

U. C. DAVIS

1969-70

Durrell



**GENERAL CATALOG
UNIVERSITY OF CALIFORNIA, DAVIS**

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GENERAL CATALOG

Davis

**Fall, Winter, and Spring Quarters
1969–1970**



May, 1969

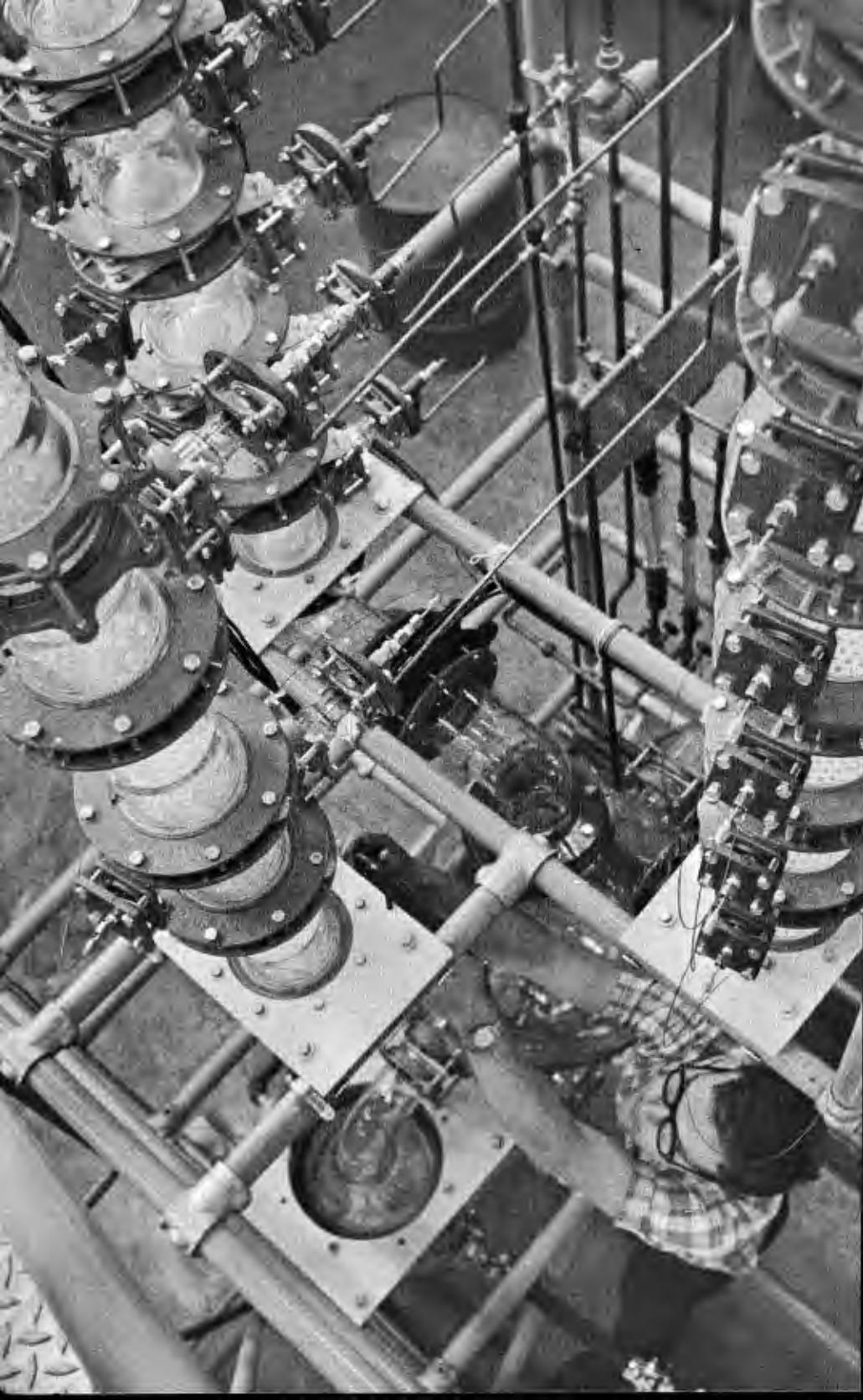
UNIVERSITY OF CALIFORNIA • DAVIS



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



UNIVERSITY CALENDAR

1969-70

Davis Campus

1

Pick up registration and course enrollment materials from Registrar's Office (all continuing students).

All continuing students obtain adviser's approval of preferred program.†

Turn in registration and course enrollment materials along with fee payments (all continuing students). Course enrollment requests may be returned prior to return of registration forms and fee payments. Course enrollment requests will be given priority in the order in which they are received and fees must be paid in order to validate class assignments.

Last day of late registration for continuing students.

Quarter begins.

Orientation and testing.

Registration in person.

Instruction begins.

File study lists by mail (continuing students only).

File study lists in person.

Last day of late registration.

Petitions to enroll or add courses to study lists must be filed with the Registrar's Office on or before this date.

Petitions to drop courses without scholarship penalty must be filed with the Registrar's Office on or before this date.

Petitions to take courses on a Passed or Not Passed basis must be filed in student's college or school on or before this date.

Fall 1969

May 19-23
Monday-Friday

May 21-23,
Wednesday-Friday

May 26-Aug. 15,
Monday-Friday

Aug 15,
Friday

Sept. 29,
Monday

Sept. 29-Oct. 4,
Monday-Saturday

Oct. 2-3,
Thursday-Friday

Oct. 6,
Monday

Oct. 6-14,
Monday-Tuesday

Oct. 15-17,
Wednesday-Friday

Oct. 17,
Friday

Oct. 17,
Friday

Nov. 7,
Friday

Nov. 7,
Friday

Winter 1970

Nov. 17-19,
Monday-Wednesday†

Nov. 18-19,
Tuesday-Wednesday†

Nov. 24-25,
Monday-Tuesday†

Feb. 24-26,
Tuesday-Thursday†

Feb. 25-26,
Wednesday-Thursday†

Feb. 27-Mar. 2,
Friday-Monday†

Mar. 31-Tuesday

Jan. 5, Monday

Jan. 5-6,
Monday-Tuesday

Jan. 5,
Monday

Jan. 16-20,
Friday-Tuesday*

Jan. 20,
Tuesday

Jan. 20,
Tuesday

Feb. 10,
Tuesday

Spring 1970 (Fall 1970)

Feb. 24-26,
Tuesday-Thursday†

Feb. 27-Mar. 2,
Friday-Monday†

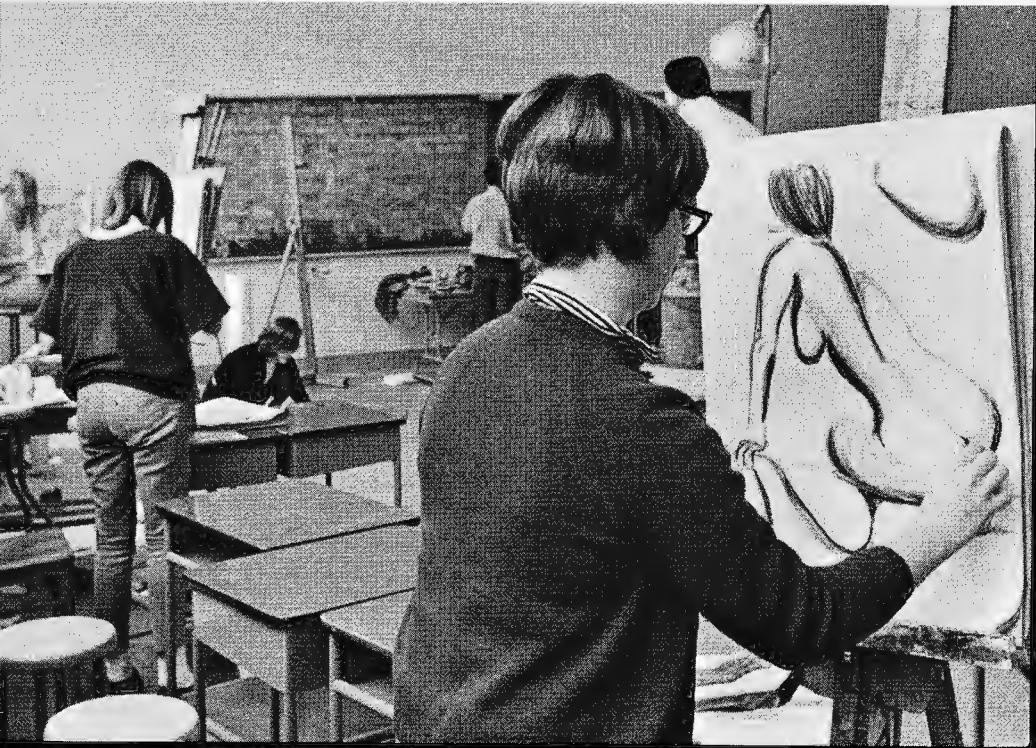
* Weekends and holidays excepted.

† Except students enrolled in College of Letters and Science and Schools of Law and Veterinary Medicine.

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

	Fall 1969	Winter 1970	Spring 1970	(Fall 1970)
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.	Mar. 1, Saturday	Nov. 1, Saturday	Feb. 1, Sunday	Mar. 1, Sunday (1970)
Credentials and applications for admission to graduate standing must be filed with the Dean of the Graduate Division on or before this date.	July 15, Tuesday	Nov. 14, Friday	Feb. 13, Friday	July 15, Wednesday (1970)
Applications for admission to the School of Medicine for 1970-71 must be filed with the School before this date.	Dec. 31, Wednesday	—	—	
Applications for admission to the School of Veterinary Medicine for 1970-71 must be filed with the Office of Admissions on or before this date.	—	Feb. 28, Saturday	—	
Applications for admission to the School of Law for 1970-71 must be filed with the School on or before this date.	—	—	May 1, Friday	
Applications for readmission to graduate status must be filed with the Registrar on or before this date.	Aug. 29, Friday	Dec. 5, Friday	Mar. 6, Friday	Aug. 28, Friday (1970)
Applications for readmission to undergraduate status must be filed with the Registrar on or before this date.	Sept. 8, Monday	Dec. 15, Monday	Mar. 10, Tuesday	
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. 17, Friday	Jan. 20, Tuesday	Apr. 15, Wednesday	
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. 9, Friday	Apr. 10, Friday	
Theses for masters' degrees must be filed with the committees in charge on or before this date.	Nov. 21, Friday	Feb. 20, Friday	May 15, Friday	
Theses for masters' degrees must be filed with the Dean of the Graduate Division on or before this date.	Dec. 19, Friday	Mar. 24, Tuesday	June 18, Tuesday	
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.	June 27, Friday	Oct. 17, Friday	Jan. 23, Friday	Apr. 17, Friday (1970)
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. 3, Friday	Jan. 9, Friday	Mar. 27, Friday	

	Fall 1969	Winter 1970	Spring 1970 (Fall 1970)
Theses for the degrees of Doctor of Philosophy and Doctor of Engineering must be filed with the Dean of the Graduate Division on or before this date.	Nov. 26, Wednesday	Feb. 27, Friday	May 22, Friday
Applications for fellowships and graduate scholarships for 1970-71 must be filed on or before this date.	—	Feb. 1, Sunday	—
Applications for 1970-71 undergraduate scholarships must be filed on or before this date.	—	Jan. 15, Thursday	—
Instruction ends.	Dec. 13, Saturday	Mar. 16, Monday	June 8, Monday
Final examinations.	Dec. 15-20, Monday-Saturday	Mar. 18-24, Wednesday-Tuesday	June 10-16, Wednesday-Tuesday
Quarter ends.	Dec. 20, Saturday	Mar. 24, Tuesday	June 16, Tuesday
Academic and administrative holidays.	Nov. 27-28, Thursday-Friday	—	May 30, Saturday
	Dec. 25-26, Thursday-Friday	Feb. 23, Monday	—
	Jan. 1-2, Thursday-Friday	Mar. 27, Friday	—
Commencement.	—	—	June 17, Wednesday



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... *The campus will preserve the tone of its nonurban traditions; the spirit of service, and of involvement and integration of each of its units with every other unit. Its students and its facilities will strive to maintain its traditional atmosphere of closeness and friendliness.*

—UCD Long-Range Development Plan

Davis Campus

The University of California is a publicly supported institution of higher learning dedicated to the tasks of increasing and disseminating knowledge primarily through teaching and research. The University is committed to academic excellence. Therefore, it is essential that all members of the University community qualify for their roles by superior preparation, intellectual curiosity, freedom from prejudice, and a desire to contribute to human progress.

A spirit of service and an atmosphere of closeness and friendliness accompany the commitment to academic excellence on the Davis campus. They grew naturally from the first days of regular instruction in 1909, when the student body consisted of twenty-eight young men who wanted to become efficient farmers.

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

The need for greater educational opportunities in the state increased rapidly, and in 1922, in conjunction with the Berkeley College of Agriculture, the degree of Bachelor of Science in Agriculture was granted. A few years later the Davis campus had its own College of Agriculture. In 1946 the School of Veterinary Medicine was established. Meanwhile, from 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.

Adding to the breadth of the campus and strengthening its research capacities for serving the people of California are the National Center for Primate Biology, the Radiobiology Laboratory, the Institute of Governmental Affairs, the Agri-

cultural History Center, the International Agricultural Center, the Crocker Nuclear Laboratory, the Computer Center, the Arboretum, the Laboratory for Research in Fine Arts and Museology, and the Center for Administration of Criminal Justice.

Although the face of the campus is constantly changing to accommodate the increasing student population, long-range building plans envision the preservation of features that give Davis its particular character. The Quadrangle, traditional focus of campus activity, will continue to be the center of academic life, with the Library to the south and the Memorial Union complex extending the length of its north side. The cork oaks surrounding the Quad are an enduring part of the landscape, as is the plane tree court, where Commencement exercises were once held. Today the court is enclosed by the expanding Library building, providing a spacious open-air retreat, easily accessible from the general reading rooms of the Library.

The Library completed another stage in its expansion in 1966 increasing its book capacity and seating space. Between it and Olson Hall, in the southeast corner of the quad, is a new pedestrian walkway-bicycle pathway designed to handle the traffic and complement the Quadrangle landscaping. Behind the Library is the new Fine Arts Complex housing the Music, Art, and Dramatic Art departments. This complex adds a concert room with pipe organ and set-ups for electronic music, two small theatre labs, and a large Main Theatre to the campus cultural facilities. These, together with Wyatt-Pavilion Theatre—an Elizabethan theatre beside Putah Creek, and Freeborn Hall—an assembly hall in the Memorial Union complex, give the campus an opportunity to provide cultural leadership to the Sacramento Valley, a goal set forth for the campus in the Long-Range Development Plan.

In pursuit of this aim, concerts, lectures, plays, films, and art exhibits have long been provided on campus. A number of distinguished artists have been guests of the University, remaining in residence for a quarter or more as performers, lecturers, and consultants. The Department of Dramatic Art is now sponsoring the fourth season of the Professional Resident Theatre, a program under which professional actors take part in campus productions and participate in acting and directing workshops. The Music Department frequently has guest composers and performers in residence and has become an internationally known center for *avant-garde* music. The Art Department, as well as the Music Department, adds well known artists to its distinguished faculty. The Memorial Union sponsors art exhibits and shows travelling art collections in its fourth floor main gallery, its second floor reading and music listening rooms, and its main floor exhibit space.

In the continued expansion of the campus, attention will be given to strengthening new colleges and schools, preserving the excellence of established ones, and providing for the changing needs of students and the state. Educational innovation, physical expansion, and the preservation of traditions will mark our future growth.

THE HONOR SPIRIT

A long-time tradition on the Davis campus, the Honor Spirit is most evident at examination time, when there are no proctors in the classrooms and students are relied on to do their own work.

But the Honor Spirit is not limited to student behavior during examinations. According to its code, the responsibility for good conduct rests with the individual student; this attitude pervades all student activities. It is largely responsible for the atmosphere of mutual respect and confidence that exists between students and faculty, as well as among the students themselves.

UNIVERSITY LIBRARY

The Library on the Davis campus contains about 730,000 volumes and annually receives 20,000 current periodicals and serials including government publications. Its holdings in the natural sciences and agriculture are outstanding, and collections in the humanities, social sciences, fine arts, engineering, law, and medicine are being rapidly developed. In addition to the main library, there are branch libraries for health sciences, physical sciences, and agricultural economics; a law library; and several specialized departmental collections.

To accommodate the rapidly growing collection and satisfy the need for additional reading space, a wing was added to the General Library in 1964, and a second wing, completed in 1967, doubles the space available for books and readers. Plans for development anticipate 900,000 volumes by 1970.

The Library is operated on the "open stack" principle, permitting direct access to volumes shelved there. The Reference Department provides orientation and assistance in using the collection. In addition to the main stack collection, there are a number of special collections, including a Bibliographic Center collection, over 420,000 items on various forms of microscopy, some 20,500 maps, more than 100,000 pamphlets, a number of speech and music phonorecords, about 300,000 items in the F. Hal Higgins Library of Agricultural Technology, and a rare book collection of 12,000 volumes.

The Government Documents Department provides service for readers requiring use of government publications. The Library is an official depository for United States government publications, for all publications of the State of California, for the Atomic Energy Commission (which has made available over 126,000 unclassified publications of great value to scientific research) and for the National Aeronautics and Space Administration unpublished research reports.

