussion—3 hours. Students survey a range of commercial law topics, mostly from the perspective of the attorney, public or private, who defends consumers. Principle items of inquiry include the regulation and disclosure of finance charges, usury, creditors' remedies, bankruptcy and consumer class actions. No other commercial law course is either a prerequisite or a bar to this one. Open to first-year students.

285. Environmental Law. (3) III.

Discussion—3 hours. Problems of protecting the environment from public and private action: environmental impact statement procedures and other aspects of governmental decision making; control of air, water and noise pollution; regulation of land and resource use; roles of federal, state and local governments; private rights and remedies. Findley

286. Economics of Legal Issues. (2) III.

Discussion—2 hours. We examine a number of legal issues from the standpoint of some recent developments in economics. Possible topics include: the economic impact of liability rules; some economics of pollution control; and the purposes and impact of the antitrust laws. No prior background in economics is necessary, or even helpful. Wang

287. Public Land Law. (2) III.

Discussion—2 hours. The course will include among other topics mining law, grazing law, timber, Indian lands, recreation and reclamation.

*288. Selected Problems in Constitutional Litigation. (3) III.

Discussion—3 hours. Course will examine 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. The 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. Oral arguments will be videotaped and students will receive some personalized instruction in technique of oral arguments. Each student will also be assigned an opinion to write and circulate for comments. No examination. Goodpaster

***289. Seminar on 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.
Goodpaster

290. Selected Problems in Criminal Justice Administration. (2) II.

Discussion—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.
Feeney

291. Seminar on Children and the Law. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. 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.
B. Bodenheimer

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 growing 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.
The Staff

Professional Courses**410. Appellate Advocacy. (2) I, II, III.**

Laboratory—2 hours. Participation in intramural or extramural appellate moot court competition, including brief writing and oral argument. May be repeated once for credit.
The Staff

415. Trial Practice and Procedure II. (2) II, III.

Laboratory—2 hours. Prerequisite: course 263A-263B, Trial Practice and Procedure I. Students form into teams to litigate mock civil and criminal trials. Following the pleading, discovery, and pre-trial motion stages, a jury trial is conducted. Students may elect to take this portion of the course twice, if the second trial is significantly different from the first. (S/U grading only.)

420. Individual Clinical Study. (1-12) I, II, III.

Clinical Program. Students may engage in individual clinical interests with the approval of a faculty committee and under the supervision of individual faculty members. A detailed outline of the proposed clinical work, endorsed by the proposed supervising faculty member, should be submitted to the Dean's Office two weeks 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 in no more than six units of individual clinical study (with no more than three units in the Spring Quarter for third-year students). In exceptional cases, a student may receive twelve units credit for a full time program away from the school. For a more complete description of the policies and procedures governing the design and approval of individual clinical study, please see the "Guidelines for Individual Clinical Study—Course 420" obtainable from the Dean's Office. (S/U grading only.)
The Staff

430. Clinical Program in Civil Legal Services.

(3-5) I, II, III.

Clinical Program. This clinical course is 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. 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 seminar keyed to their poverty law practices. May be repeated for credit. (S/U grading only.)

440A-440B. Clinical Program in Manpower Planning. (2-2) I-II.

Clinical Program. 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. (S/U grading only, deferred pending completion of sequence.)

Spurlock

450. Clinical Program in Environmental Law. (2-5) I, II.

Clinical Program. Practical experience in environmental law. Students will work under the direct supervision of a government or private lawyer engaged in some form of environmental law work. (For purpose of this course, "environmental law" includes land use control by public means.) Students will also be required to prepare a weekly journal noting, commenting upon, and reflecting upon their clinical experience. Credit awarded is two units per quarter for eight hours work per week or three units per quarter for twelve hours work per week. In limited cases credit of up to five units per quarter is available, in which case twenty hours work per week is required. (S/U grading only.)

460. Clinical Program in the Legislative Process. (3) II, III.

Clinical Program. Prerequisite: course 231 (may be taken concurrently). 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 work eight hours a week with an individual Senator, Assemblyman, Consultant or other person in the Legislature. Limited enrollment by prearrangement with the instructor. Course may be repeated once for credit. (S/U grading only.)

Parnas

470. Clinical Program in the Administration of Criminal Justice. (6-12) I, II.

Clinical Program. Program affords students the opportunity to gain practical experience working full or part time in a District Attorney's or 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. Credit for the course ranges from 6-12 units, depending upon whether the employment is full or part time. Limited enrollment with preference given to third-year students. (S/U grading only.)

Parnas

480A-480B. Legal Problems of the Prison Inmate. (2-2) I-II.

Clinical Program—8-10 hours. 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 with consent of instructor. (S/U grading only, deferred pending completion of sequence.)

Feeney, Thomas

495A-495B-495C. 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 and subject to approval of the professor in charge. (S/U grading only, deferred pending completion of sequence.)

Love, Lewis

LIBERAL ARTS

Program Offices, 4208 Storer Hall† and 210 Sproul Hall‡

Committee in Charge:

*Peter K. Cline, Ph.D. (*History*); *Committee Chairperson*†

Richard A. Levin, Ph.D. (*English*); *Committee Chairperson*‡

*Andrew D. Frank, M.A. (*Music*)

NOTE: For key to footnote symbols, see page 220.

†Fall and Winter quarters.

‡Spring quarter.

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 2A-2B-2C.

Students electing this major must also satisfy the area requirements established by the College of Let-

ters 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 proposed upper division program must be approved by both the student's adviser and the committee in charge of the major. It is expected that the student will work closely with his or her adviser in planning the program. Each student must have his or her plan approved by the end of the junior year. The one-quarter independent study project (15 units) must be approved by the Independent Studies Board of the Davis Division. (See pages 8 and 219 for filing.)

LINGUISTICS

Program Offices, 813 Sprout† and 4208 Storer‡ Halls

Committee in Charge:

³ Wayne Harsh, Ph.D. (*Linguistics and English*); *Committee Chairperson*†

² Marianne Cooley, Ph.D. (*Linguistics and English*); *Committee Chairperson*‡

Wilbur A. Benware, Ph.D. (*German*)

Richard A. Ogle, Ph.D. (*Linguistics*)

¹ Lenora Timm, Ph.D. (*Linguistics*)

Carol F. Wall, Ph.D. (*Anthropology*)

² Marianne Cooley, Ph.D. (*Linguistics and English*)

³ Linnea C. Ehri, Ph.D. (*Education*)

³ Wayne Harsh, Ph.D. (*Linguistics and English*)

⁴ Larry H. Hillman, Ph.D. (*French*)

Burt Liebert, M.F.A. (*Education*)

¹ Jerry A. Moles, Ph.D. (*Anthropology*)

Richard A. Ogle, Ph.D. (*Linguistics*)

³ David L. Olmsted, Ph.D. (*Anthropology*)

Anne-Louise Radimsky, Ph.D. (*Electrical Engineering*)

⁴ Winfried Schleiner, Ph.D. (*English*)

Gwendolyn Schwabe, M.A. (*English*)

¹ Lenora Timm, Ph.D. (*Linguistics*)

Maximo Torreblanca, Ph.D. (*Spanish*)

Edward J. Tully, Jr., Ph.D. (*Mathematics*)

Carol F. Wall, Ph.D. (*Anthropology*)

Benjamin E. Wallacker, Ph.D. (*Oriental Languages*)

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*)

Thomas P. Campbell III, Ph.D. (*English*)

† Fall quarter only.

‡ Winter and Spring quarters.

Major Advisers.—M. Cooley, W. Harsh, R. A. Ogle, L. Timm, C. F. Wall.

Graduate Advisers.—W. Harsh, D. L. Olmsted, L. Timm.

The Major Program

For the A.B. Degree in Linguistics students must complete either Linguistics 35 or 135 (introduction to linguistics; perspectives on linguistic research) and an additional 40 upper division units including Linguistics 109, 110, 111 or 165, 112, 139, 140, (phonetics; elementary linguistics analysis; intermediate linguistics analysis or introduction to generative grammar; comparative linguistics; phonological analysis; grammatical analysis). Other courses which may be elected to complete the required upper division 40 or 44 units are Anthropology 120 (language and culture); English 105A, 105B (language; history of English language); French 160 (structure of French language); Linguistics 105, 106, 107, 114, 135, 146, 150, 165 (linguistics analysis of German; history of German language; special topics in English language; ethnography of speaking; perspectives on linguistic research; the Indo-European languages; contrastive analysis of Spanish and English; introduction to generative grammar); Philosophy 137 (philosophy of language); Psychology 132A, 132B, 180G (language and cognition; psycholinguistics); Spanish 131, 132 (modern Spanish syntax; introduction to Spanish linguistics); Human Development 100A, 101 (infancy and early childhood; case study of a young child).

Language Requirement.—In addition, majors are 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). The student is expected to have completed the required 18 units of upper division work before being allowed to take Anthropology 220. If the student satisfies the Letters and Science College Foreign Language Requirement by taking a non-Indo-European language, an Indo-European language (minimum of 12 units) will be required.

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, 208 (introduction to Old En-

glish, middle and early modern English); French 201A, 201B, 230 (history of French language, old Provençal); German 201, 202 (old and middle high German); Linguistics 200, 203, 205 (Gothic, Old Saxon, history of German language); Psychology 264 (psycholinguistics); Russian 200, 202, 204 (old Church Slavic; descriptive Russian grammar; historical Russian grammar); Spanish 230A, 230B (history of Spanish language).

Lower Division Course

35. Introduction to Linguistics. (4) I, III.

Lecture—3 hours; laboratory—2 hours. Introduction to the study of language; its nature, diversity, and structure. Ogle, Timm

Upper Division Courses

105. Linguistics Analysis of German. (4) II.

Lecture—3 hours; assigned problem sets. The descriptive study of modern German with consideration of its structural differences from English. (Same course as German 105.) Benware

105C. Language Change Reflected in Literature. (4) II, III.

Lecture—3 hours; term paper. 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.) Harsh, Campbell

106. History of the German Language. (4) III.

Lecture—3 hours; written reports. Survey of the development of the German language, and study of its structure in historical perspective. (Same course as German 106.) Moelleken

107. Special Topics in English Language. (4) III.

Seminar—3 hours; special project. Prerequisite: one course from English 1, 2, 3, 4A, 4B. Investigation of varied subjects in contemporary and historical English language studies. May be repeated for credit when a different topic is studied. (Same course as English 107.) Schleiner, Cooley, Harsh

109. Phonetics. (4) I.

Lecture—3 hours; discussion—1 hour. Thorough grounding in articulatory phonetics with some attention to the fundamentals of acoustic phonetics. (Same course as Anthropology 109.) Wall

110. Elementary Linguistics Analysis. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. An introduction to phonemic theory, morphophonemics, morphemics, and tactics. (Same course as Anthropology 110.) Olmsted, Wall

111. Intermediate Linguistics Analysis. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Continuation of course 110. More advanced work in phonemics, morphophonemics, morphemics, and tactics. (Same course as Anthropology 111.) Olmsted

112. Comparative Linguistics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction. (Same course as Anthropology 112.) Olmsted

114. The Ethnography of Speaking. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2; Anthropology 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. (Same course as Anthropology 114.) Timm

135. Perspectives on Linguistic Research. (4) II.

Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: upper division or graduate standing plus familiarity with at least one language other than English. An overview of the field of linguistics and its relation to allied disciplines. Techniques of linguistic analysis will be presented and applied to natural languages. (Only 2 units of credit will be granted to students who have taken course 35.) Timm

138. Language Development. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 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. Wall

139. Phonological Analysis. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 111; Introduction to and application of phonological theory. Cooley

140. Grammatical Analysis. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Introduction to syntactical analysis; survey of types of syntactic and semantic phenomena in natural languages. Emphasis will be on developing skills in data analysis, rather than on investigating formal aspects of the theoretical framework to be employed. Ogle

146. The Indo-European Languages. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 112 recommended. Introduction to the study of the Indo-European language family and its major grammatical features. Reconstruction of Proto-Indo-European. Benware

150. Contrastive Analysis of Spanish and English. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite:

Spanish 3 or the equivalent and either course 35, 110, or 135. 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. Timm

165. Introduction to Generative Grammar. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 35 and 140. Introduction to the theory of generative grammar; formalization; goals of linguistic theory; linguistic universals; word and sentence structure; relations between syntax and semantics. Ogle

196. Stylistics. (4) II, III.

Seminar—3 hours; term paper. Prerequisite: English 105A. Analysis of linguistic stylistic variations in specific works to be selected from the corpus of writings in English. (Same course as English 196.) Harsh

198. Directed Group Study. (1-5) II, III.

Prerequisite: senior standing in linguistics. (P/NP grading only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Harsh 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. (Same course as German 200.) Offered in even-numbered years. Benware

202. Principles of Historical Linguistics. (3) II.

Lecture—3 hours. Prerequisite: course 112. Advanced treatment of the theory and method of historical linguistics. Benware, Cooley

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. Offered in even-numbered years. (Same course as German 203.) Moellenken

205. History of the German Language. (4) I.

Seminar—3 hours. The development of the German language with emphasis on the early periods, from Indo-European to Middle High German. (Same course as German 205.) Benware

209. 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. (Same course as German 209.) 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: one course from the following: courses 112, 139, 140. The develop-

ment of the major Romance languages from Proto-Romance to the modern era. Selected topics in the structure of modern Romance languages. Option of focus on phonology, syntax, or historical linguistics.

Hillman, Ogle

225. Modern Linguistic Theory. (3) III.

Lecture—3 hours. Prerequisite: courses 111 and 140. Survey of leading contributions to linguistic theory from de Saussure to the present. Ogle

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Harsh in charge)

MANDARIN—See Oriental Languages

MASS COMMUNICATION

Program Office, 4208 Storer Hall

Committee in Charge:

Stuart J. Kaplan, Ph.D. (*Rhetoric*); *Committee Chairperson*

Sidney Berger, Ph.D. (*English*)

*Everard d'Harnoncourt, Ph.D. (*Dramatic Art*)

Alan C. Elms, Ph.D. (*Psychology*)

William Henderson, M.F.A. (*Art*)

Travis Hirschi, Ph.D. (*Sociology*)

§ § §

Major Advisers.—Members of the Committee.

The major in Mass Communication which leads to the Bachelor of Arts degree is designed to acquaint the student with the general processes, content, and effects of the mass media. The program is not designed to provide specialized technical training. Rather, it is intended to introduce the student to the study of nature, values, and functions of mass communication in our society and to encourage the student to integrate theoretical concepts, research findings and critical insights from both social science and humanistic disciplines into a basic understanding of mass media. The major prepares students for graduate study in mass communication or journalism, for advanced professional training, and for careers requiring a coherent understanding of mass communication. Possible careers include advertising, public relations, news, and management of media outlets.

The Major Program

Lower Division Courses.—Courses should be selected from the following list which will satisfy

prerequisite requirements of upper division courses in the student's program: American Studies 45; Anthropology 2; Art 2; Dramatic Art 15, 20; English 1, 3, 5F, 5P; Mathematics 13; Music 3; Political Science 5; Psychology 2B, 2C; Rhetoric 1, 2, 3, 10, 42; Sociology 1, 46A, 46B.

Upper Division Courses.—Courses are to be selected from a Committee-approved list of upper division courses which is available from the major advisers. Four courses are to be chosen from one of the five following topic areas and four courses are to be distributed among at least two of the remaining topic areas.

- Communication Theory.
- Social and Political Influences on the Mass Media.
- Social Science Research Methods.
- Production of Media Content.
- Analysis of the Content and Effects of Mass Communication.

A two-unit seminar for majors is to be taken in the junior and senior years.

A senior project, 4 to 12 units, related to the student's area of concentration is required. The project might entail research into a facet of mass communication content, policy, or effects, or involve some form of creative activity that culminates in some artifact, for example, a film, video tape, or script.

Each student's program of upper division courses and senior project must be approved by an advisory committee. The committee may refuse a proposed senior project, if in its opinion the student lacks the substantive or methodological background needed for successful completion of the project. It is important for the student to seek advising as early as possible.

MATHEMATICS

David Mead, Ph.D. Chairperson of the Department
—, Vice-Chairperson 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.
Cyrus Derman, Ph.D. (Visiting)
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.
David G. Mead, Ph.D.
Washek F. Pfeffer, Ph.D.
Edward B. Roessler, Ph.D. (Emeritus)
Juliet P. Shaffer, Ph.D. (Visiting)
Sherman K. Stein, Litt.D. (hon.), Ph.D.
Takayuki Tamura, D.Sc.
Howard J. Weiner, Ph.D.

Associate Professors:

Hubert A. Arnold, Ph.D.
David W. Barnette, Ph.D.
*Doyle O. Cutler, Ph.D.
Melven R. Krom, Ph.D.
Peter Linz, Ph.D.
Donald A. Norton, Ph.D.
*G. Thomas Sallee, Ph.D.
Robert W. Stringall, Ph.D.
Edward J. Tully, Jr., Ph.D.

Assistant Professors:

Corwin L. Atwood, Ph.D.
Robert J. Buck, Ph.D.
James R. Diederich, Ph.D.
Allan L. Edelson, Ph.D.
Alan P. Fenech, Ph.D.
Ronald E. Glaser, Ph.D.
Arthur J. Krener, Ph.D.
Norman S. Matloff, Ph.D. (Acting)
E. O. Milton, Ph.D.
Richard E. Plant, Ph.D. (Acting)
*Francisco J. Samaniego, Ph.D.
Evelyn M. Silvia, Ph.D.

Lecturer:

Shirley A. Goldman, M.S.

Major Subject Advisers.—H. L. Alder, H. A. Arnold, D. C. Benson, R. J. Buck, G. D. Chakerian, D. C. Cutler, J. R. Diederich, A. L. Edelson, A. P. Fenech, R. D. Glauz, A. J. Krener, E. O. Milton, D. A. Norton, H. J. Weiner.

Special Area Advisers.—Statistics, A. P. Fenech; Computer Science, R. D. Glauz; Biological and Social Sciences, G. T. Sallee; Mathematics Education, R. W. Stringall; Physical Science, G. J. Kurowski.

Graduate Advisers.—C. L. Atwood, D. O. Banks, C. R. Borges, P. Linz, E. M. Silvia.

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, 40 additional units of upper division mathematics must be completed. During the last quarter of the sophomore year each prospective mathematics major should, in consultation with his adviser, prepare a statement of his mathematical objectives and 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 final approval prior to the last day of instruction of the first quarter of the junior year. Prospective mathematics majors transferring to the University at the upper division level should consult an adviser immediately upon arrival. In general, 198 and 199 courses are not appropriate to be applied towards the 31- or 40-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 40-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 40 units may be chosen from those courses reflecting special interests of the student. To insure 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, 139A-139B-139C and 141 are virtually essential; a selection from courses 13, 19 (or 29), 36A, 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., M.A.T., 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 or she has had the equivalent of a course offered by the Department of Mathematics (e.g., analytic geometry and calculus) may demonstrate proficiency in this course by examination. If, in the opinion of the department, the student's level of achievement is sufficiently high, he or she 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 Credential Subject Representative: R. W. Stringall. See page 215 for the Teacher Education Program.

Lower Division Courses

B. Elementary Algebra. (no credit) I.

Lecture—3 hours. Basic concepts of algebra, including polynomials, factoring, equations, graphs,

and inequalities. Offered only if sufficient number of students enroll. (There is a fee of \$45.) (P/NP grading only.) The Staff

C. Trigonometry. (no credit) I, II.

Lecture—2 hours. Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Offered only if sufficient number of students enroll. (There is a fee of \$30.) (P/NP grading only.) The Staff

D. Intermediate Algebra, (no credit) I, 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 only if sufficient number of students enroll. (There is a fee of \$45.) (P/NP grading only.) 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, matrices, introduction to linear programming. 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. The Staff

NOTE: For key to footnote symbols, see page 220.

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 students in physical sciences and mathematics. Students having had course 29 or Engineering 5A may not receive credit for this course. Kurowski, Linz

21A. Calculus. (4) I, II, III.

Lecture-discussion—4 hours. 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. Mead

21B. Calculus. (4) I, II, III.

Lecture-discussion—4 hours. 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. Mead

21C. Calculus. (4) I, II, III.

Lecture-discussion—4 hours. Prerequisite: course 21B or consent of instructor. 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. Mead

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) II.

Lecture—3 hours. Prerequisite: course 21CH or consent of instructor. Honors course covering the material of course 22A. Silvia

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. Silvia

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) I.

Lecture—3 hours. Prerequisite: course 22AH. Honors course covering material of course 22C. Silvia

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 5A and only two units of credit will be allowed for students who have had course 19. 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.

36A. Fundamentals of Mathematics. (3) I, II, III.

Lecture—3 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

37. Topics in Geometry. (3) III.

Lecture—3 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. Barnette

71A. Elementary Mathematics and Its Instruction.**(4) I, II.**

Lecture—2 hours; field work—6 hours. Introduc-

tion to the mathematics underlying the content and methods of instruction in grades K-8. Enrollment requires concurrent placement as a teacher-aide. (Deferred grading only, pending completion of course 71A-71B sequence.) The Staff

71B. Elementary Mathematics and Its Introduction. (3) II, III.

Lecture—3 hours. Prerequisite: course 71A; Education 100 (must be taken concurrently). (Deferred grading only, pending completion of course 71A-71B sequence.) The Staff

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

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. (P/NP grading only.) Kreith

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. Fenech, Samaniego

105B. Applied Statistical Methods: Multiple Regression. (3) III.

Lecture—3 hours. Prerequisite: course 105A or knowledge of analysis of variance. Multiple regression and analysis of covariance. Samaniego

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

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. 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. Chakerian

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. Barnette

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. Barnette

115C. The Theory of Numbers. (3) III.

Lecture—3 hours. Prerequisite: course 108A. Continued fractions, partitions. Offered in even-numbered years. Barnette

***116. Metric Differential Geometry. (3) III.**

Lecture—3 hours. Prerequisite: courses 22A, 22C; or consent of instructor. Vector analysis, curves and surfaces in three dimensions. Offered in odd-numbered years. 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. Diederich

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. Diederich

118C. Partial Differential Equations: Complex Analysis and Integral Transforms. (3) III.

Lecture—3 hours. Prerequisite: courses 22C and 24. Functions of a complex variable, Fourier and Laplace transforms, applications to boundary value problems. Diederich

119. Theory of Ordinary Differential Equations. (3) I.

Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C, 24. Existence and uniqueness of solutions of ordinary differential equations, matrix solutions of linear systems, linearization of nonlinear equations, local behavior near a critical point and stability theory. Benson

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. 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. Krom

127A-127B-127C. Advanced Calculus.

(4-4-4) I-II-III.

Lecture—3 hours; extensive reading and problem solving. Prerequisite: courses 22A, 22C; course 108A (may be taken concurrently with consent of instructor). Real number system, continuity, differentiation and integration on the real line; vector calculus and functions of several variables; theory of convergence. Borges, Edelson

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. Kurowski, Linz

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. Kurowski, Linz

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. Kurowski, Linz

129A. Introduction to the Theory of Programming.

(3) II.

Lecture—3 hours. Prerequisite: course 22A, course 29 or the equivalent. Assembly languages; arrays and lists; data processing algorithms. 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. Norton

130A-130B. Mathematical Statistics, Brief Course.

(4-4) I-II.

Lecture—3 hours; discussion—1 hour. 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. Glaser

131A. Introduction to Probability Theory. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 22A and 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. Fenech, Weiner

131B-131C. Introduction to Mathematical Statistics.

(4-4) II-III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 131A. Sampling, point estimation, exact sampling distributions, confidence intervals, hypothesis testing, linear regression and analysis of variance. Weiner, Samaniego

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. Weiner

133. Probabilistic Models in Operations Research.

(3) I.

Lecture—3 hours. Prerequisite: course 130B or 131B. Applications of probability to the study of biological and social systems. Topics include the Poisson process, reliability, queueing, inventory models, Markov chains and processes, diffusion processes. Offered in odd-numbered years. Derman

*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. Offered in odd-numbered years. 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. Glaser

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. Kreith

139A-139B-139C. Introduction to Algebra.

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: courses 22A and 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 the quadratic fields. Stein

***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. Sallee

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. Barnette

144. Sampling Theory of Surveys. (3) II.

Lecture—3 hours. Prerequisite: course 130B or 131B. Description and analysis of sample surveys with applications in the social and biological sciences. Stratified and cluster sampling. Ratio estimation. Problems of nonresponse. Offered in even-numbered years. Fenech

***147. Topology. (3) II.**

Lecture—3 hours. Prerequisite: course 127C, and 151A or 139A-139B. Basic notions of point-set and combinatorial topology. Offered in odd-numbered years. Edelson

151A-151B-151C. Algebra. (4-4-4) I-II-III.

Lecture—3 hours; extensive reading and problem solving. Prerequisite: course 108A. Introduction to groups, rings, fields and linear transformations.

***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. Kreith

185A-185B. Functions of a Complex Variable. (3-3) I-II.

Lecture—3 hours. Prerequisite: courses 22C, and 24. Complex number systems, Cauchy-Riemann equations, elementary functions, Cauchy integral theorem, power series, Laurent series, residue theorem, conformal mapping, special topics.

197T. Tutoring in Mathematics. (1-4) I, II, III.

Seminar—1-2 hours; laboratory—2-6 hours. Prerequisite: upper division standing and consent 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 (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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. Buck

***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. The Staff

***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. Silvia

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.) Milton

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. Borges

***218A-218B. Partial Differential Equations. (3-3) I-II.**

Lecture—3 hours. Prerequisite: courses 22A, 127C. Topics from the theory of partial differential equations and integral equations. Offered in even-numbered years. Chakerian

219A-219B. Ordinary Differential Equations. (3-3) I-II.

Lecture—3 hours. Prerequisite: courses 22A and 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. Benson

NOTE: For key to footnote symbols, see page 220.

220A-220B-220C. Mathematics for the Physical Sciences. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: courses 118B and 118C or the equivalent. Topics in ordinary and partial differential equations, boundary value problems, functions of a complex variable, matrices and calculus of variations. Banks

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. Krom

227A-227B-227C. Theoretical Numerical Analysis. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: consent of instructor. Introduction to the principles of modern numerical analysis, its terminology and problems, and its relation to other fields of mathematics. Approximation theory, numerical integration, approximate solutions of operator equations, theory of iterative procedures, optimization problems and topics of current interest. Offered in odd-numbered years. Linz

***228A-228B-228C. Numerical Solution of Differential Equations. (3-3-3) I-II-III.**

Lecture—3 hours. Prerequisite: course 128C. Numerical solution of initial-value, eigenvalue and boundary-value problems for ordinary differential equations. Numerical solution of parabolic and hyperbolic partial differential equations. Offered in even-numbered years. 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. Glauz

231A-231B-231C. Mathematical Statistics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 131C. Distribution theory, decision theoretic methods, estimation and hypothesis testing, multivariate techniques, large sample theory. Atwood

***232A-232B. Linear Model Theory. (3-3) I-II.**

Lecture—3 hours. Prerequisite: course 131C. Estimation and testing for the general linear hypothesis, components of variance, multiple comparisons. Offered in even-numbered years. Fenech

***233. Design of Experiments. (3) III.**

Lecture—3 hours. Prerequisite: course 131C.

Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces. Offered in odd-numbered years. Atwood

235A-235B-235C. Probability Theory. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 127C. Measure-theoretic foundations of probability, distribution functions and characteristic functions, law of large numbers and central limit theorems, conditional probabilities, martingales. Offered in odd-numbered years. Derman

***236A-236B-236C. Advanced Mathematical Statistics. (3-3-3) I-II-III.**

Lecture—3 hours. Prerequisite: course 231C. Statistical theory of invariance, robustness, sequential analysis, nonparametric theory. Offered in odd-numbered years. Samaniego

240A-240B-240C. Differential Geometry. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 116 or consent of instructor. Introduction to differentiable manifolds, the tangent bundle, tensor fields, differential forms, DeRham cohomology, connections, Lie groups, Riemannian geometry. Offered in odd-numbered years. Krener

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 odd-numbered years. 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. Tamura

***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. Tamura

***252. Linear Algebra. (3) I.**

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Vector spaces. Offered in even-numbered years. Stein.

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. Tamura

290. Seminar. (1-6) I, II, III.

Advanced study in various fields of mathematics,

including the following: algebraic theory of semi-groups, control theory, mathematical logic, mathematical statistics, ordinary differential equations, partial differential equations, theory of distributions, and univalent functions. (S/U grading only.)
The Staff

298. Group Study. (1-5) I, II, III.

The Staff

299. Individual Study. (1-6) I, II, III.

(S/U grading only.)

The Staff

299D. Dissertation Research. (1-12) I, II, III.

(S/U grading only.)

The Staff

Professional Courses

300A. The Teaching of Mathematics, K-9.

(1-1-1) I, or (3) II.

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 and 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 or 3 quarters. Arrangements for enrollment in the 3-quarter sequence must be made at the beginning of the Fall Quarter through the Education Department. (Deferred grading only in the 3-quarter sequence.)
Silvia

***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 the equivalent. Mathematics curriculum and teaching methods. Students may complete the course in 1, 2, or 3 quarters. Students teaching full time who wish to complete 3 units during a single year must enroll during the fall quarter. (Deferred grading only, pending completion of course.)
Silvia

301A-301B-301C. Mathematics Teaching Practicum. (3-3-3) I-II-III.

Laboratory—6 hours. Prerequisite: concurrent enrollment in course sequences 210, 302, and 303 or consent of instructor. Specialist training in mathematics teaching. Required for advanced degrees in mathematics education. Sequence requires a strong undergraduate program in the mathematical sciences and may be repeated once for credit with consent of instructor.
Silvia

302A-302B-302C. Curriculum Development in Mathematics. (1-1-1) I-II-III.

Lecture—1 hour. Prerequisite: concurrent enrollment in course sequences 210 and 303 or consent of instructor. Mathematics curriculum development for all grade levels. Required for advanced degrees in mathematics education. Course requires a strong undergraduate mathematics program. The sequence may be repeated once for credit with consent of instructor.
Stringall

303A-303B-303C. Mathematics Pedagogy. (1-1-1) I-II-III.

Lecture—1 hour. Prerequisite: concurrent enrollment in course sequences 210 and 302 or consent of instructor. An investigation of the interplay of mathematical pedagogy and mathematical content, including a historical survey of past and present methods and the influences that shaped their development. The sequence may be repeated once for credit with consent of instructor.
Stringall

MEDICAL LEARNING RESOURCES—See Medicine**MEDICAL MICROBIOLOGY—See Medicine****MEDICINE—School of, this page; Medicine (Veterinary Medicine), see page 436****MEDICINE, School of**

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 Morton Levitt, Ph.D., *Associate Dean*
 Kay H. Blacker, M.D., *Associate Dean*
 George H. Lowrey, M.D., *Associate Dean*
 Robert B. Smith, M.B.A., *Associate Dean*
 Charles C. Semple, M.B.A., *Assistant Dean*
 William McFarland, M.D., *Assistant Dean*
 Frederick W. Hanson, M.D., *Assistant Dean*

Professors:

Charles F. Abildgaard, M.D. (*Pediatrics*)
 Neil C. Andrews, M.D. (*Postgraduate Medicine, Surgery*)
 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*)
 Hugo G. Bogren, M.D. (*Radiology*)
 Robert J. Bolt, M.D. (*Internal Medicine*)
 Nemat O. Borhani, M.D. (*Community Health, Internal Medicine*)
 Robert H. Brownson, Ph.D. (*Human Anatomy*)
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 Irving I. Geschwind, Ph.D. (*Human Physiology*)

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 Eli Gold, M.D. (*Pediatrics*)
 Ernest M. Gold, M.D. (*Internal Medicine*)
 Marvin Goldman, Ph.D. (*Radiology*)
 Paul F. Gulyassy, M.D. (*Internal Medicine*)
 Paul G. Hattersley, M.D. (*in Residence; Internal Medicine, Pathology*)
 Glenn R. Hawkes, Ph.D. (*Family Practice*)
 Andrew G. Hendrickx, Ph.D. (*in Residence; Human Anatomy*)
 Robert E. Hodges, M.D. (*Internal Medicine*)
 Paul D. Hoeprieh, 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. (*Biological Chemistry*)
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John M. Palmer, M.D. (*Urology*)
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 Lawrence Rabinowitz, Ph.D. (*Human Physiology*)
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 Eugene M. Renkin, Ph.D. (*Human Physiology*)
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 Jerome L. Schwartz, Ph.D. (*in Residence; Family Practice*)
 George G. Snively, M.D. (*Family Practice*)
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 Robert E. Stowell, M.D., Ph.D. (*Pathology*)
 Wilfred E. Toreson, M.D., Ph.D. (*Pathology*)
 John D. Trelford, M.D. (*Obstetrics and Gynecology*)
 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, Human Physiology*)
 Sefton R. Wellings, M.D., Ph.D. (*Pathology*)
 Theodore C. West, Ph.D. (*Medical Learning Resources, 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. (*Neurological Surgery*)

Associate Professors:

Ezra A. Amsterdam, M.D. (*Internal Medicine, Pharmacology*)
 C. Robert Ashmore, Ph.D. (*Physical Medicine and Rehabilitation*)
 Arthur L. Barry, Ph.D. (*in Residence; Pathology, Internal Medicine*)
 William F. Benisek, Ph.D. (*Biological Chemistry*)
 Bill D. Burr, M.D. (*Family Practice*)
 Robert D. Cardiff, M.D., Ph.D. (*Pathology*)
 James J. Castles, Jr. M.D. (*Internal Medicine*)
 Guy Corkill, M.D. (*in Residence; Neurological Surgery*)
 Carroll E. Cross, M.D. (*Internal Medicine, Human Physiology*)

Robert D. D'Ambrosia, M.D. (*Orthopaedic Surgery*)
 John H. Eisele, M.D. (*Anesthesiology, Human Physiology*)
 William G. Ellis, M.D. (*Pathology, Neurology*)
 Charles E. Franti, Ph.D. (*Community Health*)
 Andrew J. Gabor, M.D., Ph.D. (*Neurology*)
 Lindsay C. Getzen, M.D. (*Surgery*)
 Jerry R. Gillespie, D.V.M., Ph.D. (*Human Physiology*)
 Albert Globus, M.D. (*Psychiatry*)
 Elliot Goldstein, M.D. (*Internal Medicine*)
 Anthony J. Hance, Ph.D. (*Pharmacology*)
 Frederick W. Hanson, M.D. (*Obstetrics and Gynecology*)
 John W. B. Hershey, Ph.D. (*Biological Chemistry*)
 Owen F. James, M.D. (*Visiting; Anesthesiology*)
 Jess F. Kraus, Ph.D. (*Community Health*)
 Bo M. T. Lantz, M.D. (*Radiology*)
 Jack W. LaPatra, Ph.D. (*Community Health*)
 David R. Leaverton, M.D. (*in Residence; Psychiatry, Pediatrics*)
 James S. Lieberman, M.D. (*Neurology*)
 Malcolm R. MacKenzie, M.D. (*Internal Medicine*)
 Brian H. Mayall, M.D. (*Adjunct; Radiology*)
 Stanley Meizel, Ph.D. (*Human Anatomy*)
 Daniel C. Merrill, M.D. (*in Residence; Urology*)
 Lois F. O'Grady, M.D. (*Internal Medicine, Medical Learning Resources*)
 V. James Polidora, Ph.D. (*Behavioral Biology*)
 Gerald L. Portney, M.D. (*Ophthalmology*)
 Richard S. Riggins, M.D. (*Orthopaedic Surgery*)
 Don A. Rockwell, M.D. (*Psychiatry*)
 Carl J. Rosenquist, M.D. (*Radiology*)
 Gabriel Smilkstein, M.D. (*Family Practice*)
 Robert El. Smith, Ph.D. (*Human Physiology*)
 Margaret S. Steward, Ph.D. (*in Residence; Psychiatry*)
 Robert G. Taylor, M.D. (*Physical Medicine and Rehabilitation*)
 Robert R. Traut, Ph.D. (*Biological Chemistry*)
 Frederic A. Troy II, Ph.D. (*Biological Chemistry*)
 John M. Vogel, M.D. (*Radiology*)
 Donal A. Walsh, Ph.D. (*Biological Chemistry*)

NOTE: For key to footnote symbols, see page 220.

Richard F. Walters, Ph.D. (*Medical Learning Resources, Human Physiology*)
 Edward J. Watson-Williams, M.D. (*Internal Medicine*)
 Richard P. Wennberg, M.D. (*Pediatrics*)
 Doris B. Wilson, Ph.D. (*Human Anatomy*)
 Lowell D. Wilson, M.D., Ph.D. (*Internal Medicine, Biological Chemistry*)

Assistant Professors:

Raymond D. Adelman, M.D. (*Pediatrics*)
 James K. Ahern, M.D. (*Obstetrics and Gynecology*)
 Otmár W. Albrand, M.D. (*Neurological Surgery*)
 Henrietta B. Amsterdam, Ph.D. (*in Residence; Psychiatry*)
 David G. Anderson, Ph.D. (*Adjunct; Obstetrics and Gynecology*)
 Stefan D. Arnon, M.D. (*Radiology*)
 Joseph H. Asling, M.D. (*Anesthesiology*)
 Najam Awan, M.D. (*in Residence; Internal Medicine, Community Health*)
 Jonathan F. Barry, M.D. (*in Residence; Radiology*)
 Joseph A. Beavo, Ph.D. (*Adjunct; Biological Chemistry*)
 Daniel R. Benson, M.D. (*in Residence; Orthopaedic Surgery*)
 Daniel S. Berman, M.D. (*in Residence; Radiology*)
 Thomas C. Brown, Ph.D. (*in Residence; Family Practice*)
 Anthony V. Carrano, Ph.D. (*Adjunct; Radiology*)
 Kurien Chacko, Ph.D. (*Human Anatomy*)
 Robert G. Chuinard, M.D. (*Orthopaedic Surgery*)
 Joseph G. Clendenin, M.D. (*in Residence; Family Practice*)
 Cully A. Cobb III, M.D. (*Neurological Surgery*)
 Matthew H. Connors, M.D. (*Pediatrics*)
 Jay B. Crain, Ph.D. (*Psychiatry*)
 Anthony N. DeMaria, M.D. (*Internal Medicine*)
 Sally J. DeNardo, M.D. (*Radiology*)
 Myron K. Denny, M.D. (*in Residence; Surgery*)
 Thomas A. Depner, M.D. (*Internal Medicine*)
 Paul J. Donald, M.D. (*Otorhinolaryngology*)

Daniel W. Edwards, Ph.D. (*in Residence; Psychiatry*)
 Donald E. Factor, M.D. (*in Residence; Radiology*)
 James Foerster, M.D. (*in Residence; Community Health*)
 Carlyle H. Folkins, Ph.D. (*in Residence; Psychiatry*)
 Alfred P. French, M.D. (*in Residence; Psychiatry*)
 Barry N. French, M.D. (*Neurological Surgery*)
 Dennis L. Fung, M.D. (*Anesthesiology*)
 Sydney E. Garfinkle, M.D. (*Surgery*)
 John P. Garratt, M.D. (*in Residence; Psychiatry*)
 Stanley E. Geel, Ph.D. (*Adjunct; Neurology*)
 M. Eric Gershwin, M.D. (*Internal Medicine*)
 William A. Gifford, M.D. (*in Residence; Community Health*)
 Larry L. Gilbert, M.D. (*in Residence; Family Practice*)
 Blaine W. Glad, M.D. (*Internal Medicine*)
 Boyd W. Goetzman, M.D. (*Pediatrics*)
 Arnold B. Gorin, M.D. (*Internal Medicine*)
 Sarah D. Gray, Ph.D. (*Human Physiology*)
 Jerry F. Green, Ph.D. (*Human Physiology*)
 Bernard R. Greenberg, M.D. (*Internal Medicine*)
 Les R. Greene, Ph.D. (*in Residence; Psychiatry*)
 Charles H. Halsted, M.D. (*Internal Medicine*)
 Crystallenia C. Halsted, M.D. (*Pediatrics*)
 Gary L. Henderson, Ph.D. (*Pharmacology*)
 General K. Hilliard, M.D. (*in Residence; Internal Medicine*)
 Manfred A. Hollinger, Ph.D. (*Pharmacology*)
 John T. Hopkin, M.D. (*in Residence; Psychiatry*)
 Thomas J. Imperato, M.D. (*Internal Medicine*)
 Julian J. Irias, M.D. (*Pediatrics*)
 Hanne M. Jensen, M.D. (*in Residence; Pathology*)
 George W. Jordan, M.D. (*Internal Medicine*)
 Laxman S. Kewalramani, M.D. (*Physical Medicine and Rehabilitation*)
 Patricia N. Konrad, M.D. (*Pediatrics*)
 Kenneth A. Krohn, Ph.D. (*Radiology*)
 Ruth M. Lawrence, M.D. (*Internal Medicine*)

Thomas C. Lee, Ph.D. (*Human Physiology*)
 Nicholas J. Lenn, M.D. (*Neurology, Pediatrics*)
 Daniel P. Link, M.D. (*in Residence; Radiology*)
 Arthur J. Lurie, M.D. (*Surgery*)
 Will L. MacHendrie, M.D. (*Psychiatry*)
 Jack F. Mangum, M.D. (*Radiology and Internal Medicine*)
 Nathaniel M. Matolo, M.D. (*Surgery*)
 Glynn E. McArn, Ph.D. (*Pathology, Medical Learning Resources*)
 David F. Merten, M.D. (*in Residence; Radiology, Pediatrics*)
 Constantine A. Michas, M.D. (*Surgery*)
 Richard R. Miller, M.D. (*Internal Medicine*)
 Thomas L. Morrison, Ph.D. (*in Residence; Psychiatry*)
 Meherji A. Oshtory, M.D. (*in Residence; Neurology*)
 Gibbe H. Parsons, M.D. (*Internal Medicine*)
 Thomas H. Peirce, M.D. (*Internal Medicine*)
 Erich W. Pollak, M.D. (*Surgery*)
 David A. Sacks, M.D. (*Obstetrics and Gynecology*)
 Antone F. Salel, M.D. (*Internal Medicine*)
 Anthony G. Salem, M.D. (*Internal Medicine*)
 Arthur B. Schuller, M.D. (*in Residence; Psychiatry*)
 Robert J. Scibienski, Ph.D. (*Medical Microbiology*)
 Robert P. Scobey, Ph.D. (*Behavioral Biology*)
 Gerard E. Seery, M.D. (*Surgery*)
 Robert F. Shapiro, M.D. (*Internal Medicine*)
 Michael Sheehan, Ph.D. (*Pathology*)
 Bagher M. Sheikholislam, M.D. (*Pediatrics*)
 Hiromu Shoji, M.D. (*in Residence; Orthopaedic Surgery*)
 Robert J. Spensley, M.D. (*in Residence; Psychiatry*)
 Robert C. Stadalnik, M.D. (*in Residence; Radiology*)
 Larry G. Stark, Ph.D. (*Pharmacology*)
 Michael J. Sullivan, M.D. (*Urology*)
 Jerold H. Theis, D.V.M., Ph.D. (*Medical Microbiology*)
 Melvin Tonkon, M.D. (*in Residence; Community Health, Internal Medicine*)
 Zakauddin Vera, M.D. (*Internal Medicine*)
 Nazhiyath Vijayan, M.D. (*Neurology*)
 Vijaya K. Vijayan, M.D., Ph.D. (*Human Anatomy*)
 Louis A. Vismara, M.D. (*Internal Medicine*)

Robert M. Walter, Jr., M.D. (*Internal Medicine*)
 George O. Waring III, M.D. (*Ophthalmology*)
 Joan Wikman-Coffelt, Ph.D. (*Adjunct; Internal Medicine, Biological Chemistry*)
 David O. Williams, M.D. (*in Residence; Internal Medicine*)
 Malcolm E. Wilson, M.D. (*in Residence; Neurology*)
 Christel S. Winterling, M.D. (*in Residence; Family Practice, Pediatrics*)
 Alayne Y. Yates, M.D. (*in Residence; Psychiatry, Pediatrics*)

Lecturers:

Lawrence Bass, M.D. (*Dermatology*)
 Herbert Bauer, M.D. (*Community Health*)
 Elaine Chaykin, R.N. (*Family Practice*)
 Loretta A. Dostal, M.H.S. (*Family Practice*)
 Donis A. B. Eichhorn, M.S. (*Pediatrics*)
 Mary Fenley, F.N.P. (*Family Practice*)
 Leona E. Judson, F.N.P. (*Family Practice*)
 Barbara J. Juzek, R.N. (*Family Practice*)
 Janet Mentink, R.N. (*Family Practice*)
 William R. Nesbitt, M.D. (*Family Practice*)
 Ethelda N. Sassenrath, Ph.D. (*Behavioral Biology*)
 Craig Watson, Ph.D. (*Human Anatomy*)
 Jean A. Zellé, M.A. (*Physical Medicine and Rehabilitation*)

Instructors:

Patricia A. Hines, M.D. (*in Residence; Psychiatry*)
 Francis Pepitone-Rockwell, Ph.D. (*in Residence; Psychiatry*)
 Gordon J. Thenemann, M.D. (*Internal Medicine*)
 Kenneth Wiesner, M.D. (*Internal Medicine*)

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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.)

Asling and staff

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 advanced 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.)

Reitan and staff

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.)

Carnes and staff

499. Anesthesiology Research. (1-6) I, II, III, IV.

Laboratory—3-18 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.)

Eisele and staff

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. (P/NP grading only.)

The Staff (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 problem. (P/NP grading only.)

The Staff (Chapman in charge)

Upper Division Courses

145. Psychophysiology of Stress. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor; open to graduate students. Basic neuroendocrine stress response systems, feedback control and hormonal interrelations. Hormonal and behavioral effects of chronic psychosocial or environmental stress. Stress interaction with CNS control of affect, sexual function and drug responses. The material covered will be of general interest, but will have special relevance to students with primary interest in medicine, social behavior, sociobiology, or environmental studies. (Same course as 245.)

Sassenrath

151. Biology of the Mind/Body. (1-4) I, II, III, IV.

Discussion—1-3 hours; experiential laboratory—2-4 hours. Prerequisite: undergraduate students with consent of instructor. Cognitive and experiential study of the ancient and modern monistic disciplines of the mind/body. Critical examination of several such disciplines, focusing on their common medically relevant aspects. Reading about, discussing and experiencing mind/body interrelationships. (P/NP grading only.) (Same course as 251 and 451.)

Polidora

155. Hormonal Correlates of Social Behavior.

(3) I, III.

Lecture—1 hour; discussion—2 hours. Prerequisite: consent of instructor. An overview of basic systems and current concepts relating hormones and social behavior in experimental animals and man. Discussion based on selected readings concerned with endocrine and behavioral interrelations in reproduction (including developmental, sexual and parental behavior), puberty, menstrual cycle, aggression and psychosocial stress. (Same course as 255.)

Sassenrath, Barkley, Anderson, Sommer

188. Recent Developments in Behavioral Biology.

(2) I.

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. What is new and interesting at the leading edge of development of behavioral biology? Through presentations by invited speakers and the instructor, the course will answer this question in lectures, demonstrations, experiential workshops and discussions. A passing grade will be contingent upon submission of a written description of each student's significant learning experience in the course. (P/NP grading only.)

Polidora

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. (P/NP grading only.)

The Staff (Chapman in charge)

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. (P/NP grading only.)
The Staff (Chapman in charge)

Graduate Courses

245. Psychophysiology of Stress. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor; open to graduate students. Basic neuroendocrine stress response systems, feedback control, and hormonal interrelations. Hormonal and behavioral effects of chronic psychosocial or environmental stress. Stress interaction with CNS control of affect, sexual function, and drug responses. (Same course as 145.) Sassenrath

251. Biology of the Mind/Body. (1-4) I, II, III, IV.

Discussion—1-3 hours; experiential laboratory—2-4 hours. Prerequisite: graduate students with consent of instructor. Cognitive and experiential study of the ancient and modern monistic disciplines of the mind/body. Critical examination of several such disciplines, focusing on their common medically relevant aspects. Reading about, discussing and experiencing mind/body interrelationships. (Same course as 151 and 451.) Polidora

255. Hormonal Correlates of Social Behavior. (3) I, III.

Lecture—1 hour; discussion—2 hours. Prerequisite: consent of instructor. An overview of basic systems and current concepts relating hormones and social behavior in experimental animals and man. Discussion based on selected readings concerned with endocrine and behavioral interrelations in reproduction (including developmental, sexual and parental behavior), puberty, menstrual cycle, aggression and psychosocial stress. (Same course as 155.) Sassenrath, Barkley, Anderson, Sommer

268. Three-Dimensional Structure of the Human Brain. (1) III, IV.

Lecture-laboratory-discussion consisting of two to three 2-hour sessions—20 hours minimum. Intensive, somewhat flexible early-quarter scheduling. Course goal is the student retaining a clear, vivid, three-dimensional mental image of the major anatomical structures of the human brain. Phases: slide-illustrated lecture emphasizing function; gross dissection; build clay model of brain; identify structures on slides. (Same course as 468.) Polidora

290. Seminar. (2) I, II, III, IV.

Seminar—2 hours. Prerequisite: consent of instructor; open to graduate students. Group discus-

sion and critique of current topics of importance and relevance to behavioral biology.

The Staff (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 (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. (S/U grading only.)
The Staff (Chapman in charge)

Biological Chemistry

Upper Division Course

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, IV.

To be arranged. Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (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.)
Benisek, Feeney

214. Contemporary Medical Biochemistry. (1) II.

Lecture—1 hour. Prerequisite: course in biochemistry or the equivalent; open to graduate students. A series of lectures on current topics of biochemistry related to medicine. The material covered stresses concepts derived from biochemical research which have some potential clinical relevance, which are intended to be of interest to medical students, graduate students, postdoctoral fellows and faculty. (S/U grading only.) (Same course as 414.)
The Staff (Troy in charge)

***220. Molecular Biology Laboratory. (4) II.**

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 grading only for medical students; S/U grading only for graduate students.) Traut, Hershey, Doi

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. (Same course as 490.) The Staff (Krebs in charge)

291. Current Topics in Protein Synthesis.

(1) I, II, III, IV.

Discussion and seminar sessions. Prerequisite: consent of instructor; open to graduate students. Review of current research in structure and function of bacterial and mammalian ribosomes and control of protein synthesis. (Same course as 491.) (S/U grading only for graduate students; H/S/U grading only for medical students.) Traut, Hershey

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 (Krebs in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. The Staff (Krebs in charge)

Professional Courses**490. Current Topics in Biological Chemistry.**

(1) I, II, III.

Seminar—1 hour. Prerequisite: course in biochemistry or molecular and cell biology. Biochemical topics of current research interest will be discussed. Students will participate in presentation of papers and/or reviews of laboratory work in progress. (Same course as 290.) (H/S/U grading only for medical students.) The Staff

491. Current Topics in Protein Synthesis.

(1) I, II, III, IV.

Discussion-seminar—1 hour. Prerequisite: consent of instructor; open to graduate students. Review of current research in structure and function of bacterial and mammalian ribosomes and control of protein synthesis. (Same course as 291.) (S/U grading only for graduate students; H/S/U grading only for medical students.) Traut, Hershey

Clinical Psychology**Graduate Courses****200. Theory of the Person-Adult. (4) I.**

Lecture—2 hours; seminar—2 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Major contemporary personality theories will be examined and compared. Emphasis will be placed on those theories which are most relevant to contemporary intervention techniques. Meadow

201. Observational Practicum. (3) I, II, III, IV.

Discussion—2 hours; laboratory—2 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Students rotate through three major field placements: a child-family, an adult clinical, and a community setting. The purpose is to develop skills in observing human behavior. Didactic material and field experience. Meadow and staff

202. Theories in Clinical Child Psychology. (4) II.

Lecture—4 hours. Major theories in clinical child psychology, as related to research and clinical findings in pediatrics, child psychiatry and child development. Steward

204. Schizophrenia Psychopathology and Intervention. (3) II, III.

Seminar—3 hours. Prerequisite: consent of instructor. Major theories on the etiology of schizophrenia and the chief methods of therapy. Meadow and staff

205. Issues in Clinical Adult Psychology.

(3) I, II, III, IV.

Lecture—3 hours. Prerequisite: consent of instructor. Detailed examination of theoretical and research data on topics of special interest to the faculty members such as psychological stress, aggression, suicide, and the etiology of schizophrenia. Morrison and staff

206. Theories of the Group. (4) III.

Lecture—2 hours; seminar—2 hours. Prerequisite: consent of instructor. A review of the literature in culture and personality and organizational theory relevant to problems of assessment and intervention in community and group processes. (S/U grading only.) Kemp and staff

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. Individual or group research on selected topics. (S/U grading only.) The Staff (Folkins in charge)

Community Health**Upper Division Courses****101. Perspectives in Community Health. (2) I, III.**

Lecture—1 hour; discussion—1 hour. Prerequisite—

site: 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.

Kraus, Borhani, Bauer

121. Introduction to Medical Ecology. (2) III.

Lecture—2 hours. Prerequisite: upper division undergraduate or graduate with interest in health sciences, human ecology, or related areas. Focus on principles of medical ecology as they relate to the study of the distribution and determinants of disease, or injury in human populations. The biological, physical and social environments are examined to show the causes, natural histories and ecological correlates of human illness.

Kraus, Borhani

131. Environmental Health. (4) II.

Lecture—3 hours; discussion—1 hour. Contemporary problems in environmentally dependent aspects of individual and public health. Disease associated with pollution of air, water, soil, food; infectious diseases such as malaria, and encephalitis; and stress phenomena related to urban crowding, noise, and occupation will be considered. (Same course as Environmental Studies 131.)

Kraus

198. Directed Group Study. (2) I, II, III.

Discussion—2 hours. Prerequisite: consent of instructor. Humanism in medicine. Discussion of humanistic aspects of various topics of community health such as health care delivery, right to die, suicide, sexuality, rights of children, etc. (P/NP grading only.)

The Staff (Bauer in charge)

Family Practice

Upper Division Courses

120A. Fundamentals of Medicine for Family Nurse Practitioners. (7) II.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner Program who are pursuing a baccalaureate degree. Instruction and practice in the fundamentals of interview technique, taking a medical history and performing a complete physical examination; study of basic anatomy, physiology, and pathophysiology of oxygenation, defense, and nutrition systems. (P/NP grading only.) Fenley, Chaykin, Andrus, and staff

120B. Fundamentals of Medicine for Family Nurse Practitioners. (7) III.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner Program who are pursuing a baccalaureate degree. Practice is offered in the fundamentals of medical history taking and physical examination; study of basic anatomy, physiology and pathophysiology of locomotion, communication, cardiovascular and re-

productive systems. (P/NP grading only.)

Fenley, Chaykin, Andrus, and staff

120C. Fundamentals of Medicine for Family Nurse Practitioners. (7) IV.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner Program who are pursuing a baccalaureate degree. Instruction and practice in the fundamentals of clinical patient care in ambulatory settings; introduction to basic pharmacologic therapeutics and laboratory procedures for nurse practitioners. (P/NP grading only.)

Winterling, Judson, and staff

120D. Fundamentals of Medicine for Family Nurse Practitioners. (7) I.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner Program who are pursuing a baccalaureate degree. Instruction and practice in the fundamentals of clinical patient care in ambulatory settings; instruction in counseling, crisis, therapy, and emergency care. (P/NP grading only.)

Winterling, Judson, and staff

121A-121B-121C-121D. Fundamental Issues for Family Nurse Practitioners.

(2-2-2-2) II, III, IV, I.

Lecture—2 hours. Prerequisite: students in the Family Nurse Practitioner Program who are pursuing a baccalaureate degree. Lectures on selected topics relevant to the role of the Family Nurse Practitioner (FNP) are presented. The course is designed to study the fundamental aspects of the role and scope of duties of the FNP. (P/NP grading only.)

The Staff

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.

Andrus, Schwartz, Finley

198 Directed Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. Directed group study for advanced undergraduates interested in health care delivery system. (P/NP grading only.)

The Staff (Andrus in charge)

199. 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. (P/NP grading only.)

The Staff (Geyman, Smilkstein in charge)

Graduate Courses

266. Law and Medicine. (3) I.

Lecture—3 hours. Prerequisite: second-year medical and second- and third-year law students with

consent of instructor; open to graduate students. Seminar approach emphasizing class work, field trips, individual projects re medical education and practice, attorney-physician relations, development of human behavior, community health care and medicolegal problems. (Same course as Law 266.) (H/S/U grading only for medical students.)

Schwartz and staff

271. Clinical Pharmacology. (2-10) I, II, III, IV.

Lecture—2-10 hours; ward rounds. Prerequisite: advanced graduate students or postdoctoral fellows. Principles of pharmacology will be related to the diagnosis and treatment of drug induced disease status as well as principles of therapy of common clinical diseases. (Same course as Pharmacology 271.)

Winters, Renolett

298. Group Study (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. (S/U grading only.)

The Staff (Schwartz in charge)

Professional Courses

406A-406B-406C. Primary Care in Sports Medicine. (2-2-2) I, II, III.

Lecture—1 hour; laboratory—2 hours. Prerequisite: second-year medical students or consent of instructor; open to graduate students. First quarter will cover primary health care in sports medicine — prevention, treatment and rehabilitation. Second quarter will deal with the physical fitness programs in health and disease — health care maintenance and rehabilitation. Third quarter is for independent study in sports medicine. (H/S/U grading only for medical students.)

Milkstein

410. Analysis of Health Care Delivery Systems for Family Nurse Practitioners. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: students in the Family Nurse Practitioner Program. Topics aimed at providing a theoretical understanding of the economics and organization of health care systems, quality of care, legislation and licensure, and the role of family nurse practitioners. (S/U grading only.)

Schwartz, Andrus

411. Family Structure and Function for Family Nurse Practitioners. (4) III, IV.

Lecture—2 hours; discussion—2 hours. Prerequisite: students in the Family Nurse Practitioner Program. Topics aimed at providing a theoretical understanding of the contemporary American family as a social unit; includes human development, family organization, roles and dynamics. (S/U grading only.)

Hawkes, Fenley

420A. Fundamentals of Medicine for Family Nurse Practitioners. (7) I.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner

Program. Instruction and practice in taking a medical history and performing a complete physical examination. Study of anatomy and physiology and pathophysiology of oxygenation, defense and nutrition systems. (S/U grading only.)

Smith

420B. Fundamentals of Medicine for Family Nurse Practitioners. (7) II.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner Program. Instruction and practice in medical history taking, use of locomotion, communication, homeostatic, and reproduction systems. (S/U grading only.)

Smith

420C. Fundamentals of Medicine for Family Nurse Practitioners. (7) IV.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner Program. Instruction and clinical practice in the ambulatory care of patients with diseases of the oxygenation, defense and nutrition systems. (S/U grading only.)

Smith

420D. Fundamentals of Medicine for Family Nurse Practitioners. (7) I.

Lecture—3 hours; laboratory—12 hours. Prerequisite: students in the Family Nurse Practitioner Program. Instruction and practice in medical history taking, use of locomotion, communication, homeostatic, and reproduction systems. (S/U grading only.)

Smith

421A-421B-421C. Seminar for Family Nurse Practitioners. (2) I, II, III.

Seminar—2 hours. Prerequisite: students in the Family Nurse Practitioner Program. Group discussion of selected topics relevant to the role of the family nurse practitioner. (S/U grading only.)

The Staff

421D. Graduate Seminar in Clinical Medicine for Family Nurse Practitioners. (2) I.

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Review and study of current patterns of management of the common chronic diseases; application of flow sheet monitoring, record audits and algorithms. (S/U grading only.)

Mentink, Dostol

Human Anatomy

Upper Division Courses

100. Functional Anatomy of the Human Body. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: open to all graduates and undergraduates with consent of instructor. The gross structure and function of the human body. Limited enrollment. Barry

102. Development and Structure of the Human Body. (4) III.

Lecture—4 hours. Prerequisite: Biological Sci-

ences 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 (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.)
The Staff (Vijayan in charge)

198. Directed Group Study. (1-5) I, II, III, IV.

Discussion—2 hours; laboratory—0-6 hours. Prerequisite: consent of instructor. Directed reading, discussion, and/or laboratory experience on selected topics. (P/NP grading only.)
The Staff (Barry in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Barry in charge)

Graduate Courses

***205A. Biochemical and Morphological Aspects of Mammalian Reproduction. (2) II.**

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Critical reading and discussion. Structural and molecular aspects of spermatogenesis; sperm maturation and transport; capacitation; and fertilization. Emphasis on the male reproductive system. Limited enrollment. Offered in even-numbered years. (S/U grading only.) Meizel

205B. Biochemical and Morphological Aspects of Mammalian Reproduction. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Critical reading and discussion. Structural and molecular aspects of oogenesis; ovulation; egg transport; fertilization; and implantation. Emphasis on the female reproductive system. Limited enrollment. Offered in odd-numbered years. (S/U grading only.) 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. The Staff

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.)
The Staff (Barry in charge)

298. Advanced Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. The Staff (Barry in charge)

299. Research. (2-12) I, II, III, IV.

Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)
The Staff (Barry 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.) Vijayan 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.) 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.) Barry 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.) Brownson

410. Human Embryology. (3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: completion of first-year medical studies or consent of instructor. Lectures and seminar discussions on normal and abnormal human development with an emphasis on congenital anomalies. (S/U grading only.) Barry

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. Walters

198. Directed Group Study. (1-5) I, II, III, IV.

To be arranged. Prerequisite: consent of instructor. Directed reading, discussion and/or laboratory experience on selected topics. (P/NP grading only.)
The Staff (Renkin 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. (P/NP grading only.) The Staff (Renkin in charge)

Graduate Courses

*200D. Advanced General Physiology. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101B, Chemistry 110B, Physiology 100B; graduate standing and consent of instructor. Physiochemical basis of living systems with emphasis on membrane permeability characteristics at both the cellular and tissue level. Offered in even-numbered years.
Renkin and staff

213. Cellular Physiology of Excitable Membranes. (4) I.

Lecture—2 hours; discussion—1 hour; 1 hour problem sets or written review per week. Prerequisite: elementary physics and calculus. Beginning with electrochemistry, this course uses elementary calculus and physics for lectures and problem sets on diffusion potentials, electrotonic conduction, synaptic transmission, etc. Several topics will be covered by invited lecturers on their research interests.
Scobey

221. Surgical Approaches to Physiology.

(2) I, II, III, IV.

Discussion—1 hour; laboratory—3 hours. Prerequisite: Physiology 210A-210B or Medical Sciences 411A-411B and consent of instructor; open to graduate students. A practical laboratory experience in the classical surgical techniques used to obtain physiological information. Hsieh and staff

231. Renal Physiology. (3) I.

Lecture—3 hours. Prerequisite: Physiology 110A, 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.
Rabinowitz

231L. Renal Physiology Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: Physiology 110A, 110B or the 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.
Rabinowitz

235. Physiology of the Body Fluids. (3) III.

Lecture—1 hour; discussion—2 hours. Prerequisite: consent of instructor. Drill and problem sets on fundamental properties and behavior of body fluid compartments including water, Na, K, Cl, distribution and exchange. Lectures on development of modern concepts. Assigned reading and discussion of clinically oriented articles on the subject. Grading based on attendance and student-given brief reports.
Rabinowitz

252. Advanced Information Systems. (3) II.

Lecture—1 hour; seminar—2 hours. Prerequisite: course 151 and consent of instructor. Case studies of information systems; development of system components through projects; analysis of on-line file structures; strategies for systems performance optimization. (Same course as Biomedical Engineering 252.)
Walters

*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 investigation of homeostasis.
Smith

280. Pulmonary Function Evaluation. (4) I, II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Medical Sciences 411B; open to graduate students. Clinical laboratory, physiological evaluations of pulmonary function.
Cross

282. Comparative Pulmonary Physiology.

(3) I, II, III.

Laboratory—8 hours. Prerequisite: Medical Sciences 411B; open to graduate students. Comparative studies of pulmonary function.
Cross

283. Respiratory Physiology. (3) III.

Lecture—3 hours. Prerequisite: Physiology 210 or the equivalent, and consent of instructor; open to graduate students. Topics in mammalian respiratory physiology and related areas. These include pulmonary mechanics, pulmonary circulation, gas exchange, and the control of respiration. Offered in even-numbered years.
Green and staff

284. Cardiovascular Physiology. (3) III.

Lecture—3 hours. Prerequisite: Physiology 210 or the equivalent and consent of instructor. Topics in mammalian cardiovascular physiology and related topics. These include capillary dynamics, pressure flow relationships in the peripheral circulation, cardiac mechanics, and the regulation of cardiac output. Offered in odd-numbered years. Green

285. Peripheral Circulation. (3) III.

Lecture—1 hour; discussion—2 hours. Prerequisite: Physiology 110B, 111B, or the equivalent and consent of instructor. Course will consist of a series of lectures and discussion sessions on the physiology of mammalian peripheral circulation including topics on: anatomy, physiology, and pharmacology of vascular smooth muscle, regional circuits, microcirculatory control mechanisms, and dynamics of capillary transport. Offered in even-numbered years. Gray

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 (Renkin in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. (S/U grading only.) The Staff (Renkin in charge)

Internal Medicine—Cardiology

Upper Division Courses

198. Directed Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. Directed reading, discussion and/or laboratory experience on selected topics. (H/S/U grading only for medical students.) The Staff (Salel, Amsterdam in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, IV.

Prerequisite: consent of instructor; senior standing in biology, chemistry, physics, psychology or engineering. Undergraduate research project. The Staff (Salel, Amsterdam in charge)

Graduate Courses

270. Cardiovascular Research Conference.

(2) I, II, III, IV.

Lecture—1 hour; discussion—1 hour. Prerequisite: freshman medical year or mammalian physiology. Weekly conference led by staff on specific topics in cardiovascular research and cardiovascular disease mechanisms. (S/U grading for graduate students; H/S/U grading only for medical students.) Mason

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 (Mason in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. Thesis research. (S/U grading only.) The Staff (Mason in charge)

Internal Medicine—Endocrinology

Graduate Course

299. Research. (3-12) I, II, III, IV.

Prerequisite: consent of instructor. Endocrinology research. (S/U grading only.) The Staff (Kumagai in charge)

Internal Medicine—Hematology-Oncology

Graduate Courses

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 (Lewis in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.) The Staff (Lewis 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.) O'Grady

402. Topics in Medical Immunology.

(1) I, II, III, IV.

Discussion—1 hour; library work. Prerequisite: one year of postbaccalaureate 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.)

MacKenzie

Internal Medicine—Infectious Diseases

Upper Division Course

199. Infectious Diseases Research.

(1-5) I, II, III, IV.

Discussion—1 hour; seminar—1 hour; laboratory—4 hours; per individual arrangement with instructor. Prerequisite: chemistry through organic chemistry, (in addition, physical and biochemistry preferred), biology through basic bacteriology (in addition, microbiology and immunology preferred), and consent of instructor. A discrete problem requiring reading and actual manual effort in solution will be assigned to each student. Progress and results will be reviewed at intervals with the instructor and via seminar presentations. (P/NP grading only.)

The Staff (Hoeprich in charge)

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.)

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.)

Hoeprich, Goldstein, Barry

Internal Medicine—Nutrition

Graduate Course

210. Nutritional Aspects of Medical Practice. (3) III.

Lecture—1 hour; seminar—2 hours. Prerequisite: medical and graduate students and/or consent of instructor. Lectures and reading assignments on clinical nutrition. Preselected topics will relate to disease processes, organ systems and therapy. Faculty lectures and student seminars will be coordinated. (H/S/U grading only for medical students.)

Hodges, Hurley, Halsted

Medical Learning Resources

Upper Division Courses

155. Applications of Computers to Biomedicine.

(2) I, III.

Lecture—1 hour; computer demonstrations or lecture—1 hour. 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.

Walters

160. Instructional Media in Biomedical Education.

(2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: Medical Sciences 410, 411A or the 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.

West, Walters

Graduate Courses

220. Evaluation in the Medical Curriculum. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410, 411A or the 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.

West, 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.

Walters

Medical Microbiology

Upper Division Courses

107. Chemical and Cellular Immunology. (4) III.

Lecture—4 hours; laboratory—provided to selected individual students. Prerequisite: Biochemistry 101A, 101B or consent of instructor. The chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies, and antigen-antibody interaction; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity and related immunological phenomena. (Same course as course 407.)

Benjamini, Sciabienski

198. Group Study in Medical Microbiology.

(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. (P/NP grading only.)

The Staff (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. (P/NP grading only.)

The Staff (Pappagianis in charge)

Graduate Courses

209. Frontiers in Immunology. (2) I, II, III.

Discussion—2 hours. Prerequisite: consent of instructor. Current developments in various aspects of immunology and their interrelationships. (S/U grading only.) (Same course as 409.)

Benjamini

215. Medical Parasitology. (2) III, IV.

Discussion—2 hours. Prerequisite: graduate student with consent of instructor. Clinical epidemiological laboratory study of protozoan, helminth and arthropods of medical importance.

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.

Theis

292. Topics in Medical Microbiology, Infectious Diseases and Immunology. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Assigned reading and discussion on recent advances in medical microbiology, infectious diseases, and immunology. (S/U grading only.)

Pappagianis

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. (Sections 1, 2, 4, 5: S/U grading only.)

The Staff (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. (S/U grading only.)

The Staff (Pappagianis in charge)

Professional Courses

401. Medical Virology. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Science 410 and consent of instructor; open to graduate students. This course deals with the clinical, epidemiological, and experimental aspects of viral diseases of man. (H/S/U grading only for medical students.)

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.)

Pappagianis

407. Chemical and Cellular Immunology. (4) III.

Lecture—4 hours; laboratory—provided to selected individual students. Prerequisite: Biochemistry 101A, 101B or consent of instructor; open to graduate students. The chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies and antigen-antibody interaction; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity and related immunological phenomena. (S/U grading only.) (Same course as course 107.)

Benjamini, Scibienski

415. Medical Parasitology. (1-12) III, IV.

Discussion—1-6 hours; laboratory—0-12 hours. Prerequisite: medical or graduate students with consent of instructor. Clinical, epidemiological, laboratory study of protozoan, helminths, and arthropods of medical importance. (H/S/U grading only for medical students.)

Theis

Neurology

Graduate Course

298. Group Study. (1-5) I, II, III, IV.

Laboratory—6-10 hours. Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. (S/U grading only.)

The Staff (Dreyfus in charge)

Professional Course

499. Research. (1-12) I, II, III, IV.

Laboratory—2-24 hours. Prerequisite: consent of instructor. Laboratory investigation on selected topics. (S/U grading only for graduate students; H/S/U grading only for medical students.)

The Staff (Dreyfus in charge)

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 system; neoplasia in the

nervous system. Given jointly with Departments of Neurology and Pathology.

The Staff (Youmans in charge)

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.) The Staff (Youmans in charge)

Orthopaedic Surgery

Professional Course

499. Orthopaedic Research. (1-12) I, II, III, IV.

Prerequisite: undergraduate, graduate, and medical students; consent of instructor. Laboratory or clinical investigation on selected topics. (H/S/U grading only for medical students.) Riggins and staff

Otorhinolaryngology

Professional Courses

400. Suture Techniques. (1) I, II, III, IV.

Lecture—5 hours total; laboratory—10 hours total. Prerequisite: second-year medical students with consent of instructor; open to graduate students. Principles of management of lacerations and the various techniques of suturing a wound. (H/S/U grading only for medical students.) Bernstein and staff

401. Clinical Examinations in Otorhinolaryngology.

(1) I, II, III, IV.

Lecture—1 hour; laboratory—1 hour; practical—1 hour total. Prerequisite: second-year medical students with consent of instructor; open to graduate students. Obtaining the history, applied anatomy of the regions, and the art of the examination. Head mirror required. (H/S/U grading only for medical students.) Bernstein and staff

402. Otorhinolaryngology in Family Practice.

(1) I, II, III, IV.