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 over 4,500 currently received, unbound titles of periodicals in a closed stack area. They are available for use only in the Library. A coin-operated copying machine in the Periodicals stack area can supply facsimiles of articles for \$.05 per exposure.

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

The Library provides its users with a series of information leaflets explaining in more detail the various aspects of its services and resources.

EDUCATION ABROAD PROGRAM

The Education Abroad Program offers outstanding students the opportunity to study overseas. The primary purpose of the program is to provide a sound academic experience in a different educational system. Through this study experience the student is able to become involved in the language and culture of the host country.

For the 1969-1970 academic year study centers will continue to operate in the United Kingdom, Japan, Scandinavia, Hong Kong, France, Lebanon, Germany, Italy, Israel, Ireland, Spain, and Mexico. The program will also include new centers in Kenya, Ghana, and an additional specialized program in Paris. The programs in Mexico City and in Paris are specially designed for individuals working toward a teaching credential who wish to teach Spanish or French.

The Education Abroad Program, centrally administered from the Santa Barbara campus, is open to both undergraduates and graduate students in the University. Eligibility requirements for undergraduate students include: junior standing by the time of participation in the program, a B average in the language of the country in which they wish to study if language competency is required, and the ability to successfully adapt to a new culture. Graduate students are eligible for consideration 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 acquire the endorsement of the Education Abroad Selection Committee on the Davis campus.

Participants spend a minimum of nine months abroad in the program. The first part of the program is usually devoted to intensive language preparation and orientation. Full academic credit is granted for course work successfully completed. The centers are administered overseas by University of California faculty members who assist students in meeting their education objectives and help with living arrangements and personal problems. Minimum costs for the program range from approximately \$2,100 to close to \$3,000 for the study centers in Africa. More detailed information on the Education Abroad Program as well as application forms are available from the Office of International Student Services, 109 North Hall.

SUMMER SESSIONS

In 1969 there will be two regular six-week Summer Sessions beginning on June 16 and on July 28. 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. A substantial offering of upper division and graduate courses of interest to teachers and teacher candidates will also be provided, 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, courses in the 198-199 and 298-299 series, advanced special study and research, will be available for qualified students in many departments.

Summer Sessions will also be conducted on the Irvine, Los Angeles, Riverside, Santa Barbara, and Santa Cruz campuses. Information about these summer sessions is available in the Summer Sessions bulletins, obtainable from the Admissions Office, or from the Office of the Summer Sessions on the respective campuses.

Announcements concerning Summer Sessions in 1970 will be issued by the Registrar and the Office of Summer Sessions.

UNIVERSITY EXTENSION

By a variety of methods the University of California Extension makes the resources of the University available to individuals and organizations throughout the state. Its aims are the intellectual and cultural development of adults; the dissemination of new knowledge resulting from teaching and research within the University; continuing professional, scientific, and technical training; development of special educational programs for public and private organizations; and education in public affairs.

Veterans may use educational benefits available to them under Federal and State laws to enroll in University Extension classes, provided the classes are part of their prescribed and recognized objectives approved by the Veterans Administration.

Detailed information is available at the Extension office on any campus of the University or at the following additional locations: 1100 South Grand Avenue, Los Angeles 90015, Tel: (213) 749-2041; 55 Laguna Street, San Francisco 94102, Tel: (415) 861-6833.

FOREIGN LANGUAGE TRAINING

Research and field work overseas may be facilitated by oral proficiency training in any of twenty-eight languages taught at the Defense Language Institute at the Presidio of Monterey. This unique program is available on a limited basis to University graduate students and faculty. Application forms and additional information may be obtained from the Secretary, University of California Language Training Advisory Committee, University of California, Santa Cruz, California 95060, or by phoning the Santa Cruz campus, (408) 429-2888.

THE STATEWIDE UNIVERSITY

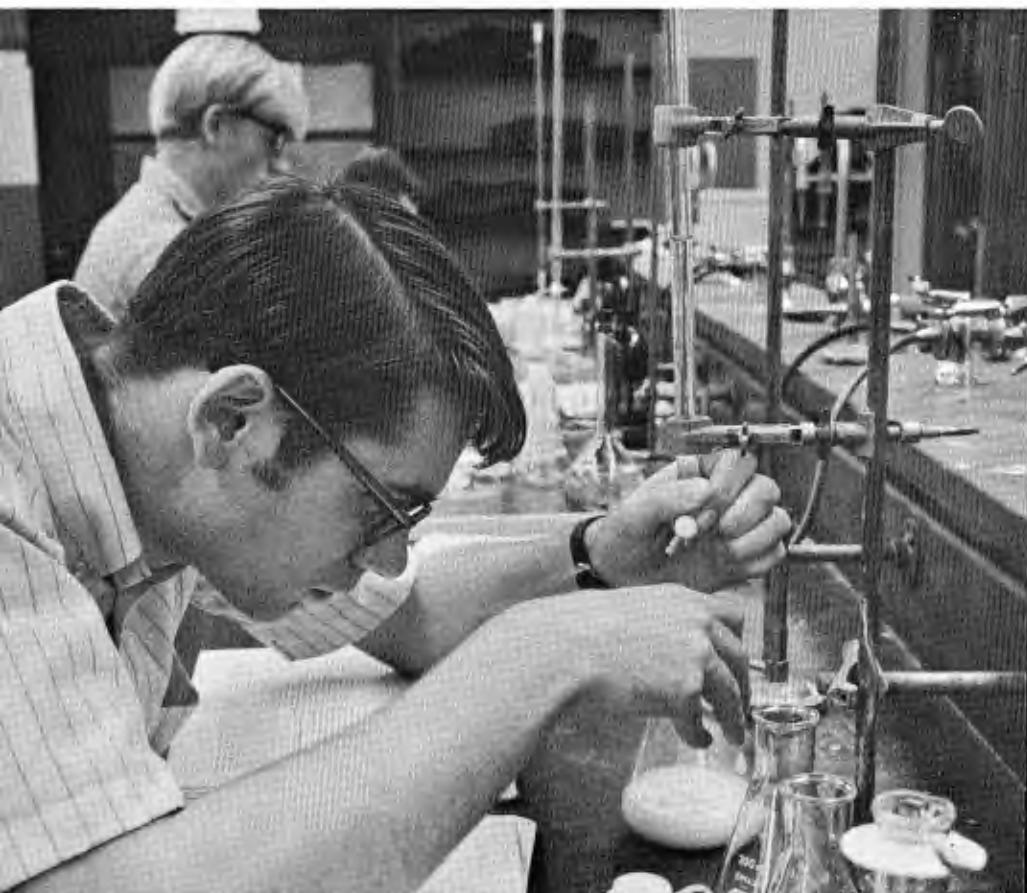
The University of California had its beginnings in 1868, with the Governor's signing of the Organic Act passed by the State Legislature. The following year the University opened its doors on the Oakland campus of the College of Cali-

fornia. Five years later the University moved to Berkeley, when the first buildings were completed.

Today the University has nine campuses to serve the State of California. Davis continues to be the center for agricultural teaching and research. The other campuses are Berkeley, 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 University-wide officer is the president. The government of the University is entrusted to a corporation called The Regents of the University of California. There are twenty-four Regents: sixteen are appointed by the Governor; the others, including the President of the University, serve *ex officio*. An Academic Senate governs the academic activities of the University; it is composed of the president, chancellors, vice-chancellors, vice-presidents, deans, directors, registrars, librarians, and all professors and instructors responsible for courses.

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



Admission and Registration

The admission requirements of the University of California are uniform on all its campuses and are based on two assumptions: first, that the best assurance of success in the University is shown by high quality of scholarship in previous work; and second, that the study of certain specified subjects will give the student good preparation for University work.

Admission to the University qualifies the student to attend the campus of his choice within the limits of curricular offerings and student capacity.

ADMISSION TO FRESHMAN STANDING

An applicant for admission to freshman standing must meet the requirements listed below. Special requirements for nonresident applicants will be found on page 19.

GRADUATION FROM HIGH SCHOOL

SUBJECT REQUIREMENTS

Courses offered in satisfaction of the following requirements must appear on a list certified by the high school principal as meeting the subject requirements and be approved by the Director of Admissions of the University of California.

a. History, 1 unit

This consists of 1 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

These consist of 6 semesters of English composition, literature, or oral expression.

c. Mathematics, 2 units

These consist of 2 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 are excluded.

d. Laboratory Science, 1 unit

This consists of an eleventh- or twelfth-grade year course in one laboratory science. Both semesters must be in the same subject field.

e. Foreign Language, 2 units

These must be in one language. Any foreign language with a written literature is acceptable.

f. Advanced course, 1 (or 2) unit

This is to be chosen from the following:

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

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

Science, 1 unit of either chemistry or physics in addition to the science offered under *d*.

Electives

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

EXAMINATION REQUIREMENT

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

College Entrance Examination Board Scholastic Aptitude Test and 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. 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.

The tests should be taken after completion of the first half of the eleventh grade. The first repetition of a test will be accepted, but the verbal and mathematics scores on the Scholastic Aptitude Test must be from the same sitting.

Examination Arrangements

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

Arrangements to take the tests should be made with the Educational Testing Service, P.O. Box 1025, Berkeley, California 94701, or P.O. Box 592, Princeton, New Jersey 08540. The fees are to be paid to the Educational Testing Service. Scores will be regarded as official only if they are received by the Office of Admissions directly from the Educational Testing Service.

SCHOLARSHIP REQUIREMENTS

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

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

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

ADMISSION BY EXAMINATION ALONE

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

College Entrance Examination Board Scholastic Aptitude Test and three Achievement Tests:

- a. English composition
- b. One in either social science or foreign language
- c. One in either mathematics or science

Arrangements to take the tests should be made with the Educational Testing Service, P. O. Box 1025, Berkeley, California 94701, or P. O. Box 592, Princeton, New Jersey 08540. The fees are to be paid to the Educational Testing Service. Scores will be regarded as official only if they are received by the Office of Admissions directly from the Educational Testing Service. Applicants should arrange to take the tests as early as possible so that the scores can be reported in time for consideration.

The tests may be taken at different times. To improve a score, a test may be repeated *once*, and the score earned on the repetition will be accepted; however, the scores earned on the Scholastic Aptitude Test, which has two parts, must come from the same sitting. 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.

REQUIREMENTS FOR OUT-OF-STATE 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 same subject pattern as for a California resident is required (see page 17).

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 tenth, eleventh, and twelfth years.

EXAMINATION REQUIREMENT

A nonresident applicant must take the same College Entrance Examination Board tests as those required of a resident applicant (see page 18). The test scores submitted will be used for the purposes of counseling, guidance, placement, and, when possible, in satisfaction of the Subject A requirement.

ADMISSION BY EXAMINATION ALONE

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

High School Preparatory Subjects

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

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

ADMISSION TO ADVANCED UNDERGRADUATE STANDING

Applicants who have registered since high school graduation in any collegiate institution, including junior colleges, summer school, or extension courses, must apply for admission to advanced standing. An applicant may *not* disregard his previous college record and apply as a freshman. However, an advanced standing applicant who has earned less than twelve units of college credit subsequent to high school graduation must satisfy the examination requirement for freshman applicants as described on page 18.

Regulations applying to admission to advanced standing are as follows:

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

tion requirement described on page 18 may be disregarded in determining eligibility for freshman standing.

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

3. Those *ineligible* for admission from high school because of grade-point deficiency may establish eligibility by taking, at an accredited college, a minimum of 56 acceptable semester units (or 84 quarter credits), with an average of 2.4 or better (2.8 for nonresidents).

4. Subject deficiencies of not more than 2 units may be waived for those who present the 56 or more semester units (or 84 quarter credits) and the 2.4 grade-point average mentioned above (2.8 for nonresidents). Deficiencies in excess of 2 units must be satisfied.

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 public junior colleges of the state. Frequently, students who intend to complete their advanced studies at the University will find it to their advantage to complete the first two years of the college work in a California public junior college. After a student has earned 105 quarter units (70 semester units) acceptable toward a degree, no further units will be granted for courses completed at a junior college, although subject credit may still be earned.

The acceptability of extension courses taken at an institution other than the University is decided 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 at least 3, 4, or 5 on both essay and objective sections of the tests.

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 23). Doing so will allow time for exchange of necessary correspondence and, if the applicant is admitted, will help him in obtaining the necessary passport visa.

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

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

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

REQUIREMENTS FOR ADMISSION TO GRADUATE STANDING

See page 155 or the *Announcement of the Graduate Division*.

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 assigned 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. They may also be required to take the examination in Subject A.

Special Status

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

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

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

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

Limited Status

Students in limited status are those with a bachelor's degree who are not candidates for an advanced degree, or those without a bachelor's degree who have completed a substantial amount of college work with a satisfactory scholar-

ship 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.

Applicants for a Second Bachelor's Degree

The second bachelor's degree is limited to students who have completely changed their objective. Those admitted to this status 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.

APPLICATION PROCEDURES

Applicants are expected to study the admission requirements (starting on page 17) to determine as closely as possible their eligibility before following the steps outlined below. Application should be directed to only one campus of the University.

Freshman Standing

1. Application Form

An application for admission is obtained by writing the Office of Admissions, University of California, Davis, California 95616. Applicants are urged to write early in the appropriate period as follows:

1970 Winter Quarter (begins January 5):

May 1, 1969 through November 1, 1969

1970 Spring Quarter (begins March 31):

August 1, 1969 through February 1, 1970

1970 Fall Quarter (begins September 28):

October 1, 1969 through March 1, 1970.

2. Application Fee

The completed application form accompanied by a \$10 nonrefundable application fee should be returned to the Office of Admissions as promptly as possible. (The application fee should be in the form of a check or money order made out to The Regents of the University of California.) An application received without the \$10 fee will be returned to the applicant.

3. Transcript of Record

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

Students still in high school should request the school to send directly to the Office of Admissions an official transcript of all work completed through the junior year and a list of courses in progress during the final two semesters. A complete and final transcript, including a statement of high school graduation

must be submitted for each applicant by the high school from which he graduated. Any additional schools attended after an application for admission has been filed 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 are not returnable.

4. Notification of Eligibility

Applicants will be notified of eligibility in order of date of application providing appropriate transcripts are on file. A delay will occur if required documents or fees have not been received. Applicants will be notified of their eligibility status as soon as their records have been evaluated.

5. "Statement of Intention to Register" Form

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

6. Smallpox Vaccination Certificate

During the registration period every new student and every student returning to the University after an absence of one or more quarters must present at the time of examination by the University medical examiners, a certificate establishing the fact that he has been successfully vaccinated against smallpox within the last three years. A form for this purpose is routinely sent to all new students.

7. Change of Campus

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

8. Reapplication

An applicant who is not eligible for admission, or one who has been admitted but does not register in the quarter for which he applied and who later desires to attend the University, must submit a new application for admission with the \$10 fee. The new application will be acted upon in light of the current availability of facilities and current admission requirements.

Advanced Undergraduate Standing

Applicants for admission to advanced undergraduate standing should follow all steps outlined above 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.

Intercampus Transfer

An undergraduate student who is registered on any campus of the University, or who was previously registered in a regular session of the University and has not since been registered in another institution may apply for transfer to another campus of the University by filing the proper forms *on the campus where he last registered*. The intercampus transfer application forms and application for transcript of record forms may be obtained from the Office of the Registrar and must be filed with that office by November 1, 1969, for the 1970 winter term, by February 1, 1970, for the 1970 spring term, and by March 1, 1970, for the 1970 fall term. There is a fee of \$10 at the time of filing.

Graduate Standing

An application form and information are obtained by writing directly to the Office of the Graduate Division, Room 252, Administration Building, University of California, Davis 95616.

Professional Schools

School of Law

The requirements for admission to the School of Law are described on page 137. 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 141. 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 147. More detailed information may be obtained by writing the School of Veterinary Medicine, University of California, Davis 95616. The application form may be obtained from the Office of Admissions, University of California, Davis 95616.

GENERAL REGISTRATION PROCEDURE

All students must complete the necessary 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 *Schedule and Directory* available from the campus Student Bookstore and the Information Desk in the lobby of the Administration Building 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 with the faculty adviser, when necessary or required of a student, a study program of courses in accordance with the following regulations, and obtaining the adviser's signature on the Study List Card, when required according to instructions issued at the time of filing.

a. Entering students must enroll in the Subject A course if they have not satisfied this requirement (see page 32).

b. Students who wish to continue a foreign language studied only in high school will take a placement test to determine the appropriate level of language ability for proper placement in class (see page 128).

c. Entering students will be given the American History and Institutions Examination at the beginning of the quarter in which they enroll (see page 32).

d. Maximum and minimum limits are placed on the number of units 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. All students participating in student and intercollegiate activities must carry this minimum number of units.

3. Paying the prescribed fees (see page 35).

For all nonimmigrant international students, the Associated Students Supplementary Health Insurance program is required (see page 45).

4. Passing a physical examination given by the University Medical Examiners (see page 45).

5. Submitting a Statement of Residence. This is required of all new and returning students, including new graduate students who may have been registered previously as Davis campus undergraduates, and those whose residency status has changed recently (see page 33).