Lecture—10 hours total. Prerequisite: fourth-year medical students and family practitioners with consent of instructor; open to graduate students. Planned as a refresher course for those already possessing a background of knowledge in the specialty. (H/S/U grading only for medical students.) Bernstein and staff

460. Clinical Otorhinolaryngology Elective.

(3-18) I, II, III, IV.

Full-time clinical activity. Prerequisite: third- and fourth-year medical students with consent of instructor; open to graduate students. Total involvement in

clinical activities of the department. (H/S/U grading only for medical students.) Bernstein and staff

490. Journal Seminar. (1) I, II, III, IV.

Lecture-discussion—10 hours total (course given three times per quarter). Prerequisite: fourth-year medical students with consent of instructor; open to graduate students. Monthly review of current otorhinolaryngologic and related literature and recent advances. (H/S/U grading only for medical students.) Bernstein and staff

491. Otorhinolaryngologic Seminars. (1)

I, II, III, IV.

Seminar—1 hour. Prerequisite: fourth-year medical students with consent of instructor; open to graduate students. Weekly formal presentations of general otorhinolaryngologic topics. The subjects will be clinically oriented and explored in depth. (H/S/U grading only for medical students.) Bernstein and staff

499. Research. (1-12) I, II, III, IV.

Prerequisite: medical students with consent of instructor; open to graduate students. Participation in ongoing projects. (H/S/U grading only for medical students.) Bernstein and staff

Pathology

Graduate Courses

207. Introduction to Nervous System Pathology.

(1-4) I, II, III, IV.

Lecture—1 hour; discussion—1 hour; seminar—2 hours. Prerequisite: open to undergraduate, graduate, and veterinary students with consent of instructor. Study of nervous system tissue responses to injury, infection, neoplasia, and malformation—in both the human and experimental animal. Seminars include correlation of clinical, gross and microscopic findings; discussions provide instruction in microscopic techniques. (H/S/U grading only for medical students.) Ellis

210. Introduction to Human Pathology. (6) I.

Lecture—2 hours; discussion—2 hours; laboratory—4 hours. Prerequisite: 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, and injuries due to environmental and toxic agents. Limited enrollment. Offered in even-numbered years. Stowell

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 (Wellings in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to undergraduate and graduate students. Research in the mechanisms of disease, the effects and causes of injury, neoplasia, neuropathology and comparative pathology. (S/U grading only.)

The Staff (Wellings in charge)

Professional Courses

402. Current Topics in Tumor Biology. (1) I, II, III.

Seminar—2 hours. Prerequisite: graduate 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.)

Faulkin, Wellings, Cardiff

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.)

Toreson

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.)

Rooney and staff

405. Brain-Cutting Conference. (1) I, II, III, IV.

Seminar—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Current specimens are sectioned, discussed, and clinical correlations proposed. (Same course as Neurosurgery 423.) (H/S/U grading only for medical students.)

Ellis

406. Histopathologic Diagnosis. (1) II.

Seminar—1 hour. Prerequisite: medical students 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.)

Toreson and staff

407. Diseases of the Nervous System.

(1-4) I, II, III, IV.

Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: medical students or special training in pathology or neurological sciences; consent of instructor; open to graduate students. Study of human nervous system reactions to disease including infection, neoplasia and maldevelopment; ap-

plication of experimental models to human disease; and clinical correlations. Seminars emphasize microscopic findings in current cases; discussion includes individualized experience in neuropathologic techniques. Given jointly with the Departments of Neurology and Neurosurgery. (H/S/U grading only for medical students.)

Ellis

408. Autopsy Case Studies. (1-12) I, II, III, IV.

Discussion—1-4 hours; laboratory—3-24 hours. Prerequisite: medical and veterinary students with 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.)

Ruebner and staff

409. Neuropathology Conference. (1) I, II, III, IV.

Seminar—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Neuropathologic findings in current cases are correlated with clinical findings and compared with previously reported cases. Given jointly with Departments of Neurology and Neurosurgery. (H/S/U grading only for medical students.)

Ellis

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.)

Cardiff, Ruebner

491. Surgical Pathology Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: 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.)

Toreson

492. Ultrastructure Seminar. (1) I, III.

Seminar—1 hour. Prerequisite: 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.)

Jensen

Pediatrics

Lower Division Course

99. Special Study for Undergraduates.

(1-5) I, II, III, IV.

Individual library or laboratory research. Prerequisite: consent of instructor; Chemistry 1B and

Biological Sciences 1 or the equivalent (may be taken concurrently). Research in the broad area of physiological maturation. Primarily for lower division students. (P/NP grading only.)

The Staff (Gold in charge)

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, 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. (P/NP grading only.)

The Staff (Gold in charge)

Graduate Course

299. Pediatric Research. (1-5) I, II, III, IV.

Laboratory—1-5 hours. Prerequisite: graduate students who are candidates for a degree in some area of biology or behavioral sciences; consent of instructor. Research will generally involve some aspect of growth and development. (S/U grading only.)

The Staff (Gold in charge)

Pharmacology

Upper Division Courses

100. Pharmacology for Educators. (2) I, III.

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.

Stark, E. K. Killam

101. Introduction to Pharmacology. (2) II.

Lecture—2 hours. Prerequisite: some knowledge of basic physiology and biochemistry. Survey course dealing with various principles of pharmacology. This course is specifically oriented to the undergraduate.

Hollinger, West

102. Pharmacodynamics A. (2) I.

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410 and 411B, or the equivalent. Pharmacology of the autonomic system; pharmacology of the cardiovascular system; renal pharmacology and pharmacology of nerve and neuromuscular junction.

Hance, West

103. Pharmacodynamics B. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410, 411B, and 413A-413B-413C, or the equivalent. Pharmacology of general anesthetics, hypnotics, sedatives, analgesics and antipyretics; narcotic analgesics; convulsants and

stimulants, anticonvulsants and drug altering behavior.

E. K. Killam, K. F. Killam

104. Pharmacology Laboratory A:

Pharmacodynamics. (2) I.

Discussion—1 hour; laboratory—4 hours. Prerequisite: courses 102 and 103 or the equivalent. Laboratory techniques used to evaluate the action of drugs. Offered in even-numbered years.

Hollinger, West

105. Pharmacology Laboratory B:

Neuropharmacology. (2) II.

Discussion—1 hour; laboratory—4 hours. Prerequisite: Medical Sciences 410, 411B, and 413A-413B-413C, or the equivalent. Specialized laboratory techniques used to evaluate centrally acting drugs. Offered in odd-numbered years.

Hance, E. K. Killam

106. Pharmacology Laboratory C:

Psychopharmacology. (2) III.

Discussion—1 hour; laboratory—4 hours. Prerequisite: Medical Sciences 410, 411B and 413A-413B-413C, or the equivalent. Specialized laboratory techniques used to evaluate drugs altering behavior. Offered in odd-numbered years.

K. F. Killam, Stark

198. Directed Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (P/NP grading only.)

The Staff (K. F. Killam in charge)

199. Special Study for Advanced Undergraduates.

(1-3) I, II, III, IV.

Laboratory—3-9 hours. Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (K. F. Killam in charge)

Graduate Courses

200A-200B. Advanced General Pharmacology.

(4-4) I-II.

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: upper division courses in biochemistry (Biochemistry 101A, 101B) and mammalian physiology (Physiology 110A, 110B, 111A, 111B) or the equivalent. May be taken concurrently. Core course in human pharmacology designed for beginning graduate students in pharmacology and toxicology. Principles of pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of the major classes of drugs will be introduced.

K. F. Killam and staff

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 the equivalent;

open to graduate students. Pharmacology of substances affecting nervous transmission. Offered in odd-numbered years. 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 the 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. E. K. Killam

203. Pharmacology of the Nervous System III: Stimulants and Anticonvulsants. (1-3) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, and 103 or Medical Sciences 410 and 411B, or the equivalent; open to graduate students. Pharmacology of stimulant and convulsant agents, anticonvulsant agents and their evaluation in animal models. Offered in even-numbered years. 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, 411B, and 413A-413B-413C, or the equivalent; open to graduate students. Activity of drugs altering mood and behavior: psychopharmacologic agents, hallucinogens, antidepressants. Offered in odd-numbered years. K. F. 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 the equivalent; open to graduate students. Evaluation of problems of drug distribution and metabolism with special reference to autoradiographic techniques. Offered in even-numbered years. Stark

207. Drug Alteration of Subcellular Function. (1-3) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 101 or Medical Sciences 410 or the equivalent; open to graduate students. The interaction of drugs and subcellular components with special emphasis on mechanism of action. Offered in odd-numbered years. Hollinger

208. Application of Computers to Pharmacology A. (1) I, II, III.

Lecture—1 hour. Prerequisite: consent of instructor; open to graduate students. Presentation of basic concepts and problems. Hance, K. F. Killam, Stark

270A-270B-270C-270D. Pharmacological Principles for Therapy. (2-4) IV, I, II, III.

Lecture—2 hours. Prerequisite: Physiological Sciences 123 or the equivalent. A systematic presentation of the characteristics of drugs and their actions with special emphasis on pharmacodynamics and therapeutic applications. (Same course as 470A-470B-470C-470D.) Killam and staff

271. Clinical Pharmacology. (2-10) I, II, III, IV.

Lecture; ward rounds. Prerequisite: advanced graduate students or postdoctoral fellows. Principles of pharmacology will be related to the diagnosis and treatment of drug induced disease status as well as principles of therapy of common clinical diseases. (Same course as Family Practice 271.) Winters, Renolett

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 (K. F. Killam in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. (S/U grading only.) The Staff (K. F. Killam in charge)

Physical Medicine and Rehabilitation

Upper Division Course

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. (P/NP grading only.) Sterling and staff

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. (P/NP grading only.) The Staff (Sterling in charge)

Professional Course

470. Rehabilitation Medicine for Allied Health Sciences. (2) I, II, III, IV.

Lecture—1 hour; laboratory—3 hours. Prerequisite: allied health students; open to graduate students. Designed to acquaint students in the clinical application of the physical modalities and the prin-

ciples of medical and vocational rehabilitation including the physical, psychosocial and occupational aspects. Zellé

Psychiatry

Upper Division Courses

198. Directed Group Study. (1-5) I, II, III, IV.

Hours to be arranged. Prerequisite: advanced standing and consent of instructor. Reading, conferences, laboratory and clinical exposure in special topics in general and child psychiatry and psychology. (P/NP grading only.)

The Staff (Langsley in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, IV.

Hours to be arranged. Prerequisite: advanced standing and consent of instructor. Supervised independent study project and research for upper division students. (P/NP grading only.)

The Staff (Langsley in charge)

Graduate Courses

220. Interdisciplinary Research Seminar in Family Psychology. (3) I, II, III, IV.

Seminar—3 hours. Prerequisite: medical, law, or social sciences graduate students with 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. (H/S/U grading only for medical students.) Meadow

222. Sociology of Mental Illness. (2) I, III.

Lecture—1 hour; discussion—2 hours. Prerequisite: medical or social sciences graduate students; 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.) Rockwell

223. Death and Dying. (2) II, III.

Lecture—1 hour; discussion—2 hours. Prerequisite: medical student or consent of instructor. A didactic introduction to issues of death and dying. Aspects of the dying process are explored using lecture, film, video and discussion. Topics covered include stages of dying, managing death, bereavement, suicide, partial deaths, and euthanasia. (H/S/U grading only for medical students.)

Rockwell, Bennington

224. The Dying Patient: Study of Dynamics and Management of Dying Process. (3) III.

Seminar—3 hours. Prerequisite: consent of instructor. Help the student (a) deal with his feelings

about death, (b) become familiar with the dying process, (c) develop skills in working with patients and families, and (d) in management of grief; acquaint student with literature; discussion of ethical and moral issues. Tupin, Schuller

225. Biological and Cultural Basis of Human Behavior. (2) II.

Seminar—2 hours. Prerequisite: consent of instructor. Discuss readings of animal behavior (especially primates) and "primitive" cultures which are relevant to human behavior in our culture, including aggression, sexuality, parent roles, dominance, family and group structure. (S/U grading only.)

Jensen, Crain

226. Forensic Psychiatry. (2) I, II, III.

Discussion—2 hours. Prerequisite: consent of instructor. The influence of laws on human behavior, and vice versa, will be explored. Particular emphasis on youth and juvenile court procedures. Moot court demonstrations. (H/S/U grading only for medical students.)

Tupin, Schuller

298. Directed Group Study for Graduate Students. (1-5) I, II, III, IV.

Hours to be arranged. Prerequisite: graduate standing and consent of instructor. Special group study for graduate students in the area of mental health and illness. The Staff (Langsley in charge)

299. Special Study for Graduate Students. (1-12) I, II, III, IV.

Hours to be arranged. Prerequisite: graduate standing and consent of instructor. Supervised independent study and research for graduate students. (S/U grading only.) The Staff (Langsley in charge)

Professional Courses

401. Family and Marital Counseling. (2) III.

Lecture—1 hour; discussion—2 hours. Prerequisite: medical students 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 as well as videotaped clinical examples of marriage counseling. (H/S/U grading only for medical students.)

Langsley

403. Medical Aspects of Human Sexuality. (2) II, III.

Lecture—2 hours. Prerequisite: medical and graduate students or consent of instructor. An integrated interdisciplinary study of human sexuality, its normal patterns and dysfunctions. Basic techniques of diagnosis and therapy for the general physician will be emphasized. There will be appropriate team teaching. (H/S/U grading only for medical students.)

Jensen and staff

420. Grand Rounds for Department of Psychiatry. (1) I, II, III, IV.

Prerequisite: students or staff of the 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.)

Langsley

473. Antisocial Behavior. (3-19) I, II, III, IV.

To be arranged—variable time experience and clinical assignment and selected conferences. Prerequisite: medical and 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.)

Tupin, Schuller

498. Directed Group Study. (1-5) I, II, III, IV.

Hours to be arranged. Prerequisite: consent of instructor; open to graduate students. For 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 (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 (Langsley in charge)

Radiology—Diagnostic

Professional Courses

498. Group Study in Diagnostic Radiology.

(1-12) I, II, III, IV.

Prerequisite: consent of instructor. (H/S/U grading only for medical students.) The Staff

499. Research in Diagnostic Radiology.

(1-12) I, II, III, IV.

Prerequisite: consent of instructor. (H/S/U grading only for medical students.) The Staff

Radiology—Nuclear Medicine

Upper Division Courses

101. Biomedical Radiochemistry. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Course is designed to combine basic nuclear physics, chemistry, and biology

into a comprehensive and vigorous lecture-laboratory experience in biomedical nuclear chemistry. Subjects include choice and purification of appropriate gamma and beta radioisotopes, compounding biological pharmacodynamics and radioimmunoassay. (Same course as 401.)

S. J. DeNardo, Krohn, Chen

198. Directed Group Study. (1-5) I, II, III, IV.

Lecture—1 hour; reading—2 hours. Prerequisite: upper division standing and consent of instructor. Selected readings in nuclear medicine. (P/NP grading only.) The Staff (S. J. DeNardo in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III, IV.

Laboratory—3-15 hours. Prerequisite: upper division standing and consent of instructor. Students will learn the scientific approach and laboratory techniques pertaining to biophysical investigation in the Nuclear Medicine Laboratory. (P/NP grading only.) The Staff (G. L. DeNardo in charge)

Professional Courses

400. Fundamental Nuclear Medicine. (4) I, II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: open to upper division, graduate, and medical students; consent of instructor. The course is intended to cover in a comprehensive, didactic, and practical fashion those fundamental and clinical sciences which are the basis for the practice of nuclear medicine and nuclear medical technology. (H/S/U grading only for medical students.)

The Staff (G. L. DeNardo in charge)

401. Biomedical Radiochemistry. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: open to graduate students; consent of instructor. Course is designed to combine basic nuclear physics, chemistry, and biology into a comprehensive and vigorous lecture-laboratory experience in biomedical nuclear chemistry. Subjects include choice and purification of appropriate gamma and beta radioisotopes, compounding biological pharmacodynamics and radioimmunoassay. (H/S/U grading only for medical students.) (Same course as 101.)

S. J. DeNardo, Krohn, Chen

498. Group Study in Nuclear Medicine.

(1-12) I, II, III, IV.

Prerequisite: consent of instructor. (H/S/U grading only for medical students.) The Staff

499. Research in Nuclear Medicine.

(1-12) I, II, III, IV.

Prerequisite: consent of instructor. (H/S/U grading only for medical students.) The Staff

Radiology—Radiological Physics

Professional Course

405A-405B-405C. Radiological Physics of Diagnostic Radiology. (1-1-1) I, II, III.

Lecture—1 hour; laboratory—1 hour. Prerequisite: residents in Radiology, Veterinary Radiology, graduate or medical students; consent of instructor. An introductory course in the radiological physics of diagnostic radiology. Subjects discussed include elementary atomic physics production of X radiation, and the physics of diagnostic radiographic procedures. Course taught at Sutter Radiation Therapy Center. (H/S/U grading only for medical students; S/U grading only for graduate students.) Heintz

Radiology—Therapeutic

Professional Courses

498. Group Study in Therapeutic Radiology. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. (H/S/U grading only for medical students.) The Staff

499. Research in Therapeutic Radiology (1-12) I, II, III, IV.

Prerequisite: consent of instructor. (H/S/U grading only for medical students.) The Staff

MEDICINE (a department in the School of Veterinary Medicine)

Murray E. Fowler, D.V.M., *Chairperson of the Department*

Department Office, 1321A Haring Hall

Professors:

John F. Christensen, D.V.M., Ph.D.
(*Emeritus*)

Murray E. Fowler, D.V.M.
Donald G. Low, D.V.M., Ph.D.

* Blaine McGowan, Jr., D.V.M.
William R. Pritchard, D.V.M., Ph.D., J.D.
Livio G. Raggi, D.V.M., Ph.D.
Edward A. Rhode, D.V.M.

Associate Professors:

Alexander A. Ardans, D.V.M.
Charles A. Hjerpe, D.V.M.
Humphrey D. Knight, D.V.M., Ph.D.
¹Gerald V. Ling, D.V.M.
Donald R. Strombeck, D.V.M., Ph.D.

Associate Clinical Professors:

Stephen J. Ettinger, D.V.M.

Assistant Professors:

Benjamin B. Baker, D.V.M., Ph.D.
Gary P. Carlson, D.V.M., Ph.D.
John S. Glenn, D.V.M., Ph.D.
Neils C. Pedersen, D.V.M., Ph.D.
William A. Rogers, D.V.M.
Bradford P. Smith, D.V.M.
Anthony A. Stannard, D.V.M., Ph.D.

Lecturers:

Dale L. Brooks, D.V.M.
Laurence R. Enos, Pharm.D.
Roy V. Henrickson, D.V.M.
E. B. Hudson, D.V.M.
Ronald L. Mull, D.V.M, Ph.D.
Sigmund T. Rich, D.V.M.

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Upper Division Courses

102. Recognition and Identification of Poisonous Plants. (1) III.

Lecture—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. Fowler

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Fowler in charge)

Graduate Courses

211A. Reproduction and Husbandry of Laboratory Animals. (1) I.

Lecture—1 hour. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Reproduction and husbandry aspects of laboratory animals as they relate to clinical and experimental medicine. (S/U grading only for veterinary students.) Brooks

211B. Lab Animal and Primate Medicine. (2) II.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Introduction to laboratory animal and primate medicine with emphasis on practical aspects of handling, husbandry, nutrition, reproduction, diseases and anesthesia. (S/U grading only for veterinary students.) Brooks, Henrickson

211C. Zoological and Laboratory Animal Medicine. (2) III.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Principles of animal facility design, husbandry, and legal aspects of laboratory animal care, primate, zoo, and exotic animal management. (S/U grading only for veterinary students.)
Brooks

215. Selected Topics in Zoo Medicine. (2) III.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Lectures on selected topics related to the health of zoo animals. These will include nutritional requirements, housing, sanitation, restraint, anesthesia, surgery, and specific disease problems.
Fowler

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.
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.
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. (S/U grading only for veterinary students.)
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.
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 for veterinary students.)
Pritchard

280. Advanced Pulmonary Physiology. (3) II.

Lecture—3 hours. Prerequisite: graduate student status or consent of instructor. Advanced study of physiology of mammalian respiration with emphasis on mechanisms of ventilation, gas distribution, diffusion and blood perfusion.
Gillespie, Cross

280L. Advanced Pulmonary Physiology. (1) II.

Laboratory—4 hours. Prerequisite: graduate student status or consent of instructor. 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.
Gillespie, Cross

285. Clinical Applications of Body Acid-Base Physiology. (2) III.

Lecture—2 hours. Prerequisite: graduate student status 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.
Gillespie, Cross

***290. Seminar in Veterinary Medicine. (1) I, II, III.**
The Staff (Fowler in charge)

298. Group Study. (1-2) I, II, III.

Prerequisite: student in School of Veterinary Medicine or consent of instructor. Group study in selected areas of the clinical sciences. (S/U grading only.)
The Staff (Fowler in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.) The Staff (Fowler in charge)

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 (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 (Knight in charge)

NOTE: For key to footnote symbols, see page 220.

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 (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.)

Hjerpe and McGowan in charge

421. Veterinary Dermatology. (¼ per week) I, II, III.

Laboratory—25 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents are 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.)

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.)

Gillespie

425. Zoo and Wildlife Medicine. (¼ per week) I, II, III.

Laboratory—25 hours. Prerequisite: professional 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.)

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 (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 (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. 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 (Ling in charge)

MEDIEVAL STUDIES

Program Office, 4208 Sproul Hall

Committee in Charge:

³ Wolfgang W. Moelleken, Ph.D.

(German); Committee Chairperson[†]

_____; Committee Chairperson[‡]

Neal W. Gilbert, Ph.D. (Philosophy);

Committee Chairperson**

Thomas P. Campbell III, Ph.D. (English)

Richard E. Grimm, Ph.D. (Classics)

⁴Gerald Herman, Ph.D. (French)

James J. Murphy, Ph.D. (Rhetoric)

[†] Fall quarter.

[‡] Winter quarter.

** Spring quarter.

Alan A. Stambusky, Ph.D. (Dramatic Art)

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Major Advisers.—W. M. Bowsky, T. P. Campbell, S. A. Fehm, G. Herman, J. J. Murphy.

The major in Medieval Studies is designed to introduce the student to the main features of European civilization during the period from the fall of Rome to the beginnings of the Renaissance. Medieval studies are inherently interdisciplinary. The program involves studies in history, art, philosophy, literature, drama, music, national languages, religion, rhetoric, and political theory.

The Major Program

Lower Division Courses.—Recommended: Art 1B; History 4A; Philosophy 20A; Medieval Studies 20A, 20B; Religious Studies 20. Language proficiency is a necessity; courses in Latin and other European languages are strongly recommended, particularly for students planning to pursue graduate studies in the medieval field.

Upper Division Courses.—Each student in the major must complete a program of 52 units of upper division credit, drawn from courses in each of the following six areas of study which have been approved by the Medieval Studies Committee.⁷

- a) History: a minimum of 12 units from History 102B, 121A, 121B, 121C, 201B.
- b) Literature: a minimum of 16 units, with 8 units drawn from each of two of the following:
 1. English 111, 112, 113, 150A, 188, 189, 205, 206, 207, 215, 240A-240B-240C.
 2. French 115A, 115B, 202A, 202B, 202C, 202D, 203, 204A, 204B, 204C, 204D.
 3. German 120, 249, 250, 285.
 4. Italian 113A, 113B, 115A, 115B, 139A, 139B; Spanish 225.
 5. Russian 200, 220.
 6. Latin 101, 102, 103, 104, 105, 106, 108, 109, 111A-111B-111C, 112, 114, 115, 116.
- c) Philosophy and Religion: a minimum of 8 units from Philosophy 105, 132, 145, 146, 190, 290; Religious Studies 102, 110.
- d) Arts and Language: a minimum of 8 units from Art 176A, 176B, 176C, 177A, 178A, 178B, 276, 278; Dramatic Art 156, 230A, 230B; French 201A; German 106, 200, 201, 202, 203, 205; Music 114, 199; Rhetoric 110, 111; Russian 204.
- e) Political Thought: a minimum of 4 units from

Political Science 115, 116, 118A, 213.

f) Senior Thesis: Medieval Studies 190 (4 units).

Lower Division Courses

20A. Readings in Early Medieval Culture. (4) II.

Lecture—3 hours; discussion—1 hour. Readings (in translation) in early medieval culture, such as the *Codes of Justinian*, the *Confessions of Saint Augustine*, *The Consolation of Philosophy of Boethius*, *Beowulf*, the *Nibelungenlied*, and the *Song of Roland*.

Murphy and staff

20B. Readings in the Culture of the High Middle Ages. (4) III.

Lecture—3 hours; discussion—1 hour. Readings (in translation) in the culture of the high Middle Ages, such as the *Summa Theologica* of Thomas Aquinas, the *Chronicles* of Froissart, the *Canterbury Tales* of Chaucer, and the *Divine Comedy* of Dante.

Murphy and staff

Upper Division Course

190. Senior Thesis. (4) I, II, III.

Seminar—4 hours. Prerequisite: senior standing and major in Medieval Studies. Preparation of a research paper dealing with a selected aspect of medieval culture, under supervision of three members of the Committee in Charge. Murphy and staff

⁷See page 220 regarding preparation for graduate courses. Art 1B should be taken prior to enrolling in Art 278; and Music 4 and 21A or consent of instructor are required prior to enrolling in Music 114.

MEXICAN-AMERICAN (CHICANO) STUDIES

Richard A. Figueroa, Ph.D., *Program Director*
 Program Office, 15 Wellman Hall

Committee in Charge:

- Guillermo Rojas, Ph.D. (*Spanish*);
Committee Chairperson
- Carlota B. Cannon, Ph.D. (*Spanish*)
- Richard A. Figueroa, Ph.D. (*Education*)
- ² ³Adaljiza S. Riddell, Ph.D. (*Political Science*)
- ²Francisco J. Samaniego, Ph.D. (*Mathematics*)

Faculty:

- Arnold J. Bauer, Ph.D. (*History*)
- Homero Castillo, Ph.D. (*Spanish*)

- Richard A. Figueroa, Ph.D. (*Education*)
- Didier T. Jaén, Ph.D. (*Spanish*)
- Daniel S. Keller, Ph.D. (*Spanish*)
- ² ³Adaljiza S. Riddell, Ph.D. (*Political Science*)
- Guillermo Rojas, Ph.D. (*Spanish*)
- Fabián A. Samaniego, M.A. (*Spanish*)
- ¹Lenora Timm, Ph.D. (*Linguistics*)
- Máximo Torreblanca, Ph.D. (*Spanish*)

NOTE: For key to footnote symbols, see page 220.

Major Advisers.—R. A. Figueroa, A. S. Riddell, G. Rojas.

Mexican-American (Chicano) Studies prepares the student for an interdepartmental major, which consists of courses in the Spanish language, linguistics, Mexican and Mexican-American history, culture and literature, and the social sciences. The major allows for flexibility to accommodate students pursuing interests in bilingual education, community or social service, or advanced professional preparation.

The Major Program

Lower Division Courses.—Required: a minimum of 9 units and a maximum of 30 units to include: Spanish 1 (elementary Spanish) or 1AT (individualized instruction), 2 (elementary Spanish) or 2AT (individualized instruction), 3 (intermediate Spanish), 6 (intermediate Spanish, conversation and reading). Students may waive the preceding courses by taking the language placement examination and placing higher than Spanish 6. Spanish 25 (introduction to Chicano culture), 26 (introduction to Chicano literature), 27B (introduction to the forms of Hispanic literature). Recommended courses: for all students, American Studies 45 (Introduction to American Studies); for non-native speakers of Spanish, two courses from Spanish 30A, 30B, or 30C; for native speakers of Spanish, English 2.

Upper Division Courses.—Required: a total of 40 units to include:

- 1) Spanish 101A-101B-101C (grammar and composition for non-native speakers) or 102A-102B-102C (grammar and composition for native speakers);
- 2) one course from Spanish 131 (modern Spanish syntax), 132 (introduction to Spanish linguistics), or 133 (phonetics);
- 3) choose either Spanish 129 (the Mexican novel), or 135 (survey of Mexican culture);

- 4) choose either Linguistics 150 (contrastive analysis of Spanish and English), or education 151 (language problems of the Mexican-American child);
- 5) choose either History 166A (history of Mexico to 1848), or 166B (history of Mexico since 1848);
- 6) History 169A (Mexican-American history, 1800 to 1910), 169B (Mexican-American history, 1910 to present), and Political Science 168 (Chicano politics).

Recommended, two courses from the following: American Studies 110 (introduction to cross-cultural studies); Sociology 124 (sociology of education), 130 (race relations); Anthropology 104 (race and sex, race mixture and mixed populations), 105A (Indians of North America), 139B (peoples of Africa); Spanish 300 (the teaching of Spanish), 108B (Spanish-American prose).

A student contemplating studies in graduate or professional schools can with the aid of an adviser, build a program around the discipline of his or her choice, i.e., Spanish or Spanish-American literature, history, or political science. Students contemplating careers in bilingual education should consult the Department of Education for information about the Teacher Credential Program (see also page 215.)

Chicano Studies

Lower Division Course

10. Introduction to Chicano Studies. (4) III.

Lecture—3 hours; discussion—1 hour. Analysis of the situation of the Chicano (Mexican-American) people, emphasizing their history, literature, political movements, education and related areas.

Juarez, Rojas, Riddell, Figueroa .

MICROBIOLOGY—See Also Medical or Veterinary Microbiology

MICROBIOLOGY (A Graduate Group)

¹David Pratt, Ph.D., *Chairperson of the Group*
JaRue S. Manning, Ph.D., *Acting Chairperson of the Group*
Group Office, 156 Hutchison Hall

Graduate Course

299. Research. (1-12) I, II, III.

Laboratory—variable. Research under the guidance of dissertation committee. (S/U grading only.)

The Staff

MILITARY SCIENCE

Richard G. Adamski, Lieutenant Colonel, *Chairperson of the Department*
Department Office, 125 Gymnasium

Professor:

Richard G. Adamski, Lieutenant Colonel

Associate Professor:

John T. Etheridge, Major

Assistant Professors:

Harold D. Brown, Captain
Homer J. Raycraft, Captain

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The Military Science Department extends the educational opportunities and provides extracurricular 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 and women to become officers who are capable of further development through active duty training and service in the Reserves. The program assists qualified students 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 ad-

dition 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 Chairperson 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 preceding 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 preceding 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 in nationwide competition. 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 of the Army 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 preceding 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 are counted in the 30-unit allowance for electives.

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. The Modern Army. (2) III.

Lecture—2 hours. The growth and development of the U.S. Army. Emphasis on the evolution of personnel, logistics, 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) III.

Lecture—1 hour. 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) II.

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) II.

Lecture—2 hours (course taken first five weeks of quarter). 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. (2) I.

Lecture—2 hours. The strategy and tactics of selected military engagements. The Staff

Upper Division Courses

131. Principles of Military Instruction. (2) III.

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

132. Theory of Leadership. (2) I.

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) II.

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) II.

Lecture—2 hours. Prerequisite: course 133 or consent of instructor. 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) I.

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 counterinsurgency 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 postwar attempts at arms control, including the Baruch Plan, strategic weapons control, test ban treaty, nonproliferation treaty, and problems of verification in arms control. The Staff

MUSIC

Jerome W. Rosen, M.A., *Chairperson of the Department*

Department Office, 112 Music Building

Professors:

Albert J. McNeil, M.S.
 Jerome W. Rosen, M.A.
 Richard G. Swift, M.A.

Associate Professor:

^a Sydney R. Charles, Ph.D.

Assistant Professors:

Robert S. Bloch, M.A.
¹Duyong Chung, M.M.
⁴Andrew D. Frank, M.A.
 D. Kern Holoman, Ph.D.
 William E. Valente, M.A.

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Major Subject Advisers.—A. D. Frank, D. K. Holoman, R. G. Swift.

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 or the equivalent (determined upon consultation with faculty adviser). 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 or the equivalent (determined upon consultation with faculty adviser), 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, 43, 44, 45, 46, 141, 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. and M.A.T. degrees. Detailed information regarding graduate study may be obtained from the Graduate Adviser for Music, S. R. Charles.

Teaching Credential Subject Representative: A. J. McNeil. See page 215 for the Teacher Education Program.

Lower Division Courses

1. Basic Musicianship. (3) I, II, III.

Lecture—3 hours. Fundamentals of music, singing, ear-training and conducting for prospective classroom teachers.

3A-3B. Introduction to Music Theory. (4-4) I-II.

Lecture—3 hours; laboratory—1 hour. Fundamentals of music theory, ear-training, harmony, counterpoint and analysis directed toward the development of listening and writing techniques. For the general student. Rosen

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. Intended primarily for music major. Valente, Bloch

5A-5B-5C. Intermediate Theory. (4-4-4) I-II-III.

Lecture—4 hours. Prerequisite: course 4C. Intermediate tonal counterpoint and harmony. Frank,

21A-21B-21C. History and Literature of Music. (4-4-4) I-II-III.

Lecture—3 hours; listening section—1 hour. Prerequisite: course 4C. The history of music from antiquity to the present. Holoman

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. Rosen

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. Valente

28. Introduction to Afro-American Music. (4) I.

Lecture—3 hours; listening and discussion—1

NOTE: For key to footnote symbols, see page 220.

hour. Historical and stylistic survey of Afro-American music. McNeil

30. Applied Study of Music Literature: Intermediate.
(1) I, II, III.

Performance instruction—1 hour. Prerequisite: admission by audition only; ability to perform scales and short compositions from the standard repertory required. Class instruction, arranged by section, in the standard orchestral instruments, or in voice. Required for music majors; recommended for those preparing for a teaching credential in music. May be repeated for credit up to 3 units. Auditors not accepted. The Staff (Rosen 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. (P/NP grading only.) Holoman

43. University Concert Band. (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. Rehearsal and performance of music for band. (P/NP grading only.) 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. (P/NP grading only.) McNeil

45. Early Music Ensemble (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. (P/NP grading only.)

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. (P/NP grading only.) Bloch

99. Special Study for Undergraduates. (1-5) I, II, III.
(P/NP grading only.) The Staff (Rosen in charge)

Upper Division Courses

104A-104B-104C. Advanced Theory. (4-4-4) I-II-III.

Lecture—4 hours. Prerequisite: course 5C. Twentieth-century compositional procedures: analyses and projects in composition. Swift

107A-107B-107C. Electronic Music. (2-2-2) I-II-III.

Laboratory—6 hours. Prerequisite: consent of instructor; limited enrollment with priority to music majors. Composition of electronic music using the Moog and Buchla synthesizers. (Only 2 units count toward the music major.)

108A-108B. Orchestration. (2-2) I-II.

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. Frank

111. Choral Conducting. (2) III.

Lecture—2 hours. Prerequisite: course 5C. Study of the principles and techniques of conducting choral ensembles. McNeil

***112. Instrumental Conducting. (2) I.**

Lecture—2 hours. Prerequisite: course 5C. Principles and techniques of conducting instrumental ensembles. Chung

113A. Music of Non-Western Civilizations. (2) I.

Lecture—2 hours; listening—1 hour. Prerequisite: courses 5A-5B-5C (may be taken concurrently). The native music of Asia. Charles

113B. Music of Non-Western Civilizations. (2) II.

Lecture—2 hours; listening—1 hour. Prerequisite: courses 5A-5B-5C (may be taken concurrently). The native music of Africa and the Western Hemisphere. McNeil

***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. Charles

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. 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.

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. 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. Frank

***119. Music of the Twentieth Century. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite:

site: course 21C. Studies in the music and styles of the twentieth century. Swift

120. Introduction to Musical Analysis. (2) I.

Lecture—2 hours. Prerequisite: course 4C. Introduction to modes of analyzing music of all style periods. Swift

***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. 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.

130. Applied Study of Music Literature: Advanced. (1) I, II, III.

Performance instruction—1 hour. Prerequisite: admission by audition only; ability to perform scales and short compositions from the standard repertory required. Class instruction, arranged by section, in the standard orchestral instruments, or in voice. Required for music majors; recommended for those preparing for a teaching credential in music. May be repeated for credit up to 3 units. Auditors not accepted. The Staff (Rosen 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. (P/NP grading only.) Holoman

143. University Concert Band. (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. Rehearsal and performance of music for band. (P/NP grading only.) 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. (P/NP grading only.) McNeil

145. Early Music Ensemble. (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. (P/NP grading only.)

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, harpsichord, and organ. (P/NP grading only.) Bloch

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Rosen in charge)

199. Special Study for Advanced Undergraduates. (2-4) I, II, III.

(P/NP grading only.) The Staff (Rosen in charge)

Graduate Courses

200A-200B. Music Research. (4-4) I, II.

Seminar—3 hours. Survey of basic materials for music research. Selected projects. Charles, Holoman

***200C. Notation. (4) III.**

Seminar—3 hours. Study of selected notation practices.

203A-203B-203C. Composition. (4-4-4) I-II-III.

Seminar—3 hours. Technical projects and free composition. The Staff (Rosen in charge)

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. Swift, Frank,

***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. Charles

299. Individual Study. (2-5) I, II, III.

Special studies and projects in musical composition or music history. (S/U grading only.) The Staff (Rosen 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 1 or equivalent. Methods of teaching music in grades K-6.
The Staff (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.
McNeil

***302. The Teaching of Music. (3) III.**

Lecture—3 hours. Prerequisite: consent of instructor. Methods of teaching college level music literature and music theory courses. Observation of undergraduate classes and supervised teaching experiences.
The Staff (McNeil in charge)

***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 standard teaching credential in music. (P/NP grading only.)

NATIVE AMERICAN STUDIES

Major Program.—See page 114.

Concentration in Native American Studies is available through an Applied Behavioral Sciences major.

The American History and Institutions Requirement may be satisfied by any one of the following courses: 20, 116, 130A, 130B, 130C, 155. (See also page 42.)

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.
Risling

20. The Native American Experience. (4) I, 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.
Adams

***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.
Risling

32B. Native American Music and Dance. (4) I.

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.
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.

site: 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.
Longfish

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.
Longfish

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.
Longfish

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.
Longfish

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Risling in charge)

Upper Division Courses**101. Contemporary Indian Art. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 33 or consent of instructor. Contemporary Indian Art and the influences that affect Native American artists today.
Longfish

106. Native Cultures of the Northern Plains. (4) II.

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.

Adams

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.

Adams

111. Native American Curriculum Development. (4) III.

Lecture—2 hours; seminar—2 hours. Prerequisite: course 110 or consent of instructor. The study and evaluation of existing Native American curricula and the design and preparation of new curricula and materials. Offered in even-numbered years. Risling

112. History and Culture of the "Five Civilized Tribes." (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 recommended. History and culture of the Native American people, found in South-eastern part of the U.S., called the "Five Civilized Tribes."

Hutchison

***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.

116. 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.

Risling

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.

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.

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.

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.

Forbes

***140. Research Analysis in Native American Studies. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 20. Research methods and techniques of analysis and synthesis pertinent to the social-behavioral science aspects of Native American Studies. Will concentrate upon one sub-area for special emphasis. Offered in even-numbered years.

Forbes, Hutchison

155. Americanisms: Native American Contributions to World Civilization. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Analysis and study of Americanisms: traits, inventions, and developments originated in the Americas by native peoples and adopted by other peoples. Attention will be given to words in the world's languages, agriculture, medicine, clothing, the arts, theories of society and government, and other pertinent areas. Offered in odd-numbered years.

Hutchison

156. Native American Ethics and Value Systems. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20, or consent of instructor. Analysis of Native American systems of values and how these values translate into actual behavior; attention to the problem of implementing traditional values in the twentieth century and the possible impact of native values on modern societies. Offered in odd-numbered years. The Staff (Hutchison in charge)

***157. Native American Religion and Philosophy. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Religious and philosophical thinking of Native American people with emphasis upon North America. Offered in odd-numbered years.

Forbes, Hutchison, Longfish

***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. Adams

***161B. Native American Economic Development and Planning. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and/or 20, 161A, Anthropology 108. Planning in economic development from the reservation standpoint, concentrating on using those institutions located on Indian reservations. Adams

170. Native American Perception. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 recommended. Study of the differences in perception between Native Americans and the dominant society. Hutchison

171. Counseling the Native American. (4) III.

Lecture—3 hours; discussion—1 hour. Theory and practice of counseling to reveal the subjective, cultural and interfering differences between Native Americans and the dominant culture. Hutchison

180. Native American Woman. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 recommended. Foundations of the feminine personality including the psychological development of the Indian girl, life phases of mature womanhood and the individual feminine ego experience. Hutchison

***181A-181B-181C. Native American Literature.**

(4-4-4) I-II-III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20. Analysis of works by or about Native Americans including novels and autobiographies; analysis of Native American poetry, oral literature, songs, and tales. A. The novel and fiction; B. Non-fiction works by Native authors; C. Traditional literature and poetry. Offered in even-numbered years. Hutchison

190. Seminar in Native American Studies. (2) III.

Discussion—2 hours. Prerequisite: senior standing. Seminar of critical issues faced by Native American people. (P/NP grading only.)
The Staff (Risling in charge)

195. Field Experience in Native American Studies. (12) I, II, III.

Prerequisite: major in Native American Studies and consent of instructor; courses 161A-161B and Applied Behavioral Sciences 151A-151B recommended. Internship with governmental, community and grassroots groups, application of knowledge learned in other courses. Risling in charge

196. Senior Project in Native American Studies. (1-5) I, II, III.

Prerequisite: major in Native American Studies and consent of advisor. Guided research or creative activity leading to completion of senior thesis or project. May be repeated for credit, for a maximum of 10 units. (P/NP grading only.) Risling in charge

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. (P/NP grading only.)

The Staff (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. (P/NP grading only.)

The Staff (Risling in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

The Staff (Risling in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Risling in charge)

NEMATOLOGY

Related Undergraduate Major.—See pages 105 and 117.

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.

Lownsbury

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. Maggenti

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. 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. Offered in odd-numbered years. 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. Lowmsbery

*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. Raski

290. Seminar. (1) II.

Seminar—1 hour. (S/U grading only.)
The Staff (Maggenti in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.)
The Staff (Maggenti in charge)

NEUROSURGERY—See Medicine

NUTRITION

Major Advisers.—See Class Schedule listing.

Major Program and Graduate Study.—See pages 97, 115, and 210.

Related Courses. See *Avian Sciences 150* (comparative nutrition of avian species); *Food Service Management*; *Wildlife and Fisheries Biology 108* (comparative nutrition of wildlife and fish.)

Questions pertaining to the following courses should be directed to the instructor of the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

10. Discoveries and Concepts in Nutrition. (3) II, III.

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. Hill

93. Public Issues in Nutrition and Food Science. (1) II.

Seminar—1 hour. Faculty and invited guest speakers will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to Nutrition and Food Science for students new to the campus. (Same course as Food Science and Technology 93.) (P/NP grading only.) Weir

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. (P/NP grading only.) The Staff (Weir in charge)

Upper Division Courses

102A-102B. General Nutrition. (4-4) I-II.

Lecture—4 hours. Prerequisite: Chemistry 8B; Physiology 101 or 2; not open for credit to students who have taken courses 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. Canolty

102L. General Nutrition Laboratory. (1) II.

Discussion—1 hour; laboratory—2 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. Canolty

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. Garrett

110. Principles of Nutrition. (5) II, III.

Lecture—5 hours. Prerequisite: Biochemistry

NOTE: For key to footnote symbols, see page 220.

101B; 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. Weir, Grau

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. Rucker, Stern

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. 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. 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. Zeman, Clifford, Stern

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. 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. Vermeersch

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. Vermeersch

119. Field Work in Community Nutrition. (3) II, 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. Vermeersch

121. Technical Animal Nutrition. (2) II.

Lecture—2 hours. Prerequisite: course 110. The application of the principles of nutrition to the feeding of livestock. Evaluation of the nutrient content and feeding value of feedstuffs and formulated rations. Feeding standards and nutrient requirements for physiological functions. Ration formulation; least cost rations. Heitman, Bath

122. Ruminant Nutrition and Digestive Physiology. (3) III.

Lecture—3 hours. Prerequisite: a course in nutrition; Physiology 101. Study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant. 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. Robinson

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 (Weir in charge)

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.) The Staff (Weir in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Weir in charge)

Graduate Courses

201. Advanced Protein and Amino Acid Nutrition. (4) III.

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 (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 (Baldwin in charge)

203. Advanced Vitamin and Mineral Nutrition. (3) I.

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 (Kratzer in charge)

216. Advanced Diet Therapy. (3) III.

Lecture—3 hours. Prerequisite: graduate standing, course 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. Zeman

218. Advanced Field Work in Community Nutrition. (2-12) I, II, III, IV.

Discussion—1 hour; field work. Prerequisite: courses 118, 118L, 119; graduate standing; consent of instructor. Directed experience in community nutrition. Organization and implementation of nutrition programs. The Staff (Zeman in charge)

250. Concepts of Animal Nutrition. (3) I.

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. Hill

***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. Vohra

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. Hurley

***253. Control of Food Intake. (3) III.**

Lecture—2 hours; discussion—1 hour; 2 or 3 laboratory demonstrations per quarter. 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. Rogers, Mendel

254. Ruminant Digestion and Metabolism. (3) I.

Lecture—3 hours. Prerequisite: courses 122, 201, 202, 203 recommended. 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. Morris, 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. Vohra, 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, energetic 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. Baldwin, 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. Henderson, 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 (Morris 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 (Morris 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 or consent of instructor. 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.) Weir

298. Group Study. (1-5) I, II, III.

The Staff (Weir in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Weir in charge)

NOTE: For key to footnote symbols, see page 220.

ORIENTAL LANGUAGES (Department of Anthropology)

Department Office, 328 Young Hall

Professor:

Benjamin E. Wallacker, Ph.D.

Lecturers:

Kay H. Kim, M.A.

San-pao Li, M.A.

Related Courses. See *Asian American Studies* 1C-2C-3C, 4C-5C-6C.

Lower Division Courses

1J-2J-3J. Elementary Modern Japanese. (5-5-5) I-II-III.

Lecture—3 hours; laboratory—3 hours. Not open for credit to students who have completed the first two years of high school Japanese. Kim

1M-2M-3M. Elementary Modern Mandarin. (5-5-5) I-II-III.

Lecture—3 hours; laboratory—3 hours. Introduction to the "National Language" (Kuo Yu) of China. Not open for credit to students who have completed the first two years of high school Mandarin. Wallacker

4J-5J-6J. Intermediate Modern Japanese. (5-5-5) I-II-III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 3J. Continuation of course 3J. Kim

4M-5M-6M. Intermediate Modern Mandarin. (5-5-5) I-II-III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 3M. Continuation of course 3M. Li

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.) The Staff (Chairperson in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

Upper Division Courses

*100. Languages of Eastern Asia. (4) II.

Lecture—3 hours; oral reports. Prerequisite: An-

thropology 110 (may be taken concurrently) or the equivalent. Survey of languages and language families of Eastern Asia, their natures and distributions. Wallacker

101. Classical Chinese. (4) I, II, III.

Lecture—3 hours; term paper. Prerequisite: course 6M. Readings in selected texts. May be repeated twice for credit. Offered if sufficient number of students enroll. Wallacker

111. Advanced Chinese. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6M. Readings in modern and contemporary Chinese texts. May be repeated twice for credit. Li

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. Kim

197T. Tutoring in Oriental Languages. (1-5) I, II, III.

Tutorial—1-5 hours. Prerequisite: consent of Department Chairperson. Leading of small voluntary discussion groups affiliated with one of department's regular courses. May be repeated for credit. (P/NP grading only.) The Staff (Wallacker in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-3) I, II, III.

(P/NP grading only.) The Staff (Chairperson in charge)

Graduate Courses

*201. Proseminar in Sinological Methods. (4) III.

Seminar—3 hours. Prerequisite: knowledge of classical Chinese. Wallacker

299. Research. (1-12) I, II, III.

(S/U grading only.) Wallacker

ORIENTATION

Questions pertaining to the following course should be directed to the Dean of the College of Agricultural and Environmental Sciences, 228 Mrak Hall. See also *Class Schedule* course listing.

Lower Division Course

1. Orientation. (no credit) I, II, III.

Discussion. Exploration of the philosophy, purposes, significance, expectations and mechanisms of university education. (P/NP grading only.) The Staff

ORTHOPAEDIC SURGERY—See Medicine

OTORHINOLARYNGOLOGY—See Medicine

PATHOLOGY—Veterinary Medicine, this page; Medicine, see page 430

PATHOLOGY

Donald L. Dungworth, B.V.Sc., Ph.D., *Chairperson 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.
Peter C. Kennedy, D.V.M., Ph.D.
Jack E. Moulton, D.V.M., Ph.D.
Bennie I. Osburn, D.V.M., Ph.D.

Associate Professors:

David H. Gribble, D.V.M., Ph.D.
Thomas G. Kawakami, Ph.D. (*Adjunct*)
Roy R. Pool, Jr., D.V.M., Ph.D.

Assistant Professors:

L. Thomas Pulley, D.V.M., Ph.D.
Lester W. Schwartz, D.V.M., Ph.D.
(*Adjunct*)

Lecturer:

Lynn A. Griner, D.V.M., Ph.D.

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Upper Division Course

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

282. Tumor Pathology. (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: 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. Moulton, 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. Dungworth, Faulkin, Kawakami, Theilen

284. Pathology of Reproductive Failure. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: 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. Kennedy, Osburn

285. Neuropathology. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate student standing or final year veterinary student and consent of instructor. Patterns of nervous tissue reaction in disease. Offered in odd-numbered years. Cordy

290. Seminar in Veterinary Pathology. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

The Staff (Osburn in charge)

291. Histopathology Conference. (1) I, II, III.

Discussion—1 hour. Prerequisite: graduate status or final-year veterinary student; consent of instructor. Discussion of selected cases based on records and slides. Defense of diagnoses. (S/U grading only.) The Staff (Gribble in charge)

292. Surgical Pathology Conference. (1) I, II, III.

Discussion—1 hour. Prerequisite: graduate status or final-year veterinary student; consent of instructor. Diagnosis and discussion of current surgical pathology cases based on clinical records and microscopic study. (S/U grading only.) Gribble, Pulley

293. Necropsy and Surgical Pathology.

(1-4) I, II, III.

Discussion—1 hour; laboratory—32 hours. Prerequisite: graduate status; consent of instructor. Responsible diagnostic casework. Performance of necropsies, slide reading, and case reporting. (S/U grading only.) The Staff (Kennedy in charge)

NOTE: For key to footnote symbols, see page 220.

294. Primate Pathology Conference. (1) I, II, III.

Discussion—1 hour. Prerequisite: graduate status or final-year veterinary student; 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 California Primate Research Center. (S/U grading only.) (Same course as Pathology-Medicine 401.) Gribble, ———

298. Group Study. (1-4) I, II, III.

Group Study of advanced topics in pathology. (S/U grading only.) The Staff

299. Research in Veterinary Pathology. (1-12) I, II, III, (Summer).

(S/U grading only.) The Staff

PEDIATRICS—See Medicine

PHARMACOLOGY—See Medicine

PHARMACOLOGY AND TOXICOLOGY (A Graduate Group)

Wendell W. Kilgore, Ph.D., *Chairperson of the Group*

Group Office, 109 Environmental Toxicology

Graduate Course

290. Seminar. (1) I, II, III.

Prerequisite: consent of instructor. Current topics

in pharmacology and toxicology. (S/U grading only.) The Staff (Kilgore in charge)

PHILOSOPHY

William H. Bossart, Ph.D., *Chairperson of the Department*

Department Office, 308 Voorhies Hall

Professors:

- William H. Bossart, Ph.D.
- ³ Arthur Child, Ph.D.
- Neal W. Gilbert, Ph.D.
- Marjorie Grene, Ph.D.

Associate Professors:

- Ronald A. Arbini, Ph.D.
- Melvin W. Beal, Ph.D.
- Fred R. Berger, Ph.D.
- Joel I. Friedman, Ph.D.
- ²John F. Malcolm, Ph.D.

Assistant Professor:

- Michael V. Wedin, Ph.D.

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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) I.**

Seminar—4 hours. Prerequisite: consent of instructor. Intensive introduction to philosophical inquiry. Open only to freshmen with strong interest or background in philosophy. Grene

12A. Introduction to Logic. (4) I.

Lecture—3 hours; discussion—1 hour. Basic concepts and techniques of deductive logic with emphasis on propositional logic. Development of a deductive system for propositional logic. Translation of English into symbolic formulas. Berger

12B. Introduction to Logic. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: 12A.

site: course 12A or consent of instructor. Development of the full quantifier logic, with identity and descriptions; decision procedures; advanced translation of English into the formal language; elementary theory of classes and relations; Russell's paradox. Friedman

14. Ethical and Social Problems in Contemporary Society. (4) III.

Lecture—3 hours; discussion—1 hour. Philosophical issues and positions involved in contemporary moral and social problems. Among possible topics are: civil disobedience and revolution, racial and sex discrimination, environment and population control, genetic engineering, technology and human values, sexual morality, freedom in society. Berger

15. Basic Religious Concepts. (3) I.

Lecture—3 hours. Prerequisite: Religious Studies 20 recommended. 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. 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. Malcolm

20B. History of Philosophy. (4) II.

Lecture—3 hours; discussion—1 hour. The seventeenth century and its background. Grene

20C. History of Philosophy. (4) III.

Lecture—3 hours; discussion—1 hour. Eighteenth-century philosophy. Beal

Upper Division Courses

101. Metaphysics. (4) III.

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. Gilbert

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. Friedman

103. Philosophy of Mind. (4) III.

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 odd-numbered years. Wedin

105. Philosophy of Religion. (4) II.

Lecture—3 hours. Prerequisite: two courses in philosophy. Logical, metaphysical, epistemological and existential aspects of selected religious concepts and problems. Gilbert

107. Philosophy of the Physical Sciences. (4) I.

Lecture-discussion—3 hours; written papers. Prerequisite: one philosophy course or a major in science. The nature of testability and confirmation of scientific hypotheses; the nature of scientific laws, theories, explanations, and models. Problems of causality, determinism, induction, and probability; the structure of scientific revolutions. Friedman

108. Conceptual Problems in the Biological Sciences. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: biology major or one philosophy course. The nature of theories, explanations and models in biology. Problems of evolutionary theory and taxonomy. (Same course as Zoology 146.) Grene

109. Philosophy of the Social Sciences. (4) III.

Lecture-discussion—3 hours; written reports. Prerequisite: one philosophy course or major in a social science. The nature of human action and behavior, and of explanation of behavior. Nature of laws and explanation in the social sciences. Problems in the social sciences such as: "interpretive understanding", role of prediction, behaviorism, reductionism, role of value judgements, and social rules. Berger

114A. Introduction to Ethics. (4) I.

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. Arbini

114B. Problems of Ethical Theory and Practice. (4) II.

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. Berger

117. Political Philosophy. (4) III.

Lecture-discussion—3 hours. Prerequisite: course

6 or 6F recommended. Intensive examination of some central concepts of political thought such as the state, sovereignty, rights, obligation, freedom, law, authority, and responsibility. Offered in odd-numbered years. 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. 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. Beal

131. Philosophy of Logic and Mathematics. (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: course 12A or one course for credit in mathematics. The nature of formal systems and mathematical theories. Selected topics from: logical and semantical paradoxes; foundations of mathematics; set theory, type theory, and intuitionistic theory; philosophy of geometry; philosophical implications of Gödel's incompleteness results. 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. 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. Friedman

137. Philosophy of Language. (4) III.

Lecture-discussion—3 hours. Prerequisite: course 20C, 156, or Linguistics 35 recommended. 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. Arbini

143. Hellenistic Philosophy. (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20A. Offered in odd-numbered years. Gilbert

145. Medieval Philosophy. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 20A. Study of major philosophers in the medieval period. Gilbert

***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. Gilbert

151. Philosophy of the Nineteenth Century. (4) III.

Lecture-discussion—3 hours. Prerequisite: courses 20A, 20B, or 20C recommended. The idealism of Hegel, his contemporaries and his successors; Marxism; the positivism of Comte and Mill; the irrationalism of Kierkegaard and Nietzsche. Offered in odd-numbered years. Bossart

155. American Philosophy. (4) II.

Lecture-discussion—3 hours. Prerequisite: course 6 or 6F recommended. Study of such American thinkers as Peirce, James, Royce, Dewey, Santayana, Whitehead, and C. I. Lewis. Offered in even-numbered years. Berger

156. Contemporary British Philosophy. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 20C or 151 recommended. Interpretation and analysis of the most influential works of Bertrand Russell, G. E. Moore, Wittgenstein, J. L. Austin, and G. Ryle. Offered in even-numbered years. Wedin

157. Special Topics in Contemporary British and American Philosophy. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 155 or 156. Intensive study of special topic or special author in contemporary British or American philosophy. May be repeated for credit with consent of instructor. Offered in odd-numbered years. Wedin

158. Phenomenology. (4) II.

Lecture-discussion—3 hours. Prerequisite: course 20C, 151, or 175 recommended. Husserl, his predecessors and successors. Offered in even-numbered years. Bossart

159. Existentialism. (4) III.

Lecture-discussion—3 hours. Prerequisite: course 20C, 151, or 175 recommended. Such twentieth-century thinkers as Jaspers, Marcel, Sartre, Merleau-Ponty. Offered in even-numbered years. Grene

160. Special Topics in Contemporary European Philosophy. (4) I.

Lecture-discussion—3 hours. Prerequisite: course 158 or 159 recommended. Intensive study of special topic or author from the general fields covered by courses 158 and 159. May be repeated for credit with consent of instructor. Offered in even-numbered years. Bossart

161. Plato. (4) III.

Lecture-discussion—3 hours. Prerequisite: course 20A. Offered in even-numbered years. Wedin

162. Aristotle. (4) I.

Lecture-discussion—3 hours. Prerequisite: course 20A or consent of instructor. Offered in even-numbered years. Malcolm

168. Descartes. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20B. Offered in even-numbered years. Arbini

169. Spinoza. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20B. Offered in odd-numbered years. Friedman

170. Leibniz. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20B. Offered in even-numbered years. Gilbert

171. Hobbes. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20B recommended. Offered in odd-numbered years. Gilbert

***172. Locke. (4) I.**

Lecture-discussion—3 hours. Offered in odd-numbered years. Child

173. Berkeley. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20C. Offered in odd-numbered years. Beal

174. Hume. (4) III.

Lecture-discussion—3 hours. Offered in even-numbered years. Arbini

175A. Kant. (4) I.

Lecture-discussion—3 hours; written reports. Prerequisite: course 20C. Offered in even-numbered years. Bossart

175B. Kant. (4) II.

Lecture-discussion—3 hours; written reports. Prerequisite: course 175A. Offered in odd-numbered years. Bossart

176. Hegel. (4) I.

Lecture-discussion—3 hours. Prerequisite: courses 20C, 175 recommended. Offered in odd-numbered years. Bossart

178. Kierkegaard. (4) I.

Lecture—3 hours. Prerequisite: course 20A and course 20C or 185. Offered in odd-numbered years. Child

181. Heidegger. (4) II.

Lecture-discussion—3 hours. Prerequisite: course

20C, 151, or 175 recommended. Offered in odd-numbered years. Child

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. Grene

190. Special Topics in the History of Philosophy. (4) II.

Lecture—3 hours; term paper. Intensive study of special topic, problem, or authors in the history of philosophy. May be repeated for credit. Wedin

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.) The Staff (Bossart in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (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. Wedin

202. Theory of Knowledge. (4) II.

Seminar—3 hours. Beal

***206. Philosophical Argumentation. (4) II.**

Seminar—3 hours. Prerequisite: graduate standing. Investigation and evaluation of philosophical arguments. Critical discussion of student papers on various aspects of philosophical disputes.

207. Philosophy of Science. (4) II.

Seminar—3 hours. Grene

***214. Ethics. (4) I.**

Seminar—3 hours. Berger

***223. Aesthetics. (4) II.**

Seminar—3 hours. Offered in even-numbered years.

261. Plato. (4) III.

Seminar—3 hours. Offered in even-numbered years. Wedin

NOTE: For key to footnote symbols, see page 220.

262. Aristotle. (4) I.

Seminar—3 hours. Offered in odd-numbered years. Malcolm

275. Kant. (4) II.

Seminar—3 hours. Offered in odd-numbered years. Bossart

290. History of Philosophy. (4) III.

Seminar—3 hours. Special topics in the history of philosophy. Bossart

298. Group Study. (1-5) I, II, III.

The Staff (Bossart in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Bossart in charge)

PHYSICAL EDUCATION

E. Dean Ryan, Ed.D., *Chairperson of the Department*

Herbert A. Schmalenberger, M.A., *Vice-Chairperson of the Department*

Department Office, 264 Gymnasium

Professors:

- Edmund M. Bernauer, Ph.D.
- Charles R. Kovacic, Ed.D.
- Willard S. Lotter, Ed.D.
- E. Dean Ryan, Ed.D.

Associate Professors:

- William C. Adams, Ph.D.
- Melvin R. Ramey (*Civil Engineering*)
- Jack H. Wilmore, Ph.D.

Assistant Professor:

- Janet L. Walter, Ph.D.

Lecturer and Supervisor of Physical Education:

- Barbara Heller, Ed.D.

Supervisors:

- Robert R. Brooks, M.A.
- Joseph E. Carlson, M.A.
- Robert I. Hamilton, M.S.
- ² John W. Pappa, M.A.
- Herbert A. Schmalenberger, M.A.
- Joe L. Singleton, M.A.
- James L. Sochor, Ed.D.
- Marya Welch, Ed.D.

Associate Supervisors:

- ¹ Jere H. Curry, M.A.
- Jerry W. Hinsdale, A.B.
- Philip S. Swimley, M.A.

Assistant Supervisors:

- Suzanne Cumnock, Ed.M.
- Robert L. Foster, M.A.
- Pamela Gill, A.B.
- Raymond S. Goldbar, M.A.

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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. 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.—W. C. Adams, E. M. Bernauer, C. R. Kovacic, W. S. Lotter, E. D. Ryan, H. A. Schmalenberger, J. L. Walter, M. Welch.

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, either Psychology 2A or 2B. Students interested in the physiological aspects of physical education are urged 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. Students are urged to consult their adviser at the earliest possible date.

Teaching Credential Subject Representative: H. A. Schmalenberger. See page 215 for the Teacher Education Program.

Teaching Major.—The teacher-training curriculum in physical education requires in addition to

the departmental major requirements, courses 130, 180, and 380B.

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 I.C.A. athletics and women qualified for W.A.A. athletics may enroll in any sport pursued at Davis, such as baseball, basketball, football, or tennis, and receive credit.) This course may be repeated for credit not to exceed a total of 6 units. (P/NP grading only.) The Staff (Ryan in charge)

5. Foundations of Emergency First Aid Services.

(2) I, II, III.

Lecture—1 hour; laboratory—1 hour. An introduction to the basic principles and practices that fulfill the prerequisites for advanced study in First Aid and Emergency Medical Services. Upon successful completion of course the Standard Red Cross Certificate is awarded. Swimley

10. Professional Physical Education Activities

(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, trampolining, weightlifting, wrestling, and volleyball. The Staff (Ryan in charge)

15. Administration of Intramural Sports. (2) II.

Lecture—2 hours. Planning and administering intramural sports programs at the high school and college level.

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.) Hinsdale

27. Training Course for Water Safety Instructors. (2) II, III.

Lecture—1 hour; laboratory—2 hours. Prerequisite: advanced swimming and Senior Life Saving Certificate. Theoretical knowledge and practical experience necessary for the organization and teaching of swimming, life saving, and water safety courses. (American Red Cross Water Safety Instructors Certificate awarded upon successful completion of necessary requirements.) Hinsdale

29. Basic Scuba. (2) I, III.

Lecture—2 hours; laboratory—2 hours; two 8-hour field trips to the ocean. 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, function and maintenance of equipment, physics and physiology of diving, safety and first aid, currents and wave action, marine life and underwater communication. (P/NP grading only.) Bernauer

*35. Dance Composition. (2) II.

Laboratory—4 hours. Principles of choreography for solo and group compositions.

*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.

44. Principles of Healthful Living. (2) I, II, III.

Lecture—2 hours. Application of scientific knowledge to personal, family, and community health problems. Heller

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. Adams

97T. Tutoring in Physical Education. (1-5) I, II, III.

Tutorial—1-5 hours. Prerequisite: lower division standing and consent of Department Chairperson. 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. (P/NP grading only.)

The Staff (Chairperson in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson 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. 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. Bernauer

105. Physical Education for the Handicapped. (4) II.

Lecture—4 hours. Prerequisite: course 103. The role of exercise, physical retraining and remedial work in the improvement of movement for handicapped individuals. Kovacic

110. Psychosocial Factors in Motor Performance.

(4) I.

Lecture—3 hours. Prerequisite: Psychology 2A, 2B; course 45 or consent of instructor. Analysis of various psychological and social factors affecting the development and use of motor skills. Ryan, Walter

***115. Growth and Development in Human Performance. (4) II.**

Lecture—4 hours. 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.

120. Sports in American Society. (4) III.

Lecture—4 hours. Historical development of sport: the phenomenon of play, games and non-structured sport. The national and international rules and interrelationship of American sports, its socio-cultural aspect, current trends, problems and issues. Welch

125. Human Performance and Motor Learning. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 110, Psychology 2B; Psychology 130 recommended. The process of skill acquisition, with consideration given to open and closed loop theory, attention, automaticity, kinaesthesia, movement control, and learning. Proprioception and intrinsic feedback mechanism are also discussed. Laboratory illustrations are offered when practicable. Walter

130. Principles and Theory of Physical Education. (4) II.

Lecture—4 hours. Prerequisite: course 45 or con-

sent of instructor. Critical analysis of the assumptions underlying the physical education program. Lotter

135. Design and Program Evaluation in Physical Education. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: basic statistics course; courses 103, 104A, 110 or consent of instructor. Topics include data reduction and analysis; test selection, construction and administration; grading; and teacher evaluation. Bernauer

140. Recreation in the Community. (3) I.

Lecture—2 hours; discussion—1 hour; two Saturday field trips—8 hours. The nature and scope of community recreation programs in California emphasizing low income, highly populated areas and poor rural communities. Lotter

171. First Aid Leadership and Accident Management. (3) I, II, III.

Lecture—2 hours; students assist in teaching course 5—1 hour to be arranged. Prerequisite: course 5 or American Red Cross Advanced First Aid Card. Administration, organization and supervision of safety and first aid programs in school and community sports, recreation and all types of group activities. The study and practice of first aid leadership skills. The American Red Cross First Aid Instructor Card will be awarded upon successful completion of the course. Heller

***172. Conditioning of Athletes: The Prevention and Care of Sports Injuries. (1) I.**

Laboratory—3 hours. Prerequisite: a major or minor in Physical Education; American Red Cross Advanced First Aid Card. Prevention and care of injuries; adhesive strapping, protective devices, and injury care therapies. Training and first aid room organization, equipment, and supplies.

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. Cumnock

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. (P/NP grading only.)

The Staff (Chairperson in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor and Department Chairperson. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of Department Chairperson. (P/NP grading only.)
The Staff (Chairperson 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. Adams, Walter

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. 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, athletics, and alteration of normal growth patterns.

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. Kovacic

221. Anthropometry in Relation to Physical Performance. (4) II.

Lecture—2 hours; discussion—1 hour; laboratory—2 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 accom-

panying prolonged, systematic physical conditioning.

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. 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; kinesthesia; and reaction time; consideration of sensory-motor perception, motivation, and personality factors in relation to physical activities. 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. Bernauer

298. Group Study. (1-5) I, II, III.

Prerequisite: graduate standing; consent of instructor. (S/U grading only.)
The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing; consent of instructor and Department Chairperson. (S/U grading only.)
The Staff (Chairperson in charge)

Professional Course

380A-380B-380C. Methods of Physical Education in the Secondary School. (3-3-3) I-II-III.

Lecture—2 hours; laboratory—3 hours (380A, 380C) and 2 hours (380B). 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 extramural programs. Schmalenberger, Cumnock

PHYSICAL MEDICINE AND REHABILITATION—See Medicine

PHYSICAL SCIENCES

Program Office, 225 Physics-Geology Building

NOTE: For key to footnote symbols, see page 220.

Committee in Charge:

Roderick V. Reid, Jr., Ph.D. (*Physics*);
Committee Chairperson
 Harry W. Green II, Ph.D. (*Geology*)
 Peter A. Rock, Ph.D. (*Chemistry*)

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Major Adviser:—See *Class Schedule* listing.

The Major Program

The program is designed to give a foundation in the principal physical science fields without requiring a high degree of specialization restricted to 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 as well as within one of the physical science fields itself. The major is also appropriate for those who desire a general secondary teaching credential. In order to take advantage of the inherent flexibility of the program the student should consult with a Physical Sciences adviser as early as possible.

Lower Division Courses.—Required: Chemistry 1A-1B-1C or Chemistry 4A-4B-4C; Geology 1-1L or 60-60L; Mathematics 21A, 21B, 21C; Physics 4A, 4C, 4E. Additional requirements for the Bachelor of Sci-

ence degree: Physics 4B, Physics 4D, and a course involving computer programming (e.g., Mathematics 29 or Engineering 5). Recommended: Geology 1, 1L, 2, 2L, 16, 20, 25, 60, 60L; Mathematics 22A, 22B, 22C. The choice of recommended courses depends on the preparation desired for upper division specialization in the major.

Bachelor of Arts Degree

Upper Division Courses.—A total of 36 units of upper division courses within the areas of chemistry, geology, and physics with a minimum of 22 of these units in one field, 6 units in a second field, and 3 units in the third field. Subject to approval by the Physical Sciences Committee up to 3 units may be substituted from fields related to the three above.

Bachelor of Science Degree

Upper Division Courses.—A total of 44 units of upper division courses within the areas of chemistry, geology and physics with a minimum of 22 of these units in one field, 8 units in a second field, and 6 units in the third field. Subject to approval by the Physical Sciences Committee up to 6 units may be substituted from fields related to the three above.

Teaching Credential Subject Representative: R. V. Reid. See page 215 for the Teacher Education Program.

PHYSICS

William J. Knox, Ph.D., *Chairperson of the Department*

Department Office, 225 Physics-Geology Building

Professors:

Franklin P. Brady, Ph.D.
 James E. Draper, Ph.D.
 Glen W. Erickson, 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.

Winston T. Ko, Ph.D.
 Neal Peek, Ph.D.
 Wendell H. Potter, Ph.D.
 Thomas M. Powell, Ph.D. (*Physics and Environmental Studies*)
 Philip M. Yager, Ph.D.

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Major Subject Advisers.—N. Peek, D. E. Pellett, R. V. Reid.

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:

- 1) a core program consisting of Physics 104A-104B, 105A-105B, 110A-110B (-110C for B.S. only), 115A (-115B for B.S. only), 112A, 122, plus
- 2) a minimum number of advanced electives (11 units for B.S., 7 units for A.B.) selected from Physics

Associate Professors:

³Thomas A. Cahill, Ph.D.
¹Ching-Yao Fong, Ph.D.
¹Claude Garrod, Ph.D.
 James P. Hurley, Ph.D.
 Douglas W. McColm, Ph.D.
 David E. Pellett, Ph.D.
 Roderick V. Reid, Jr., Ph.D.

Assistant Professors:

Albert C. Cheung, M.A. (*Acting*)
 Linton R. Corruccini, Ph.D.