6. Familiarizing themselves with the requirements of their particular college or school.

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

ADDING OR DROPPING COURSES

Adding or dropping courses after the registration materials have been submitted to the Registrar requires the approval of the adviser and the appropriate dean on a petition which is subsequently presented to the Registrar. Since this entails a considerable amount of work for everyone, students are encouraged to keep these requests to a minimum by determining from the instructor as early as possible the nature of the course requirements such as the number of term papers required, examinations, reading lists, etc. The student's appreciation of this problem will be of great help.

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.

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 may be obtained from the Registrar's Office.

It is also important that any student who has been receiving veterans benefits and those who have been deferred by Selective Service because of registration in the University, report immediately to the Dean of Students Office or write regarding any change of status.

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 \$10 fee. Official transcripts of all work attempted in the interim must be submitted. Final dates for filing for readmission are listed on page 6.

RULES GOVERNING RESIDENCE

The residence classification of each student is determined in accordance with Section 244 of the California Government Code, Sections 23054, 23055; and 23057 of the California Education Code; and the Standing Orders of the Regents. It is therein provided that a resident student is any person who has been a legal resident of the State of California for more than one year immediately preceding the opening day of the quarter during which he proposes to enroll.

The attention of the prospective student who is not a citizen is directed to the fact that he is a nonresident unless, in addition to the general California residence requirements for tuition purposes, he has been admitted to the United States for permanent residence in accordance with all applicable laws of the United States. The attention of the prospective student who has not attained the age of 22 and whose parents are not California residents, and the attention of the veteran who was not a resident of California at the time of his entrance into the Armed Forces, is directed to the fact that presence in California for more than one year does not, of itself, entitle the student to classification as a resident.

A person incorrectly classified as a resident student is subject to reclassification as a nonresident. If the incorrect classification resulted from concealed facts or untruthful statements made by him, the student then shall be required to pay all tuition fees which would have been charged to him as a nonresident student. He shall be subject also to such discipline as the President of the University may approve.

Every student who is classified as a resident but who becomes a nonresident of California is obliged to notify the Registrar at once.

The final determination of the eligibility of a student to register as a resident will be made by the Attorney in Residence Matters, 590 University Hall, University of California, Berkeley, California 94704 or by his deputy in the Registrar's office. Application for a change in classification with respect to a previous quarter will not be received under any circumstances.

Students classified as nonresidents are required to pay a tuition fee of \$400 each quarter. This fee is in addition to the incidental fee. (Exemption from payment of the nonresident tuition fee may be granted to an unmarried minor whose parent is in the active military service of the United States and is stationed in California on the opening day of the quarter during which the minor proposes to attend the University. It is the responsibility of the student to file official verification of this fact from the parent's commanding officer. This verification should be addressed to the Registrar and filed when the student declares residency.)



Scholastic Requirements

EVALUATIONS

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

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

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

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

Passed (P) or Not Passed (NP); Subject to regulation by the faculties of the various colleges and schools, a student in good standing is authorized to undertake one course each term (on the average) on a *Passed* or *Not Passed* basis. Units thus earned shall 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.

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 grades. A student electing such a course may do so in addition to using *his* Passed-Not Passed options.

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

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

$$A = 4; B = 3; C = 2; D = 1; I \text{ and } F = 0.$$

All grades except I are final when filed by an instructor in his end-of-term course report. No final grade except I may be revised by re-examination. A student may repeat only those courses in which he has received a grade of D or F.

Except as authorized by the appropriate dean, no student may repeat more than once a course in which he has received a grade of D, F, or Not Passed. For the first 16 units, repeated work for an undergraduate student will receive only the most recently earned grade and grade points. Thereafter the student will receive the grade assigned and the corresponding grade points earned for each time he takes the class. However, when a course is repeated, the units completed shall be credited toward a degree only once.

The QUANTITY of work attempted by the student is measured in quarter units (see page 163) which are assigned by the faculty for each individual course. To convert these units to semester units they should be multiplied by $\frac{2}{3}$; from semester to quarter units by $\frac{3}{2}$.

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

SCHOLASTIC DEFICIENCIES

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

Probation. A student shall be placed on probation if at the end of the term his grade-point average is less than C (2.0) computed on the total of all courses undertaken in the University, including courses graded I (incomplete).

To be removed from probationary status, a student must achieve an overall grade-point average of at least C (2.0) on all work attempted in the University of California, including courses graded I (incomplete).

Dismissal. A student shall be subject to dismissal from the University if:

- a. His grade-point average falls below 1.5 for any term, or
- b. After one term on probation he has not achieved an overall grade-point average of at least C (2.0) on all work attempted in the University of California, including courses graded I (incomplete).

The School of Veterinary Medicine has the following provisions:

Probation. A student shall be placed on probation if at the close of his first term in the School of Veterinary Medicine his record for that term falls below a C average, computed on the total of all courses taken in the veterinary medical curriculum.

Dismissal. A student shall be subject to dismissal from the School of Veterinary Medicine:

- a. If at the end of any term subsequent to his first he has failed to maintain a grade-point average of 2.0 (a C average), computed on the total of all courses taken in the veterinary medical curriculum, subsequent to his admission to the School, for which he has received a final report; or
- b. If during any term he fails to pass with a grade of C or higher courses totaling at least 4 units; or
- c. If at any time he has, in the judgment of the faculty of the School, failed to meet the professional and ethical standards of the profession of veterinary medicine.

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

- a. Dismiss such a student from the University, or
- b. Suspend his dismissal, continuing him on probation.

The faculty of his school or college is also the body which may authorize the return on probation of a dismissed 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 dismissed or is on probation must obtain the approval of the dean whose jurisdiction he is seeking. After making the transfer, the student is subject to supervision by the faculty of the new college, school or campus.

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

TRANSCRIPTS OF RECORD

Upon written request to the Office of the Registrar, a student will be provided with an official transcript of work he has completed at the Davis campus of the University of California. Transcripts of work completed at any other University campus or any other institution must be requested directly from the school concerned. University Extension transcripts must be requested from the University Extension Office, University of California, Berkeley, California 94720.

A fee of \$1 per copy of each graduate and each undergraduate record should accompany each request. Graduate and undergraduate transcripts are individual records and must be requested separately.

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

MID-TERM GRADE STANDING

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

FINAL EXAMINATIONS

The *Schedule and Directory* lists the final examination groups. 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 as follows:

a. They are not normally required in laboratory courses or their equivalent; however, a department, at its option, may require a final examination in any laboratory course if prior announcement has been made in the *Schedule and Directory*.

b. Final examinations may be omitted in any undergraduate course with the approval of the appropriate committee on courses and upon recommendation of the department concerned.

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

Under certain prescribed conditions a student may receive Credit by Examination without formal enrollment in a course. The rules governing such examinations may be obtained from the Registrar.

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

GRADUATION REQUIREMENTS

Three groups of requirements must be satisfied before the student can become eligible for candidacy for the bachelor's degree. They are: 1) college or school

requirements; 2) individual departmental requirements, which are all specific and vary as to particulars; and 3) the University requirements, which are general and apply to all schools and colleges. For information on college, school, or departmental requirements see the appropriate section of this catalog.

The University requirements are as follows:

Subject A: English Composition

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

1. By achieving a grade of 5, 4, or 3 in the College Entrance Examination Board (CEEB) Advanced Placement Examination in English, *or*
2. By achieving a score of 550 or higher in the CEEB Achievement Test in English Composition, *or*
3. By entering the University with credentials showing the completion of an acceptable college-level course in English composition with a grade of C or better.

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.

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

American History and Institutions

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

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

1. By passing a special examination in American History and Institutions. No unit credit is given for completing this requirement by examination. This examination is given to all entering students, freshmen and transfers, who have not already fulfilled the requirement. The exam is given at the start of each quarter. Students attending the University before the exam was mandatory may also take it, but it can only be taken once.

2. By completing any two of the following courses: History 17A, 17B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 176A, 176B, 178A, 178B, 179A, 179B, 180, 183A, 183B; Political Science 1A, 1B, 100, 102, 103A, 103B, 104, 105, 106, 113, 128A, 128B, 163, 164, 166; Economics 111. Students taking these courses are subject to the rules that apply for prerequisites and majors. Upper division history courses may be taken to satisfy the requirement only with the permission of the instructor. Other courses not on the list

may be used to satisfy the requirement, but approval must be obtained from the Requirements Supervisor (see below).

3. By presenting evidence that the requirement has been satisfied at another collegiate institution through equivalent courses 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.

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

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

Residence Requirement

The minimum residence requirement for a bachelor's degree at the University of California is one academic year. Each summer session in which a student completes a course of at least 3 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 the 35 quarter units may be completed in summer session courses on the campus of residence.

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

Scholarship Requirement

To receive a bachelor's degree, except for Juris Doctor, a student must obtain twice as many grade points as units for all courses attempted by him in the University. An exception to this rule is authorized for honors students undertaking certain courses (see "Credit by Examination" page 31).

Unit Requirement

Every candidate will normally 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 a degree must file an Announcement of Candidacy with the Registrar at the beginning of the quarter in which he plans to receive it. The dates for filing are published on pages 5-7 of this catalog and in the *Schedule and Directory*.

HONORS AND PRIZES

Honors at Entrance

All entering freshmen are considered for Honors at Entrance on the basis of outstanding scholarship achieved in high school. Certificates are presented to the honors recipients shortly after registration in the University.

Deans' Honors List

The names of all students, with the exception of Letters and Science students (see page 133), who have completed a minimum of 12 units of work on the Davis campus and who have achieved a 3.0 grade-point average or better in all work undertaken in the University and in the college will be listed by the various deans and submitted to the Registrar for publication in the *Student Directory* the following quarter. Students achieving this distinction have the privilege of credit by examination.

Honors students may request credit by examination in courses without formally enrolling in them, or in subjects appropriate to their curriculum but not offered as courses in the University. Arrangements should be made with the dean, and his approval and that of the instructor appointed to give the examination are necessary before the examination can be given. Application forms for such examinations may be obtained from the Registrar.

Graduation Honors

Graduating students may qualify for honors, high honors, or highest honors. The names of recipients are published in the commencement program and the appropriate notation is made on their diploma and on their permanent record in the Registrar's Office.

Prizes

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



Student Expenses, Housing, and Financial Aids

FINANCIAL AIDS PROGRAM Introduction

4

The primary purpose of the Financial Aids Program at Davis is to provide financial assistance and advice to students who would be unable to pursue their education at the University without such help. In addition to budgetary advice and counsel, financial assistance consists of scholarships, grants, loans, and employment—offered singly or in various combinations—to meet the difference between the student's resources and the cost of attending the University.

The University expects parents to make a maximum effort to assist their sons and daughters with college expenses. The student's desire to be independent of his parents and 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 summer employment. The financial assistance given by the University should be viewed only as supplementary to the resources of the applicant and his family. These premises are assumed in determining the type and amount of assistance necessary to meet the student's financial deficit.

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

EXPENSES

Legal residents of California are not required to pay tuition at the University. (Students classified as nonresidents must pay a tuition of \$1,200 per year.) Nevertheless, there are certain other expenses that have to be considered. Although each student must determine his own budget in keeping with his needs and resources, the following approximated costs are presented as a guide:

	<i>Quarterly</i>	<i>Annually (3 Quarters)</i>
Registration (includes the University registration fee \$100.00, Memorial Union fee \$3.50, and Student body membership \$5.00)	\$ 108.50	\$ 325.50
Room and board	400.00	1,200.00
Books and supplies	55.00	165.00
Miscellaneous (includes travel, health insurance, laundry and clothing, recreation, medical and		

Registration (Cont.)	<i>Quarterly</i>	<i>(3 Quarters)</i>
dental care, campus parking permit for car, and toiletries.)	175.00	525.00
Total for California Residents	\$ 738.50	\$2,215.50
Tuition for nonresidents	400.00	1,200.00
Total for nonresidents	1,138.50	\$3,415.50
Subject A (if needed)	45.00	

The costs listed above are average costs and fees are subject to revision.

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

Refunds. For students who withdraw with official approval before the end of any quarter, part of the fees enumerated above may be refunded. A schedule of refunds and other information will be found in the circular *Student Fees and Deposits*, obtainable from the Registrar.

APPLICATION PROCEDURE

Application forms may be obtained from the Office of Financial Aids, South Hall, University of California, Davis, California 95616.

Application Form. To facilitate the granting of monies to students, one application form has been developed to handle all of the undergraduate scholarships, loans, grants, and Work-Study jobs administered by the Davis campus.

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

Thus, a student applicant is first considered for a scholarship, and then is automatically considered for a grant, a loan, and/or a job until the student's financial need (the difference between student and family resources and the cost of attending the University) has been met.

A Parents' Confidential Statement must accompany the student's personal and budget information page in order for the application to be complete and to permit an evaluation of need. The Parents' Confidential Statement form may be obtained from the high school or college and must be sent to the College Scholarship Service, P.O. Box 1025, Berkeley, California 94701 for evaluation at least one month before the deadline stated below.

Application Deadline. Applications are available in November for the following academic year. In order to be given consideration for a scholarship, the application must be received by the Financial Aids Office no later than January 15.

For other types of financial assistance (loans, jobs, grants) applications must be received no later than

April 15—for continuing students

June 1—for entering students

Applications submitted after these dates will be considered only as funds become available.

Notification of awards will be made to students by

April 30—for scholarships

August 15—for other types of financial aid (loans, jobs, grants).

SCHOLARSHIPS

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

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

The term of appointment is four years for students entering from high school (three and one-half years for midyear entrants who will have completed one semester of college work) and two years for students appointed on completion of the sophomore year. Regents Scholars are expected to maintain at least a "B" average in course work undertaken at the University.

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

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

University, Alumni, Endowed, and Agency Scholarships

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

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

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

Normally, scholarships are awarded for one year; financial assistance for succeeding years will depend upon the academic performance in the University and continued financial need. A "B" average in the University is generally required for a recipient to be considered for awards after the first year.

California State Scholarships

The University is one of sixty institutions participating in the California State Scholarship Program. Nearly 30 per cent of all California State Scholars are enrolled on the several campuses of the University.

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

California State Scholars who elect to attend a public junior college before enrolling in the University may have their scholarships held and activated upon entering the University. Information and application forms have been sent to all schools and colleges in the State, and may be obtained from local school counselors or by writing to the California State Scholarship and Loan Commission, Room L-100, 520 Capitol Mall, Sacramento, California 95814.

EDUCATIONAL OPPORTUNITY GRANTS

Eligibility for Educational Opportunity Grants is limited to undergraduate students of exceptional financial need, as measured on an absolute scale of parent contribution which has been established by the Federal Government. Upon receipt of the Financial Aids Application and the Parents' Confidential Statement, the Financial Aids Office determines the parent contribution by using College Scholarship Need Analysis procedures. The amounts of the grants range from \$200 to \$1,000 per academic year. The amount of grant may not exceed one-half of the total financial aid award, as the grant must be matched on an equal basis with some other form of financial aid (i.e., a scholarship, grant, loan, or job from the University, or a scholarship, grant, loan, or job from outside sources).

COLLEGE WORK-STUDY PROGRAM

The College Work-Study Program, established under the Economic Opportunity Act of 1964, enables the University to offer employment to financially needy students during the school year and vacation periods. The program

is designed to assist those students who are from low or middle-income families, who need funds to continue their education, and who are enrolled or accepted for enrollment for a full-time course of study at the University. The on-campus and off-campus jobs are limited to an average of 15 hours per week for any one quarter. During scheduled holidays or vacation 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 specifically awarded to assist students in meeting their college expenses and in gaining valuable work experience related to their educational endeavors. 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 employment offered by the Student Placement Center, as the jobs under the Work-Study Program are limited to those students having a definite financial need.

LOANS

National Defense Education Act Loans (NDEA). Regularly enrolled students, or applicants for admission to the University, who are United States citizens or permanent residents of the United States, are eligible for NDEA loans to meet their financial need.

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

Repayment of NDEA loans begins nine months after graduation or withdrawal from the Davis campus and may be extended over a ten-year period at 3 per cent interest on the unpaid balance. Members of the armed forces, members of the Peace Corps, members of VISTA, and students who transfer to other schools may defer payment and extend the repayment period.

Up to 50 per cent of the loan (and interest thereon) may be forgiven those entering the teaching profession, at the rate of 10 per cent for each year of full-time teaching in public or nonprofit (1) elementary and/or secondary school or (2) institution of higher education. A cancellation of 15 per cent is made for each year of service as a full-time teacher of handicapped children or a full-time teacher in public or other nonprofit elementary or secondary school which is in an area designated by the Commissioner of Education as a poverty area. Hence, the total amount of the loan may be cancelled by teaching the handicapped or teaching in a deprived area for seven years.

Regents Loan Funds. These funds are principally used to supplement stipends

of scholarship and fellowship recipients but may also be granted to other qualified students. Regents Loans, normally repayable in five years, bear an interest rate of 3 per cent on the unpaid balance, beginning upon graduation or withdrawal from the University of California. Students who undertake graduate studies at the University of California may defer payment until they complete or terminate such studies. Regents loans are limited to \$1,560 a year or \$6,000 per student.

Short-Term Loans. To be eligible for a short-term loan, a student ordinarily must have attended the University for at least one quarter. These funds, made possible by gifts to the University, are granted in small amounts, \$300 to \$500, to help students with educational expenses. Although repayment schedules are determined individually for each loan, these loans are usually repaid within the academic year or with earnings from employment the following summer.

Emergency Loans. Loans not to exceed \$100 are available for emergency educational expenses. Repayment is normally made within 30 days. Interest at the rate of 1 per cent per month is charged on the unpaid balance after the loan has been outstanding more than 30 days.

FEDERALLY INSURED LOANS

Federally insured student loans are available through local lenders for citizens or nationals of the United States or those in the country for other than a temporary purpose. These loans may be made to students attending both higher education and vocational education institutions. No financial need test is required.

Undergraduate and graduate students may borrow up to \$1,500 an academic year or its equivalent. The student pays an insurance premium of $\frac{1}{4}$ of 1 per cent of the amount advanced for the period he is in school, plus 12 months. Students whose family income is under \$15,000 pay no interest while attending an eligible school on at least a half-time basis. Interest payments will be made for not less than nine nor more than twelve months after the student leaves school or graduates. When repayment begins the student pays 4 per cent simple interest. A student whose family income is in excess of \$15,000 pays the full interest charge (7 per cent simple) during the life of the loan.

The minimum monthly payment under the Federal program (one or more loans) is \$30. Depending on the dollar amount, outstanding higher education students may repay their loans over a five- to ten-year span and vocational education students over a three- to six-year span.

Applications may be obtained from the Financial Aids Officer, eligible lenders, or the U. S. Office of Education in San Francisco. The student completes his portion of the application and then submits it to the Financial Aids Office for proper attestation of his status. When the application is returned the student presents it to an eligible lender. If the lender is willing to make the loan, the application is forwarded to the U. S. Office of Education in San Francisco where it is reviewed for compliance with governing regulations. If the student meets all requirements the lender is issued an insurance commitment. Upon receipt of the commitment the lender may make disbursement to the student.

MISCELLANEOUS

Graduate Scholarships and Fellowships. Information about scholarships or fellowships, etc., for graduate students may be obtained from the Dean of the Graduate Division, Room 252, Administration Building. Applications for fellowships and graduate scholarships must be filed with the Dean of the Graduate Division, University of California, Davis 95616 not later than February 1 prior to the academic year for which the award is sought.

Army ROTC Scholarship Program. Applications may be obtained from the Department of Military Science, University of California, Davis 95616 during the month of November. Selection will be based upon academic and military records and potential officer qualities. Notification will be made before July 15 of each year.

Veterans Benefits. Students who qualify for veterans benefits under the program established on July 1, 1966, by Public Law 89-358, will be certified to the Veterans Administration by the Financial Aids Office.

Eligibility for educational benefits is dependent on service in the U. S. Armed Forces for at least 181 days, any part of which was after January 31, 1955. For each month of active duty, a veteran is entitled to one and one-half months of educational assistance, up to a maximum of 36 months. The allowance for a single student enrolled in a full-time course of study is \$130 per month. A married student will receive \$155 per month and a married student with one child will receive \$175 a month plus \$10 for each additional child.

Application forms for veterans benefits may be obtained in the Financial Aids Office as well as the Regional Office of the Veterans Administration. These should be filled out and submitted to the Veterans Administration, Regional Office, 49 Fourth Street, San Francisco, California 94103. This should be done well in advance of the date of enrollment in the University.

Dependents of deceased or disabled veterans are entitled to certain educational benefits under California and Federal laws. Certification of their enrollment is also a function of the Financial Aids Office.

LIVING ACCOMMODATIONS

Residence Halls

The University provides housing for approximately 2,900 students in a variety of residence halls on campus. There are five coed halls of 400 students each; three 200-student coed halls; and one 200-student hall for women. Each of these halls is staffed with professional personnel who work in conjunction with the residents, striving to create and maintain an environment conducive to educational goals.

Each hall elects its own student officers to act on matters such as student government, planning programs, and helping to solve problems of student discipline. Annual hall dues average about \$12. The Residence Hall Association is a coordinating governing body for all of the residence halls.

The room and board rate (which includes 20 meals a week) is \$1,146. All

students planning to live in residence halls sign a contract for one academic year. Payment is usually made in installments according to a payment schedule. Rooms in the residence halls contain all of the necessary furniture and also include study lamps, linen, and blankets. Telephones and weekly laundering of linen are included in the room and board rate. Further information and applications for housing are sent when students apply for admission to the University. Specific questions should be directed to the Housing Office, South Hall, University of California, Davis 95616. Since accommodations are limited, early application is advised. A deposit of \$125 is required when a signed contract is returned. If a student withdraws and sends written notice to the Housing Office before June 15, a total refund will be made; after this date, only a partial refund will be effected. An additional \$25 for damage and loss deposit is required of new students and remains with the University until the student terminates University housing.

Housing for Married Students

There are 475 apartments for married students on the Davis campus. Some of these apartments have one bedroom, but most are two-bedroom units. Both furnished and unfurnished accommodations are available. Apartment rates for 1969-70 are: one bedroom, unfurnished, \$83; two bedrooms, unfurnished, \$95; two bedrooms, furnished, \$110. Rates include water, gas, trash collection, and electricity. Applications for these units can be obtained by writing the Married Student Housing Office, South Hall, University of California, Davis 95616.

Off-Campus Accommodations

Members of the Housing Office staff work closely with Davis apartment owners and managers as well as with student committees in their attempt to serve the off-campus resident.

The Housing Office maintains a listing service for those interested in off-campus housing. Students, faculty, and staff associated with the University should contact this office for assistance in locating accommodations.

Approximately 1,000 students are housed in privately owned off-campus residence halls. These halls meet all the standards set by the University and adhere to the same rules and regulations that apply to the University residence hall. They have their own dining facilities.

Students who live off-campus may take advantage of either of two food plans which allow them to eat in the University residence hall dining rooms.

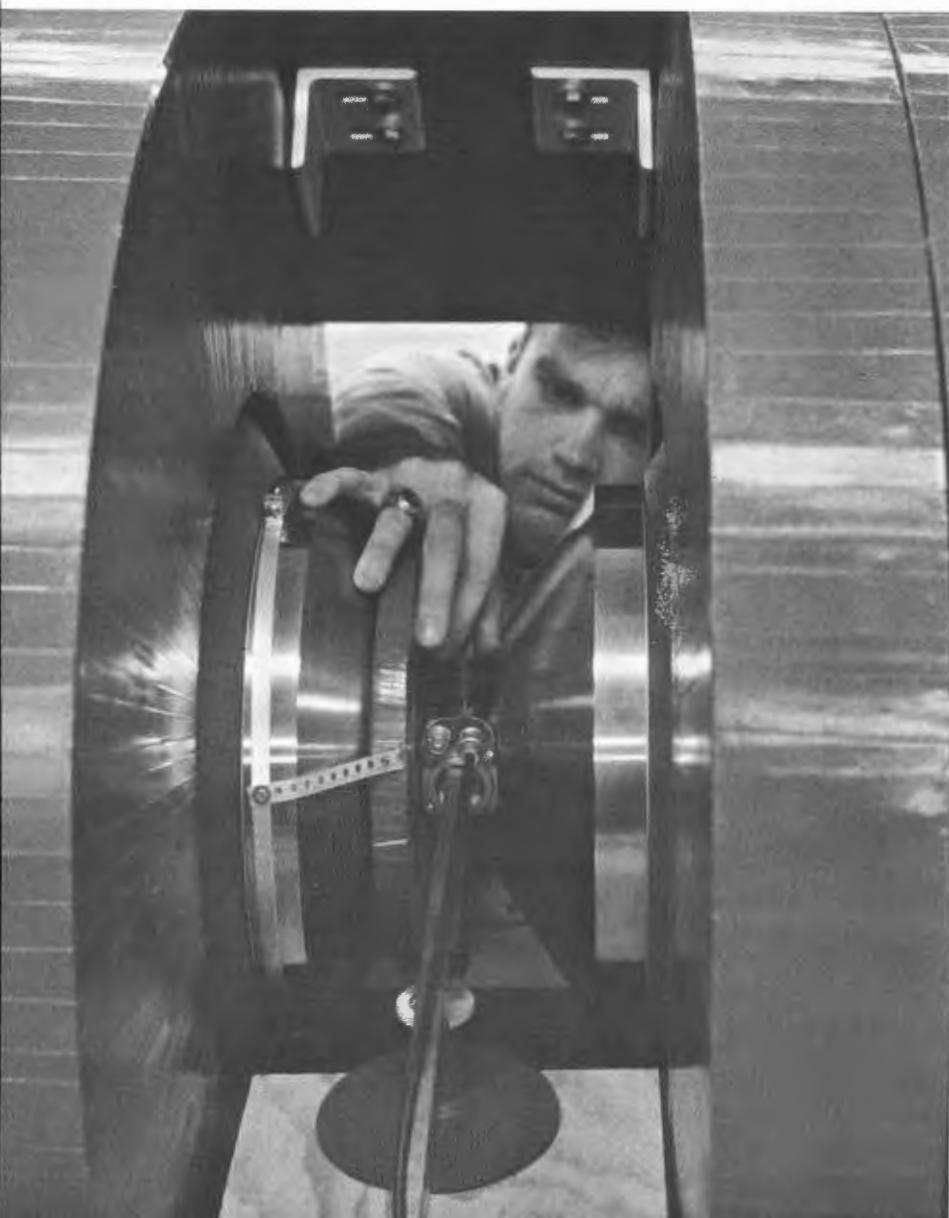
Fraternities

Thirteen national fraternities are represented on the Davis campus, providing living quarters and meals for their more than 600 undergraduate members and pledges. The fraternities, under their system of self-government, provide social, recreational, and academic programs for their members as well as some experience with business activities. This unique "total" living experience gives fraternity members the opportunity to secure a progressive education both in and out of the classroom. A faculty member acts as adviser for each fraternity.

The cost of fraternity living is roughly the same as that of the residence halls. Room and board rates range from a low of \$100 per month to a high of \$115. An additional fee is usually required when a man is initiated.

Membership in fraternities is by invitation. Men who are interested in fraternities should write or call on the Fraternity Adviser in South Hall.

The national fraternities are—Alpha Gamma Rho, Chi Phi, Delta Upsilon, Delta Sigma Phi, Kappa Sigma, Phi Delta Theta, Phi Kappa Tau, Phi Sigma Kappa, Sigma Alpha Epsilon, Sigma Nu, Sigma Phi Epsilon, Theta Chi, Theta Xi.





Student Services and Activities

STUDENT HEALTH PROGRAM

Medical Evaluation

To safeguard the health of the student and the University community, every new student, as a part of registration, must be examined by the University Medical Examiners. Every new student should have at the time of registration a certificate of successful vaccination against smallpox performed within the last three years. A form for certification is provided by the University. Tests for tuberculosis are a part of the physical examination of all new students.

Applicants with contagious diseases will be excluded. Any applicant having physical conditions that grossly disturb the classwork of other students should not apply for admission as he would be disqualified at registration.

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

Students returning after an absence must comply with the University requirements regarding smallpox vaccination and must have a health evaluation at the Student Health Service.

Supplementary Health Insurance

A supplementary health insurance plan is available at the time of registration. This insurance supplements the student health program and is used for medical care needed between quarters and when away from the campus. It likewise provides for surgical-professional fees and other benefits as outlined in the Supplementary Health Insurance brochure. Procurement of this insurance is strongly urged, and a waiver must be signed if it is not obtained.

International Students. The acquisition of health insurance is a condition of registration for all nonimmigrant international students. At the time of registration, all nonimmigrant international students must enroll in the Associated Students Supplementary Health Plan. Students who present documentary evidence of equivalent insurance coverage may petition the Office of International Student Services for permission to waive the Associated Students Supplementary Health Plan.

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

Student Health Service

The Student Health Service, by preventing and treating acute illnesses, conserves the time of students for their classwork and studies. This service is made possible, for the most part, by the registration fee. It is not a health insurance. The service is limited by the staff and facilities available.

Each regularly enrolled student may have such medical care as the Student Health Service is staffed and equipped to provide from the first day of the quarter through the last day of the quarter. Additional services may be provided for seven days after the last day of the quarter at the discretion of the Director of the Student Health Service. Hospitalization, up to ten days per quarter, is provided for illnesses. When, in the opinion of the Director of the Student Health Service, serious illness or injury requires prolonged care and will obviously prevent continuation in college during the current quarter, the patient will be returned to his community or home for definitive treatment.

The Student Health Service does not take responsibility for dealing with chronic physical defects or illnesses present at the time of entrance to the University. Except for first aid and emergency care, the Student Health Service does not assume responsibility for dental treatment. It does not take responsibility for treatment of remedial 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.

STUDENT AND ALUMNI PLACEMENT SERVICES

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

Student Part-Time and Summer Employment

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

Placement advisers help students to find part-time and summer employment. The office receives job listings from employers and refers qualified students to these openings. To receive assistance students must be interviewed personally, as satisfactory arrangements cannot be made by correspondence. Interested students should register with the Part-Time and Summer Employment Division after arriving on campus.

Career Placement Service

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

Educational Placement Service

Placement service is available to students and alumni who are interested in teaching. Information on the background, training, and professional experience of its candidates, which is kept in confidential files, 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.

Occupational Information—Career Planning

A library of vocational information is maintained by the Placement Service and the Counseling Service (see below). Students may use this library at their convenience. Placement advisers encourage students of all levels to discuss their career planning and the various occupational opportunities available.

COUNSELING CENTER

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

Help students with personal problems.

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

Provide a wide range of psychological testing when appropriate.

Make available information about various occupational opportunities for which students may wish to prepare.

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

SELECTIVE SERVICE

The Office of the Dean of Men assists students who have inquiries and problems with their status regarding Selective Service. It is up to each individual, however, to request educational or other deferments from his local draft board, which has exclusive authority over all deferments. The Dean of Men's Office will, upon request of the student, certify information about the student's educational progress to the local board.

Under existing Selective Service regulations, a student must make satisfactory progress toward his degree to be eligible for a student deferment. Any student who receives an educational deferment extends his liability to age 35. Students desiring a deferment on the basis of participation in the University ROTC program should consult the Department of Military Science.

Students attaining their eighteenth birthday may register for Selective Service at the Office of the Dean of Men.

All male students (undergraduate and graduate) will find it to their advantage to continually keep themselves aware of Selective Service laws and procedures. Any question or request for assistance may be brought to the Office of the Dean of Men at any time.

MILITARY SCIENCE

The University has an Army Reserve Officers' Training Corps unit at Davis which offers both basic and advanced courses in general military science. Enrollment in military science is on a voluntary basis. The ROTC Program is described in detail with the course offerings of the Department of Military Science.

INTERNATIONAL STUDENT SERVICES

International Students

An adviser is available to assist students from abroad in all matters pertaining to their attendance at the University and to their residence in the United States.

Education Abroad

Administrative assistance in the nonacademic aspects of the University's Education Abroad Program (see page 14) is provided by the Office of International Student Services. Application forms and information about the program may be obtained at this office.

Information pertaining to other means of study, travel, and employment opportunities abroad is also available at the same office.

STUDENT CONDUCT AND DISCIPLINE

Students enrolling 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 students are subject to disciplinary actions 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 identification;
3. Obstruction or disruption of teaching, research, administration, disciplinary procedures, or other University activities, including its public service functions, or of other authorized activities on University premises;

4. Physical abuse of any person on University-owned or -controlled property or at University-sponsored or -supervised functions, or conduct which threatens or endangers the health or safety of any such person;
5. Theft of or damage to property of the University or of a member of the University community or campus visitor;
6. Unauthorized entry to or use of University facilities;
7. Violation of University policies or of campus regulations, including campus regulations concerning the registration of student organizations, the use of University facilities, or the time, place, and manner of public expression;
8. Use, possession, or distribution of narcotic or dangerous drugs, such as marijuana and lysergic acid diethylamide (LSD), except as expressly permitted by law;
9. Violation of the rules governing residence in University-owned or -controlled property;
10. Disorderly conduct or lewd, indecent, or obscene conduct or expression on University-owned or -controlled property or at University-sponsored or -supervised functions;
11. Failure to comply with directions of University officials acting in the performance of their duties; or
12. Conduct which adversely affects the student's suitability as a member of the academic community.

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 several student hearing bodies.

Types of Disciplinary Actions

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;

Disciplinary Probation: Exclusion from participation in privileges or extra-curricular University activities as set forth in the notice of disciplinary probation for a specified period of time;

Restitution: Reimbursement for damage to or misappropriation of property. Reimbursement may take the form of appropriate service to repair or otherwise compensate for damages;

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 other privileges or activities as set forth in the notice of suspension for a definite period of time;

Dismissal: Termination of student status for an indefinite period. The student may be readmitted to the University only with the specific approval of the Chancellor of the campus to which he applies;

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

Student Honor Council

The Honor Council of the Associated Students deals with student welfare, student conduct, 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 AND STUDENT ACTIVITIES

The entire undergraduate student body holds membership in the Associated Students, University of California, Davis (ASUCD). The ASUCD, through its elected Legislative Assembly and appointed activities chairmen, is responsible for organized student activities on campus.

Independent student organizations are administered by the Dean of Students Office. Included in this category are departmental, honor, service, special-interest, political, and religious organizations, as well as an International Club.