105C, 110C (A.B. only), 112B, 115B (A.B. only), 129A, 129B, 140A, 140B, plus

3 additional electives (10 units for B.S., 5 units for A.B.) in upper division physics or astronomy courses open to majors. No more than 6 units (4 for A.B.) of 194, 195, 197T, 198, 199 courses taken may be used to satisfy these requirements. Substitutions from other departments for any of these upper division requirements, including the core, may be made by written permission of the Undergraduate Curriculum Committee Chairperson as approved by the Department Chairperson. Recommended additional courses: Mathematics 24, 118, 119, 185; Mathematics 129 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 10 is a primarily concept-oriented one-quarter lecture/discussion course requiring relatively little mathematical background.

Physics 2 and Physics 5 are three-quarter sequences requiring some mathematics (trigonometry; calculus). Physics 5 includes laboratory work as an integral part of the course; the optional laboratory accompanying Physics 2 is Physics 3.

Physics 4 is a five-quarter sequence using calculus throughout and including laboratory work as an integral part. The course is designed primarily for students in the physical sciences and engineering.

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 prerequisite to all upper division courses. Some prerequisites may be waived with consent of the instructor.

Teaching Credential Subject Representative: R. V. Reid. See page 215 for the Teacher Education Program.

Astronomy

Lower Division Courses

1A. Introduction to General Astronomy: The Solar System. (4) II.

Lecture—3 hours; laboratory—2 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.) Cheung

1B. Introduction to General Astronomy: Stars and the Universe. (4) III.

Lecture—3 hours; laboratory—2 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.) Cheung

Upper Division Course

127. Introduction to Astrophysics. (3) I.

Lecture—3 hours. Prerequisite: Physics 4A. Prior knowledge of astronomy not required. Celestial mechanics, earth-moon dynamics, solar system physics, radiation, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology. 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.

Lecture—3 hours. Prerequisite: trigonometry or consent of instructor. Mechanics. Not open to students who have completed course 5A. The Staff

2B. General Physics Lecture. (3) II, III.

Lecture—3 hours. Prerequisite: course 2A or 5A. Electricity and magnetism, heat, kinetic theory, and thermodynamics. Not open to students who have completed course 5B. The Staff

2C. General Physics Lecture. (3) I, III.

Lecture—3 hours. Prerequisite: course 2B or 5B. Wave motion, optics, modern physics. Not open to students who have completed course 5C. The Staff

3A. General Physics Laboratory. (1) I, II.

Laboratory—2 hours. Prerequisite: course 2A (may be taken concurrently). Mechanics. Experimental work planned to accompany the lectures in course 2A. Recommended for all students who take course 2A. The Staff

3B. General Physics Laboratory. (1) II, III.

Laboratory—2 hours. Prerequisite: course 2B (may be taken concurrently) and either course 3A or 5A. Electricity and magnetism, heat, kinetic theory, and thermodynamics. Experimental work planned to accompany the lectures in course 2B. Recommended for all students who take course 2B. The Staff

3C. General Physics Laboratory. (1) I, III.

Laboratory—2 hours. Prerequisite: course 2C (may be taken concurrently), and either course 3A or 5A. Wave motion, optics, modern physics. Experimental work planned to accompany the lectures in course 2C. Recommended for all students who take course 2C. The Staff

4A. General Physics. (4) II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 21B (may be taken concurrently). Mechanics. McColm

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. Corruccini

4C. General Physics. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4A; Mathematics 21C, 22C (may be taken concurrently); course 4B recommended. Fundamentals of electromagnetic theory; Maxwell's equations. Draper

4D. General Physics. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4C; Mathematics 22B (may be taken concurrently). Fundamentals of electromagnetic theory (continuation of course 4C), A.C. circuitry, electromagnetic waves, optics, electric and magnetic fields in matter. Yager

4E. General Physics. (4) III.

Lecture—3 hours; discussion-quiz—2 hours. Prerequisite: course 4C; course 4D and Mathematics 22A recommended. Physics since 1900; special relativity, quantum mechanics, atoms, molecules, the solid state, nuclei, and particle physics. Reid

5A. General Physics. (4) I.

Lecture—3 hours; laboratory—2 hours. Prerequisite: Mathematics 16A (may be taken concurrently) or consent of instructor. Mechanics, introduction to general principles and analytical methods used in physics. Not open to students who have completed course 2A. The Staff

5B. General Physics. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 5A (or 2A, 3A, Mathematics 16A, and consent of instructor). Electricity and magnetism, heat, kinetic theory and thermodynamics. Not open to students who have completed course 2B. The Staff

5C. General Physics. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 5B (or 2B, 3B, Mathematics 16A, and consent of instructor). Wave motion, optics, modern

physics. Not open to students who have completed course 2C. The Staff

10. Basic Concepts of Physics. (4) I, II, III.

Lecture—3 hours, discussion—1 hour. Prerequisite: high school algebra; students having had any other physics course must have departmental approval prior to enrolling. 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. Greider

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.) The Staff (Chairperson in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson 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. Erickson

105A. Analytical Mechanics. (3) I.

Lecture—3 hours. Prerequisite: course 4A; Mathematics 22A, 22B, 22C. Principles and applications of Newtonian mechanics. Ko

105B. Analytical Mechanics. (3) II.

Lecture—3 hours. Prerequisite: courses 4B and 105A. Continuation of course 105A; introduction to Lagrange's and Hamilton's equations. Ko

105C. Analytical Mechanics. (3) III.

Lecture—3 hours. Prerequisite: course 105B. Continuation of course 105B. 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. Jungerman, Reid

112A-112B. Thermodynamics and Statistical Physics. (3-4) I-II.

Lecture—3 hours; (4th unit for 112B) outside work—9 hours. Prerequisite: course 4; Mathematics 22C. Thermodynamics, kinetic theory, and introduction to statistical mechanics. Corruccini

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 clas-

sical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.

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.

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.

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.

McColm

122. Advanced Physics Laboratory. (2) II, III.

Discussion—1 hour; laboratory—3-6 hours. Prerequisite: course 4. Experimental techniques and measurements in atomic, nuclear, and solid-state physics. May be repeated once for credit.

Corruccini, Cahill

123. Applications of Nuclear Physics. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Applications to environmental, medical, and energy source problems. Course emphasizes but is not limited to experimental programs underway at Crocker Nuclear Laboratory. Student participation in one such experimental program is the required lab work.

Jungerman

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.

Peek

129B. Nuclear Physics. (4) III.

Lecture—3 hours; outside work—9 hours. Prerequisite: courses 115B, 129A. Continuation of course 129A.

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.

Potter

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.

Potter

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 (Chairperson 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 (Chairperson in charge)

197T. Tutoring in Physics and Astronomy.

(1-5) I, II, III.

Prerequisite: consent of instructor and department chairperson. Tutoring of students in lower division course. Weekly meetings with instructor. (P/NP grading only.)

The Staff (Chairperson in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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.

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. Garrod

200C. Theory of Mechanics and Electromagnetics. (3) III.

Lecture—3 hours. Prerequisite: course 220B, Mathematics 220C concurrently. Brief review of static electromagnetic fields; Maxwell's equations; plane waves in various media; magnetohydrodynamics. True

200D. Theory of Mechanics and Electromagnetics. (3) I.

Lecture—3 hours. Prerequisite: course 200C. Diffraction theory. Radiating systems and electron theory. 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. True

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. True

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. True

219A. Statistical Mechanics. (3) I.

Lecture—3 hours. Prerequisite: courses 112B and 115B. Foundations of classical and quantum statistical mechanics. Garrod, 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. Hurley, 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. Offered in even-numbered years. 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 odd-numbered years. Brady, Draper

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. Draper, Brady

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. Draper, Brady

***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. Offered in even-numbered years. 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. Offered in even-numbered years. 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 odd-numbered years. 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. 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. Offered in even-numbered years. 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. Offered in even-numbered years. Garrod

240A-240B. Solid State Physics. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 221A—221B. One electron model of solids. Properties of lattice waves. Optical and magnetic properties of solids. Fermi surface. Superconductivity. Offered in even-numbered years. 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 odd-numbered years. Ko

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. 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. Draper

290. Seminar. (1-3) I, II, III.

Seminar—1-3 hours. (S/U grading only.)
The Staff (Chairperson in charge)

291. Seminar in Nuclear Physics. (1-2) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

292. Seminar in Theoretical Physics. (1-2) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

293. Seminar in Solid State Physics. (1-2) I, II, III.

Seminar—1-2 hours. (S/U grading only.)
Fong, Potter

297. Techniques of Teaching Physics. (3) I, II, III.

Prerequisite: consent of instructor and Department Chairperson. 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.) Greider

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

PHYSIOLOGICAL SCIENCES

Richard A. Freedland, *Chairperson of the Department*
Department Office, 2163 Haring Hall

Professors:

Arthur L. Black, Ph.D.
Victor W. Burns, Ph.D.
Richard A. Freedland, Ph.D.
Marvin Goldman, Ph.D. (*Radiological Sciences*)
Alfred A. Heusner, Docteur-es-Sciences
James G. Morris, Ph.D. (*Animal Science*)
Stuart A. Peoples, M.D. (*Emeritus*)
Robert E. Smith, Ph.D. (*Emeritus*)

Associate Professors:

Richard L. Bell, Ph.D. (*Chemical Engineering*)
Gaylord M. Conzelman, Jr., Ph.D.
Donald L. Curry, Ph.D.

Jerry R. Gillespie, D.V.M., Ph.D.
(*Physiological Sciences and Human Physiology*)
Shri N. Giri, B.V.Sc., A.H., Ph.D.
Harold R. Parker, D.V.M., Ph.D. (*Surgery*)
Quinton R. Rogers, Ph.D.

Assistant Professors:

Robert J. Hansen, Ph.D.
Robert M. Joy, Ph.D.

Lecturer:

Allen C. Andersen, V.M.D., Ph.D.

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NOTE: For key to footnote symbols, see page 220.

Upper Division Courses

101A-101B. Physiological Chemistry. (4-3) I, II.

Lecture—4-3 hours. Prerequisite: organic chemistry. Recommended: a course in physiology (may be taken concurrently) and quantitative analysis. 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; chemistry of respiration, energy metabolism and nutrition.

Black, Freedland, Rogers, Hansen

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

200. Cell Physiology: Biophysical Aspects. (2) II.

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.

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.

Black, Freedland, 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.

Black, Freedland, Rogers

223. Comparative Pharmacology. (5) III.

Lecture—4 hours; laboratory—3 hours. Prerequisite: biochemistry and mammalian physiology. Action of drugs on the physiological mechanisms of animals.

Giri, Conzelman, Joy

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.

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.

Burns

253. Drug Metabolism. (2) II.

Lecture—2 hours. Prerequisite: courses 101A-101B or former 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.

Giri

***254. Applied and Clinical Pharmacology. (2) III.**

Lecture—2 hours. Prerequisite: course 223; 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.

Conzelman, Giri, 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.

Peoples, 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.

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.

Conzelman

258. Drug Receptors. (2) II.

Lecture—2 hours. Prerequisite: Pharmacology 200A-200B or the equivalent. Theories of drug-receptor interactions and their application to known receptor systems are stressed. Present concepts of adrenergic, cholinergic, opiate, and other receptors

are considered in conjunction with their functional importance. Joy

260. Comparative Bioenergetics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 107A. Fundamentals of thermodynamics and their application in physiology: entropy, probability, information, and thermodynamic potentials. Theory of biological similarity: dimensional analysis, poikilothermy, heterothermy, homeothermy, and biological time. Heusner

265. Experimental Physiology. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. Selected lectures and ex-

periments on cardiovascular, renal and pulmonary mechanisms with emphasis on chronically maintained preparations and perinatal problems. Offered in odd-numbered years. Parker

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff (Chairperson in charge)

298. Group Study. (1-4) I II, III.

The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only)

The Staff (Chairperson in charge)

PHYSIOLOGY—Also see Plant Physiology, and Zoology

PHYSIOLOGY (Animal)

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 116 and 210.

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 (page 529).

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. B. Horwitz, J. Horowitz

100L. General Physiology Laboratory. (2) II.

Discussion—five 2-hour sessions (alternate weeks); laboratory—five 6-hour sessions (to alternate with discussion). Prerequisite: courses 100A, 100B (concurrently), Biological Sciences 1; or consent of instructor. Laboratory in the physical and chemical processes of cells and tissues. B. Horwitz, J. Horowitz

101. Functions of Organ Systems. (5) I, II, III.

Lecture—5 hours; optional discussion—1 hour. Prerequisite: Biological Sciences 1. Physiology of organ systems; including concepts of integrative and homeostatic mechanisms. Boda, Colvin, Mendel, Goldberg

101L. Organ Function Laboratory. (2) I, III.

Laboratory—6 hours. Prerequisite: course 101

(may be taken concurrently). Selected experiments to illustrate functional characteristics of organ systems discussed in course 101.

102. Physiology of Growth. (3) III.

Lecture—3 hours. Prerequisite: courses 101 and 101L. Biological, physical, and chemical aspects of the growth of cells, organisms, and populations. A. Smith

103. Physiology of Animal Cells. (4) III.

Lecture—4 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. 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. 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. Ogasawara

108. Biodynamics. (3) III.

Lecture—3 hours. Prerequisite: course 100A or 101; Mathematics 16A, 16B. Application of mathematics to physiological processes. Horowitz

110A-110B-110C. Mammalian Physiology. (3-3-4) I, II, III.

Lecture—3-3-4 hours. Prerequisite: course 101 and Biological Sciences 1; Chemistry 8B, Physics

NOTE: For key to footnote symbols, see page 220.

2A-2B-2C, and anatomy and/or physiology (e.g., course 2) recommended. Physiology of the organ systems of mammals. The physiology of the neuromuscular, neurophysiology, autonomic, respiration and cardiovascular, renal, digestion, and thermoregulation systems of mammals.

Wagman, Burger, Goldberg, Boda, Colvin

111A-111B. Mammalian Physiology Laboratory.
(3-3) I-II.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 101; course 110A-110B-110C recommended. 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.

Burger

120A. Comparative Physiology. (3) I.

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom: neurophysiological mechanisms of integration including aspects of phylogenetic development at both neuronal and systemic levels.

Woolley

120B. Comparative Physiology. (3) II.

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom: respiration and circulation. Offered in odd-numbered years.

Goldberg, Burger

120C. Comparative Physiology. (3) III.

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom: digestion and osmoregulation. Offered in even-numbered years.

Colvin

120D. Comparative Physiology. (3) I.

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom: humoral integrative mechanisms. Offered in odd-numbered years.

Boda

121. Physiology of Reproduction. (3) III.

Lecture—3 hours. Prerequisite: course 101. Physiological mechanisms related to reproduction, breeding efficiency, and fertility, with special reference to domestic animals.

Cupps

121L. Physiology of Reproduction Laboratory.
(1) III.

Laboratory—3 hours. Prerequisite: course 121 recommended. Experiments on the reproductive systems of domestic animals including male and female gametes.

Cupps

130. Physiology of the Endocrine Glands. (5) I.

Lecture—4 hours; discussion—1 hour. Prerequisite: course 101 or 110B. Control of endocrine secretion and the physiological effects of the hormones.

Moberg

148. Principles of Environmental Physiology. (3) II.

Lecture—3 hours. Prerequisite: course 101. Intensive treatment of basic aspects of environmental physiology; introduction to physiological control mechanisms; special emphasis on adaptation to the environment.

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 animals including man. The nature of environmental variations which influence physiological responses are given emphasis.

W. O. Wilson

***161. Topics in Voluntary Control of Physiological Processes. (3) II.**

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 101 or consent of instructor. Physiology of voluntary activity, including voluntary control of involuntary processes as studied by use of bio-feedback systems; topics include electrical activity of the brain, body, temperature, smooth and skeletal muscle tonus, and cardiovascular system.

The Staff (Mendel in charge)

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.

B. W. Wilson

197T. Tutoring in Physiology. (2) I, II, III.

Discussion—1 hour; tutorial—1 hour. Prerequisite: course 101 or 110B or 210B with grade of B or better and consent of instructor. Extensive review of systemic physiology through leading a weekly tutorial session with a small group of students taking course 101. Course format will vary with background of tutors and instructional needs. (P/NP grading only.)

The Staff (Mendel in charge)

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Mendel in charge)

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

(P/NP grading only.)

The Staff (Mendel in charge)

Graduate Courses

200A, 200B. Advanced General Physiology.
(3,3) I, II.

Lecture—2 hours; discussion—1 hour. Prerequisite: courses in undergraduate biochemistry and cell biology, or general physiology, or consent of instructor. Current topics in the physico-chemical bases of living systems with emphasis on regulation of cell

processes. Courses 200A and 200B may be taken in either order; may be repeated for credit.

B. W. Wilson

200L. Advanced General Physiology Laboratory.

(4) I.

Discussion—2 hours; laboratory—10 hours. Prerequisite: course 100B or Zoology 166, 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.

B. W. Wilson,

210A-210B. Advanced Systemic Physiology.

(3-3) II, III.

Lecture—3 hours. Prerequisite: course 110A-110B or consent of instructor. Advanced consideration of the physiology of the neuromuscular, circulatory, respiratory, digestive, endocrine, reproductive, and excretory systems. Goldberg, 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.

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. Wagman

215. Neurophysiology Laboratory. (3) II.

Discussion—3 hours; laboratory—9 hours. Prerequisite: course 214 (may be taken concurrently). Selected experiments based on modern concepts to illustrate, in depth, surgical techniques, stimulating and recording techniques used in neurophysiology research. Offered in odd-numbered years. 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.

Wagman

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.

Ashmore, Wilson

220. General and Comparative Physiology of Reproduction. (3) I.

Lecture—3 hours. Prerequisite: courses 101,101L; 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.

Ogasawara, Cupps, Anderson

225. Physiology of Lactation. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101; Biochemistry or Physiological Sciences 101B. Consideration of the biochemical, genetic, physiological, nutritional and structural factors determinant of mammary gland development, lactogenesis and milk yields and composition; animal physiological adaptations to lactation; mammary cancer research; and, research perspectives in mammary research.

Geschwind

231. Selected Topics in Neuroendocrinology. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 130 or consent of instructor. Neuroendocrine interactions; neural regulation of endocrine systems; hormonal modifications of neural development and activity. Offered in even-numbered years.

Woolley, Moberg

***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. Offered in odd-numbered years.

Winget

250. Development of Physiological Concepts:

Selected Topics. (3) I.

Lecture—2 hours; discussion—1 hour. Historical development of physiology. Selected topics from ancient to modern times. Course may be repeated for credit when a different topic is studied. (S/U grading only.)

The Staff (Mendel in charge)

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 (Mendel in charge)

297T. Tutoring in Physiology. (3) I, II, III.

Discussion—1 hour; tutorial—2 hours. Prerequisite: completion of course to be tutored (with a grade of A) and consent of instructor. Advanced study of

systemic physiology through leading small discussion groups in upper division courses (students are required to attend lectures in the course which they are tutoring). May be repeated for credit by tutoring in different courses or in the continuation of a course (e.g., course 110A-110B-110C). (S/U grading only.)

The Staff (Mendel in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Mendel in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Mendel in charge)

300A-300B. Pedagogical Aspects of Physiology in Higher Education. (3-5) I, II, III.

Lecture, discussion, or laboratory, or combination. Prerequisite: a Ph.D. candidate and qualification as T.A. in physiology. Participation as T.A. for one quarter in designated physiology course is required: attend lectures, lead discussion groups, be available for students' questions, study laboratory material, help prepare laboratory exercises including pre-runs when necessary, develop competence in laboratory procedures and techniques, and prepare and correct quizzes. (S/U grading only.)

The Staff (Mendel in charge)

PLANT PATHOLOGY

Related Undergraduate Major and Graduate Study.
See pages 117 and 210.

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. Campbell; III. 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.

Nyland

130. Physiology of Fungi. (3) I.

Lecture—3 hours. Prerequisite: Botany 2; Biochemistry 101B, Botany 119 recommended. Discussion of the nature and interrelationships of fungal cell structure, growth, spore germination, nutrition, and metabolism with emphasis on responses of fungi to environmental changes. Selected examples of beneficial and destructive roles of fungi will also be considered.

DeVay, Kosuge

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.) The Staff (Kosuge 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 (Ogawa in charge)

208. Ecology of Plant Pathogens and Epidemiology of Plant Disease. (3) II.

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.

Duniway

210. Physiology and Biochemistry of Host-Pathogen Interaction. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 130 or equivalent; Biochemistry 101B. Discussion of the nature of host-pathogen interactions, metabolic alterations in plant disease, biochemistry of disease resistance, toxins in plant disease.

DeVay, 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.

Webster

224. Pathogenic Fungi. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Botany 119. Morphology and taxonomy of plant pathogenic fungi.

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.

Shalla, Shepherd

228. Plant Bacteriology. (5) I.

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 120; Bacteriology 2 or equivalent; Biochemistry 101A, 101B. Study of bacteria which have a saprophytic, symbiotic or parasitic association with higher and lower plants. Clinical and molecular methods for identification and classification of these bacteria.

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.

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.

Grogan

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

I. Nyland; II. Grogan; III. Shepherd

291. Seminar in Host-Parasite Physiology. (1) I, II.

Seminar—1 hour. Prerequisite: course 120. (S/U grading only.)

I. Kado; II. Kosuge

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. Campbell; III. 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. Butler; III. Wells

298. Special Group Study. (1-4) I, II, III.

The Staff (Kosuge in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Kosuge in charge)

PLANT PHYSIOLOGY (A Graduate Group)

Ray C. Huffaker, Ph.D., *Chairperson of the Group*

Group Office, 1045 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 profes-

sional field of Plant Physiology.

The Staff (Huffaker in charge)

299. Research. (1-6) I, II, III.

Prerequisite: graduate standing. (S/U grading only.)

The Staff (Huffaker in charge)

PLANT SCIENCE

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 117.

Related Courses. See *Agronomy, 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.

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.

Flocker, Lider

98. Directed Group Study. (1-5) I, II, III.

Group study of selected topics. Restricted to lower division students. (P/NP grading only.)

The Staff (Chairperson in charge)

NOTE: For key to footnote symbols, see page 220.

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. Loomis, Rains

102. Physiology of Cultivated Plants. (4) III.

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. Sachs, Rappaport

103. Evolution of Crop Plants. (3) I.

Lecture—2 hours; discussion—1 hour (a few sessions will be used for laboratory work on plant materials). Prerequisite: course 1; introductory genetics (e.g., Genetics 100B). Diversity and domestication of economic plants; principles of plant evolution; centers of origin, genetic diversity and germ plasm collections; implications in new agricultural developments. Jain

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. Hartmann

112. Postharvest Physiology and Handling of Horticultural Commodities. (3) I.

Lecture—3 hours. Prerequisite: Botany 111B or consent of instructor; course 112L (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. Morris, 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. Morris, Nelson

113. Plant Breeding. (3) II.

Lecture—3 hours. Prerequisite: Genetics 100B. The principles of plant breeding. Knowles, Hansche

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. Ashton

121A-121B-121C. Applied Crop Physiology. (3-3-3) I-II-III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: basic knowledge of botany, chemistry, and horticulture and consent of instructor; elementary plant physiology advisable, and courses 101, 102 recommended (may be taken concurrently). Introduction to research in applied plant physiology with examples drawn primarily from agronomic and vegetable crops. Field and laboratory projects, data reduction, and preparation of suitable reports. Limited enrollment. (Same course as 221A-221B-221C.)

Agronomy and Vegetable Crops Staff
(Pratt in charge)

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 in plant science and crop production. (P/NP grading only.)

The Staff (Howard in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (_____ 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. Epstein

221A-221B-221C. Crop Physiology. (3-3-3) I-II-III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: basic knowledge of botany, chemistry, and horticulture and consent of instructor; elementary plant physiology advisable, and courses 101, 102 recommended (may be taken concurrently). Introduction to research in applied plant physiology with examples drawn primarily from agronomic and vegetable crops. Field and laboratory projects, data reduction, and preparation of suitable reports. Limited enrollment. (Same course as 121A-121B-121C.)

Agronomy and Vegetable Crops Staff
(Pratt in charge)

POLITICAL SCIENCE

Edmond Costantini, Ph.D., *Chairperson of the Department*

Department Office, 228 Voorhies Hall

Professors:

- Richard W. Gable, Ph.D.
 Alexander J. Groth, Ph.D.
 Charles M. Hardin, Ph.D.
 *⁴Clyde E. Jacobs, Ph.D.
 Lloyd D. Musolf, Ph.D.
 John R. Owens, Ph.D.
 Donald S. Rothchild, Ph.D.
 *⁴Larry L. Wade, Ph.D.
 Marvin Zetterbaum, Ph.D.
 *⁴Paul E. Zinner, Ph.D.

Associate Professors:

- Edmond Costantini, Ph.D.
 Melvin Gurtov, Ph.D.
 Joyce K. Kallgren, Ph.D.
 Robert J. Lieber, Ph.D.
 Larry I. Peterman, Ph.D.
 Dale Rogers Marshall, Ph.D.
 Randolph M. Siverson, Ph.D.
 Alvin D. Sokolow, Ph.D.
 Geoffrey A. Wandesforde-Smith, Ph.D.
 (*Political Science; Environmental Studies*)

Assistant Professor:

- *³Adaljiza S. Riddell, Ph.D.

§ § §

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 42.)

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.

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, 170-171, 191); political parties (courses 160-169); public law (courses 150-159); public administration (courses 180-189).

Group C. Comparative government (courses 140-149, 176-179); 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, 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, 191; 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.

Teacher Credential Subject Representative: J. R. Owens. See page 215 for the Teacher Education Program.

NOTE: For key to footnote symbols, see page 220.

Lower Division Courses

1. American National Government. (4) I.

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) I, 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 required 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.

Siverson, 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.

Siverson, Lieber

4. Basic Concepts in Political Theory. (4) II.

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.

Peterman, 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.

Peterman, Zetterbaum

5. Contemporary Problems of the American Political Systems. (4) II.

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) 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 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

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.

Kallgren

Upper Division Courses

100. Local Government and Politics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Politics and government of local communities in the United States, including cities, counties, and special districts. Emphasizes sources and varieties of community conflict, legislative and executive patterns, expertise, decision making, and the politics of structure. Observation of local governing boards.

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.

Marshall

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.

Marshall

103. Comparative State Government and Politics. (4) I.

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.

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.

Owens

106. The Presidency. (4) III.

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.

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.

Wandesforde-Smith

108. Agricultural Policy and Politics. (4) II.

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.

Hardin

109A. Public Policy and the Governmental Process. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Examination of the processes of formulating public policy. Methods of policy making by executive, legislative, judicial, in-

terest groups, and parties with special emphasis upon socio-psychological approaches.

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.

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.

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.

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.

Peterman

***115. Medieval Political Thought. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 118A. Offered in even-numbered years.

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.

Peterman, Zetterbaum

117. Marxism. (4) III.

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. 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. 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. Zetterbaum

119. Studies in Modern Political Thought. (4) III.

Lecture—4 hours. A study in depth of philosophers considered central to modern political thought especially nineteenth and twentieth century political thought. Emphasis will be upon an individual philosopher or concept rather than upon a survey of modern political thought. Peterman

121. War. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 recommended. An analysis of political processes involved in the initiation, conduct, and termination of modern international warfare. Siverson

***122. International Law. (4) III.**

Lecture—4 hours. Selected topics in international law: territory, sovereign immunity, responsibility, the peaceful settlement or nonsettlement of international disputes. Jacobs

123. Theories of International Politics. (4) I.

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. 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.

***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.

Siverson

126. Arms Control and Disarmament. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 recommended. 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.

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.

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.

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. May be repeated once for credit. The Staff

131. Soviet Foreign Policy. (4) II.

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. Zinner

132. The American Role in East Asia. (4) I.

Lecture—4 hours. Prerequisite: course 3 recommended. Survey of the role the United States has played in East Asia. The influence on Asian westernization of U.S. governmental East Asian policy, missionaries, traders, and returning students.

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.

Rothchild

137. Nationalism and Imperialism. (4) I.

Lecture—4 hours. Prerequisite: course 3 recommended. The theory of nation building illustrated by Western and non-Western experience. Offered in even-numbered years. 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. Rothchild

139. International Relations in Western Europe. (4) II.

Lecture—4 hours. Study of the emerging unity in Western Europe and its implications for the North Atlantic area. Offered in even-numbered years. Lieber

140A. Comparative Politics: Ideology, Institutions and Political Process in the Modern State. (4) II.

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. 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. 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. 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. Groth

143. Latin American Politics. (4) III.

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. Riddell

***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. 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. Zinner

***146. Contemporary African Politics. (4) II.**

Lecture—4 hours. Analysis of party systems, military coups, bureaucracy, regional integration, and disintegration, and economic development in Africa south of the Sahara. Rothchild

147. Politics and Policy in Western Europe. (4) II.

Lecture—4 hours. The evolution, politics, and contemporary problems of selected political systems of Western Europe. Groth

148A. Government and Politics in East Asia. (4) II.

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. 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. Kallgren

149. International Communism. (4) III.

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. Zinner

150. Jurisprudence. (4) III.

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) II.

Lecture—4 hours. Prerequisite: course 5 or 5D or consent of instructor. The constitutional rights and political possibilities of minority groups. Citizenship in the American federal system. Offered in even-numbered years.

152. The Politics of Justice. (4) I.

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. 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. 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. 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) III.

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 structured operations of the party system in the United States; party functions and organizations, nomination processes, campaigns and elections, party trends and reforms. Owens

161. Comparative Political Parties. (4) I.

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. Hardin

162. Elections and Voting Behavior. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 recommended. Analysis of American elections and partisan behavior; political socialization, political participation, partisanship and individual and group determinants of voting. Owens

163. Group Politics. (4) II.

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. 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. 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. 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. Riddell

***167. Black Politics. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division status. A review of the role of black Americans in politics; the rise of black politicians; the civil rights movement; campaign techniques in the urban ghetto. Guest Lecturers and Staff

168. Chicano Politics. (4) III.

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. 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. May be repeated once for credit. The Staff

170. Government and Economy. (4) III.

Lecture—3 hours; discussion—1 hour. The legal and political environment of economic controls; techniques of regulating and assisting various sectors of the economy; policy alternatives and administrative processes; the search for the public interest. Gable

171. Community Power and Change. (4) I.

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. Riddell

***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.

***175. 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.

***176. Race, Ethnicity and Conflict Management. (4) II.**

Seminar—3 hours; term paper. Prerequisite: consent of instructor. Compares relations 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. Rothchild

177. Modern Dictatorships. (4) II.

Lecture—3 hours; discussion—1 hour. Selected political processes and institutions of dictatorships in Germany, Italy, Russia, Spain, Japan, and other states. Topics include executives, legislatures, parties, courts, bureaucracies, communications, and public opinion with comparisons to U.S. processes. Groth

178. Political Development in Modernizing Societies. (4) III.

Lecture—3 hours; discussion—1 hour. 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. Gable

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. May be repeated once for credit. 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. Marshall

181. The American Administrative System. (4) I.

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. Marshall

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. Musolf

***185. Comparative Administration. (4) III.**

Lecture—4 hours. Methodologies, theories, and models of comparison; the setting of administrative systems; structures and functions of administrative systems in developed and developing politics, role of bureaucracy in development and nation-building. Gable

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.

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

***191. Special Studies in Local Government and Politics. (4) III.**

Lecture—3 hours; 1 hour field work. Prerequisite: consent of instructor; enrollment limited to advanced students. Intensive study of one or more topics relating to urban policy and politics, designed for advanced students. Group projects and field work in one or more communities are emphasized.

Sokolow, Marshall, Riddell

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 (Zinner in charge)

194H. Special Study for Honors Students. (1-5) I-II-III.

Directed reading, research, and writing. Prerequisite: selection of candidates by Department. Program of research, culminating in writing of a senior honors thesis, under direction of a faculty adviser. (P/NP grading deferred until completion of a 3-quarter sequence.)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses**202. American State and Local Government. (4) II.**

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.

The Staff

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. Field Research in Urban Politics and Policy. (4) III.

Seminar—2 hours; field research—2 hours. Examination of research design and methodologies appropriate to field research in community-level politics and policy, with an emphasis on elite interviewing and observation. Analysis of illustrative studies. Team participation in design, execution and analysis of a field research project.

Sokolow, Marshall

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.

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.

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.

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

ing the scientific or value-free school, the historicist school, and the contributions of analytic philosophy. Offered in even-numbered years. Zetterbaum

218. Political Theory. (4) I.
Seminar—3 hours. Zetterbaum

223. International Relations. (4) II.
Seminar—3 hours. Lieber

***224. International Organization. (4) I.**
Seminar—3 hours. _____

225. The International System. (4) III.
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. Siverson

230. American Foreign Policy. (4) I.
Seminar—3 hours. _____

***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. 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. 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. 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. _____

***246. Selected Problems of Transitional Societies. (4) I.**
Seminar—3 hours. Rothchild

***247. Western European Government and Politics. (4) II.**

Seminar—4 hours. The evolution, politics, and contemporary problems of selected political systems of Western Europe. Groth

***248. Politics of East Asia. (4) III.**
Seminar—3 hours. Selected contemporary problems of government and international relations in East Asia. Kallgren

260. Political Parties. (4) II.
Seminar—3 hours. Hardin

***261. Political Behavior. (4) III.**
Seminar—3 hours. Owens

***264. Seminar in Public Opinion. (4) III.**
Seminar—3 hours. 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. Rothchild

***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. Gable

286. Administrative Values. (4) I.
Seminar—3 hours. Examination of American administrative values. Offered in odd-numbered years. Musolf

***291. Seminar in American Constitutional Law. (4) III.**
Seminar—3 hours. Prerequisite: course 157B or consent of instructor. 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 (Chairperson in charge)

NOTE: For key to footnote symbols, see page 220.

299. Research. (1-12) I, II, III.
(S/U grading only.)
The Staff (Chairperson in charge)

299D. Directed Reading. (1-6) I, II, III.
(S/U grading only.)
The Staff (Chairperson in charge)

POMOLOGY

Related Undergraduate Major.—See page 117.

Related Courses. See *Plant Science 112, 112L (Postharvest Physiology and Handling of Horticultural Commodities).*

Lower Division Courses

3. Citrus and Other Subtropical Fruits. (3) II.
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. Catlin

10. Fruit Production and Utilization. (3) I.
Lecture—3 hours. Introduction to pomology including: origin and climatic adaptation of deciduous fruits; orchard planning and management; agricultural chemicals; tree nutrition; insect and disease control; fruit development, maturation and harvesting; quality control, storage, transportation and marketing; dietary significance. Martin, Sommer

Upper Division Courses

101. Tree Growth and Development. (4) II.
Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 102 or consent of instructor. Physiology of fruit plant growth and maintenance; species adaptation; responses to environment and cultural modification (pruning, soil and water management, etc.). Crane, Uriu

102. Principles of Fruit Production: Flowering, Fruiting, and Harvesting. (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2 or Plant Science 102 or consent of instructor. Growing and harvesting of edible fruits; the nature and development of buds, flowers, and

fruits, with emphasis on commercial deciduous species. Griggs, Ryugo

198. Directed Group Study. (1-5) I, II, III.
Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Sommer in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.
(P/NP grading only.) The Staff (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.) The Staff (Sommer in charge)

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. The Staff

290. Seminar. (1) I, II, III.
Seminar—1 hour. The Staff (Catlin in charge)

298. Group Study. (1-5) I, II, III.
The Staff (Sommer in charge)

299. Research. (1-9) I, II, III. (Summer).
(S/U grading only.) The Staff (Sommer in charge)

PORTUGUESE—See Spanish

PSYCHIATRY—See Medicine

PSYCHOLOGY

Neal E. A. Kroll, Ph.D., *Chairperson 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.
- Stanley Coopersmith, Ph.D.
- Alan C. Elms, Ph.D.
- Albert A. Harrison, Ph.D.
- Kenneth R. Henry, Ph.D.
- Neal E. A. Kroll, Ph.D.
- Dale F. Lott, Ph.D. (*Wildlife and Fisheries Biology*)
- Gary D. Mitchell, Ph.D.
- Robert M. Murphey, Ph.D.
- Theodore E. Parks, Ph.D.
- Charles T. Tart, Ph.D.
- Edward D. Turner, Ph.D.