A major effort of the ASUCD is *Picnic Day*, the campus open house welcoming the public each spring. Other special ASUCD events or activities include *Judging Day* (competition in agricultural skills and knowledge for high school students), *Little International* (livestock show for Aggie students), *Cal Aggie Camp* (an annual summer encampment for underprivileged children in the area, financed by student fund-raising events), *Cal Aggie Study Center Project* (a weekly tutoring program for disadvantaged primary and secondary school children in Sacramento area schools), *Homecoming*, *Wild West Days*, *Radio KDVS-FM*, *Speakers Bureau*, *Student Forums*, *Blood Bank*, and the all-important *Orientation* for incoming students. The University Band is supported by the ASUCD, and the Memorial Union Student Council presents in the Memorial Union a continuing educational and recreational program for students, as well as a concert series and a Spring Festival of the Arts.

The ASUCD publishes the *California Aggie*, a daily campus newspaper; *El Rodeo*, the yearbook; and *Motley*, a literary magazine.

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

The University of California, Davis, is a member of the Far Western Inter-collegiate Athletic Conference and stresses intramural and recreational as well as intercollegiate athletics. Included are football, basketball, track, rifle, baseball, tennis, wrestling, golf, swimming, and water polo. Independent student clubs provide opportunities to participate locally or in independent leagues in the following activities: rugby, cricket, badminton, rodeo, gymnastics, sailing, skiing, fencing, judo and karate. The Women's Athletic Association sponsors sports and recreational activities for all women students, including intercollegiate playdays in basketball, volleyball, hockey, softball, badminton, tennis, rifle, and swimming.

Unity of student life on all campuses of the University is emphasized by the California Club, an organization of student leaders.



Requirements and Curricula

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College of Agricultural and Environmental Sciences

UNDERGRADUATE PROGRAM

The undergraduate program of the college is divided into eight broad instructional programs. These curricula and related majors (see p. 56) vary in their requirements but reflect the common desire:

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

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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, prevention of starvation in major segments of the burgeoning 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 wise and perpetual use 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, along with industries which serve the needs associated with the production, processing and marketing of more than 200 crops, offer special challenges as well as outstanding career opportunities.

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

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

Choosing a Major

Exploratory Program—an aid to finding a major

Many freshmen 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 specially selected advisers, to take courses which pinpoint more accurately individual interests and aptitudes. This is not a degree program, but is an *aid to the student in finding a major best suited to him and his needs*. He should not expect to stay in the program more than a year as further delay in selecting a major may delay graduation. For registration purposes, students should indicate *Exploratory* on admission materials and study list cards.

Curricula and Majors

Programs of instruction are offered in the following curricula and majors. If your career objective is not apparent among the majors below, refer to *Fields of Interest* listed on page 57.

Curricula	Majors	Requirements	Sample Program
Agricultural Biosciences	Agricultural Genetics	Page 66	Page 97
	Animal Science	Page 69	Page 97
	Entomology	Page 77	Page 97
	Plant Protection	Page 87	Page 97
	Plant Science	Page 88	Page 97
Agricultural Economics & Business Management	Agricultural Economics	Page 64	Page 97
	Agricultural Business Management	Page 63	Page 97
Agricultural Education & Development	Agricultural Education	Page 65	Page 98
	International Agricultural Development	Page 82	Page 98
	Agricultural Science & Management	Page 67	Page 98
Family and Consumer Sciences	Child Development	Page 73	Page 100
	Design	Page 74	Page 100
	Dietetics and Nutrition	Page 76	Page 99
	Foods	Page 78	Page 99
	Home Economics	Page 80	Page 99
Food Science Quantitative Biology	Textile Sciences	Page 94	Page 99
	Food Science	Page 79	Page 100
	Biochemistry	Page 72	Page 101
	Nutrition	Page 83	Page 101
	Physiology	Page 86	Page 102
Resource Sciences	Atmospheric Science	Page 71	Page 102
	Park and Recreation Administration	Page 84	Page 102
	Range Management	Page 90	Page 102
Pre-Professional	Renewable Natural Resources	Page 91	Page 102
	Soil and Water Science	Page 93	Page 102
	Wildlife and Fisheries Biology	Page 95	Page 102
	Preforestry	Page 89	Page 103
	Preveterinary Medicine	Page 90	Page 147

Fields of Interest

The *fields of interest* that are broadly grouped under the agricultural and environmental sciences differ in nomenclature or major title depending upon institutional organization. The following list is given as a cross-reference to majors offered by the College as an aid to the student:

Fields of Interest	Offered in These Majors in the College
Agricultural Policy	Agricultural Economics
Agronomy	Plant Science or Agricultural Science and Management
Animal Husbandry	Animal Science or Agricultural Science and Management
Bee Biology	Entomology
Biological Control	Entomology or Plant Protection
Biology	Entomology, Animal Science, Plant Science, Biochemistry, Nutrition or Physiology
Biometeorology	Atmospheric Sciences
Biophysics	Biochemistry
Brewing Technology	Food Science
Business Management	Agricultural Business Management
City Planning	Park and Recreation Administration
Clothing	Textile Science
Costume Design	Design or Textile Science
Dairy Husbandry	Animal Science or Agricultural Science and Management
Dietetics	Dietetics and Nutrition
Enology	Food Science
Entomology	Entomology, Plant Protection
Environmental Horticulture	Plant Science (Environmental Horticulture Specialization)
Fabrics	Textile Science
Farm Management	Agricultural Economics
Farming	Agricultural Business Management, Agricultural Science and Management, Animal Science, Entomology, Plant Protection, Plant Science, Range Management, Soil and Water Science
Finance	Agricultural Business Management and Agricultural Economics
Fish and Game Management	Wildlife and Fisheries Biology
Floriculture	Plant Science (Environmental Horticulture specialization), Plant Protection
Food Technology	Foods and Food Science
Foreign Service or Agriculture	International Agricultural Development
Genetics—Animal or Plant	Agricultural Genetics, Animal Science, or Plant Science
Horticulture	Plant Science (Environmental Horticulture Specialization), Agricultural Science and Management, or Plant Protection
Interior Decoration	Design
Irrigation	Soil and Water Science
Landscape Horticulture	Plant Science (Environmental Horticulture specialization)
Marketing	Agricultural Economics

Fields of Interest	Offered in These Majors in the College
Meat Science	Animal Science
Meat Technology	Food Science
Merchandising	Design or Textile Science
Meteorology	Atmospheric Sciences
Molecular Biology	Biochemistry
Nematology	Plant Protection or Plant Science
Nursery Production	Plant Science (Environmental Horticulture specialization)
Nursery School	Child Development
Nutrition	Dietetics and Nutrition; Animal Science; or Nutrition
Ornamental Horticulture	Plant Science (Environmental Horticulture specialization)
Park Administration	Park and Recreation Administration
Physiology	Animal Science or Physiology
Plant Disorder Diagnosis	Plant Protection
Plant Pathology	Plant Science or Plant Protection
Plant Nutrition	Soil and Water Science or Plant Science
Pomology	Plant Science or Agricultural Science and Management
Poultry Husbandry	Animal Science or Agricultural Science and Management
Production	Animal Science and Plant Science
Ranching	Agricultural Business Management, Agricultural Science and Management, Animal Science, Entomology, Plant Protection, Plant Science, Range Management, Soil and Water Science
Soils	Soil and Water Science
Teaching	Agricultural Education or Home Economics
Truck Crops	Plant Science or Agricultural Science and Management
Turf Management	Plant Science (Environmental Horticulture specialization)
Vegetable Crops	Plant Science or Agricultural Science and Management
Viticulture	Plant Science or Agricultural Science and Management
Vocational Agriculture	Agricultural Education
Weed Science	Plant Protection or Plant Science
Wine Making	Food Science

PROGRAM PLANNING

The Academic Adviser

The advising program has a number of goals, but paramount among these is helping the student to maximize his educational experience. Each student possesses specific and unique characteristics and desires and these will be taken into consideration during program planning.

Some flexibility is included in all majors and advisers assist in examining and evaluating the alternatives this flexibility allows. Careful selection of electives can be especially helpful in broadening interests—each adviser has a booklet

of course outlines, describing course content and objective of various lower division courses offered by the College of Agricultural and Environmental Sciences.

Advisers can play a significant role in improving the educational programs because of their close personal contact with students. It is often through their advisees that they become aware of needed changes.

General Requirements

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

University Requirements: Subject A; American History and Institutions requirement; Residence requirement; total of 180 quarter units of work with a C average or better; Announcement of Candidacy at the beginning of the quarter in which student plans to graduate (see page 31 to 33 for complete details).

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

Major Requirements: See various majors beginning on page 63 of this section. Specializations are encouraged in some majors to give greater emphasis to a particular area of the major.

Study List

The student has the authority to structure his program any way he wishes provided he shows academic responsibility toward meeting the above requirements at a normal pace. Advice on program planning is available and *recommended* through carefully selected faculty advisers. Sample programs may be found beginning on page 97. Each student should consult with his adviser at least once a quarter concerning his program. The signature of the adviser must be obtained on either the Preferred Program Card used in early registration or on the Official Study List Card. Signature on the final study list is required only if there is a change in program prior to final filing.

RESPONSIBLE PLANNING on the part of the student is shown by:

1. Taking an average course load of 15 units per quarter. Regular students are limited to a program of not less than 12 (including Subject A which earns no units) or more than 18 units unless an exception is approved by the Dean. A lower division physical education course may be added to the maximum number of units without the Dean's approval. Students should consider that each unit normally requires three hours of student effort per week.

2. Taking courses in appropriate sequence so that course prerequisites are met and maximum benefits achieved.

In addition, the following details may prove important:

1. Assure adequate high school preparation in trigonometry and advanced algebra or the equivalent by correspondence if necessary. Some courses at the

University that are required for majors in the College of Agricultural and Environmental Sciences have prerequisites of mathematics equivalent to three years of high school mathematics, whereas the University admission requirement is only two years.

2. Foreign language is not generally required, except for majors in International Agricultural Development and Biochemistry. (See major requirements).

Passed or Not Passed Option

To enable students to enroll in courses outside their major area of study without jeopardizing their grade-point average, a Passed or Not Passed option has been approved by the faculty of the College. Students in good standing (not on probation) may take an average of one *elective type* course each term on a Passed or Not Passed basis. Grades of D or better are designated as Passed for courses *taken in any college for students enrolled in the College of Agricultural and Environmental Sciences*. Units attempted shall be disregarded in calculating grade-point average, but those passed may be used to satisfy elective unit requirements indicated in the various majors by a double asterisk(**). Permission of the adviser and the Dean is required on petitions available at the Dean's Office, 228 Administration Building. The petitions must be completed and filed by the end of the fifth week of classes.

Special courses may be authorized in which only Passed or Not Passed grades are given. Such courses may be taken in addition to those which a student takes on his own Passed or Not Passed option.

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 130. Students should consider the list carefully in selecting course work in the same areas to avoid taking equivalent courses and thus duplicating credit.

Transfer Students

The breadth requirements of the *College of Agricultural and Environmental Sciences* at Davis are designed to provide a balanced program in the natural sciences, the social sciences and humanities, and the agricultural sciences. The total of 180 units required for graduation cover a variety of fields. The preparatory or *core* courses indicated may be taken at the University of California or elsewhere. The list of courses and their descriptions may be used by prospective transfer students as a guide in selecting courses of similar content and purpose offered in their own institutions. Students attending a California junior college should consult their counselors to determine which junior college courses are appropriate and are accepted in satisfaction of the breadth requirements of the college in which they plan to enroll.

Work Experience Opportunities

One of the unique programs available to all students on the Davis campus is the Agricultural Practices work-experience program. It enables students to acquire initial and advanced work experience in nearly all phases of the agricultural industry, including production, processing, marketing, and distribution. Summer placement on farms and ranches, with State and Federal Divisions of Forestry in range or wildlife management, and in the production, distribution and service organizations of agriculture, enables students to combine earning and learning activities in a broad and impressive spectrum of employment opportunities. Students who are uncertain about the selection of a major may use the experience to identify occupations leading to satisfying, productive careers.

Made possible by grant from the late Fred H. Bixby, the voluntary noncredit program enables students to supplement their academic training with supervised work experience. Instruction in the operation, care and maintenance of both basic and specialized agricultural equipment is provided in the course, Agricultural Practices 49 (see Agricultural Practices page 169).

Students wishing to participate in this program should register during Orientation at the Agricultural Practices Office and complete a work-experience questionnaire.

Honors

Undergraduate Honors

The Dean's Honors List appears each quarter in the *Student Directory*. It includes the names of all students in the College of Agricultural and Environmental Sciences, who, in the preceding quarter, have completed at least 12 units on the Davis campus and have a grade-point average of at least 3.0 for all work undertaken in the University.

Senior students in honors status have the privilege of taking courses in the 194H series entitled "Special Study for Honors Students."

Honors at Graduation

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

<i>Units Completed at the University</i>	<i>Grade-Point Average</i>	
	<i>Honors</i>	<i>Highest Honors</i>
135 or more	3.15	3.50
90-134	3.35	3.70
45- 89	3.45	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 industries, many companies and private individuals have established scholarships restricted to students majoring in the College.

Approximately one-third of the scholarships administered by the Committee on Undergraduate Scholarships are awarded to students in the College of Agricultural and Environmental Sciences. Students with high scholastic standings who need additional financial support are, therefore, encouraged to apply (see page 37).

Graduate Instruction

Graduate instruction is under the jurisdiction of the Dean of the Graduate Division, and inquiries concerning the graduate program should be addressed to him. In addition to pursuing advanced studies, the graduate student may qualify for an assistantship to work with members of the research staff in the Agricultural Experiment Station. A number of assistantships providing half-time employment during the academic terms and full-time summer employment are available to outstanding students.

Programs for certain graduate degrees are offered by the faculty of individual departments, and the degree normally bears the name of the department. Other graduate programs are offered by groups composed of faculty members from several departments, and the degree bears the name of the group, such as Agricultural Chemistry, Plant Physiology, Comparative Biochemistry, International Agricultural Development, etc. The *Announcement of the Graduate Division* should be consulted for complete information regarding graduate instruction, but work leading to advanced degrees may be pursued in the following departments of the College:

Agricultural Botany	Environmental Toxicology
Agricultural Economics	Food Science and Technology
Agricultural Engineering	Genetics
Agricultural Zoology	Nematology
Agronomy and Range Science	Nutrition
Animal Science	Plant Pathology.
Animal Physiology	Pomology
Applied Behavioral Sciences	Poultry Husbandry
Biochemistry and Biophysics	Soils and Plant Nutrition
Consumer Sciences	Vegetable Crops
Entomology	Viticulture and Enology
Environmental Horticulture	Water Science and Engineering

Teaching Credentials

Inquiries concerning preparation for teaching credentials in subject matter taught in the College should be addressed to the Department of Applied Behavioral Sciences, University of California, Davis 95616. Teacher education is provided not only in such specialized fields as home economics and vocational agriculture but also in more general areas.

THE MAJORS

AGRICULTURAL BUSINESS MANAGEMENT provides training in the managerial aspects of agricultural business. It emphasizes the decision-making function of management, the use of management controls, personnel policies, and procurement and marketing methods. The major provides knowledge and training in such areas as scheduling, producing, maintaining adequate inventories, controlling quality of products, marketing products, evaluating data, and organizing the business operation as well as in managing financial resources, investment alternatives, and the growth of the firm. Computer-oriented problem-solving techniques are emphasized.

Because of this need for training in scientific management, the *Agricultural Business Management* program focuses on production and distribution theory, development and use of managerial tools (accounting and statistics) for control and analysis, and principles of management and organization. The student's understanding of the total economic and social environment is developed and extended through study of the agricultural, biological, physical, and social sciences.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in Agricultural Economics and Business Management curriculum)	Units
Accounting (Economics 11A, 11B)	6
Agriculture other than agricultural economics**	9
Chemistry and physics (Chemistry 1A and Physics 2A or 10)	9
Economics (Economics 1A, 1B or 2A, 2B, 2C)	9
English (choose from English 1, 2, 3, 4A, 4B, or 5)	4
English or rhetoric (choose from above or Rhetoric 1A, 1B)	4
Mathematics, including discrete, analytical geometry and calculus (Mathematics 15, 16A)	6
Natural science electives**	17
Statistical Methods (Mathematics 13)	4
Social sciences and humanities electives approved by adviser†**	19
Unrestricted electives**	33

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

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

MAJOR COURSES:

Agricultural Economics 18, 100A, 100B, 106A, 112	17
Agricultural Economics 106B or 155†	3
Three Agricultural Economics courses from:	
100C, 113, 114, 117, 130, 155†	10
Economics, upper division	7
Agricultural Economics 190A, 190B (senior research project)	4
Electives approved by adviser * *	19
 Total units for the degree	 180

See *Sample Program II*, page 97. For further details concerning the major, contact G. W. Dean, Chairman of the major, 218 Voorhies Hall.

AGRICULTURAL ECONOMICS considers the economics of agricultural production, marketing, use of resources, prices and policy. It permits the student a choice of specialization best adapted to his plans and broadens his knowledge of economic forces and the environment in which agricultural production and distribution take place. Decisions concerning the size of the farm, ranch or other business unit, the crops to plant, the amount of fertilizer to use, the type of livestock to purchase, whether to participate in government control programs, and when to sell products are apt to have greater impact on profits than the physical operation itself. Changes in production techniques, governmental programs, and market outlets are the rule, not the exception, so ranchers must be able to analyze their effects. Supplemental courses are offered in statistics, effects of governmental policy toward agriculture, rural appraisal, and the general areas of business. Emphasis is placed on the decision-making process under changing economic and technological conditions.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in Agricultural Economics and Business Management curriculum)	Units
Accounting (Economics 11A, 11B)	6
Agriculture other than agricultural economics * *	9
Chemistry and physics (Chemistry 1A and Physics 2A or 10)	9
Economics (Economics 1A, 1B or 2A, 2B, 2C)	9
English (choose from 1, 2, 3, 4A, 4B or 5)	4
English or rhetoric (choose from above or Rhetoric 1A, 1B)	4
Mathematics including discrete, analytical geometry and calculus (Mathematics 15, 16A)	6

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

** These elective courses may be taken on a Passed or Not Passed basis.

† Agricultural Economics 155 may be used to meet only one requirement.

Natural science electives** (Mathematics 16B)	17
Statistical methods (Mathematics 13)	4
Social sciences and humanities electives approved by adviser†**	19
Unrestricted electives**	33

MAJOR COURSES:

Agricultural Economics 100A, 100B, 100C, 106A, 106B	15
Agricultural Economics electives, including one senior level course (include one course from: 155, 160, 170 176)	12
Economics 101A, plus two upper division economics courses	9
Agricultural Economics 190A, 190B (senior research project)	4
Mathematics 16B†	
Electives approved by adviser**	20
Total units for the degree	180

See *Sample Program II*, page 97. For further details concerning the major, contact G. W. Dean, Chairman of the major, 213 Voorhies Hall.

AGRICULTURAL EDUCATION is designed primarily for those students interested in teaching agricultural sciences or other forms of vocational instruction in high schools and junior colleges.

Recent social developments in the United States have helped to emphasize the need to provide all secondary school students an opportunity to participate in some form of creative learning. The need for scientists, technicians, and educators to assist in domestic and international agricultural programs has created an unprecedented demand for qualified instructors and supervisory personnel.

The major also provides background for work in banking, public service, and industry.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in Agricultural Education and Development curriculum)	Units
Agricultural science (introductory)	3
Biological sciences, including genetics (Biology 1, Zoology 2, Genetics 100A, 100B, 100L)	21
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	15
Economics (Economics 1A or 1B)	5
English (choose from 1, 2, 3, 4A, 4B or 5)	8
Mathematics, statistics (Mathematics 13)	4
Physics (Physics 2A, 2B)	6
Social sciences and humanities electives‡**	15
Unrestricted electives**	24

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

** These elective courses may be taken on a Passed or Not Passed basis.

† May be used to satisfy in part the natural science core requirement.

‡ Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

MAJOR COURSES:

Agricultural economics	9
Agricultural Education 160, 320A	4
Agricultural engineering	11
Animal science	16
Plant and soil science	16
Social sciences and humanities†**	8
Electives approved by adviser (from the following: Nutrition 103, Entomology 110, Plant Pathology 120, Soil and Water Science 1, Water Science 110A, 110B)	14
Total units for the degree	180

See *Sample Program III*, page 98. For further details concerning the major, contact H. Heitman, Jr., Chairman of the major, 124 Animal Science.

Teacher Credential

Students may make appointments with credential counselors and obtain a statement of the complete requirements for the credential at the Applied Behavioral Science departmental office.

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

AGRICULTURAL GENETICS major emphasizes the study of heredity in plants and animals, with the aim of improving domestic species. Genetics uses information taken from many other disciplines, but makes special use of chemistry, physics, and mathematics. Students majoring in *agricultural genetics* take basic courses in these subjects, as well as courses designed to give broad training in biology. These undergraduate studies prepare a student not only for graduate work in genetics, but also for careers in private industry, governmental agricultural agencies, medical technology, and teaching.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in Agricultural Biosciences curriculum)	Units
Biological sciences, including one animal-oriented and one plant-oriented course	20
Chemistry, including organic chemistry (Chemistry 1A, 1B, 8A, 8B)	16
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5 or Rhetoric 1A, 1B)	8
Mathematics, including calculus and/or statistics (Mathematics 13, 16A)	7

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

** These elective courses may be taken on a Passed or Not Passed basis.

† 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 (Physics 2A, 2B, 2C)	9
Social sciences and humanities electives† ^{**}	28
Unrestricted electives ^{**}	24
MAJOR COURSES:	
Biochemistry 101A, 101B	6
Mathematics 16B–16C or 21B–21C, and 105A–105B or 130A–130B	12
Genetics 100A, 100B, 100L	7
Additional genetics	9
Animal, microbial or plant physiology	4
Electives approved by adviser, including 9 upper division units each in agricultural and biological sciences	30
Total units for the degree	180

See *Sample Program I*, page 97. For further details concerning the major, contact R. W. Allard, Chairman of the major, 201 Hutchison Hall.

AGRICULTURAL SCIENCE AND MANAGEMENT is designed for students interested in management positions in farming, ranching or other agriculturally oriented industries. The scientific principles involved in *Agricultural Science and Management* receive equal emphasis.

The trend to larger farm, ranch, and industry operations has caused many extensive and highly visible changes within agriculture. Farmers and ranchers have increased the size of their production units and the related processing and service organizations have expanded the scope of their operations. Less apparent, but certainly of equal importance, is the parallel increase in demand for management personnel with training associated with both production and management. Students may specialize in one of three areas: animal science, food technology, or plant science.

A core program during the first three years, including the biological, physical, and social as well as agricultural sciences permits students to develop programs which satisfy individual objectives. Supporting courses in economics, business, and management prepare graduates for a large number of operator-management positions. Depending upon the extent of specialization and training desired, students may elect to pursue the Bachelor of Science program, normally completed in four years, or the Master of Science program which requires an additional year.

Bachelor of Science Major Requirements*

CORE COURSES:	<i>Units</i>
Agricultural science, at least one course in each of the following: animal science, food science, plant science, soil and/or water science	20

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

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

Biological sciences	16
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Economics† (Economics 1A, 1B, 11A, 11B)	10
English or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; and/or Rhetoric 1A, 1B)	8
Mathematics (Mathematics 13, 16A and either 16B or 15)	10
Physics (Physics 2A, 2B, 2C)	9
Social sciences and humanities electives‡ **	18
Unrestricted electives**	24

MAJOR COURSES:

Agricultural economics† (economics of agricultural management), including 100A and two chosen from 112, 114, 117 and 140	15
Animal science, food technology, or plant science specialization (see specializations listed below)	18
Electives approved by adviser**	16
Total units for the degree	180

See *Sample Program IV*, page 98. For further details concerning the major, contact W. C. Weir, Chairman of the major, 162 Animal Science.

Specialization Requirements

Animal Science: Animal Genetics 107; Animal Genetics 107A, 107B, 107C, or 107D; Animal science, choose from 114A–114B§, 116A–116B§, 118A–118B, or any two from Animal Science 10§, 11§ 12, or 149§; Nutrition 103 or 110§; 5 units of animal science electives. The following required courses may be used to satisfy the preparatory core requirements in addition to fulfilling the specialization requirements: Biology 1; Genetics 100A, 100B; and Physiology 101 recommended. The indicated (§) courses are recommended for students who may take the program leading to a Master of Science degree.

The animal science major is described on p. 69.

Food Technology: Food science, 18 units including Food Science and Technology 100, 101, 104A, 104B and a food processing course. The following courses may be used to satisfy the preparatory core requirements in addition to fulfilling the requirements of the specialization: Bacteriology 2; Biology 1; Biochemistry 101A, 101B; Chemistry 1C and 5 recommended.

The food science major is described on p. 79.

Plant Science: 12 units related to agronomy, floriculture, landscape horticulture, park administration, plant pathology, pomology, vegetable crops, or viticulture; 8 units from: Entomology 110; Genetics 100A, 100B; Plant Pathology

** These elective courses may be taken on a Passed or Not Passed basis.

† Agricultural Economics 100A–100B, 106A–106B, and Economics 1A–1B, 11A–11B are recommended for students taking the program leading to the Master of Science degree.

‡ Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

120; Nematology 110; and Plant Science 120. The following courses may be used to satisfy the preparatory core requirements in addition to fulfilling the requirements of the specialization: Biology 1; Botany 2, 111; Plant Science 2, 101, 102; Soil and Water Science 1, 2.

The plant science major is described on p. 88.

PROGRAM LEADING TO THE MASTER OF SCIENCE DEGREE

1. Completion of the Bachelor of Science program or its equivalent.	
2. Completion of the Graduate Division requirements of one year of graduate residence and 36 units, including 21 units of graduate credit, in addition to the requirements for a Bachelor of Science degree.	
a. Graduate units (200 series)	
Seminar	3
Agricultural economics (economics of agricultural management).....	6
Animal science, food technology, plant science, or resource science.....	6
Additional graduate work in agricultural economics or the specialization.....	6
	—
	21
b. Electives approved by adviser (upper division or graduate).	15
	—
	36
3. A comprehensive oral examination in agricultural economics and the field of specialization	—
Total units required for the Master of Science degree.....	36

All students must complete the requirements in Economics of Agricultural Management and one other specialization. Certain courses are required and may have been satisfied while in undergraduate standing or must be included as part of the graduate program:

Economics of Agricultural Management

Agricultural Economics including 100A, 100B, 106A, 106B, 3 units from 155, 160, 170, 176; and Economics 1B, 11B. The 6 graduate units must be selected from Agricultural Economics 250, 253A, 253B, 257, and 260.

Animal Science

Biochemistry, 6 units; physiology (excluding Physiology 101, 101L), 6 units.

The indicated (\$) courses listed under the Bachelor of Science program are recommended. See p. 68.

Food Technology

Program of courses to be developed in consultation with the adviser.

Plant Science

Entomology 110; Genetics 100A, 100B; Plant Pathology 120; and Nematology 110 or Plant Science 120.

Resource Technology

Soil Science 105, 120B; Water Science and Engineering 110B; a course in climatology.

Recommended: Geography 161; Political Science 181.

ANIMAL SCIENCE is the study of the biological, physical and social sciences as they apply to animal and poultry production. Students may specialize in live-

stock, dairy, or poultry husbandry, nutrition, physiology, or animal breeding. In recent years increased understanding of the biological principles of inheritance, reproduction and growth in animals has extended dramatically the usefulness of animals to mankind. Future activities will include efforts to improve meat and carcass characteristics, a shortening of the growth period required to produce finished animals, more effective disease prevention and control, and research designed to answer questions concerning the total nutritional needs of livestock, fowl, and fish.

Outstanding opportunities for using science to enhance the use of animals exist on ranches, in chemical and feed companies, in food processing and distributing units, and all of the occupations supporting the animal industry. Community, government, education, industry and business have places for individuals with a sound knowledge of science related to animal production and use.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in Agricultural Biosciences curriculum)	Units
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Biological sciences, including one animal-oriented and one plant-oriented course (Biology 1; Physiology 101, 101L. Recommended: Animal Science 1, 2 and Bacteriology 2)	20
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5 or Rhetoric 1A, 1B)	8
Mathematics, including calculus and/or statistics	7
Physics (Physics 2A, 2B, 2C)	9
Social sciences and humanities electives† ^{**}	28
Unrestricted electives [*]	24

MAJOR COURSES:

Biochemistry (Biochemistry 101A, 101B or Physiological Sciences 101A, 101B)	6
Genetics (Genetics 100A, 100B)	6
Nutrition (Nutrition 110)	5
Physiology (Physiology 110A, 110B)	6
Laboratory units in biochemistry, genetics, nutrition, or physiology	4
Specialized courses in animal science	18
Electives approved by adviser to complete major	23

Total units for the degree	180
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See *Sample Program I*, page 97. For further details concerning the major and specialization, contact M. Ronning, Chairman of the major, 130 Animal Science.

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

** These elective courses may be taken on a Passed or Not Passed basis.

† 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 may also specialize in Animal Science under the Agricultural Science and Management major described on p. 67.

ATMOSPHERIC SCIENCE comprises studies of the basic meteorological elements, including atmospheric circulation and weather systems; mass and energy transfers between atmosphere and surface and within the atmosphere; radiation, turbulence, diffusion, and precipitation mechanisms; and developments in meteorological instrumentation. This field is now a fully developed branch of applied physics, with impressive credentials of achievement and exciting prospects for the future. For instance, the possibility of significant weather and climate modifications now looms on the horizon, and our understanding of basic physical processes in the atmosphere is expanding as never before. The challenge to the new generation of atmospheric scientists is immense and the solution of the scientific and technical problems is of profound importance to the people of the world.

The course of study is designed to provide a strong mathematical and physical science background on which the student can build his career in research, education, or the most direct application of scientific knowledge. Emphasis is on studies of the basic meteorological elements and their role in the larger context of the physical and biological environment. While the major provides a broad background in *Atmospheric Science*, many students will be encouraged to specialize in some particular phase through the pursuit of graduate work.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the	<i>Units</i>
Resource Sciences curriculum)	

Biological sciences, including biology and botany (Biology 1, Botany 2)... 11

Physical sciences, including:

Physics and chemistry, 24 units (Physics 4A, 4B, 4C, 4D); mathematics, 9 units (Mathematics 21A, 21B, 21C)	33
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Social sciences and humanities, including:

English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; Rhetoric 1A, 1B)	8
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Upper division social sciences in at least two of the following: economics, geography, political science**	12
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Electives approved by adviser† **	16
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Renewable natural resources (Renewable Natural Resources 100, 190)... 6	
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Unrestricted electives**	24
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MAJOR COURSES:

Additional physical sciences to include:

Mathematics (Mathematics 22A, 22B, 22C recommended)	15
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Physics	2
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* For convenience in planning your program the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses will be accepted. Courses shown without parentheses are required.

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

Atmospheric science courses approved by adviser:

<i>Thermodynamics and statics of the atmosphere, Atmospheric Science</i> 120	3
<i>Dynamics of the atmosphere, Atmospheric Science</i> 121	3
<i>Micrometeorology, Atmospheric Science</i> 123	4
<i>Meteorological instruments and observations, Atmospheric Science</i> 124	3
<i>Weather analysis and forecasting, Atmospheric Science</i>	
110A-110B-110C	9
<i>Electives</i>	9
<i>Biological sciences electives**</i>	14
<i>Electives**</i>	8
 Total units for the degree	 180

See *Sample Program VIII*, page 102. For further details concerning the major, contact L. O. Myrup, Chairman of the major, 2042 Engineering.

BIOCHEMISTRY considers the quantitative, organic, and physical-chemical aspects of living systems as these relate to the broad areas of zoology, botany, microbiology, and chemistry. The major consists of a sequence of at least 26 units in biochemistry and related subjects. Included are laboratory, advanced lecture, and undergraduate research. Also required are courses in bacteriology and genetics, a year of physical chemistry, and reading knowledge of a foreign language.

The undergraduate program may serve as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and education. Students interested in research and advanced teaching may use this program as preparation for continued study leading to the Master of Science and Doctor of Philosophy degrees.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in Quantitative Biology curriculum)	Units
Biology	21
<i>Preparation:</i> Biology 1; one additional course from Bacteriology 2, Botany 2, Zoology 2, or Physiology 101 and 101L	
<i>Upper Division Biology Core:</i> at least one upper division course from two areas other than the major subject: botany, bacteriology, genetics, nutrition, physiology and zoology (Genetics 100A, 100B)	
Chemistry (Chemistry 1A, 1B, 1C, 5, 112A, 112B, or 1A, 7A, 7B, 112A, 112B)	25
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; and/or Rhetoric 1A, 1B)	8

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

** These elective courses may be taken on a Passed or Not Passed basis.

Mathematics, including one year of calculus (Mathematics 16A, 16B, 16C and one from: 13, 15, 30, 22A) or (Mathematics 21A, 21B, 21C and one from: 13, 15, 30, 22A, 22B, 22C)	12
Physics, any courses except Physics 10, and including at least one laboratory course (Physics 2A, 2B, 2C, and 3A, 3B, 3C or 4A, 4B, 4C, 4D, 4E)	12
Social science and humanities electives† **	28
Unrestricted electives**	24

MAJOR COURSES:

Biochemistry 101A, 101B, 101L	11
Additional biochemistry or closely related courses (Biochemistry 108, 122, 190, 194H, and 199 are strongly recommended)	15
Chemistry 110A, 110B, 110C, 112C	14
Genetics 100A, 100B†	
Physics, including at least 3 units of laboratory†	
Electives approved by the adviser	10
 Total units for the degree	 180

Students in biochemistry must have completed 12 units of a new foreign language, or the equivalent of course 5 in a language started in high school. Units may be used to partially satisfy the social sciences and humanities requirement.

See *Sample Program VIIA*, page 101. For further details concerning the major, contact J. L. Hedrick, Chairman of the major, 5206 Storer Hall.

CHILD DEVELOPMENT is an appropriate major for students who plan to work with children in a wide variety of situations—in teaching, counseling, or in welfare or community agencies for children and youth. It is valuable preparation for working directly with the disadvantaged, retarded, handicapped, or gifted child—as well as with the “normal” child.