Assistant Professors:

- Richard G. Coss, Ph.D.
- Carl C. Jorgensen, Ph.D. (*Psychology and Sociology*)
- Thomas W. Klein, Ph.D.
- Donald H. Owings, Ph.D.
- Karen E. Paige, Ph.D.

§ § §

Departmental Major Advisers.—J. R. Bastian, S. Coopersmith, R. G. Coss, A. C. Elms, A. A. Harrison, K. R. Henry, C. C. Jorgensen, T. W. Klein, N. E. A. Kroll, J. Lyons, W. A. Mason, G. D. Mitchell, R. M. Murphey, T. Natsoulas, D. H. Owings, K. E. Paige, T. E. Parks, R. Sommer, C. T. Tart, E. D. Turner.

The Major Program

All Majors

Lower Division Courses.—Required: Psychology 2A-2B-2C, 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 sociology or cultural anthropology. These may be taken at any time during the four years and may be either lower or upper division courses. Mathematics 15 and Psychology 103 are strongly recommended to students who plan to do graduate work in psychology.

Bachelor of Arts Degree

Lower Division Courses.—Required: 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, 129, 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 Sciences 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 154A, 154B.

Honors and Honors Program (see page 181).—The honors program comprises course 194H, which includes an honors thesis, to be taken normally during the senior year.

Lower Division Courses

2A. Introduction to Psychology: General Processes.

(5) I, II, III.

Lecture—5 hours. An analysis of behavior in terms of its biological determinants. Major topics include evolution, the adaptiveness of behavior, genetics, ontogeny, sensory processes, motivation, emotion.

The Staff

2B. Introduction to Psychology: General Processes.

(5) I, II, III.

Lecture—5 hours. Strongly recommended that 2A and 2B be taken in the appropriate sequence. The experimental psychology of general behavioral and mental processes treated in order of increasing com-

plexity. Major topics include conditioning, perception, human learning and memory, cognitive processes. The Staff

2C. Introduction to Psychology: Personality and Social Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 2B. The normal and abnormal personality. The influence of social factors on the individual. The Staff

10. 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. (P/NP grading only.) The Staff (Chairperson in charge)

99. Special Study for Lower Division Students. (1-5) I, II, III.

By prior arrangement with individual instructor. (P/NP grading only.) The Staff (Chairperson in charge)

Upper Division Courses

103. Advanced Quantitative Description of Behavior. (5) I, II, III.

Lecture—5 hours. Prerequisite: Mathematics 13 or consent of instructor. Summary, inference, and prediction from psychological data, with emphasis on the theoretical aspects. Kroll, Turner

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. Klein

108. Physiological Psychology. (5) I, II, III.

Lecture—5 hours. Prerequisite: course 2A; at least one zoology or physiology course or consent of instructor. Influences of neuroanatomy and physiology on emotion, motivation, states of consciousness, language, learning, and memory in man and other animals. Henry

112. Developmental Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 2B. An ontogenetic account of human behavior through adolescence with emphasis on motor skills, mental abilities, motivation, and social interaction. Coopersmith, Coss, Mitchell

120. History of Psychology. (4) I, III.

Lecture—3 hours; term paper. Prerequisite: course 2A-2B-2C; upper division standing; and either Philosophy 20A, 20B, or 20C, or consent of instructor. The historical development of psychological thought and research. Bastian, Murphy

129. Sensory Processes. (5) II.

Lecture—5 hours. Prerequisite: course 2A or Zoology 2 or consent of instructor. Psychobiology of sensory systems in man and other animals. The relationship of behavior to the physiology, structure and function of the senses. Henry, Owings

130. Human Learning and Memory. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 2B and Mathematics 13; or consent of instructor. Consideration of major theories of human learning and memory with critical examination of relevant experimental data. Kroll, Parks

131. Perception. (4) I, II, III.

Lecture—3 hours; independent library work. Prerequisite: course 2B. The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events. Natsoulas, Turner

132A. Language and Cognition. (3) I.

Lecture—3 hours. Prerequisite: course 2B 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. 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. Bastian

134. Animal Learning and Motivation. (5) III.

Lecture—5 hours. Prerequisite: courses 2A, 2B, and Mathematics 13, or consent of instructor. Examination of several theories of animal conditioning and their consequences for current motivational microtheories. Coss

135. Psychology of Consciousness. (4) I, III.

Lecture—3 hours; term paper. Prerequisite: course 2B. Consideration of major theories of consciousness, with critical examination of relevant experimental, clinical, and field data. Natsoulas

137. Altered States of Consciousness. (4) II, III.

Lecture—4 hours. Prerequisite: course 2B 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. Tart

145. Social Psychology. (5) I, II, III.

Lecture—4 hours; term paper. Prerequisite: course 2B. Behavior of the individual in the group. Examination of basic psychological processes in so-

cial situations, surveying various problems of social interaction: group tensions, norm-development, attitudes, values, public opinion, status.

Harrison, Elms, Turner

147. Personality Theory. (5) I, II, III.

Lecture—4 hours; independent library work. Prerequisite: course 2B and 6 units upper division work in psychology. A systematic consideration of contemporary theories of personality. Elms, 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. 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. Paige

150. Comparative Psychology. (5) I, II, III.

Lecture—4 hours; term paper. Prerequisite: course 2A 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. Mason, 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, measurement and research. Klein

***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. Jorgensen, Turner

165. Introduction to Clinical Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: courses 2C, 168, and either 112 or 145. Major theoretical formulations in the history of clinical psychology, from classical

psychoanalysis to contemporary existentialism and behavior modification. Survey based on lectures, films, and tapes, of what clinical psychologists do, including methods of appraisal, professional roles, and approaches to treatment. Lyons

168. Abnormal Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 2B. Descriptive and functional account of behavioral disorders, with primary considerations given to neurotic and psychotic behavior. Murphey, Sommer

170. Environmental Awareness. (4) II.

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.) Sommer, Cross

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. 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. A. General Methodology; B. Physiological; C. Developmental; D. Sensory Processes; E. Learning; F. Perception; G. Psycholinguistics; H. Motivation; I. Social; J. Personality; K. Comparative. May be repeated for credit when different subject area studied. The Staff

181A-181B. Field Work in Psychology.

(3-3) I, II, III.

Laboratory—4 hours; term paper. Prerequisite: upper division standing in psychology; consent of instructor. Supervised internship in approved community agency. Credit not applicable toward 36 units of upper division psychology required of majors. (P/NP grading only.) Harrison

190. Seminar in Psychology (4) I, II, III.

Seminar—4 hours. Prerequisite: Junior or senior standing; major in psychology or consent of instructor. Intensive treatment of a special topic or problem of psychological interest. May be repeated for credit in different subject area. The Staff

194H. Special Study for Honors Students. (1-5) I, II, III.

Prerequisite: 20 units in psychology and honors status; consent of Department Chairperson. Inde-

pendent investigation of an empirical problem. Course required for highest honors in Psychology. (P/NP grading only.) 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. 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. (P/NP grading only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

By prior arrangement with individual instructor. (P/NP grading only.) The Staff (Chairperson 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. Klein, Kroll

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. Turner, 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. 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.

***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. Parks, 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. Natsoulas

245. Social Psychology. (4) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in social psychology. Harrison

***247. Personality. (4) III.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in human personality. 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. 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. Klein, 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. Bastian

***272. Experimental Study of Personality. (4) II.**

Seminar—4 hours. 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. Sommer

275. Attitude Formation and Change. (4) I.

Seminar—4 hours. Prerequisite: graduate stand-

ing in psychology or consent of instructor. Development of attitudes; theories of attitude change; relationships between attitudes and behavior. Elms

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

299D. Dissertation Research. (1-9) I, II, III.

Prerequisite: consent of instructor. (S/U grading only.) The Staff

Professional Course

390A-390B-390C. The Teaching of Psychology.

(4-2-4) I-II-III.

Seminar—4-2-4. Prerequisite: graduate standing in psychology and consent of instructor. Practical experience in teaching. 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. (Deferred grading only, pending completion of sequence.) The Staff

RADIOLOGICAL SCIENCES

Joe P. Morgan, D.V.M., Vet. med. dr., *Chairperson of the Department*

Department Office, Temporary Building-173, Room 100

Professors:

Gerald L. DeNardo, M.D. (*School of Medicine*)

Marvin Goldman, Ph.D. (*Radiobiology Laboratory*)

Joe P. Morgan, D.V.M., Vet. med. dr.

Philip E. S. Palmer, M.D. (*School of Medicine*)

Peter F. Suter, Dr. med. vet.

Associate Professor:

Timothy R. O'Brien, D.V.M., Ph.D.

Lecturers:

Steven Book, Ph.D. (*Radiobiology Laboratory*)

Sam Silverman, D.V.M.

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Upper Division Courses

180. Bioenvironmental Consequences of Nuclear Technology. (3) III.

Lecture—1½ hours; discussion—½ hour; term paper; field trip to Nuclear Power Station. Prerequisite: Physics 2A or Biological Sciences 1 or their equivalents; consent of instructor. Discussion of biospheric implications of radionuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on the predications of the response of the most sensitive physiological systems will be emphasized. (Same course as Environmental Studies 180.) Goldman

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

Radiology staff

Graduate Courses

210. Radiography Technic. (6) I (Extra Session)

Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: DVM degree. Duties of the radiologic technician are discussed enabling the student to become proficient in the operation of x-ray machines. Position, protocol for diagnostic procedures, film quality and preparation of technic charts are covered. Course begins in late summer. (Deferred S/U grading only, pending completion of course in Fall quarter.)

Morgan and staff

211. Radiology of the Skeletal System, I. (6) I.

Lecture—3 hours; discussion—2 hours; laboratory—2 hours. Prerequisite: DVM degree. The course presents information on radiographic diagnosis of pathologic conditions of the appendicular skeleton. Included are diseases of joints, fracture diagnosis and fracture healing, epiphyseal injury, congenital anomalies, developmental disease, bone infection, and malignant disease. Offered in even-numbered years. (S/U grading only.)

Morgan and staff

212. Radiology of the Abdomen, I. (6) II.

Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: DVM degree. This course presents information on radiographic diagnosis of pathologic conditions of the abdomen. Included are diseases of the stomach and intestines. The theory and interpretation of upper and lower GI

procedures, cholecystography, splenoportography and abdominal angiography will be discussed. Offered in odd-numbered years. (S/U grading only.)

Morgan and staff

213. Radiology of the Thorax, I. (6) III.

Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: DVM degree. This course presents information on the normal radiographic anatomy and radiographic diagnosis of pathologic conditions of the lungs, diaphragm, and pleura. The theory and interpretation of pleurography and bronchography will be covered. Offered in odd-numbered years. (S/U grading only.)

Morgan and staff

214. Radiology of the Skeletal System, II. (6) I.

Lecture—3 hours; discussion—2 hours; laboratory—2 hours. Prerequisite: DVM degree. Information on the radiographic diagnosis of pathologic conditions of the axial skeleton including degenerative diseases of the intervertebral disc, trauma, infection, and neoplasia is discussed. Theory and interpretation of myelography and cerebral angiography is covered. Offered in odd numbered years. (S/U grading only.)

Morgan and staff

215. Radiology of the Abdomen, II. (6) II.

Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: DVM degree. This course presents information on radiographic diagnosis of pathologic conditions of the abdomen. Included are diseases of kidneys, ureters, urinary

bladder, urethra, uterus, and prostate. The theory and interpretation of intravenous pyelography, retrograde cystography and urethrography will be discussed. Offered in even-numbered years. (S/U grading only.)

Morgan and staff

216. Radiology of the Thorax, II. (6) III.

Lecture—3 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: DVM degree. This course presents information on radiographic diagnosis of congenital and acquired heart diseases and mediastinal diseases. The theory and techniques of cardiac catheterization, lymphangiography, and esophageal studies will be covered. Offered in even-numbered years. (S/U grading only.)

Morgan and staff

269A-269B. Fundamentals of Radiation Biology.

(2-2) I-II.

Lecture—2 hours. Prerequisite: introductory courses in: physics, biochemistry and physiology or consent of instructor. Biological effects of radiation including genetic, teratogenic, carcinogenic responses in terms of dose quality and quantity. Included are discussions of dose-effect relationships, radiation therapy, environmental radioactivity, and radiation-protection criteria.

Goldman

298. Group Study. (1-5) I, II, III.

(S/U grading only.)

Radiology staff

299. Research. (1-9) I, II, III.

(S/U grading only.)

Radiology staff

RADIOLOGY—See Medicine

RANGE MANAGEMENT

Major Advisers.—See *Class Schedule* listing under Range Science.

Major Program and Graduate Study.—See pages 118 and 210.

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)*, *120 (Soil Genesis and Morphology)*, *121 (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 Courses

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.

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Upper Division Courses

100. Range Plants. (4) I.

Lecture—2 hours; laboratory—6 hours; two Saturday field trips. Prerequisite: Botany 2. Systematic relationships and identification of range grasses; legumes, forbs, and shrubs; their distribution, environmental requirements, and use.

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 production and utilization, carrying capacity, and changes in the plant community. Range inventory analysis and planning range use. Offered in odd-numbered years. Jones

Graduate Courses

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. Love

133. Grassland Ecology. (3) II.

Lecture—3 hours; one Saturday field trip. 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 and management including vegetation improvement, utilization by animals, and recreation and aesthetic values. Offered in even-numbered years. Raguse

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Love in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: senior standing and consent of instructor. (P/NP grading only.) The Staff (Love in charge)

208. Computer Modeling in Range Management. (3) I.

Lecture—1 hour; discussion—1 hour; computer programming and analysis—1 hour. Prerequisite: Agronomy 205B or the equivalent experience. Workshop on use of computer models involving dynamic simulation (DYNAMO and CSMP) and optimization (linear programming) modes using industrial management techniques on range management problems. Modeling philosophy: assumptions, implementation, validation, and experimentation will be emphasized. Offered in odd-numbered years. Williams

290. Seminar in Range Management. (1-2) II, III.

Seminar—1-2 hours. Topics of current interest in grassland ecology, range and wildlands management, and related modelling and systems analysis. The Staff

298. Group Study. (1-5) I, II, III.

Selected topics from current world literature in range science. The Staff (Love in charge)

299. Research. (1-12) I, II, III.

Original research involving plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of range and wildlands. (S/U grading only.) The Staff (Knowles in charge)

RELIGIOUS STUDIES

Program Office, 4208 Storer Hall

Committee in Charge

Paul A. Castelfranco, Ph.D. (*Botany*); *Committee Chairperson*

Glen W. Erickson, Ph.D. (*Physics*)

R. David Freedman, M. Phil. (*Religious Studies*)

David A. Robertson, Ph.D. (*English*)

David S. Wilson, Ph.D. (*American Studies*)

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Major Adviser.—P. A. Castelfranco.

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

NOTE: For key to footnote symbols, see page 220.

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 religions); Dramatic Art 156 (European Theater and Drama: Greek to Renaissance); English 171 (English Bible as literature); Greek 101 (Plato); History 131B (early modern European history, 1500 to 1650); Italian 139A (Italian literature in English; early Italian literature and Dante Alighieri); Philosophy 105, 161, 162, 178 (philosophy of religion, Plato, Aristotle, Kierkegaard); Rhetoric 111 (Medieval and Renaissance Rhetorical Theory); Russian 140, 141 (Dostoevsky, Tolstoy); Sociology 146 (Sociology of Religion).

Lower Division Courses

4A. World Religions. (4) I.

Lecture—3 hours; discussion—1 hour. The major world religions, particularly Judaism, Hinduism, Buddhism, Christianity and Islam, with emphasis on their beginnings. Selected readings from canonical and early devotional literature. Students who have completed course 20 may take this course for 2 units of credit. The Staff

4B. World Religions. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4A or 20. Continuation of course 4A emphasizing the development of major world religions. The course will focus upon recurring problems of religious life and thought, the interaction between religion and social structure and between religion and the arts. The Staff

20. Introduction to Religious Studies. (2) I, II, III.

Lecture—2 hours. Reading and discussion of basic texts from at least two major religious traditions. The Staff

22. Jewish Civilization I: The Old Testament. (4) I.

Lecture—3 hours; term paper. A survey of the Old Testament and the religious and social ideas and institutions of ancient Israel. Frequent references will be made to the ancient Near East and developments in later Judaism. Freedman

23. Jewish Civilization II: Rabbinic Judaism. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 22. Rabbinic Judaism from its Pharisaic origins at the beginning of the Christian Era through its classical expressions in the Middle Ages. The contribution of various types of Rabbinic thought (mystical, philosophical, legal) to the development of Jewish civilization. Freedman

24. Jewish Civilization III: Modern Judaism. (4) III.

Lecture—3 hours; term paper. Prerequisite: courses 22, 23. The confrontation of the millenia-old Jewish civilization with emancipation, enlightenment, modernity, modern anti-Semitism, and ecumenism: development of traditional and non-traditional responses. Freedman

30A-30B-30C. Elementary Hebrew. (6-6-6) I-II-III.

Lecture—5 hours; discussion—1 hour. Introduction to modern written and spoken Hebrew. Course 30A not open for credit to students who have completed the first two years of high school Hebrew. The Staff

*32A. Intermediate Modern Hebrew. (4) I.

Lecture—1 hour; discussion—3 hours. Prerequisite: course 32A; course 24 recommended. Review of grammatical principles by means of written exercises; readings of modern texts. Freedman

*32B. Intermediate Modern Hebrew. (4) II.

Lecture—1 hour; discussion—3 hours. Prerequisite: course 32A; course 24 recommended. Continuation of course 32A. The readings will reflect Hebrew literature from the Enlightenment to the present. Authors represented will include: Bialik, Tschernikhovski, Ahad Ha'am, and Agnon. Freedman

35A-35B. Introduction to Biblical Hebrew. (4) I, II.

Lecture—2 hours; discussion—2 hours. The grammar and syntax of Biblical Hebrew; the goal is to achieve the ability to read Biblical prose. Freedman

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.) The Staff (Chairperson in charge)

99. Special Study for Lower-Division Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

Upper Division Courses

102. Christian Origins. (3) II.

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. The Staff

110. Religious Biographies. (3) III.

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. Sano

*140. Christian Theology. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 102; English 171 and Philosophy 15 recommended. Christian dogmas, their scriptural basis and their implication for the life of the church and of the individual believer. Readings from major Christian theologians. Sano, Castelfranco

150. Topics in Judaean-Christian Ethics. (4) I.

Lecture—4 hours. An examination of contemporary ethical issues from the standpoint of the Bible and the teachings of major Jewish and Christian communions.

Bianchi

168. The Religions of India. (3) I.

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.

Epstein

170. Chinese and Japanese Buddhism. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 168 recommended. Lectures and readings on the 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.

Epstein

172. Ch'an (Zen) Buddhism. (3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 170 recommended. Doctrines and methods of the Patriarchs and great masters, both

ancient and modern, in the framework of the orthodox Buddhist tradition. Emphasis on doctrinal basis of meditational techniques.

The Staff

190. Senior Colloquium. (2) I.

Seminar — 2 hours. Prerequisite: open only to seniors in Religious Studies. Discussion of central issues of religion.

Murphy

193. 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. (P/NP grading only.)

The Staff (Committee Chairperson in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

REPRODUCTION

John W. Kendrick, D.V.M., Ph.D., *Chairperson of the Department*

Department Office, 2301 Haring Hall

Professors:

Andrew G. Hendrickx, Ph.D. (*in Residence*)

John P. Hughes, D.V.M.

John W. Kendrick, D.V.M., Ph.D.

¹George H. Stabenfeldt, D.V.M., Ph.D.

Clyde Stormont, Jr., Ph.D.

heritable differences in red cell antigens, serum proteins and enzymes of domestic animals. Stormont

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Kendrick in charge)

Associate Professor:

¹Maarten Drost, D.V.M.

Lecturers:

Donald L. Bath, Ph.D.

D.P. Neely, V.M.D.

Victor M. Shille, D.V.M.

Ann T. Smith, 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

Graduate Courses

209. Equine Theriogenology. (2) II.

Lecture—1 hour; laboratory—2 hours. 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. Hughes

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

NOTE: For key to footnote symbols, see page 220.

factors, anatomical and hereditary defects, intersexuality and behavior. Stabenfeldt

232. Teratologic Aspects of Development. (2) II.

Lecture—2 hours. Prerequisite: courses in embryology, histology, and anatomy, or consent of instructor. Embryological and pharmacological 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. Hendrick

233. Large Animal Obstetrics and Diagnostic Gynecology. (1) III.

Laboratory—3 hours. Prerequisite: Veterinary Medicine 145 or consent of instructor. Diagnostic and manipulative techniques used for examination and treatment of pregnant and parturient animals. Drost, Kendrick

234. Applied Dairy Cattle Nutrition. (2) III.

Lecture—1 hour; laboratory—2 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Application of basic nutritional principles to practical dairy cattle feeding and use of computers to formulate rations based on optimum nutritional and economic value. Lectures supplemented with visits to dairy farms to evaluate feeding programs. Bath

*290. Seminar. (1) I, II, III.

(S/U grading only.) The Staff (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. (S/U grading only.) The Staff (Stabenfeldt in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Kendrick in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff

Professional Course

424. Theriogenology of Farm Animals.

(1½ per week) I, II, III.

Seminar-laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, graduate students, 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 required. May be repeated for credit. (S/U grading only.)

The Staff (Kendrick and Hughes in charge)

RESOURCE SCIENCES

Related Undergraduate Major.—See page 119.

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 (*Introduction to Urban and Economic Geography*), 161 (*Conservation of Resources and Environment*); *Range Management 1 (Introduction to Range Management)*, 105 (*Field Course: Soil Science 2 (Introduction to Soil Science)*), 10 (*Land and Life*), 105 (*Field Studies*); *Wildlife and Fisheries Biology 10 (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. Delwiche

10. Natural Resources of California. (2) I, III.

Lecture—2 hours. Study of the natural resources of

California; topographical influences on climate and resource characteristics; resource interrelationships; the social and economic implications of resource utilization for agriculture, recreation, and urban development. Walker

12. Aerial Study of Natural Resources of California. (2) III.

Discussion—2 hours; one Saturday flight. Prerequisite: course 10 (may be taken concurrently) or consent of instructor. Group study of natural resources of California and the adjacent states with emphasis directed to resource character and utilization potential. Mid-quarter study of topics via a "flying classroom" enhances a unique learning experience. (Flight fee approximately \$50.) Walker

99. Special Study for Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Whittig in charge)

Upper Division Courses

100. Concepts in Renewable Natural Resources. (3) II.

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. Walker, Snyder

100L. Discussion of Resource Concepts. (1) II.

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.) Snyder, Walker

101. Agriculture and Wildlife. (3) II.

Lecture—3 hours; two Saturday field trips. 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. Crampton

***108. Mineral Elements in Food Chains. (2) I.**

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. 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. Crampton

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.) The Staff (Whittig in charge)

RHETORIC

James J. Murphy, Ph.D., *Chairperson of the Department*

Department Office, 207 North Hall

Professors:

Gerald P. Mohrmann, Ph.D.

James J. Murphy, Ph.D.

Associate Professor:

Ralph S. Pomeroy, Ph.D.

Assistant Professors:

Stan C. Johnson, M.A. (*Acting*)

Stuart J. Kaplan, Ph.D.

Michael C. Leff, Ph.D.

F. Eugene Scott, Ph.D.

Lecturer:

John L. Vohs, M.A.

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Departmental Advisers.—S. J. Kaplan, G. P. Mohrmann, J. J. Murphy, R. S. Pomeroy, F. E. Scott, J. L. Vohs.

The Major Program

Lower Division Courses.—Required are courses 1 and 3.

Upper Division Courses.—Thirty-six units in rhetoric, including: (1) courses 110, 120, 153; (2) at least one additional course each from both the 110 and 120 series, and one course from courses 114, 130, and 141; (3) courses 190 and 191.

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 100, 110, 120, or 150).

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.

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) 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. Study of the rhetorical process in informal situations. Topics include interaction,

NOTE: For key to footnote symbols, see page 220.

leadership techniques, and decision making in groups. Regular participation in discussions. (P/NP grading only.)
The Staff

10. Introduction to Communication Studies.

(3) II, III.

Lecture—3 hours. Introduction to the nature and function of human communication, special reference to messages, sending, receiving, and channels.

Mohrman

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.

Pomeroy

51. 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.

Leff

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)
The Staff (Chairperson in charge)

Upper Division Courses

100. Analysis of Message Systems. (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.

Vohs

*105. Rhetorical Functions of Language. (4) III.

Lecture—4 hours. The role of language in shaping attitudes and perceptions of self and others. The use and abuse of verbal symbols in communicative situations. Concepts of meaning in discourse.

110. Classical Rhetorical Theory. (4) I, III.

Lecture—4 hours. Origins of Greek and Roman rhetorical theory, with emphasis upon the contributions of Isocrates, Plato, Aristotle, Cicero, and Quintilian.

Murphy

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.

Murphy

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.

Pomeroy

113. Current Humanistic Trends in Rhetorical Theory. (4) III.

Lecture—4 hours. Contemporary developments in traditional rhetorical concepts such as style, meaning, theory of argument, and persuasion.

Kaplan

114. Social Science Perspectives in Rhetorical Theory. (4) III.

Lecture—3 hours; discussion—1 hour. Rhetoric as a social science, characteristics of social theories, components of theories, development and testing of hypothesis, general models (balance, dissonance, congruity), resistance to persuasion.

Kaplan

120. Rhetorical Criticism. (4) I.

Lecture—4 hours. Survey of critical methods and their use in the interpretation of rhetorical discourse.

121. Public Address in Western Culture. (4) II.

Lecture—3 hours; discussion—1 hour. Notable and representative speeches from antiquity to the present. Speeches are examined both as dynamic and significant events in their historical contexts, and as noted instances of rhetorical art.

Scott

122. Rhetoric in Social Controversy. (4) III.

Lecture—3 hours; discussion—1 hour. Case studies of rhetoric in social, political, and economic protest embodied in selected social movements. Examination of rhetorical dilemmas of social movements; rhetorical strategies and tactics, including extra-discursive means of persuasion, and the nature and effects of establishment response.

Scott

123. 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.

130. 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.

Vohs

140. 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 ad-

vances, including cable television and communication satellites. Kaplan

141. 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. Kaplan

151. Methods of Advocacy. (4) I.

Lecture—4 hours. Prerequisite: course 51 recommended. Study and practice of methods involved in the effective advocacy of positions on current controversial issues. Relation of inquiry and explanation to advocacy. Consideration of logical and nonlogical means of persuasion. 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. 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.

180. Current Topics in Rhetoric. (4) II, III.

Seminar—4 hours. Prerequisite: upper division standing with a major in Rhetoric or consent of instructor. Group study of a special topic in Rhetoric. May be repeated once for credit. Enrollment limited. The Staff

190. Rhetorical Research. (2) I, II.

Lecture—2 hours; laboratory—1 hour; term paper. Prerequisite: junior standing and declared major in Rhetoric, or consent of instructor. Required for majors in Rhetoric. Methods of reporting research into various aspects of human communication. Weekly assignments in organization and writing of research reports. Murphy

191. Senior Proseminar. (4) II, III.

Lecture—3 hours; seminar—1 hour. Prerequisite: course 190. Individual research on a rhetorical topic approved by a faculty committee. The Staff

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.)

197T. Tutoring in Rhetoric. (2-4) I, II, III.

Seminar—1-2 hours; laboratory—1-2 hours. Pre-

requisite: upper division standing with major in rhetoric and consent of Department Chairperson. 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. (P/NP grading only.) The Staff (Chairperson in charge)

198. Directed Group Study. (1-4) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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.

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. 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. Scott

250. Rhetoric of Non-Oratorical Works. (3) III.

Lecture—3 hours. Prerequisite: course 100 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. Pomeroy

298. Group Study. (1-5) I, II, III.

Lecture—3 hours.

The Staff (Chairperson in charge)

299. Individual Study. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

NOTE: For key to footnote symbols, see page 220.

RUSSIAN

Department Office, 416 Sproul Hall

Professor:

Valerie A. Tumins, Ph.D.

Assistant Professors:

Andrew G. Comings, Ph.D.
 C. J. Gallant, Ph.D. (*Acting*)
 George Genereux, Ph.D.

Lecturers:

Lawrence J. Grant, M.A.
 Vadim P. Kreidenkov, M.A.

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Departmental Major Adviser.—A. G. Comings.*Graduate Adviser.*—V. A. Tumins.*The Major Program*

Lower Division Courses.—Required: Russian 1 through 6 (or the equivalent); Russian 40, 41, 42.

Language and Literature emphasis

Upper Division Courses.—Required: a minimum of 36 units of upper division course work including Russian 101A, 101B, 101C, 102, 103, 125, and 127.

Translator and Pre-Interpreter emphasis

Upper Division Courses.—Required: a minimum of 36 units of course work including Russian 101A, 101B, 101C, 102, 103, 104, 105, and 160.

Honors and Honors Program (see page 181).—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 Credential Subject Representative: G. Genereux. See page 215 for the Teacher Education Program.

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. Reading, speaking, and composition; all students may study at their own speed and may contract for a grade. Only 4 units of credit will be allowed to stu-

dents who have received credit for course 22 or 23. Not open for credit to students who have completed the first two years of high school Russian.

Grant and staff

2. Elementary Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 1. Reading, speaking and composition; all students may study at their own speed and may contract for a grade.

Grant and staff

3. Elementary Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 2. Reading, speaking and composition; all students may study at their own speed and may contract for a grade.

Grant and staff

4. Intermediate Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 1. Grammar review. Science students read texts in their specialization. Others read literature and increase conversational practice. Students may study at their own speed and may contract for a grade upon consent of instructor.

Grant and staff

5. Intermediate Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 4. Grammar review. Science students read texts in their specialization. Others read literature and increase conversational practice. Students may study at their own speed and may contract for a grade upon consent of instructor.

Grant and staff

6. Intermediate Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 5. Grammar review. Science students read texts in their specialization. Others read literature and increase conversational practice. Students may study at their own speed and may contract for a grade upon consent of instructor.

Grant and staff

10. Elementary Conversation. (2) I, II, III.

Discussion—2 hours. Prerequisite: course 1; course 2 or 3 to be taken concurrently. Conversational practice to improve pronunciation and master spoken idioms. May be repeated for credit up to a maximum of 6 units.

The Staff

21. Elementary Scientific Russian. (6) I, II, III.

Reading and translation—5 hours; language laboratory—1 hour. Reading and translating from Russian to English; all students may study at their own speed and may contract for a grade.

Grant and staff

22. Elementary Scientific Russian. (6) I, II, III.

Reading and translation—5 hours; language laboratory—1 hour. Prerequisite: course 21. Reading and translating from Russian to English; all students may study at their own speed and may contract for a grade.

Grant and staff

23. Elementary Scientific Russian. (6) I, II, III.

Reading and translation—5 hours; language laboratory—1 hour. Prerequisite: course 22. Reading and translating from Russian to English; all students may study at their own speed and may contract for a grade. Grant and staff

30. Great Russian Writers (In English). (3) I.

Lecture—3 hours. 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. Comings

40. Survey of Russian Literature to 1800 (in English). (4) II.

Lecture—3 hours. Introduction to the philosophical, historical, and stylistic elements of Russian literature from the earliest period up to Sentimentalism with a discussion of major writings and major literary figures. Offered in odd-numbered years. Tumins

41. Survey of Nineteenth-Century Russian Literature (In English). (4) I.

Lecture—3 hours. Introduction to dominant literary trends, 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. Comings

42. Survey of Twentieth-Century Russian Literature (In English). (4) III.

Lecture—3 hours. 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. Genereux

99. Special Study for Undergraduates. (1-5) I, II, III. (P/NP grading only.)

The Staff (Tumins in charge)

Upper Division Courses**101A. Advanced Conversation and Reading. (4) I.**

Lecture—1 hour; discussion—2 hours; individual reading with instructor—1 hour. Prerequisite: course 6. Conversational practice based partly on reading materials (newspapers and literature). Student develops passive vocabulary by reading and active vocabulary by conversing. Grant

101B. Advanced Conversation and Reading. (4) II.

Lecture—1 hour; discussion—2 hours; individual recitation with instructor—1 hour. Prerequisite: course 6. Conversational practice based partly on reading materials (newspapers and literature). Student develops passive vocabulary by reading and active vocabulary by conversing. Grant

101C. Advanced Conversation and Reading. (4) III.

Lecture—1 hour; discussion—2 hours; individual recitation with instructor—1 hour. Prerequisite: course 6. Conversational practice based partly on reading materials (newspapers and literature). Student develops passive vocabulary by reading and active vocabulary by conversing. Grant

102. Russian Composition. (4) I.

Recitation—3 hours. Prerequisite: course 101C. Tumins

103. Literary Translation. (4) III.

Discussion—3 hours. Prerequisite: course 101C. Translation of Russian literary texts into stylistically equivalent idiomatic English. Genereux

104. Scientific Translation. (4) I.

Discussion—3 hours; individual consultation—1 hour. Prerequisite: course 6 or consent of instructor. Translation of Russian scientific texts. Each student will read materials selected from his field of interest. Comings

105. Advanced Russian Conversation. (4) II.

Conversation—3 hours; preparation of texts—1 hour. Prerequisite: course 6. Intensive conversational practice and discussion based on current events and contemporary texts. Tumins

106. Russian Public Speaking. (4) III.

Discussion—3 hours; individual consultation—1 hour. Prerequisite: course 105. Introduction to Russian public speaking. Students present formal reports, summarize speeches, learn rules of parliamentary procedure.

121. The Nineteenth-Century Russian Novel (in English). (4) II.

Lecture—3 hours; discussion—1 hour. 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). Genereux

123. The Twentieth-Century Russian Novel (in English). (4) II.

Lecture—3 hours. Examination of various trends including Critical Realism, Symbolism, Neorealism, and Socialist Realism in development of the novel. Readings from such writers as Gorky, Zamiatin, Sholokhov, and Pasternak. Genereux

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.
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. Tumins

126. The Russian Theater (In English). (4) I.

Lecture—3 hours; discussion—1 hour. The main works of Russian dramatists from Gogol to the present, including Turgenev, Tolstoy, Chekhov, Gorky, Mayakovsky, Bulgakov, Shvarts. Offered in even-numbered years. Genereux

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. Comings

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, Maiakovsky, Pasternak, and Evtushenko. Offered in odd-numbered years. Comings

140. Dostoevsky (In English). (4) I.

Lecture—3 hours. 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. Tumins

141. Tolstoy (In English). (4) I.

Lecture—3 hours. 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. Comings

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. 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.
Gallant

160. Russian Pronunciation. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 1. Intensive instruction and drill in the pronunciation of Russian. Students will make individual tapes weekly to be evaluated in detail by instructor. Lectures will deal also with the scientific description and analysis of the Russian sound system in terms of both phonetics and phonemics. Gallant

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 (Chairperson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

200. Old Church Slavic. (4) I.

Lecture—3 hours; reading projects. A synchronic and diachronic analysis of Old Church Slavic.
Gallant

202. Descriptive Russian Grammar. (4) II.

Lecture—3 hours. Introduction to modern Russian phonology and morphology.
Gallant

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.
Gallant

210. Style and Syntax. (4) I.

Discussion—3 hours; reading projects. Examination of stylistic differences between spoken and written Russian.

***220. Old Russian Literature. (4) III.**

Seminar—3 hours. 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. Tumins

221. Eighteenth-Century Russian Literature. (4) II.

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. Tumins

222. Nineteenth-Century Russian Literature. (4) II.

Seminar—3 hours. Advanced study of the works of one or several writers or movements of the period. May be repeated for credit with consent of instructor when different topics are studied.

Tumins, Comings, Genereux

223. Early Twentieth-Century Russian Literature. (4) I.

Seminar—3 hours. Advanced study of one or more of the modernist movements in Russian literature, including Symbolism, Acmeism, and Futurism. May be repeated for credit when different topics are studied. Comings

***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. Genereux

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.)