How does a child grow? What are his needs? How can we help him to meet life—to find fulfillment in our complex world? Students of *Child Development*, a major of the Family and Consumer Sciences curriculum, seek answers to these questions. They study the intelligence, personality, and special abilities of children. Students observe infants and children in a variety of situations: in real life, in films, and on closed-circuit television. They participate in study projects with children from different socio-economic and cultural backgrounds who need special counseling or educational services. They study not only from books but also from life. The emphasis is on the child, his family, the community, and the interrelationship of all three.

** These elective courses may be taken on a Passed or Not Passed basis.

† May be used to satisfy the core requirements in part, in addition to fulfilling the requirement of the major field.

‡ 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

CORE COURSES: (Requirements common to majors in the Family and Consumer Sciences curriculum)

	<i>Units</i>
Natural Sciences:	
Chemistry, one course	
Physics, one course	
Statistics or other mathematics, one course	
One course in each of two biological sciences	
Additional courses in the natural sciences to make a total of**	27
Social Sciences:	
One course in each of two of the following: psychology, sociology, cultural anthropology	
One course: economics or political science†	
Additional courses in the social sciences to make a total of**	27
Humanities:	
English, 8 units	
One course in each of two of the following: foreign language, history‡, literature, philosophy	
One course: art, design, dramatic art, music, or rhetoric	
Additional courses in the humanities to make a total of**	27
MAJOR COURSES: major requirements (see below) and electives	99
The following courses may be used to partially satisfy the above <i>core requirements</i> :	
Anthropology 2	
Biology 10	
Genetics 115	
Human Development 131, 133, 136, 137, 139, 140, 141, 142	
Nutrition 10	
Physiology, one course	
Psychology 1A, 1B, 1C	
Sociology 1, 2, 126	
Statistics, one course	
Total units for the degree	180

For information regarding the *Elementary Teaching Credential*, contact the Education Department.

See *Sample Program VB*, page 100. For further details concerning the major, contact David Lynn, Chairman of the major, 210 Walker Engineering Building.

DESIGN emphasizes interior, costume and textile design. Graduates will be prepared for advanced study in design, for teaching, and for the satisfaction of being a creative member of society.

** These additional courses and other unrestricted electives may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

With a growing staff of practicing designers, *Design* at Davis, a part of the Family and Consumer Sciences curriculum, builds on the needs of people in the environment. Through laboratory classes, lectures, seminars, workshops, exhibitions, and field trips, the *Design* major places emphasis on the behavior and artistic foundations of individual and family living. Specializations are offered in interior, costume, and textile design.

Design is also an accepted academic major for the individual wishing a background for a teaching credential.

Bachelor of Science Major Requirements

CORE COURSES: (Requirements common to majors in the Family and Consumer Sciences curriculum)	<i>Units</i>
Natural Sciences:	
Chemistry, one course	
Physics, one course	
Statistics or other mathematics, one course	
One course in each of two biological sciences	
Additional courses in the natural sciences to make a total of**	27
Social Sciences:	
One course in each of two of the following: psychology, sociology, and cultural anthropology	
One course: economics or political science†	
Additional courses in the social sciences to make a total of**	27
Humanities:	
English, 8 units	
One course in each of two of the following: foreign language, history†, literature, and/or philosophy	
One course: art, dramatic art, music, or rhetoric	
Additional courses in the humanities to make a total of**	27
MAJOR COURSES: Major requirements (see below) and electives	99
The following courses may be used to partially satisfy the above <i>core requirements</i> .	
Anthropology 2	
Art 1A, 1B, 2, 16; two courses chosen from the following: Art 12A, 12B, 14A, 14B; one additional course in the history of art	
Design 6, 120A, 120C, 140A, 140B, 197; one course from the following:	
Design 143 or 144; four courses from the following nine courses:	
Design 160A, 160B, 160C, 170A, 170B, 170C, 180A, 180B, 180C	
Philosophy 123	
Psychology 1A	
Total units for the degree	180

** These additional courses and other unrestricted electives may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

For information regarding the *Elementary or General Secondary Teaching Credential*, contact the Education Department.

See *Sample Program VB*, page 100. For further details concerning the major contact K. Rossbach, Chairman of the major, 155 Home Economics Building.

DIETETICS AND NUTRITION prepares students for work as dietitians in hospitals and other institutions or for participation in research on nutritional properties of foods and their relation to human health. The major includes a basic background in physiology, biochemistry, bacteriology, and nutrition. The *dietetics* option adds emphasis on nutrition in disease and on management. It qualifies the student for a one-year dietetic internship which leads to professional work as a dietitian. The *nutrition* option offers additional background in biochemistry and nutrition for those interested in laboratory work. Either option may be used as preparation for advanced work leading to a graduate degree. The major is a part of the Family and Consumer Sciences curriculum.

Bachelor of Science Major Requirements

CORE COURSES: (Requirements common to majors in the Family and Consumer Sciences curriculum)	<i>Units</i>
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Natural Sciences:

Chemistry, one course

Physics, one course

Statistics or other mathematics, one course

One course in each of two biological sciences

Additional courses in the natural sciences to make a total of**

27

Social Sciences:

One course in each of two of the following: psychology, sociology, and cultural anthropology

One course: economics or political science†

Additional courses in the social sciences to make a total of**

27

Humanities:

English, 8 units

One course in each of two of the following: foreign language, history‡, literature and philosophy

One course: art, design, dramatic art, music, or rhetoric

Additional courses in the humanities to make a total of**

27

MAJOR COURSES: Major requirements (see below) and electives	99
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The following courses may be used to partially satisfy the above *core requirements*.

Bacteriology 2

Biochemistry 101A, 101B

Biology 1

** These additional courses and other unrestricted electives may be taken on a Passed or Not Passed basis.

† 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 1A, 1B, 8A, 8B
 Economics 1A, 1B
 Foods 100A, 100B, 101A, 101B
 Mathematics 13
 Nutrition 110, 111, 111L
 Physiology 101, 101L
 Psychology 1A

Plus either Group A (*Dietetics*) or Group B (*Nutrition*), as follows:

<i>Group A</i>	<i>Group B</i>
Economics 11A, 11B	Biochemistry 101L
Education 110	Chemistry 1C, 5
Institution Management 121, 122A, 122B	Nutrition 117
Nutrition 116	Physics 2A, 2B, 2C and one laboratory course
	Mathematics 16A, 16B recommended

Total units required for the degree 180

See *Sample Program VA*, page 99. For further details concerning the major, contact F. Zeman, Chairman of the major, 161 Home Economics Building.

ENTOMOLOGY is the study of a fascinating and complex group of organisms—the *insects*. There are more kinds of insects than of all other animals combined. This diverse assemblage includes both beneficial and harmful forms. Progress in research on insects has been immense but represents only a small part of the information needed before man can deal most advantageously with them. Some of the special branches of *entomology* are: transmission of plant and animal diseases; control of insects with natural enemies and chemicals; management of honeybees for honey production and crop pollination; and the study of insects themselves—their behavior, physiology, classification, and intricate structure.

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 graduates in *entomology* prepare to teach zoology, biology, and entomology in high schools and junior colleges.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Agricultural Biosciences curriculum)	<i>Units</i>
Biological sciences, including one animal-oriented and one plant-oriented course (Biology 1, Zoology 2, Botany 2)	20
Chemistry, including organic chemistry (Chemistry 1A, 1B, 8A, 8B)	16

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

English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; Rhetoric 1A, 1B)	8
Mathematics, including calculus and/or statistics (Mathematics 13, 16A)	7
Physics (Physics 2A, 2B, 2C)	9
Social sciences and humanities electives†**	28
Unrestricted electives**	24
MAJOR COURSES:	
Bacteriology (Bacteriology 2)	5
Botany or zoology, in addition to core requirements (courses generally selected from: Botany 107, 108, 111, 117, 140, 141, 180; Zoology 112, 116, 125, 125L, 140, 147, 148)	12
Genetics (Genetics 100A, 100B)	6
Plant physiology, plant pathology, or biochemistry (Botany 111, Plant Pathology 120, or Biochemistry 101A and 101B or equivalent)	4
Introduction to entomology, Entomology 1	5
Structure and function of insects, Entomology 101	4
Insect physiology, Entomology 102	4
Systematic entomology, Entomology 103	4
Insect ecology, Entomology 104	4
Field taxonomy and ecology, Entomology 109	5
Electives approved by adviser	15
Total units for the degree	<hr/> 180

See *Sample Program I*, page 97. For further details concerning the major, contact O. G. Bacon, Chairman of the major, 124 Robbins Hall.

FOODS emphasizes the chemical and physical properties of foods, and why they behave as they do in processing and preparation for the table. Graduates are prepared for careers in teaching, new-product development in test kitchens, and food research in industrial, governmental, and university laboratories. The major is part of the Family and Consumer Sciences curriculum.

Food is more than something that *nourishes*. We know that nutrition is not necessarily of prime importance in the selection of the foods that people eat. People select food on the basis of color, texture, and flavor and their individual responses to these properties. Habit and tradition play a part in the selection. Pleasant or unpleasant associations with a particular food also play a part in the choice.

Of concern to the *Foods* major are questions about color, flavor, and the textural properties of foods, as well as biological and behavioral responses to these properties. These questions encompass the effects of processing, storage, and consumer handling of foods, and the socio-economic and cultural aspects of food as they relate to consumer acceptability and use.

** These elective courses may be taken on a Passed or Not Passed basis.

† 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

CORE COURSES: (Requirements common to majors in the Family and Consumer Sciences curriculum)	<i>Units</i>
Natural Sciences:	
Chemistry, one course	
Physics, one course	
Statistics or other mathematics, one course	
One course in each of two biological sciences	
Additional courses in the natural sciences to make a total of**	27
Social Sciences:	
One course in each of two of the following: psychology, sociology, and cultural anthropology	
One course: economics or political science‡	
Additional courses in the social sciences to make a total of**	27
Humanities:	
English, 8 units	
One course in each of two of the following: foreign language, history†, literature and philosophy	
One course: art, design, dramatic art, music or rhetoric	
Additional courses in the humanities to make a total of**	27
MAJOR COURSES: major requirements (see below) and electives	99
The following courses may be used to partially satisfy the above <i>core</i> <i>requirements:</i>	
Bacteriology 2	
Biochemistry 101A, 101B	
Biology 1	
Chemistry 1A, 1B, 1C, 5, 8A, 8B	
Economics 1A	
Foods 100A, 100B, 101A, 101B, 134A, 134B, 135A, 135B, 197	
Mathematics 13	
Nutrition 102A, 102B, 102L	
Physics 2A, 2B, 2C	
Physiology 2	
Psychology 1A	
Total units for the degree	180

See *Sample Program VA*, page 99. For further details concerning the major, contact D. Heinz, Chairman of the major, 156 Home Economics Building.

FOOD SCIENCE is the study of the principles of processing and preserving of plant and animal products.

The biological, physical, and behavioral sciences, as well as engineering, all

** These additional courses and other unrestricted electives may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

play important roles in the development of new food products, new processing methods, and the evaluation and improvement of products. The focus of the food scientist is maintaining product quality at all times, especially in terms of controlling chemical and microbiological changes both during processing and during the period between processing and consumption. Graduates qualify for supervisory, technical, sales and executive positions in the food and allied industries. The program offers interdisciplinary training to students planning careers in food processing, food research, and other food-related fields. The curriculum is sufficiently flexible to satisfy a student's individual interest in a general program, in a scientific discipline applicable to food processing and utilization, or in a specialized area of food technology such as brewing, dairy, fruits and vegetables, meat and poultry, or enology. This program also provides an excellent basis for graduate study leading to the M.S. degree in food science and the Ph.D. degree in such fields as agricultural chemistry, comparative biochemistry, microbiology, and nutrition.

Bachelor of Science Major Requirements*

CORE COURSES:

	<i>Units</i>
Bacteriology-biology (Biology 1, Bacteriology 2)	11
Biochemistry-chemistry (Chemistry 1A, 1B, 1C, 5, 8A, 8B; Biochemistry 101A, 101B	31
English and/or rhetoric (English 1, 2; or Rhetoric 1A, 1B)	8
Mathematics-physics (Mathematics 13, 16A, 16B, 16C; Physics 2A, 2B, 2C)	20
Social sciences and humanities electives† **	28
Unrestricted electives* *	24
 MAJOR COURSES: Courses listed in <i>General Catalog</i> under the heading Food Science and Technology or Viticulture and Enology	 30
Electives approved by adviser	28
 Total units for the degree	 180

A *food technology* specialization is available to interested students under the *Agricultural Science and Management* curriculum described on page 67.

See *Sample Program VI*, page 100. For further details concerning the major, contact E. B. Collins, Chairman of the major, 114C Roadhouse Hall.

HOME ECONOMICS is designed primarily for the student who wishes to become a professional home economist. The demand for home economists is growing as never before—in teaching at high school and junior college levels, in Extension Service, in governmental and community agencies dealing with social service, and in private industry. In addition, this major provides an

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

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

excellent background for homemaking and professional work. The major is part of the Family and Consumer Sciences curriculum.

The academic program encompasses the broad field of family and consumer sciences, with courses including laboratory work along with academic theory in exciting areas: Child Development, Family Relationships, Consumer Economics, Home Management, Housing, Design, Nutrition, Foods, Clothing and Textiles. The foundation is broad and liberal, including humanities and social sciences as well as natural sciences.

The major in *Home Economics* at Davis is also an academic major for the individual wishing to obtain a teaching credential.

Bachelor of Science Major Requirements

CORE COURSES: (Requirements common to majors in the	<i>Units</i>
Family and Consumer Sciences curriculum)	

Natural Sciences:

Chemistry, one course

Physics, one course

Statistics or other mathematics, one course

One course in each of two biological sciences

Additional courses in the natural sciences to make a total of**

27

Social Sciences:

One course in each of two of the following: psychology, sociology, and cultural anthropology

One course: economics or political science†

Additional courses in the social sciences to make a total of**

27

Humanities:

English, 8 units

One course in each of two of the following: foreign language, history‡, literature, and philosophy

One course: art, design, dramatic art, music, or rhetoric

Additional courses in the humanities to make a total of**

27

MAJOR COURSES: Major requirements (see below) and electives

99

The following courses may be used to partially satisfy the above *core requirements*.

Bacteriology 2

Biology 1

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

Consumer Economics 142

Design 6

Applied Behavioral Sciences 150

Economics 1A

Foods 100A, 100B

** These additional courses and other unrestricted electives may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

Human Development 131, 133, 137
 Mathematics 13
 Nutrition 102A, 102B
 Physiology 2 or 101
 Psychology 1A
 Home Management 140
 Textiles and Clothing 7, 160

Total units required for degree	180
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See *Sample Program VA*, page 99. For further details concerning the major, contact Louise Bachtold, Chairman of the major, 211 Walker Hall.

Additional requirements for the secondary teaching credential or for extension positions are: Food 101A, 101B; Nutrition 102L; Home Management 140L; Textiles and Clothing 160L, 172, 370, 375. For further details contact the Department of Applied Behavioral Sciences.

INTERNATIONAL AGRICULTURAL DEVELOPMENT prepares students for overseas service in agriculture in the developing countries.

The most persistent and urgent need of the developing countries of the world is food: food of high quality available in large amounts. Impressive outlays of financial and technical assistance have done much to increase the agricultural and industrial capacities of the less well-developed areas. *International Agricultural Development* graduates, who are prepared for careers in world-wide agricultural affairs by virtue of competency in a technical field of agriculture, hold a unique and enviable position in terms of opportunity to assist others. Assuming a given degree of technical competency (whether, for example, in agricultural business, agricultural engineering, agronomy, animal science, entomology, or horticulture), students interested in careers in foreign countries also must be perceptive, sensitive, understanding, and possessed with a knowledge of the political, economic, social, and cultural differences among people in other countries.

Graduates may enter the Foreign Agricultural Service or other governmental agencies with overseas activities via civil service examinations or join commercial firms with foreign branches or departments. The Peace Corps and similar organizations offer additional career opportunities.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Agricultural Education and Development curriculum)	<i>Units</i>
Agricultural science (introductory)	3
Biological sciences, including genetics (animal or plant physiology, bacteriology, biochemistry, botany, zoology, Genetics 100A)	21

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

Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	15
Economics (Economics 1A or 1B)	5
English (choose from English 1, 2, 3, 4A, 4B, or 5)	8
Mathematics, statistics (Mathematics 13)	4
Physics (Physics 2A, 2B)	6
Social sciences and humanities electives†** including two courses from the following: History 174A, 174B, 176A, 176B, 178A, 178B, 179A, 179B, and 180; Political Science 102, 105, 113, 128A, 163, and 166.	15
Unrestricted electives**	24

MAJOR COURSES:

International Agricultural Development 101 or 102, 190	6
Economics or agricultural economics, upper division	6
Foreign language, humanities and social sciences (anthropology, sociology, geography and/or psychology); proficiency in a single foreign language equivalent to passing course 4 is required	32
<i>Primary field of specialization: animal science or plant science</i> (at least 10 units upper division)	14
<i>Secondary field of specialization: agricultural economics, agricultural engineering, animal science, plant science, or soil and water science</i> including at least 8 units upper division	12
Agricultural and other science electives approved by adviser to be selected from agricultural engineering, animal physiology, bacteriology, biochemistry, entomology, nutrition, plant pathology, soil science, water science and weed science	8
Total units for the degree	180

See *Sample Program III*, page 98. For further details concerning the major, contact D. S. Mikkelsen, Chairman of the major; 109 Hunt Hall.