The Staff (Chairperson in charge)

Professional Course

300. The Teaching of Russian. (3) I, II, III.

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 HISTORY

Program Office, 404 Sproul Hall

Committee in Charge:

Valerie A. Tumins, Ph.D. (*Russian*); *Committee Chairperson*

George Genereux, Ph.D. (*Russian*)

W. Georg Isaak, M.A. (*English*)

Don C. Price, Ph.D. (*History*)

§ § §

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 Nineteenth-Century Russian Literature to 1800), 41 (Survey of Russian Literature), 42 (Survey of Twentieth-Century Russian Literature).

b) A minimum of 12 units from the following courses: Russian 101A-101B-101C (Advanced Conversation and Reading), 102 (Russian Composition), 103 (Russian Literary Translation).

c) A minimum of 8 units from the following courses: Russian 121 (The Nineteenth-Century Russian Novel), 123 (The Twentieth-Century Russian Novel), 125 (Russian Drama to 1917), 127 (The Golden Age of Russian Poetry), 128 (Modern Russian Poets), 140 (Dostoevsky), 141 (Tolstoy).

SOCIOLOGY

Leon H. Mayhew, Ph.D., *Chairperson of the Department*

Department Office, 135 Young Hall

Professors:

Travis Hirschi, Ph.D.

Edwin M. Lemert, Ph.D.

John Lofland, Ph.D.

Leon H. Mayhew, Ph.D.

*Julius Roth, Ph.D.

NOTE: For key to footnote symbols, see page 220.

Associate Professors:

Bruce Hackett, Ph.D.
James McEvoy, Ph.D.
Thomas W. Pullum, Ph.D.
John F. Scott, Ph.D.

Assistant Professors:

James C. Cramer, Ph.D.
Ruth Dixon, Ph.D.
Gary G. Hamilton, M.A. (*Acting*)
Carl C. Jorgensen, Ph.D. (*Sociology and Psychology*)
Lyn Lofland, Ph.D.
Lenore Weitzman, Ph.D.
§ § §

Departmental Major Advisers.—(a) Undergraduate: The Staff (b) Graduate: The Staff.

The American History and Institutions Requirement may be satisfied by any one of the following courses: 30A, 30B, 30C. (See also page 42.)

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 2A-2B-2C. 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 109, 151, 156; Political Science 150, 161; Psychology 145; Mathematics 105A, 105B.

Pre-Social Welfare emphasis

A list of required and recommended courses for the Pre-Social Welfare emphasis is available on request from the Department of Sociology Office. Contact departmental adviser for further information.

Graduate Study.—The Department offers programs 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 Credential Subject Representative: J. Roth. See page 215 for the Teacher Education Program.

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) III.

Lecture—3 hours; discussion—1 hour. General sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement. The Staff

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

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

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, Davis. Hackett

30A-30B-30C. The Negro Experience in American Society. (4-4-4) I-II-III.

Lecture—4 hours. A historical consideration of the 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. Examination of the methodological problems of social research. Selection and definition of problems of investigation, data-gathering techniques, and sampling. The Staff

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. The Staff

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily intended for lower division students. (P/NP grading only.) The Staff

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Mayhew in charge)

Upper Division Courses**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. McEvoy

105A-105B. Laboratory in Survey Research. (5-5) I-II.

Lecture—4 hours; laboratory—3 hours. 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.) 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. 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. 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 movement; analysis of concepts of alienation, revolution, ideology, ruling class, and elite. The Staff

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. 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. Lemert

122. Sociology of Adolescence. (4) III.

Lecture—4 hours. 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. The Staff

123. American Society. (4) III.

Lecture—4 hours; essay take-home examinations. The demographic and social structure of American society and population, with emphasis on ethnic and class groups as bases for political and economic interest. Attention to selected current social controversies. Scott

124. Sociology of Education. (5) II.

Lecture—4 hours; term paper. 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. Scott

125. Sociology of Intellectual Life. (4) I.

Lecture—4 hours. 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. Mayhew

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. J. Lofland

127. Sociology of Death. (4) III.

Lecture—4 hours. Overview of attitudes toward,

structural effects of, and methods of coping with, death and death-related behaviors. Particular attention to social psychological aspects of death and dying, to death occupations and to death rituals in various cultures.
L. Lofland

130. Race Relations. (4) I, III.

Lecture—4 hours. Functions of the social definitions of *race* and *racial* groups. Analysis of *racial* conflict, oppression, and other forms of ethnic stratification. Models of ethnic interaction and social change. Emphasis on *racial* relationships within the U.S.
The Staff

131. The Family. (5) I.

Lecture—4 hours; term paper. 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.
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.

140. Social Stratification. (4) III.

Lecture—4 hours. 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.
Hackett

141. Industrialization and Social Change. (4) II.

Lecture—4 hours. 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.
The Staff

143. Urban Society. (4) I.

Lecture—4 hours. Urbanization as a social process; comparison of urban, suburban, metropolitan and rural phenomena; types of cities; the subcultures of cities; the urban future.
L. Lofland

144. Rural Society. (4) III.

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.
The Staff

146. Sociology of Religion. (4) II.

Lecture—4 hours. 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.
The Staff

147. Sociological Perspectives on East Asia. (4) III.

Lecture—4 hours. Sociological theories and concepts applied toward understanding East Asian society. Emphasis on the political structure, stratification and economy in China and Japan. Analysis of historical and contemporary similarities and differences.
Hamilton

148. Collective Behavior. (4) III.

Lecture—4 hours. Analysis of the characteristics, causes and consequences of noninstitutionalized collective actions; fads, panics, expressive crowds, riots, social and revolutionary movements.
The Staff

150. Criminology. (4) III.

Lecture—4 hours. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.
Lemert

152. Juvenile Delinquency. (4) II.

Lecture—4 hours. 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.
Hirschi

153. Practicum in Delinquency and Criminology. (2) II.

Lecture—2 hours. The criminal justice system as seen by practitioners; attorneys, police, probation officers, judges, legislators, therapists, convicts. Provides exposure to workers in the field and the literature on their activities. Students interested in research and theory are encouraged to take courses 150 and 152.
Hirschi, Lemert

154. Sociology of Health Care. (4) I.

Lecture—4 hours. An overview of sociological research in medicine and health care, with emphasis on the organizational, institutional and social psychological aspects.
Roth

155. Sociology of Law. (4) III.

Lecture—4 hours. 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.
Lemert

156. Sociology of Complaint and Protest. (4) III.

Lecture—4 hours; term paper. Conditions and types of felt grievances and the forms, processes, strategies and effects of complaining and protesting in various institutional realms, particularly the political and economic. Emphasis upon developing generalized principles and processes from the study of documented episodes of complaining and protesting.
J. Lofland

159. Sociology of Occupations. (4) II.

Lecture—4 hours. 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. Roth

165A. Sociological Theory. (4) I.

Lecture—4 hours. 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. Mayhew

165B. Sociological Theory. (4) II.

Lecture—4 hours. 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. Mayhew

170. Population. (4) I.

Lecture—4 hours. 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. Scott

173. Sociology Through Literature. (4) II.

Lecture—4 hours. 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. McEvoy

175. Sociology of Communication. (4) II.

Lecture—4 hours. 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. The forms and processes of contemporary social organization. Comparative analysis of the problems of organizing families, business firms, government agencies, schools, political movements, religious ceremonies and utopian communities. Hackett

185. Sociology of Social Welfare. (4) I.

Lecture—4 hours. 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 Chairperson (P/NP grading only.) The Staff (Mayhew in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Mayhew in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: open to seniors only. (P/NP grading only.) The Staff (Mayhew in charge)

Graduate Courses**205. Methodological Critique of Research. (4) III.**

Lecture—4 hours. 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. Hirschi

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. Development of behavioral and empirical political sociology; study of conflict, discontent, community politics, the international system, game theory, and coalition formation. Empirically grounded theories. 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. Lemert

224. Sociology of Education. (4) II.

Seminar—4 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. 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

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. 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. L. 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. J. 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 functions of law, 2) the organization and

administration of law, and 3) the capacity of law to affect social behavior. 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.

270. Social Demography. (4) III.

Seminar—4 hours. Prerequisite: course 170 or consent of instructor. How social institutions affect and are affected by the level and variation of mortality, migration, and fertility. Special emphases on the determinants of fertility-related attitudes and behavior, on less-developed countries, and on contemporary empirical studies. Pullum

280. Organizations and Institutions. (4) II.

Seminar—4 hours. 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. Hackett

290. Seminar. (4) I, II, III.

Seminar—3 hours. (S/U grading only.)
The Staff (Chairperson 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.) J. Lofland

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

299. Individual Study. (1-9) I, II, III.

(S/U grading only.)
The Staff (Chairperson in charge)

SOIL AND WATER SCIENCE—See Soil Science, Water Science**SOIL SCIENCE**

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 120 and 210.

Related Courses. See *Plant Science 216 (Principles of Plant*

Nutrition); Resource Sciences 108 (Mineral Elements in Food Chains); see also 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

2. Introduction to Soil Science. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B; Biological Sciences 1; Physics 2B or 2C recommended. Development and properties of soils; interactions between the solid, aqueous, gaseous, and biotic soil components; technical aspects of management, development and conservation of soils. Munns

10. Land and Life. (2) I.

Lecture—2 hours. Introduction to soils as parts of ecosystems. The relationship of soils to man and land use. Singer, Walker

Upper Division Courses

102. Soil and Water Chemistry. (5) II.

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2 or equivalent preparation in introductory earth science 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. Burau

105. Field Studies of Soil Resources. (8) (Extra Session—Summer)

On campus—1 week daily; study tour—daily 5 weeks. Prerequisite: consent of instructor; course 120 recommended. *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. Begg, Huntington, Singer

107. Transfer Processes in Soil. (4) I.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2; Water Science 2; Mathematics 16A or 21A; or equivalent preparation in elements of soil and water, and calculus. Principles of water, gas, heat, and solute movement in soil with selected examples related to agricultural and urban use of land. Influence of soil physical properties on transfer processes and root growth. Rolston

109. Soil Fertility and Fertilizers. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2 or the equivalent preparation in elements of soil science. 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. 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 geo-

sphere and their responses to environmental variables. Activities of microorganisms in relation to water pollution, solid waste disposal, pesticide degradation, and soil fertility. Broadbent

118. Soils in Land Use and the Environment. (3) II.

Lecture—2 hours and discussion—1 hour; (including 4 field trips). Prerequisite: course 2 or consent of instructor. Physical and chemical characteristics of soils and the position of soils on the landscape as they relate to agricultural and non-agricultural uses of land. Identification and interpretation of soil survey information applicable in land use decision making. Singer

120. Soil Genesis and Morphology. (2) II.

Lecture—2 hours. Prerequisite: course 2; Geology 1 or 2; or consent of instructor. Soil forming factors and how these factors affect soil properties and soil morphological characteristics. Soil forming processes as they influence the genesis and features of the soil profile. Soil-land form relationships. Begg

120L. Soil Genesis and Morphology Laboratory. (1) II.

Laboratory—3 hours (including 4 Saturday field trips). Prerequisite: course 120 (may be taken concurrently). Identification and description of soil morphological characteristics. Use of thin sections and the petrographic microscope to identify micro-pedological features. Field trips to study soil parent material, soil-climate, soil-vegetation, and soil-land form relationships. Begg

121. Soil Classification, Mapping and Evaluation. (3) III.

Lecture—2 hours; laboratory—3 hours (4 or more lab periods and field studies). Prerequisite: course 120 or consent of instructor. Course introduces systems of soil classification to develop both a broader understanding of soils on the landscape and a basis for soil use evaluation. Laboratory-field studies investigate methods of morphological soil description, soil mapping and soil evaluation. 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. Whittig, Rains

123. Soil Taxonomy. (3) II.

Lecture—1½ hours; discussion—1½ hours. Prerequisite: courses 120, 120L and 121, or consent of instructor. An intermediate course in soil classifica-

NOTE: For key to footnote symbols, see page 220.

tion study and analysis of the current system of classification used by the National Cooperative Soil Survey of the United States. Practice in classifying soil individuals with emphasis on evaluating their placement in the system. Offered in even-numbered years only. Huntington

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. Brown

198. Directed Group Study. (1-5) I, II, III.

Directed group study in soil science for advanced undergraduates. (P/NP grading only.)

The Staff (Whittig in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.) The Staff (Whittig in charge)

Graduate Courses**207. Soil Physics. (3) II.**

Lecture—3 hours. Prerequisite: Mathematics 22B or consent of instructor; course 107 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 system. Offered in even-numbered years. Rolston

208. Soil-Plant Interrelationships. (3) III.

Lecture—3 hours. Prerequisite: course 2; Botany 111B; or consent of instructor. Processes and reactions involved in the acquisition by plants of nutrients from soils; the root-soil interface; physiological reactions involved in the assimilation of nutrients; soil factors and crop quality. Rendig

211. Soil Microbiology. (2) II.

Lecture—2 hours. Prerequisite: Chemistry 8B, course 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. 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. 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. Bureau

290. Special Topics in Soil Science. (1) I, III.

Seminar—1 hour. Prerequisite: graduate standing. Oral presentation and discussion of scientific material and procedures for review and critique of publications. (S/U grading only.) Delwiche

291. Current Literature in Plant Nutrition. (1)

I, II, III.

Seminar—1 hour. Prerequisite: graduate standing in Soil Science, Plant Physiology, Ecology, or related subject, and consent of instructor. The current literature in plant nutrition and soil-plant relationships will be reviewed and discussed. Each participant will prepare and present reports to the seminar. (S/U grading only.)

The Staff (Reisenauer in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Whittig in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Whittig in charge)

SPANISH

Homero Castillo, Ph.D., *Chairperson of the Department*

Department Office, 616 Sproul Hall

Professors:

Donald G. Castanien, Ph.D.

Homero Castillo, Ph.D.

Antonio 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.

Hugo J. Verani, Ph.D.

Lecturers:

Mariano González, Ph.D.
Fabián A. Samaniego, M.A.

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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 Chairperson, 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 Chairperson, 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 Chairperson of the Spanish Department.

Teaching Credential Subject Representative: D. S. Keller. See page 215 for the Teacher Education Program.

Portuguese**Lower Division Courses*****1. Elementary Portuguese. (4) I.**

Laboratory—2 hours; recitation—3 hours. Portuguese grammar, conversation, and reading. Not open for credit to students who have completed the first two years of high school Portuguese. _____

***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. _____

Spanish

Departmental Major Advisers.—R. Anderson, C. B. Cannon, D. T. Jaén, D. S. Keller, G. Rojas, R. M. Scari.

Lower Division Courses**1. Elementary Spanish. (6) I, II, III.**

Laboratory—two ½-hour sessions; recitation—5 hours. Not open for credit to students who have completed the first two years of high school Spanish. _____
The Staff

1AT. Individualized Instruction in Elementary Spanish. (1-6) I, II, III.

Student-instructor contacts consisting of individual appointments, conversation practice and testing periods. Prerequisite: one or more years of high school Spanish. Covers material of course 1. Students may enter at any level. If a student completes more units than contracted for, he is given credit for them. May be repeated for a total of 6 units. _____

Samaniego

2. Elementary Spanish. (6) I, II, III.

Laboratory—two ½-hour sessions; recitation—5 hours. Prerequisite: course 1. Continuation of course 1. _____
The Staff

2AT. Individualized Instruction in Elementary Spanish. (1-6) I, II, III.

Student-instructor contacts consisting of individual appointments, conversation practice and test-

ing periods. Prerequisite: one or more years of high school Spanish. Covers material of course 2. Students may enter at any level. If a student completes more units than contracted for, he is given credit for them. May be repeated for a total of 6 units.

Samaniego

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

25. Chicano Culture. (3) II.

Lecture—3 hours. Prerequisite: course 2 or consent of instructor. Study of Chicano culture in the Southwest from 1598 to the present, emphasis on the period after 1848. Lectures and discussions in English; readings in English and/or Spanish. May not be counted as part of major or minor in Spanish.

Rojas

26. Introduction to the Forms of Chicano Literature. (3) I.

Lecture—3 hours. Prerequisite: course 2 or consent of instructor. Analysis and interpretation of representative works in poetry, prose fiction, essay, and drama. Lectures and discussions in English. Readings in English and/or Spanish. May not be counted as part of the major or minor in Spanish.

Rojas

27A-27B-27C. Introduction to the Forms of Hispanic Literature. (3-3-3) I, II, III.

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

30A. Conversational Spanish. (3) I.

Lecture—3 hours. Prerequisite: course 6 or consent of instructor. Intensive conversational practice, stressing accurate pronunciation, verbal fluency.

The Staff

30B. Conversational Spanish. (3) II.

Lecture—3 hours. Prerequisite: course 30A or consent of instructor. Continuation of course 30A.

The Staff

30C. Conversational Spanish. (3) III.

Lecture—3 hours. Prerequisite: course 30B or consent of instructor. Continuation of course 30B.

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.

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.

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.

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.

Scari

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor and Department Chairperson. Primarily for lower-division students. (P/NP grading only.)

The Staff (Chairperson in charge)

Upper Division Courses

101A-101B-101C. Grammar and Composition.

(4-4-4) I, II, III.

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.

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.

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*.

Jaén

108A. Spanish-American Prose of the Twentieth Century. (4) III.

Lecture—3 hours; conferences and reports. Pre-

requisite: course 27C. Emphasis on the development of the novel. Offered in odd-numbered years.
Castillo

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.
Jaén

109. Spanish Drama of the Golden Age. (4) III.

Lecture—3 hours; conferences and reports. Prerequisite: course 27C. Offered in even-numbered years.
Sánchez-Romeralo

111. Don Quijote. (4) II.

Lecture—3 hours. Prerequisite: course 27C.
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.
Scari

115. Lyric Poetry of the Golden Age. (4) III.

Lecture—3 hours. Prerequisite: course 27C. Offered in odd-numbered years.
Sánchez-Romeralo

119. Spanish Novel of the Nineteenth Century. (4) III.

Lecture—3 hours. Prerequisite: course 27C. Offered in odd-numbered years.
Scari

120A. Twentieth-Century Spanish Prose. (4) I.

Lecture—3 hours. Prerequisite: course 27C.
Anderson

120B. Twentieth-Century Spanish Drama. (4) III.

Lecture—3 hours. Prerequisite: course 27C. Offered in odd-numbered years.
Anderson

120C. Twentieth-Century Spanish Poetry. (4) III.

Lecture—3 hours. Prerequisite: course 27C. Offered in even-numbered years.
Anderson, Sánchez-Romeralo

125A. Modernism: The Precursors. (4) I.

Lecture—3 hours. Prerequisite: course 27C. Offered in even-numbered years.
Castillo

125B. Modernism: The Major Poets. (4) II.

Lecture—3 hours. Prerequisite: course 27C. Offered in even-numbered years.
Castillo

127. Poetry of Post-Modernism and Vanguardism. (4) III.

Lecture—3 hours; conferences. Prerequisite: course 27C. Offered in even-numbered years.
Verani

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.
Castillo

129. The Mexican Novel. (4) III.

Lecture—3 hours; conferences and reports. Prerequisite: course 101C or consent of instructor. Major figures in the development of the Mexican novel. Offered in odd-numbered years.
Rojas

131. Modern Spanish Syntax. (4) I.

Lecture—3 hours; conferences and reports. Prerequisite: course 101C or 102C or consent of instructor. Study of word relationships in European and American Spanish, with special attention to syntax of verbs.
Keller

132. Introduction to Spanish Linguistics. (3) III.

Lecture—3 hours. Prerequisite: course 101C or 102C or consent of instructor. 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.
Torreblanca

133. Spanish Phonetics. (3) I, II.

Lecture—3 hours. Prerequisite: course 6 or consent of instructor. The sound structure of modern Spanish; theoretical analysis of selected problems in pronunciation. Strongly recommended for prospective teachers.
Torreblanca

134. Survey of Spanish Culture. (4) I.

Lecture—3 hours. Prerequisite: course 27C or consent of instructor.
Gonzalez

135. Survey of Mexican Culture. (4) III.

Lecture—3 hours; conferences and reports. Prerequisite: course 27C or consent of instructor.
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.
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.
Jaén

150. Masterpieces of Spanish Literature. (4) I.

Lecture—3 hours. Reading, lectures, and discus-

sion in English. May not be counted as part of the major in Spanish. 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

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. Jaén

180. History of Spanish Literature. (4) III.

Lecture—3 hours. Prerequisite: open only to majors in their senior year; consent of instructor. 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. Keller

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor and Department Chairperson. (P/NP grading only.) The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Chairperson 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.) Castanien

210. Literary Criticism: Poetry. (4) I.

Seminar—3 hours. Offered in odd-numbered years. Castillo

220A. History of the Spanish Language. (4) I.

Seminar—3 hours. Prerequisite: Latin I. Torreblanca

220B. History of the Spanish Language. (4) II.

Seminar—3 hours. Prerequisite: Latin I. Torreblanca

221. Hispanic Dialectology. (4) III.

Seminar—3 hours. Prerequisite: course 220A or consent of instructor. Descriptive and historical study of the distinctive features of Peninsular and American Spanish dialects. Torreblanca

225. Medieval Spanish Literature. (4) II.

Seminar—3 hours. 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. Torreblanca

229. Spanish Literature of the Early Renaissance. (4) I.

Seminar—3 hours. Spanish literature, 1450-1550, with emphasis on *La Celestina*. Castanien

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. 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. Sánchez-Romeralo

231C. Spanish Literature of the Golden Age: Prose Non-Fiction. (4) II.

Seminar—3 hours. Offered in odd-numbered years. Castanien

231D. Spanish Literature of the Golden Age: Prose Fiction. (4) II.

Seminar—3 hours. Offered in even-numbered years. Castanien

231E. Spanish Literature of the Golden Age: The Drama. (4) II.

Seminar—3 hours. Offered in odd-numbered years. 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. Castanien

234A. Twentieth-Century Spanish Poetry. (4) I.

Seminar—3 hours. From 1898 up to the Generation of 1927. Sánchez-Romeralo

234B. Twentieth-Century Spanish Poetry. (4) II.

Seminar—3 hours. New trends in Spanish poetry from 1927 to the present. Sánchez-Romeralo

235A. Twentieth-Century Spanish Prose. (4) I.

Seminar—3 hours. Offered in odd-numbered years. Anderson

235B. Twentieth-Century Spanish Prose. (4) II.

Seminar—3 hours. Offered in even-numbered years. Anderson

236. Twentieth-Century Spanish Thinkers. (4) III.

Seminar—3 hours. Major thinkers from Ganivet 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. Scari

237. Twentieth-Century Spanish Drama. (4) I.

Seminar—3 hours. Major Spanish dramatists from Valle-Inclán to the present. Anderson

238. Spanish Romanticism. (4) I.

Seminar—3 hours. Sources and development of Romanticism in Spain, particularly in poetry and drama. Scari

239. Post-Romantic Spanish Literature of the Nineteenth Century. (4) II.

Seminar—3 hours. Offered in even-numbered years. Cannon

240A. Spanish-American Drama: 1880-1930. (4) III.

Seminar—3 hours. Keller

240B. Spanish-American Drama: 1930 to Present. (4) III.

Seminar—3 hours. Keller

241A. Spanish-American Novel, 1900-1920. (4) I.

Seminar—3 hours. Offered in even-numbered years. Castillo

241B. Spanish-American Novel, 1920-1940. (4) II.

Seminar—3 hours. Offered in odd-numbered years. Castillo

242. New Trends in Spanish-American Fiction from 1940 to the Present. (4) III.

Seminar—3 hours. Offered in odd-numbered years. Castillo

243. Spanish-American Short Story. (4) III.

Seminar—3 hours. Works by major writers, with emphasis on twentieth-century authors such as

Quiroga, Borges, García Márquez, Cortázar, and Rulfo. Jaén

245. Dario and His Contemporaries. (4) II.

Seminar—3 hours. Offered in even-numbered years. Castillo

247. New Directions in Spanish-American Poetry. (4) III.

Seminar—3 hours. Offered in even-numbered years. Verani

248. The Spanish-American Essay. (4) II.

Seminar—3 hours. Major Spanish-American essayists from Sarmiento to Octavio Paz. Offered in odd-numbered years. 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.

(S/U grading only.)

The Staff (Chairperson 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. 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. Samaniego

SUBJECT A

Program Office, 906 Sproul Hall

Lecturer and Supervisor of Instruction:

Karl F. Zender, Ph.D.

§ § §

SURGERY

John D. Wheat, D.V.M., *Chairperson of the Department*

Department Office, 1319 Haring Hall

Professors:

Robert M. Cello, D.V.M.

Terrell A. Holliday, D.V.M., Ph.D.

Robert L. Leighton, V.M.D.

NOTE: For key to footnote symbols, see page 220.

Gordon H. Theilen, D.V.M.
John D. Wheat, D.V.M.

Associate Professors:

I. M. Gourley, D.V.M., Ph.D.
Dennis M. Meagher, D.V.M., Ph.D.
Harold R. Parker, D.V.M., Ph.D. (*Surgery and Physiological Sciences*)

Assistant Professors:

Eugene M. Breznock, D.V.M., Ph.D.
Robert Hart, M.R.C.V.S., D.V.A., D.V.M.
Steve C. Haskins, D.V.M., M.S.
Kenneth G. Kagan, D.V.M.
A. D. MacMillan, D.V.M., Ph.D.
Bruce R. Madewell, V.M.D.
Robert D. Norrie, D.V.M.
Robert R. Selcer, D.V.M.
Eugene P. Steffey, V.M.D., Ph.D.

Assistant Clinical Professors:

S. Gary Brown, D.V.M.
Charles T. Robinson, D.V.M.
Fredrick P. Sattler, D.V.M.

Lecturers:

Thomas G. Kawakami, Ph.D. (*Pathology*)
Alida P. Wind, M.V.D.

§ § §

Upper Division Course

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

(P/NP grading only.) The Staff (Wheat in charge)

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 Medicine 204 and Veterinary Medicine 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. Limited enrollment. Holliday

206. Clinical Oncology. (3) II.

Lecture—2 hours; rounds—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. A study of neoplastic diseases of animals. Theilen, Ling

208. Soft Tissue Surgery: Small Animals. (1) III.

Laboratory—3 hours. Prerequisite: senior stand-

ing in the School of Veterinary Medicine, graduate students, or consent of instructor. Course is designed to provide further experience in surgery of small animals with emphasis on practical soft tissue surgery. Open to students who have not had course 224. Limited enrollment. (S/U grading only for Veterinary students.) Leighton

213. Veterinary Ophthalmology. (2) III.

Lecture—2 hours. Prerequisite: Medicine 204E or consent of instructor. Selected topics relating to the eye and its diseases. Cello

214. Ophthalmic Surgery. (1) III.

Laboratory—2 hours. Prerequisite: consent of instructor. Techniques of eye surgery in domestic animals. Limited enrollment. Cello

220. Introductory Surgery. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: junior standing in School of Veterinary Medicine or consent of instructor. Principles of surgery and surgical technique. Wheat

221. Veterinary Surgery. (5) II.

Lecture—4 hours; laboratory—3 hours. Prerequisite: course 220 or consent of instructor. Course is designed to teach diagnosis and treatment of diseases requiring surgical treatment. The lecture schedule will follow organ-system pattern and includes diseases of both large and small domestic animals. Laboratory designed to supplement lectures for demonstration and practice of the common surgical procedures. Surgery Staff

222. Veterinary Surgery. (5) III.

Lecture—4 hours; laboratory—3 hours. Prerequisite: junior standing in School of Veterinary Medicine or consent of instructor. Course designed to teach diagnosis and treatment of diseases requiring surgical treatment. Lecture schedule will follow organ-system pattern and includes diseases of both large and small domestic animals. Laboratory designed to supplement lectures for demonstration and practice of the common surgical procedures. Surgery Staff

224. Orthopedic Surgery: Small Animals. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Elective course in orthopedic surgery with emphasis on common orthopedic problems in the dog and on the use of orthopedic equipment. Limited enrollment. (S/U grading only for Veterinary students.) Wind

225. Bovine and Equine Surgery Laboratory. (2-4) II.

Laboratory—3-6 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Laboratory designed to give experience in common surgical procedures performed on cattle and horses. In addition to surgery, techniques in anesthesia are performed by students. (S/U grading only for Veterinary students.) Meagher, Wheat

226. Veterinary Anesthesiology. (1) II.

Lecture—1 hour; demonstrations. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Advanced course in veterinary anesthesia emphasizing patient management and anesthesia for specific diseases and surgical procedures. Discussions will include the relation between pathophysiology and the aspects of anesthesia; preoperative preparation; and particular species requirements including laboratory animals.

Hart

298. Group Study. (1-2) I, II, III.

The Staff (Wheat in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.)

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 (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 follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

The Staff (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 farm animal 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 (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 (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.)

Holliday

422. Veterinary Ophthalmology. (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 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.)

Cello

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 (Wheat in charge)

SWEDISH

Department Office, 416 Sproul Hall

Lower Division Courses**1. Elementary Swedish. (6) I.**

Discussion—5 hours; language laboratory—two ½-hour sessions. Not open for credit to students who have completed the first two years of high school Swedish.

Sammern-Frankenegg

2. Elementary Swedish. (6) II.

Discussion—5 hours; language laboratory—two ½-hour sessions. Prerequisite: course I.

Sammern-Frankenegg

3. Intermediate Swedish. (6) III.

Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 2.

Sammern-Frankenegg

6A. Spoken Swedish. (2) III.

Discussion—2 hours. Prerequisite: course 2. Conversational practice based on everyday vocabulary of modern spoken Swedish. May be taken concurrently with course 3. (P/NP grading only.)

Sammern-Frankenegg

TEXTILES AND CLOTHING

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 122.

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 2B or 10. The relation of the self-concept and of the human form to elements of design as expressed through clothing. Arbaugh

17A. Clothing Structure. (4) I, II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: clothing construction skills; courses 6 and 7 recommended. Principles of clothing design through the medium of drafting and flat pattern. Construction principles are applied. Pontrelli

17B. Clothing Structure. (4) I, II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 17A. Principles of clothing design through the medium of draping in various textile fabrics. Pontrelli

172. Clothing and Society. (3) II.

Lecture—3 hours. Prerequisite: Economics 1A; Psychology 2B 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. Arbaugh

175. Experimental Problems in Clothing Structure. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 17B, 162, and 172. Design and construction of body coverings utilizing technological innovations in fabrics and in fabric joining. Influence of changing socioeconomic values on design and construction. The Staff (Zeronian in charge)

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. Morris

160. Textile Fibers and Finishes. (3) III.

Lecture—3 hours. Prerequisite: course 6 and Chemistry 8B. Structural, physical and chemical properties of textile fibers in relation to end-use; the properties and classifications of dyes and finishes for textiles; chemistry and function of products used in textile maintenance. Needles

160L. Textile Fibers and Finishes Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 6, 160 (may be taken concurrently); Chemistry 8B. Demonstrates various physical and chemical properties of fibers, application of dyes and finishes to textiles and their effect on fiber properties, and the effect of various detergent additives on textile maintenance. Needles

161. Textile Chemistry. (3) I.

Lecture—3 hours. Prerequisite: course 160. The theory of fiber structure; the relation between chemical structure and physical properties of fibers. The principles of the application of dyes and finishes to textiles. 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. Zeronian

162. Textile Fabrics. (3) II.

Lecture—3 hours. Prerequisite: course 6. Properties of fabrics as related to serviceability, comfort, and appearance. 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. Morris

260. Recent Advances in Textiles. (2) III.

Lecture—2 hours. Prerequisite: course 161 or consent of instructor. Critical reading and evaluation on

selected topics of current interest in textiles. May be repeated for credit. Zeronian

c) FIELD, GROUP, AND SPECIAL STUDIES

47. Field Study. (1) III.

Seminar—two 2-hour sessions; field trip—2 days. Prerequisite: consent of instructor; registration in advance required. Field trip to observe commercial aspect of the design, production, development, distribution and maintenance of textiles and clothing. To be given between winter and spring quarters. Considered a spring course for preenrollment. (P/NP grading only.) Lundgren

99. Special Study for Lower Division Students.

(1-5) I, II, III.
(P/NP grading only.)
The Staff (Zeronian in charge)

180A-180B. Introduction to Research in Textiles and Clothing. (2-2) II-III.

Prerequisite: textile major of senior standing.

Senior thesis on independent problems. The research begun in 180A will be continued and completed in 180B. (Deferred grading only, pending completion of sequence.)

The Staff (Needles in charge)

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)
The Staff (Zeronian in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.)
The Staff (Zeronian in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Zeronian in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Zeronian in charge)

VEGETABLE CROPS

Related Undergraduate Majors and Graduate Study.—See pages 105, 117, and 210.

Related Courses. See *Plant Science 112, 112L (Postharvest Physiology and Handling of Horticultural Commodities), 121A-121B-121C (Applied Crop Physiology).*

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. 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. Harrington

105. Systematic Olericulture. (2) I.

Laboratory—6 hours. Prerequisite: Botany 2. Origin, history, types, classification, nomenclature, and adaptation of the more important American vegetable varieties; minor vegetable crops; trends in development of new varieties. Smith

118. Seed Physiology and Production. (3) II.

Lecture—3 hours. Prerequisite: Botany 111B. Physiological factors affecting induction of seeding, seed development, viability and longevity of seed.

Principles of seed production. One or more field trips. Harrington

150. Vegetables as World Food Crops. (3) III.

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. 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 operations, 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.) Flocker

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.) The Staff (Lorenz in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Lorenz in charge)

Graduate Courses

***212. Postharvest Physiology of Vegetables. (4) III.**

Lecture—2 hours; laboratory—6 hours. Prerequisite:

NOTE: For key to footnote symbols, see page 220.

site: 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.

Morris, 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.

Rick

290. Seminar. (1) I, II, III.

Discussion—1 hour. (S/U grading only.)

The Staff (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. (S/U grading only.) The Staff (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 (Yamaguchi in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (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*

Donald L. Dungworth, B.V.Sc., Ph.D., *Associate Dean—Research*

Timothy R. O'Brien, D.V.M., Ph.D., *Associate Dean—Student Services*

*William J. Winchester, D.V.M., *Assistant Dean*

School Office, 1018 Haring Hall

Associate Clinical Professors:

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.

Ronald S. Laub, D.V.M.

Gerald R. Mitchell, D.V.M.

Jack W. Morse, D.V.M.

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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.)

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.

Knight and staff

102. Cell Biology. (12) I, II.

Lecture—8 hours; discussion—2 hours; laboratory—6 hours. Prerequisite: freshman standing in the School of Veterinary Medicine. Physical-chemical principles underlying biological processes; 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. (Deferred grading only, pending completion of 12-week session.)

Black and staff

103. General Principles of Pharmacology. (3) II.

Lecture—2 hours; laboratory-demonstration-discussion—2 hours. 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.

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.

Morgan and staff

105A. Agents of Disease and Host Responses. (4) I.

Lecture—22 hours total; laboratory—16 two-hour sessions. Prerequisite: sophomore standing in School of Veterinary Medicine. Course will furnish a basis for understanding diseases of infectious, parasitic, immunological, neoplastic and radiological nature, and includes general responses of vertebrate tissues to injury.

Osebold

105B. Agents of Disease and Host Responses. (9) I.

Lecture—54 hours total; laboratory—32 two-hour sessions. Prerequisite: sophomore standing in School of Veterinary Medicine. Course will furnish a basis for understanding diseases of infectious, parasitic, immunological, neoplastic and radiological nature, and includes general responses of vertebrate tissues to injury. Course runs for 16 weeks. (Deferred grading only, pending completion of course.)

Osebold

105C. Agents of Disease and Host Responses. (4) II.

Lecture—33 hours total; 30 one-hour demonstration laboratories. Prerequisite: sophomore standing in School of Veterinary Medicine. Course will furnish a basis for understanding diseases of infectious, parasitic, immunological, neoplastic and radiological nature, and includes general responses of vertebrate tissues to injury.

Osebold

107. Principles of Anesthesiology and Surgery. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: second-year standing in School of Veterinary Medicine. Course in the principles of surgery and anesthesiology including instruction in surgical anatomy and techniques of surgery and anesthesia.

Gourley, Meagher, Lohse

108. Nutrition and Nutritional Diseases in Animals. (4) II.

Lecture—4 hours; one demonstration; one field trip. Prerequisite: second-year standing in the School of Veterinary Medicine or consent of instructor. Principles of nutrition and their application to the feeding of small and large animals. Selected clinical material will be discussed in relation to defi-

ciency symptoms, pathology and biochemical lesions.

Rogers, Morris, Hjerpe

120. Musculoskeletal Basis of Locomotion. (5) I-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. (Deferred grading only pending completion of 16-week session.)

Kitchell, Julian, Lohse

121. Neurosciences. (6½) II.

Lecture—4 hours; laboratory—3 hours. Prerequisite: normal animal, examination and topographic anatomy; biochemical and cellular bases 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. (Deferred grading only, pending completion of 13-week session.)

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 mechanisms governing body fluids and electrolytes will be included.) (Deferred grading only, pending completion of 13-week session commencing the last part of Winter Quarter and through Spring Quarter.)

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.

Kaneko and staff

131. Metabolism and Bioenergetics. (2) II, III.

Lecture—20 hours total. 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. (Deferred grading only, pending completion of course.)

Kaneko and staff

135. Hemolymphatic System—Normal Structure and Function. (3) III.

Lecture—2 hours; laboratory—10 hours total. Prerequisite: freshman standing in School of Veterinary Medicine or consent of instructor. Consideration of the development, structure and functions of erythrocytes, leukocytes, platelets, and hematopoietic and lymphoid tissues; hematopoiesis and its regulation; hemoglobin synthesis; blood groups; hemostasis and blood coagulation; methods of study including laboratory exercises.

The Staff

136. Laboratory Practices. (1) I.

Lecture—1 hour; laboratory—2 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Basic techniques in clinical hematology and chemistry necessary for adequate performance in the clinical rotation during the second year of the core curriculum. Course runs for 6 weeks.

Osburn, Schalm, Kaneko

140. Endocrine System Normal and Abnormal Structure and Function. (3) I.

Lecture—22 hours; laboratory-discussion—9 sessions (discussion-laboratory sessions flexible). Prerequisite: sophomore standing in School of Veterinary Medicine. Correlated presentation of the structure and function of the normal and diseased endocrine glands of domesticated animals.

Kennedy

145. Reproduction. (7) II-III.

Lecture—4 hours; laboratory—6 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Course covers structure, function, pathologic and clinical aspects of reproduction (normal and abnormal). (Deferred grading only, pending completion of 11-week session.)

Kendrick and staff

170A-170B-170C. Hospital Practices. (2) I-II-III.

Laboratory—6 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Instruction in the technical skills required for the diagnosis and treatment of animal patients. (P/NP grading only, deferred until completion of sequence.)

VMTH Staff (Low in charge)

180A-180B-180C. Clinic Rounds for Freshmen.

(1) I, II, III.

Discussion—1 hour. Prerequisite: freshman standing in School of Veterinary Medicine. Basic aspects of clinical diagnosis. (P/NP grading only.)

Knight and Ling in charge

181A, 181B, 181C. Rounds. (1) I, II, III.

Discussion—2 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Discussion of selected cases from the clinic. (S/U grading only.)

VMTH Staff (_____ in charge)

Graduate Courses

207. Small Animal Anesthesiology. (1) III.

Lecture—1 hour; video tapes and home study. Prerequisite: junior standing; candidate for DVM degree. A course in small animal anesthesiology emphasizing the influence of pathophysiology on anesthetic homeostasis and techniques suitable for animals of poor physical status using opiates, relaxants and dissociative agents.

Hart

209. Epidemiology, Public Health and Infectious Diseases. (8) II.

Lecture—49 hours total; laboratory—13 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to preventive and population aspects of veterinary medicine, with special attention to zoonoses and systemic infections of animals. Course runs for 17 weeks. (Deferred grading only, pending completion of course.)

Howarth

210. Veterinary Toxicology. (3) I.

Lecture—3 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Diseases of animals produced by chemical poisons, organic and inorganic. The prevalence of toxic agents in the environment and exposure of animals to them; the incidence, pathology, pathogenesis, diagnosis and treatment of diseases produced by poisons.

Fowler

220. Musculoskeletal System: Abnormal Function. (4) II.

Lecture—36 hours total; laboratory—six 2½-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. A course on abnormal function of the musculoskeletal system and diseases affecting the musculoskeletal system in animals. The manifestations, pathology, pathogenesis, diagnosis, and medical and surgical treatments of musculoskeletal disease will be discussed. Course runs for 13 weeks. (Deferred grading only, pending completion of course.)

Wheat

221. Neurology: Abnormal. (4) III.

Lecture—36 hours; laboratory—six 2½-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. A course on abnormal function of the nervous system and diseases affecting the nervous system in animals. The manifestation of diseases, pathology, pathogenesis, diagnosis and medical and surgical treatments of neurologic disease will be discussed.

Holliday

222. Veterinary Ophthalmology. (3) II.

Lecture—21 hours total; laboratory—7 three-hour sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. The normal structure and function of the eye and the response of the eye to disease. All species of domestic animals will be included. Discussion of selected ocular diseases of various species.

Cello

223. Small Animal Ophthalmology. (2) III.

Lecture—2 hours. Prerequisite: course 222. The diagnosis and treatment of commonly encountered eye diseases of small animals. Cello

226. Cardiopulmonary, Renal, Abnormal. (9) I-II.

Lecture—68 hours total; laboratory—66 hours. Prerequisite: third-year standing in School of Veterinary Medicine. A course on abnormal function of the circulatory, pulmonary and renal systems and disease affecting these systems in animals. The manifestations, pathology, pathogenesis, diagnosis, and medical and surgical treatments of cardiopulmonary-renal disease will be discussed. (Deferred grading only, pending completion of sequence.) Dungworth

226. Advanced Small Animal Cardiology. (1½) III.

Lecture—15 hours total for course. Prerequisite: course 225 or its equivalent. Cardiovascular diseases of canine and feline species. Rhode

230. Gastrointestinal Diseases: Gastroenterology. (6) II-III.

Lecture—53 hours total; nine laboratory sessions—23 hours total. Prerequisite: second-year standing in School of Veterinary Medicine. A course on abnormal function of the digestive system and diseases affecting the digestive system in all species of animals. The manifestations, pathology, pathogenesis, diagnosis including special diagnostic procedures, and medical and surgical treatments of gastrointestinal disease including diseases of the liver and pancreas. (Deferred grading only, pending completion of sequence.) Strombeck

235. Hemolymphatic: Abnormal. (6) I.

Lecture—39 hours total; laboratory 42 hours total. Prerequisite: third-year standing in the School of Veterinary Medicine. A course on abnormal function of the hemolymphatic system and diseases affecting the blood, blood forming organs and lymphatic system in animals. The manifestation of these diseases, pathology, pathogenesis, diagnosis and medical and surgical treatments of hemolymphatic disease will be discussed. Osburn

245. Small Animal Reproduction. (1) III.

Lecture—1 hour. Prerequisite: fourth-year standing in the School of Veterinary Medicine. Conditions affecting the reproductive system in the dog and cat, with emphasis on symptomatology, pathophysiology and treatment. The development of logical diagnostic and therapeutic approaches to the clinical patient will be stressed. Stabenfeldt

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.) VMTH Staff (Low in charge)

255. Integumentary System. (5) I.

Lecture—45 hours total; laboratory—10 hours total. Prerequisite: third-year standing in the School of Veterinary Medicine. Course covers structure, function, pathologic and clinical aspects including therapeutics of the integumentary system and diseases of the integumentary system of animals. Stannard

268. Equine Lameness and Radiology. (5) III.

Lecture—4 hours; laboratory—3 hours. Prerequisite: third-year standing in the School of Veterinary Medicine. Principles in the radiologic diagnosis of conditions that cause lameness in the equine will be emphasized. Methods used in large animal radiography will be illustrated and the latest technique for treating equine lameness will be discussed. Anatomy and pathology of some areas of the musculoskeletal system will also be presented. Meagher, O'Brien, Lohse, Pool

270A-270B. Hospital Practices. (10) II-III.

Clinics—30 hours per week. Clinical training in Veterinary Medicine. The student will have assignments in the medical and surgical services and clinical diagnostic laboratories of the Veterinary Medical Teaching Hospital. (S/U grading only, deferred pending completion of two quarter course.) VMTH Staff (Low in charge)

VETERINARY MICROBIOLOGY

Yuan Chung Zee, D.V.M., Ph.D., *Chairperson 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.

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.

NOTE: For key to footnote symbols, see page 220.

Moshe Shifrine, Ph.D. (*Adjunct*)
Yuan Chung Zee, D.V.M., Ph.D.

Associate Professor:

Audria M. Buchanan, Ph.D.

Assistant Professors:

Dwight C. Hirsh, D.V.M., Ph.D.
Gerald F. Slonka, D.V.M., Ph.D.
Jerold H. Theis, D.V.M., Ph.D. (*Medical
Microbiology*)

Lecturers:

Hector A. Alcaino, D.V.M., M.S.
Edmond C. Loomis, Ph.D.
Ming Ming Wong, Ph.D.

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Upper Division Courses

126. Fundamentals of Immunology. (2) II.

Lecture—2 hours. Prerequisite: general bacteriology; Biochemistry 101A or the equivalent recommended. The immune response and defenses of the host against infection: antibodies, antigens, antibody-antigen interactions, regulation and manipulation of the immune response, hypersensitivity mechanisms and their relationships to disease processes. Buchanan, Hirsh

126L. Immunology Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 126 (may be taken concurrently), introductory course in microbiology. Laboratory procedures in immunology. The immune response to antigens, antigen-antibody interactions, hypersensitivity mechanisms. Limited enrollment. (P/NP grading only.) Buchanan, Hirsh

127. Medical Bacteriology and Mycology. (3) III.

Lecture—2 hours; discussion—1 hour; paper or seminar-type presentation. Prerequisite: fundamentals of immunology and microbiology. The bacterial and mycotic pathogens of man and animals, with emphasis on pathogenic mechanisms and ecologic aspects of infectious disease. Biberstein, Hirsh

127L. Medical Microbiology Laboratory. (3) III.

Laboratory—6 hours; follow-up work—2-3 hours. Prerequisite: general bacteriology with laboratory; course 127 (may be taken concurrently) or equivalent. Laboratory aspects of pathogenic bacteria and fungi, principles of laboratory diagnosis of bacterial and mycotic infections. Biberstein, Hirsh

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.

Zee, Manning

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. Zee, Manning

132. Introduction to Human and Animal Parasitology. (2) III.

Lecture—2 hours. Prerequisite: Zoology 2. The nomenclature of human and animal parasites, their general morphology, life cycles, epidemiology, diagnostic techniques, and host-parasite relationships. Wong

132L. Laboratory in Human and Animal Parasitology. (1) III.

Laboratory—3 hours. Prerequisite: course 132 (may be taken concurrently). Laboratory study to complement course 132, consisting of individual studies supplemented with demonstrations. Wong

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Zee in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Zee in charge)

Graduate Courses

270. Advanced Immunology. (6) III.

Lecture—3 hours; laboratory—9 hours. Prerequisite: course 126 or Veterinary Medicine 105 or consent of instructor. Immunoglobulin structure and function, antigenic determinants, complement. Biology of lymphocytes; cell-mediated immune reactions, immunogenetics, hypersensitivity. Pathogenetic mechanisms in immunological diseases, immunological unresponsiveness, cancer immunology. Dynamics of infection and resistance. Methods in immunochemistry and immunobiology. Offered in even-numbered years. Osebold, Buchanan, Shifrine

291. Seminar in Immunology. (1) I, II, III.

Seminar—1 hour. A discussion of the current topics in immunology. Shifrine

292. Seminar in Animal Virology. (1) I, II, III.

Seminar—1 hour. A discussion of the current topics in animal virology. (Same course as Bacteriology 296.) Zee

293. Seminar in Infectious Diseases. (1) I, II, III.

Seminar—2 hours, alternate weeks. A discussion of the current topics in infectious diseases in man and animals. (S/U grading only.) Biberstein, Hirsh

294. Seminar in Parasitology. (1) I, II, III.

Seminar—1 hour. A discussion of the current topics in parasitology and entomology.

Baker, Lavoipierre, Slonka

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.

Biberstein, Hirsh

298. Group Study. (1-5) I, II, III.

The Staff (Zee in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff

VITICULTURE AND ENOLOGY

Related Undergraduate Majors.—See pages 106 and 117.

Related Courses. See *Food Science and Technology: Plant Science 112 and 112L (Postharvest Physiology and Handling of Horticultural Commodities).*

Lower Division Courses

3. Introduction to Wine Making. (3) I, II, III.

Lecture—2 hours; discussion—1 hour. An introduction to wine technology, including effects of alcohol, history of wine, fermentation, production practices, wine types, and the wine industry of California and other wine producing areas.

Singleton, Kunkee

99. Special Study for Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Webb 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. Principles underlying pruning, training, grafting, and propagation of vines; environmental factors affecting composition of the fruit during growth and maturation; fruit handling practices for wine, raisin, and table grape production.

Nelson, 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.

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.

Cook

123. Analysis of Musts and Wines. (3) I.

Lecture—1 hour; discussion—1 hour; labora-

tory—3 hours. Prerequisite: Chemistry 5; Food Science and Technology 103 recommended. The principles and practice of wine analysis.

Ough

124. Wine Production. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: courses 3 and 123 (may be taken concurrently). 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.

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 107, 107L; and courses 3, 123, and 124. Major types of wines and the factors influencing their quality; principles of sensory evaluation.

Noble

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.

140. Distilled Beverage Technology. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B or equivalent; Food Science and Technology 110A recommended. Distillation principles and practices; production technology of brandy, whiskey, and other distilled beverages, characteristics of raw materials, fermentation factors, distillation and aging, chemical analysis and sensory evaluation.

Guymon

190. Proseminar in Viticulture. (1) I.

Lecture—1 hour. Prerequisite: consent of instructor. Reports and discussions of recent advances in viticulture.

Olmo

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.)

The Staff (Webb in charge)

NOTE: For key to footnote symbols, see page 220.

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

(P/NP grading only.) The Staff (Webb 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. 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. Kunkee

219. Plant Phenolics. (3) II.

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. Singleton

290. Seminar. (1) II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Webb

298. Group Study. (1-5) I, II, III.

(S/U grading only.) The Staff (Webb in charge)

299. Research. (1-12) II, III.

(S/U grading only.) The Staff (Webb in charge)

WATER SCIENCE

Related Undergraduate Major.—See page 120.

Related Courses. See *Engineering: Civil 142 (Water Supply), 143 (Water Resources Engineering), 144 (Ground Water and Seepage), 146 (Hydraulic Engineering Laboratory), and 148 (Waterborne Waste 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.

Lower Division Courses**2. Introduction to Water Science. (4) II**

Lecture—3 hours; laboratory—3 hours; one all-day field trip. Prerequisite: Chemistry 1A, physics 2A, and Botany 2; or the equivalent preparation; Chemistry 1B and Physics 2B recommended. Introduction to scientific principles as applied to water and water problems. Topics include hydrology (surface and ground water), flow through porous media, water in soil-plant-atmosphere continuum, water quality, flow through pipes and channels, and sample water-resource problems.

The Staff (T. Hsiao in charge)

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.

Hagan

40. Ecological Studies of Streams and Ponds.

(2) I, III.

Lecture—2 hours. Prerequisite: introductory course in biology. Analysis of water quality prob-

lems 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. Knight, Biggar

Upper Division Courses**103. Water Quality, Salt Control and Reclamation. (4) I.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: course in soil or water chemistry or consent of instructor. Water quality parameters, water analysis and salinity control in relation to soil and plant factors; reclamation of soil and disposal of waste water and their effect on receiving waters; localized and regional river basin problems in relation to salinity control and water quality. Biggar

104. Plant-Water-Soil Relationships. (4) III.

Lecture—3 hours; discussion—1 hour; two mid-quarter examinations to be arranged. Prerequisite: course 2 or equivalent preparation in elements of water in soil and plants, Soil Science 2 and one additional course in soils or plant physiology; or consent of instructor. Principles of plant interactions with soil and water environs and their applications in crop and environmental management. Including: nutrient and water uptake and transport; transpiration; soil processes affecting supplies; deficiencies and plant responses. T. Hsiao

110A. Irrigation Principles and Practices. (3) II.

Lecture—3 hours. General course for agricultural and engineering students dealing with soil and plant aspects of irrigation and drainage. Soil-water movement and storage; plant responses to irrigation regimes; water use by crops; procedures for determining frequency and depth of irrigation; drainage.

Henderson

110B. Irrigation Principles and Practices. (3) III.

Lecture—3 hours. Prerequisite: Physics 2B. General course for agricultural and engineering students dealing with engineering aspects of irrigation on the farm. Irrigation distribution systems; water measurement; farm water supply including wells and pumping plants; water application methods; land grading. Henderson

120. Ecology of Polluted Waters. (3) II.

Lecture—3 hours. Prerequisite: Biological Sciences 1 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. Knight

140. Groundwater Hydrology. (3) II.

Lecture—3 hours. Prerequisite: course 2, Soil Science 2. Groundwater occurrence and development, flow through porous media. Groundwater wells, drainage of agricultural lands. Reclamation procedures. Course not recommended for Engineering majors. Luthin

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. 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. Malakoff

154. Water and Related Resource Allocation from Economic Principles. (2) I.

Lecture—2 hours. Prerequisite: Mathematics 16A or consent of instructor. An examination of information needed for analysis and basic procedures of production economics used for an appropriate allocation of water and related resources in agriculture. Cost minimization in production and alternative goals are considered. Grimes

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. 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. Offered in odd-numbered years. The Staff (Robinson in charge)

172. Farm Irrigation Management. (3) III.

Lecture—3 hours; one field trip. Prerequisite: course 104 or 110A, or consent of instructor. The water budget is used as a means of orderly analysis of plant, soil, climatic, systems, and operational factors to develop a rationale for farm irrigation practices. Plant and soil factors are emphasized. Henderson

180. Chemistry of the Hydrosphere. (3) III.

Lecture—3 hours. Prerequisite: Chemistry 5 and introductory courses in geology, soils, hydrology or limnology. To provide an understanding of various mechanisms and processes regulating the chemistry of natural waters. Linkage between hydrologic and geochemical cycles is stressed. Covered are chemical characteristics of rainwater and snow, streams and rivers, lakes, ground waters, estuaries, and oceans. Tanji

198. Directed Group Study. (1-5) I, II, III, (Summer).

(P/NP grading only.)

The Staff (Chairperson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, (Summer).

Prerequisite: senior standing. (P/NP grading only.) The Staff (Chairperson in charge)

Graduate Courses**200. Water-Soil-Plant Relationships in Irrigation Programming. (3) III.**

Lecture—3 hours. Prerequisite: course 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. Hagan

***201. Advanced Plant-Water Relations. (3) I.**

Lecture—3 hours; discussion sessions. Prerequisite: course 104 or Plant Science 101 or Botany 111A; elementary knowledge of metabolism and rudiments of thermodynamics or concurrent enrollment

in 1 unit of course 298 with instructor. Chemical and component potentials of water; quantitative aspects of water transport to, within, and from plants; dynamics, regulation, and environmental factors affecting plant water status; metabolic and other characteristics associated with efficient water use, and with xerophytism; responses to water deficiency and salinity. Offered every fourth quarter. 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. Pruitt

205. Water-Resource Systems Analysis: Deterministic Models. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 22A or consent of instructor; course 141 or the equivalent. Applications of deterministic linear and dynamic programming techniques to water-resource systems design. Allocation of aqueduct and reservoir capacities, conjunctive surface and groundwater systems. Sequencing of water supply projects. Marino

207. Water-Resource Systems Analysis: Stochastic Models. (3) III.

Lecture—3 hours. Prerequisite: Mathematics 131A or consent of instructor; course 205 recommended. Applications of stochastic linear and dynamic programming, Markov chains, and inventory theory to water-resource systems design. Design and operating policy models of reservoirs. Water quality management models. Marino

*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, mem-

brane phenomena, rate processes and thermodynamic applications to the water soil system. Offered in odd-numbered years. Biggar

217. Hydrochemical Models. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: physical chemistry, calculus, and computer programming or consent of instructor. Mathematical and computer modeling of chemical state variables in terrestrial and aquatic systems. Equilibrium and rate models; transport models; systems assessment and simulations. Tanji

222. The Biology of Streams. (3) III.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours; field trips. Prerequisite: graduate standing; aquatic entomology (or the equivalent), limnology, and phycology. The course will relate various environmental factors to the ecology and productivity of flowing freshwater systems. Emphasis is placed on relationships between stream organisms and their environment by means of integrated field and lecture activities. Knight

*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 even-numbered years. 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. Knight

298. Group Study. (1-5) I, II, III, (Summer).

The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III, (Summer).

S/U grading only.)

The Staff (Chairperson in charge)

WILDLIFE AND FISHERIES BIOLOGY

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 123.

Related Courses. A selection of courses may depend on each student's special interests. A set of related courses is available from advisers.

Lower Division Course

10. Wildlife Biology. (4) I.

Lecture—4 hours. Introduction to the biology and

ecology of aquatic and terrestrial wildlife, and basic principles of management. Jacobsen, Moyle

Upper Division Courses

101. Field Studies in Wildlife Biology. (6) (Extra Session—Summer).

Lecture—1 hour; laboratory—40 hours; field study—4 weeks, and data analysis and presentation—2 weeks. Prerequisite: upper division course

in ecology and laboratory in biology of birds or mammals; consent of instructors. Intensive 4 week field study of the biology and management of wildlife followed by 2 weeks of data analysis and presentation. Emphasis is on individual investigation affording the student the opportunity to implement knowledge gained from other courses on biology and management of wildlife. Raveling, Schwab

102. Field Studies in Fisheries Biology. (6)
(Extra Session—Summer).

Lecture—1 hour; laboratory—40-80 hours; field study—4 weeks, and data analysis and presentation—2 weeks. Prerequisite: upper division course each in ecology and biology; consent of instructors. Intensive field study of the biology and management of fishes, followed by sample processing, data analysis and presentation. Emphasis is on individual projects that utilize knowledge gained from other courses on fish and fisheries. Li, Moyle

108. Comparative Nutrition of Wildlife and Fish. (4) III.

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. 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. Schwab

110L. Mammalian Biology Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: concurrent enrollment or previous completion of course 110 or Zoology 136 or consent of instructor. Laboratory 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. Schwab

111. Biology and Management of Waterfowl and Upland Game Birds. (3) II.

Lecture—3 hours. Prerequisite: upper division course in ecology 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. Raveling

111L. Waterfowl and Upland Game Birds Laboratory. (1) II.

Laboratory—3 hours (including one or more field trips). 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. Raveling

120. Biology of Fish. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Zoology 2 or consent of instructor. Introduction to ecology, morphology, evolution, and systematics of freshwater and marine fishes. Laboratory emphasizes morphology and identification; lectures emphasize ecology and its relationship to fish management. 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.

122. Dynamics of Exploited Animal Populations. (3) III.

Lecture—3 hours. Prerequisite: upper division ecology courses; Mathematics 13, 16A, 16B. A critical evaluation of the ecological bases for exploiting animal populations (vertebrates and invertebrates). Application of formal logic to quantitative concepts of population analyses and strategies of hypothesis testing. Simulation gaming will be used in teaching decision-making skills. 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. Jacobsen

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. Jacobsen

140. Behavioral Adaptation in Animals. (3) I.

Lecture—3 hours. Prerequisite: Biological Sciences 1 or Zoology 2. The social and individual behavior of animals viewed through the evolution of physiological and experiential mechanisms. Human activities that disrupt some adaptations and favor others will be considered. Lott

151. Wildlife Ecology. (3) I.

Lecture—3 hours. 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. Howard

152. Principles of Vertebrate Control. (3) II.

Lecture—3 hours. Prerequisite: course 151 recommended. The philosophical, historical, ecological, behavioral, and economical basis for regulating population levels of species of terrestrial vertebrates found throughout the world. Howard

152L. Principles of Vertebrate Control Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 152 (concurrently) and consent of instructor; course 151 recommended. Laboratory and field experiences to complement course 152. 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 (Lott in charge)

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.) The Staff (Lott in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

(P/NP grading only.) The Staff (Lott in charge)

Graduate Courses**290. Seminar. (3) I, II, III.**

Seminar—3 hours. Prerequisite: consent of instructor. Seminar devoted to a highly specific research topic in any area of wildlife or fisheries biology. Special topic selected for a quarter will vary depending on interests of instructor and students. The Staff (Lott in charge)

291. Fish Ecology Seminar. (2) II.

Seminar—2 hours. Prerequisite: graduate status or consent of instructor. Current research and advances in fisheries biology and fish ecology. Moyle, Li

298. Group Study. (1-5) I, II, III.

Lectures and/or discussions—1-5 hours. The Staff (Lott in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Lott in charge)

WORK-LEARN

Questions pertaining to the following course should be directed to the Bixby Work-Learn Office, 223 South Hall.

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., *Chairperson of the Department*
 Ronald D. Grey, Ph.D., *Vice-Chairperson of the Department*
 Department Office, 2320 Storer Hall

Professors:

Ronald J. Baskin, Ph.D. (*Zoology and Physiology*)
³Milton Hildebrand, Ph.D. (*Zoology*)
 Everett W. Jameson, Jr., Ph.D.
 Milton A. Miller, Ph.D. (*Emeritus*)
 Lauren E. Rosenberg, Ph.D. (*Emeritus*)
 Robert L. Rudd, Ph.D.

⁴George W. Salt, Ph.D.
 Herman T. Spieth, Ph.D. (*Emeritus*)
 Kenneth E. F. Watt, Ph.D., LL.D.

Associate Professors:

Peter B. Armstrong, Ph.D.
 David W. Deamer, Ph.D.
³Robert D. Grey, Ph.D.
 Stephen L. Wolfe, Ph.D.

Assistant Professors:

John H. Crowe, Ph.D.
 William E. Jacobus, Ph.D.
 Brian Mulloney, Ph.D.
 David W. Phillips, Ph.D.
 Arthur M. Shapiro, Ph.D.
 Judy Stamps, Ph.D.
 Victor D. Vacquier, Ph.D.

§ § §

Bachelor of Science Major Program

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.

Lower Division Courses.—Required: Biological Sciences 1; Zoology 2; Bacteriology 2 (or 102) or Botany 2; Chemistry 1A-1B-1C and 8A-8B or 128A-128B-128C; Mathematics 13 and 16A-16B or 21A-21B; Physics 2A-2B-2C. *Recommended:* Chemistry 5; Mathematics 16C or 21C; Geology 3.

Upper Division Courses.—Required:

1) Biochemistry 101A-101B or Physiological Sciences 101A-101B.

2) Genetics 100A-100B or Genetics 115.

3) One of the following courses in Evolution: Zoology 148, Genetics 103, Geology 107 or 111A, Anthropology 151.

4) An additional 30 units of upper division courses in a biological science, of which at least 15 units must be taken in zoology. The 30 units must include a minimum of 12 quarter hours or 4 quarter units of laboratory, and must include at least one course or course sequence from four of the following five areas of study:

- a. Ecology and Behavior—Zoology 116, 117, 125, 147, 149, 155.
- b. Systematics, Morphology, and Natural History—Zoology 105, 106, 112A, 112B, 133, 133L, 136, 137.
- c. Cell Biology—Zoology 121A, 121B, 121L, 166; Botany 130, 130L.
- d. Developmental Biology—Zoology 100, 100L, 101, 102.
- e. Physiology—Zoology 142, 142L, 143, 165, 166; Physiology 110A-110B, 111A-111B.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Biological Sciences 1; Zoology 2; Bacteriology 2 (or 102) or Botany 2 or Physics 2C; Chemistry 1A-1B and 8A-8B; Mathematics 13 or 16A-16B; Physics 2A-2B. *Recommended:* Geology 3.

Upper Division Courses.—Required:

- 1) Genetics 100A-100B or Genetics 115.
- 2) One of the following courses in Evolution:

Zoology 148, Genetics 103, Geology 107 or 111A, Anthropology 151.

3) An additional 27 units of upper division courses in a biological science, of which at least 15 units must be taken in zoology. The 27 units must include one course or course sequence from three of the five areas of study listed under the B.S. degree program above. *Recommended:* Biochemistry 101A-101B or Physiological Sciences 101A-101B.

Students transferring to Davis from another institution and majoring in Zoology must consult their adviser immediately upon matriculation so that their transfer credits can be applied to the major requirements. All new students in the major should contact the Zoology Department Office for adviser assignment. A list of approved upper division courses for the Zoology major is available from the Department Office. Substitutions of other courses for major requirements are arranged through the adviser. Pre-professional students should establish contact with the Health Sciences Advising Office, in South Hall, to learn what specific courses are required on their transcripts.

Continuing students having declared, or who are changing to the Zoology major prior to this academic year should follow the requirements in effect at the time they enter the major. Adjustments to fit the new program however, may, be made on an individual basis with the advisers.

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 Credential.—Students planning for a teaching career should consult the Department of Education in regard to preparation for certification.

Physiology*Lower Division Courses***2. Introductory Physiology. (4) I.**

Lecture—4 hours. Prerequisite: Biological Sciences 1. Physiology of muscular contraction, nervous integration, sensation, circulation, respiration, excretion, and digestion. Jacobus

2L. Introductory Physiology Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 2 (completed or in progress). Jacobus

10. Elementary Physiology. (4) III.

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. Deamer

Zoology

Lower Division Courses

2. General Zoology. (6) I, II, III.

Lecture—3 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1 recommended. Survey of the diversity of animal life and the basic principles of adaptation, evolution, and integration in animals.

I. Stamps; II. Crowe; III. Phillips

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.)

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. (P/NP grading only.)

The Staff (Chairperson in charge)

Upper Division Courses

100. Embryology. (4) I, II, III.

Lecture—4 hours. Prerequisite: Biological Sciences 1; course 2. Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

I. Grey; II. Vacquier; III. Armstrong

100L. Laboratory in Vertebrate Embryology.

(2) I, II, III.

Laboratory—6 hours. Prerequisite: course 100 (concurrently). Comparative analysis of the embryonic development of vertebrates. Limited enrollment. (P/NP grading only.)

I. Grey; II. Vacquier; III. 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.

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.

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.

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.

Hildebrand

112A. Invertebrate Zoology. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Phylogeny, morphology, and embryology of the protozoa, the diploblastic animals, and the deuterostomatous invertebrates. Mulloney

112B. Invertebrate Zoology. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Phylogeny, morphology, and embryology of the protostomes.

Phillips

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.

Watt

117. Principles of Environmental Science. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course each in biological sciences and physical sciences. Principles basic to biological ecology, human ecology, and planning. (Same course as Environmental Studies 117.)

Watt

121A. Cell Biology. (3) I.

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.

Deamer

121B. Cell Biology. (3) II.

Lecture—3 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.

Wolfe

121L. Cell Biology Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 121A and/or 121B recommended. Exercises illustrating

the principles of cell biology; emphasis on individual research employing one or more advanced techniques. Deamer, Wolfe

125. Animal Ecology. (3) I.

Lecture—3 hours. Prerequisite: course 2. A general survey of the concepts of animal ecology. Salt

133. Biology of Cold-Blooded Vertebrates. (3) II.

Lecture—3 hours. Prerequisite: course 2. Adaptive and evolutionary significance of biological patterns of poikilothermous vertebrates. Jameson

133L. Systematics and Field Studies in Cold-Blooded Vertebrates. (3) III.

Laboratory—6 hours; field trips. Prerequisite: course 133 and consent of instructor. Systematic and faunal studies on poikilothermous vertebrates. 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. 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. Rudd

142. Invertebrate Physiology. (3) I.

Lecture—3 hours; extensive reading and research report. Prerequisite: either course 112A or 112B, Chemistry 1A, 1B, Physics 2B; Biochemistry 101A, 101B recommended. Comparative physiology of invertebrate organ systems. 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. Crowe

143. Neurobiology. (4) I.

Lecture—3 hours; assigned reading. Prerequisite: course 2 or Physiology 2; Biochemistry 101A-101B and Zoology 121A-121B recommended. Neurobiological basis of behavior; excitable tissues, signaling in nervous systems, sensory transduction, and production of ordered movement; organization of vertebrate and invertebrate nervous systems; synaptic transmission, facilitation and habituation; embryonic differentiation and regeneration of nervous systems. Mulloney

146. Conceptual Problems in the Biological Sciences. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: a major in a biological science, or one philosophy course. Nature of theories, explanations and models in biology. Problems in evolutionary theory and taxonomy. (Same course as Philosophy 108.) Shapiro

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. Jameson

148. Animal Phylogeny and Evolution. (5) II.

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. Rudd

149. Evolution of Ecological Systems. (4) II.

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. Coadaption in trophic and competitive relationships. Ecology of polymorphisms, clines, and speciation. 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. Stamps

165. Biology of the Vertebrate Heart. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101B (may be taken concurrently). Course integrates the specific subsections of the natural sciences which are related to the cardiovascular system. Comparative aspects will be stressed. Provides the student with a broad view of modern, multi-discipline information focused on a dynamic biological network. Jacobus

166. Advanced Cell Biology. (4) III.

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. Baskin

***167. Cellular Inheritance. (3) III.**

Lecture—3 hours. Prerequisite: Genetics 100B and course in cytology or cell biology. The morphol-

ogy and replication of cellular structures with partial or complete genetic autonomy, including chromosomes, mitochondria, chloroplasts, and centrioles. Possible evolutionary origins of the major cytoplasmic organelles. 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 (P/NP grading only.) The Staff (Chairperson in charge)

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Chairperson 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. (P/NP grading only.)

The Staff (Chairperson in charge)

Graduate Courses

201A. Ecological Theory. (3) II.

Lecture—3 hours. 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.) Salt, Major, Valentine

201B. Analysis of a Selected Ecosystem. (3) I.

Lecture—3 hours; one field trip—to be arranged. 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

201C. The Changing Biosphere. (3) III.

Lecture—3 hours. Prerequisite: graduate standing and course 201A 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

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. Watt

203. Global and Regional Modelling. (6) III.

Lecture—1 hour; discussion—1 hour; seminar—3 hours; laboratory—3 hours. Prerequisite: Mathematics 16A-16B; Mathematics 105A-105B or 131A-131B-131C; FORTRAN. Use of statistical analysis of data, mathematical modelling, and computer simulation of the world or regions to provide basis for policy recommendations and new legislation. Offered in even-numbered years. Watt

224. Developmental Biology. (3) III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. 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. Offered in odd-numbered years. Vacquier

225. Biology of Fertilization. (3) III.

Lecture—2 hours; term paper. Prerequisite: course 121A or the equivalent and consent of instructor. The morphology, physiology and biochemistry of gametes and the mechanism and consequences of their union. Offered in even-numbered years. Vacquier

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. Salt

236. Muscle Physiology. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: Biochemistry 101A-101B and Mathematics 16B or 21B; or consent of instructor. The physical and chemical aspects of muscle function. Baskin

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. Wolfe

266. Seminar in Cell Biology. (2) II.

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. 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.) Armstrong, 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. Stamps

292. Seminar in Development. (2) II.

Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms. Armstrong, Grey

293. Seminar in Invertebrate Zoology. (2) III.

Seminar—2 hours. Prerequisite: either course 112A or 112B, or consent of instructor. Critical re-

view of the literature in selected topics and taxa in the invertebrata. Open to qualified undergraduates. Crowe

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. Rudd, Salt

296. Seminar in Geographical Ecology. (2) I.

Seminar—2 hours. Prerequisite: course 125 or 148 or Genetics 103 or consent of instructor. Recent developments in theoretical and experimental biogeography, the biology of colonizing species, and related topics. Shapiro

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. Rudd

298. Group Study. (1-5) I, II, III.

The Staff (Chairperson in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.)

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Division of Extended Learning

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Office of Student Affairs

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