NUTRITION is the study of the components of foods that are basic to life and health, with primary interest centered on the biochemical and physiological aspects of these factors in the animal body. The major includes at least 25 units of *nutrition* and closely related courses plus mammalian physiology and general biochemistry, with laboratory. Courses in bacteriology and genetics are required. The considerable elective freedom provided allows emphasis on specific aspects of *nutrition* and related areas of biology. The undergraduate program may serve as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and education. Students interested in research and advanced teaching may use this program as preparation for continued study leading to the Master of Science and Doctor of Philosophy degrees.

** These elective courses may be taken on a Passed or Not Passed basis.

† 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*

CORE COURSES: (Unit requirements common to majors in the Quantitative Biology curriculum)	Units
Biology	21
<i>Preparation:</i> Biology 1; one additional course chosen from Bacteriology 2, Botany 2, Zoology 2 or Physiology 101 and 101L.	
<i>Upper division biology core:</i> at least one upper division course from two areas other than the major subject: bacteriology, biochemistry, botany, genetics, nutrition, physiology, and zoology.	
Chemistry	25
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; Rhetoric 1A, 1B)	8
Mathematics, including one year of calculus (Mathematics 16A, 16B, 16C)	12
Physics, any courses except Physics 10, and including at least one laboratory course	12
Social sciences and humanities electives†**	28
Unrestricted electives**	24

MAJOR COURSES:

Bacteriology 2, English 1, Physiology 101, 101L and an upper division course in genetics†	
Biochemistry 101A, 101B, 101L (or Animal Biochemistry 102)	9
Nutrition 110	5
Additional nutrition or closely related courses	20
Physiology 110A, 110B, 111A, 111B	8
Electives approved by the adviser	<hr/> 8
Total units for the degree	180

See *Sample Program VII B*, page 101. For further details concerning the major, contact M. Brin, Chairman of the major, 35 Home Economics Building.

PARK AND RECREATION ADMINISTRATION is the study of the planning, development, and management of natural and man-made areas for man's use, enjoyment, and well-being. The total environment in which man can creatively live, work, and play includes a city plaza, a metropolitan park, a suburban shopping center, a tree-lined street, a golf course, a landscaped freeway, an historical site, a mountain stream, and a high Sierra camp. Park and recreation administrators develop and implement plans for the *visual and functional aspects* of this environment.

Students in this major take work in economics, geography, geology, sociology,

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

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned for these major courses may be used also to satisfy the above core requirements in part.

‡ Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

planning, and design to gain competence in analyzing, planning, and developing natural and man-made areas through application of their aesthetic, functional, and economic strengths. Biology, plant science, horticulture, soil and water sciences, and wildlife biology present principles and practices by which the renewable natural resources of an area can be effectively and economically managed. Courses in sociology, psychology, political science, and park administration provide the basis for organizing and administering public and private park and recreation programs.

Bachelor of Science Major Requirements*

CORE COURSES:

	<i>Units</i>
Biological sciences, including: Biology 1, Botany 2	11
Physical sciences, including:	
Physics and chemistry (Physics 2A, 2B, 2C; Chemistry 1A, 1B, 1C)	24
Mathematics	9
Social sciences and humanities, including:	
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; Rhetoric 1A, 1B)	8
Upper division social sciences in at least two of the following areas**:	
economics, geography, political science†	12
Electives approved by adviser†**	16
Renewable natural resources (Renewable Natural Resources 100, 190)	6
Unrestricted electives**	24

MAJOR COURSES:

Additional biological sciences, including:	
Introduction to ornamental plants, Environmental Horticulture 5, 6, 7	6
Advanced landscape horticulture, Environmental Horticulture 128A, 128B	4
Electives** (animal ecology courses, such as Zoology 134 or Wildlife and Fisheries Biology 151)	4
Additional physical sciences, including:	
Geology (Geology 1)	3
Soil and water science (Soil and Water Science 1 and 2)	6
Additional biological and physical science electives**	17
Additional social sciences and humanities:	
Economics 1A†, Sociology 1†	
Additional requirements to complete the major:	
Introduction to landscape design, Environmental Horticulture 1, 1L	5
Introduction to city planning, Park Administration 110	4

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

** These elective courses may be taken on a Passed or Not Passed basis.

† May be used to satisfy the social sciences and humanities core requirement in part, in addition to fulfilling the requirement of the major.

‡ Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

<i>Park and recreational area planning</i> , Park Administration	134	4
<i>Park administration</i> (Park Administration 140)		3
<i>Outdoor recreation</i> (Physical Education 142)		4
<i>Conservation of natural resources</i> (Geography 161)		4
<i>Electives**</i>		6
 Total units for the degree		180

See *Sample Program VIII*, page 102. For further details concerning the major, contact R. W. Harris, Chairman of the Major, 162 TB-38.

PHYSIOLOGY is concerned with the vital functions of living things, including a systematic study of the functional properties of tissues and organs and comparisons of processes among different kinds of animals. The major consists of a sequence of at least 25 units of *physiology* and closely related courses. Lecture and laboratory courses in mammalian and general physiology lead to more specialized courses, such as environmental, avian, comparative, and reproductive physiology; endocrinology; growth; biodynamics; and nervous function. Biochemistry, with laboratory, is required. Additional organic chemistry, and gross and microscopic anatomy are also advised.

The undergraduate program may serve as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and education. Students interested in research and advanced teaching may use this program as preparation for continued study leading to the Master of Science and Doctor of Philosophy degrees.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Quantitative Biology curriculum)	Units
Biology	21
<i>Preparation:</i> Biology 1; one additional course chosen from Bacteriology 2, Botany 2, Zoology 2 or Physiology 101 and 101L (Physiology 101, 101L)	
<i>Upper division biology core:</i> At least one upper division course from two areas other than the major subject: bacteriology, biochemistry, botany, genetics, nutrition, physiology, and zoology (Genetics 100A, 100B; Nutrition 110)	
Chemistry (equivalent to Chemistry 1A, 1B, 1C and 5)	25
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; and/or Rhetoric 1A, 1B)	8
Mathematics, including one year of calculus (Mathematics 16A, 16B, 16C)	12

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

** These elective courses may be taken on a Passed or Not Passed basis.

Physics, any course except Physics 10, and including one laboratory course	12
Social sciences and humanities electives†**	28
Unrestricted electives**	24

MAJOR COURSES:

Biochemistry 101A, 101B and laboratory (preferably Animal Biochemistry 102)	10
Genetics, one upper division course†	
Nutrition, one upper division course†	
Physiology 100A, 100B, 100L, 110A, 110B, 111A, 111B	15
Additional physiology courses	10
Electives approved by adviser	15
 Total units for the degree	180

See *Sample Program VIIC*, page 102. For further details concerning the major, contact J. M. Boda, Chairman of the major, TB-30.

PLANT PROTECTION includes the sciences involved in the control of agricultural pests. To ensure future generations the high standard of living we now enjoy, we must increase our production of food and fiber at least as fast as the population increases. An important way of increasing production and quality is through the control of harmful insects, nematodes, plant disease, and weeds. To gain competence in diagnosing ills of agricultural crops and prescribing treatments, students in this major take work in plant physiology and weed science, entomology, plant pathology, nematology, agricultural engineering, agricultural toxicology, and wildlife.

Career opportunities are available as research technicians and in technical sales and service with chemical companies, food processing firms, Farm Adviser offices, and grower's organizations.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Agricultural Biosciences curriculum)	Units
Biological sciences, including one animal-oriented and one plant-oriented course: Biology 1, Botany 2, Plant Science 1 (Recommended: Plant Science 2, Animal Science 1, 2 or Zoology 2)	20
Chemistry, including organic chemistry (Chemistry 1A, 1B, 8A, 8B)	16
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, or 5; or Rhetoric 1A, 1B)	8
Mathematics, including calculus and/or statistics (Mathematics 13 and 16A)	7

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

** These elective courses may be taken on a Passed or Not Passed basis.

† May be used to partially satisfy the preparatory core requirements.

‡ 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 (Physics 2A, 2B, 2C)	9
Social sciences and humanities electives† **	28
Unrestricted electives**	24

MAJOR COURSES:

Agricultural engineering, chemical application (Agricultural Engineering 110)	3
Agricultural toxicology (Agricultural Toxicology 180)	3
Animal science, wildlife in land use (Animal Science 151)	4
Botany, plant physiology and weed science (Botany 107, 111, 180)	12
Economics (Economics 1A)†	3
Entomology (Entomology 110, 112, 117)	12
Nematology (Nematology 100, 130)	8
Plant pathology (Plant Pathology 120, 122)	12
Electives approved by adviser	14
 Total units for the degree	180

See *Sample Program I*, page 97. For further details concerning the major, contact J. A. Cook, Chairman of the major, 2009 Wickson Hall.

PLANT SCIENCE is the study of the biological, physical and social sciences as they apply to plant and crop production. Students may specialize in agronomy, floriculture, landscape horticulture, nursery management, plant pathology, pomology, vegetable crops, and viticulture.

A major in *Plant Science* discovers that the life processes are no less complex in plants than in other organisms. He learns that plants are very responsive to their environment, and that plant growth and yield can be dramatically affected by the manipulation of plants and environment.

Basic biological and physical sciences provide broad training for the plant sciences, including plant genetics, plant nutrition, plant pathology, plant physiology, and the related fields of entomology and soil and water science.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Agricultural Biosciences curriculum)	Units
Biological sciences, including one animal-oriented and one plant-oriented course (Biology 1, Botany 2, Plant Science 1, 2; Animal Science 1, 2 or Zoology 2)	20
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; or Rhetoric 1A, 1B)	8

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

** These elective courses may be taken on a Passed or Not Passed basis.

† May be used to satisfy the social sciences and humanities requirement in part.

‡ Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

Mathematics, including calculus and/or statistics (Mathematics 13, 16A)	7
Physics (Physics 2A, 2B, 2C)	9
Social sciences and humanities electives† **	28
Unrestricted electives**	24

MAJOR COURSES:

Entomology (Entomology 110 or 112)	4
Genetics (Genetics 100A, 100B)	6
Nematology or weed science (Nematology 110 or Plant Science 120)	2
Plant pathology (Plant Pathology 120)	4
Plant physiology (Botany 111)	5
Soil and water science (Soil and Water Science 1 and 2)	6
Electives approved by adviser:	
a) Biochemistry, botany, chemistry, genetics, geography, geology, mathematics, microbiology, physics or zoology	6
b) Entomology, nematology, plant nutrition, plant pathology, plant science, soil and water science or weed science	9
c) Courses to complete major	26
Total units for the degree	180

See *Sample Program I*, page 97. For further details concerning the major, contact D. S. Brown, Chairman of the major, 1043 Wickson Hall.

Students may also specialize in *Plant Science* under the *Agricultural Science and Management* curriculum described on page 67.

PREFORESTRY students are admitted to the School of Forestry and Conservation located on the Berkeley campus, following completion of the sophomore year. The preparatory 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, he must satisfy the preparatory subject matter requirements for one of the two majors offered.

General Forestry. The requirements of the preparatory program may be satisfied in full by completion of the course work shown in *Sample Program IX-A*, page 103.

Wood Science and Technology. The requirements of the preparatory program may be satisfied in full by completion of the course work shown in *Sample Program IXB*, page 103.

For full details on the majors in general forestry and in wood science and technology, please consult the *Announcement of the School of Forestry and Conservation*, 145 Mulford Hall, Berkeley, California 94720.

See *Sample Program IXA* and *IXB*, page 103.

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

PREVETERINARY MEDICINE students may apply for admission to the School of Veterinary Medicine on the Davis campus following completion of at least 90 quarter units, including the requirements listed below. This normally requires a minimum of two years of study and satisfies the course requirements for admission to the School of Veterinary Medicine. For further information, including a sample program, refer to the material beginning on page 147 or write to the Office of the Dean, School of Veterinary Medicine, Davis 95616.

Subject and unit requirements for the preveterinary medical curriculum are:

	<i>Units</i>
Chemistry (general, qualitative, organic, and quantitative)	25
Physics (general)	9
Biology, zoology, embryology	17
English composition and additional English or rhetoric	8
Animal science§	3
Restricted electives in social sciences and humanities† **	17
Additional electives in social sciences, humanities or agriculture**	11
	90

RANGE MANAGEMENT as a field of study includes the sciences required for development and management of public and private lands used primarily for grazing—that is, animal and plant sciences, soil and water sciences, and social sciences. Under the multiple-use concept the program takes into account the demands imposed on these lands for recreation and forestry, and for watersheds as well. The program includes the study of botany, ecology, genetics, geology, animal nutrition, range management, soil and water science, and zoology.

The student draws upon the interdisciplinary aspects of the major when he learns to make decisions affecting the multiple-use potential of an area. For example, conversion (not necessarily complete) of a brushland site to grassland means more forage and browse for livestock and big game, thus providing more meat and better hunting, better habitats for wildlife, newly developed springs, increased stream flow, and less fire hazard. The resulting parklike landscape is a better environment for man, livestock, and wildlife.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Resource Sciences curriculum)	<i>Units</i>
Biological sciences, including biology and botany (Biology 1, Botany 2) . . .	11
Physical sciences, including:	
Physics and chemistry, Physics 2A, 2B, 3A, 3B; Chemistry 1A, 1B, 8A, 8B	24
Mathematics	9

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

** Refer to page 147 for School of Veterinary Medicine recommendations regarding Passed or Not Passed options.

§ May be waived if not available.

† Art, anthropology, economics, foreign languages, geography, history, music, philosophy, political science, psychology, and/or additional English, rhetoric, and mathematics.

Social sciences and humanities, including:

English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; and/or Rhetoric 1A, 1B)	8
Upper division social sciences in at least two of the following areas**:	
economics, geography, political science†	12
Electives approved by adviser†**	16
Renewable natural resources (Renewable Natural Resources 100, 190) ..	6
Unrestricted electives**	24

MAJOR FIELDS

Additional biological sciences, including:

Botany (Botany 108, 111)	10
Ecology (Plant Science 101 or Botany 117)	3
Genetics (Genetics 100A)	3
Zoology (Zoology 2 and 116, 125, 134, 147, or 155)	9

Additional physical sciences, including:

Geology (Geology 1)	3
Soil and water science (Soil and Water Science 1 and 2)	6

Additional requirements to complete the major include:

Plant science (Plant Science 1)	3
Agronomy (Agronomy 2 or 112 and 112L)	3 or 4
Animal science (Animal Science 1, 2, 118A)	9
Nutrition (Nutrition 103 or Wildlife and Fisheries Biology 108)	4
Range management (Range Management 100, 103, 105; and 133, 198 or 199)	14
Electives**	2 or 3

Total units for the degree 180

See *Sample Program VIII*, p. 102. For further details concerning the major, contact R. M. Love, Chairman of the major, 131 Hunt Hall.

RENEWABLE NATURAL RESOURCES involves the study of those natural resources (i.e., air, water, land, plants, animals, and climate) which are vital to man's existence. An integrated, multi-departmental approach to resource development, management, and protection considers the varied aspects of resource use and protection. Elimination of air, water, and soil pollution and planning for the most beneficial use of land, water, and recreational areas are included as primary objectives. The major provides students excellent opportunity to develop an appreciation of the social, technological, and economic forces affecting the resource management efforts.

Courses in the biological, physical, and social sciences and humanities enable students to develop programs which include the elements of a well-balanced general education while providing technical-professional competencies in the voca-

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

tional areas selected for in-depth preparation. Within the *Renewable Natural Resources* major, course emphasis may be directed to: agricultural economics, agricultural engineering, animal science, atmospheric science, environmental horticulture, geography, geology, plant science, range management, park administration, soil science, water science, wildlife and fisheries biology, and zoology.

Graduates are prepared for technical and managerial positions dealing with the development, use and conservation of renewable natural resources, and for graduate work in the technical specialties of Resource Sciences.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the *Units*
Resources Sciences curriculum)

Biological sciences, including biology and botany (Biology 1, Botany 2) 11

Physical sciences, including:

Physics and chemistry (Physics 2A, 2B, 3A, 3B; Chemistry 1A, 1B, 8A, 8B)	24
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Mathematics	9
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Social sciences and humanities, including:

English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B 5; Rhetoric 1A, 1B)	8
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Upper division social sciences in at least two of the following areas ^{**} : economics, geography, political science†	12
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Electives approved by adviser† **	16
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Renewable natural resources (Renewable Natural Resources 100, 190)	6
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Unrestricted electives ^{**}	24
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MAJOR COURSES:

Additional biological sciences, including:

Plant science (Plant Science 1 and 2)	6
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Animal science (Animal Science 1 and 2)	6
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Electives ^{**}	2
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Additional physical sciences, including:

Soil and water science (Soil and Water Science 1 and 2)	6
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Geology (Geology 1)	3
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Biological and physical sciences electives ^{**}	17
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Agricultural economics (Agricultural Economics 148 or 176)	3
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One upper division course from each of four departments or groups from
the following: agricultural economics, agricultural engineering, animal
sciences, atmospheric science, environmental horticulture, geography,
park administration, plant science, range management, soil science,
water science, wildlife and fisheries biology, and zoology 15

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

** These elective courses may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

Electives**	12
Total units for the degree	180

See *Sample Program VIII*, p. 102. For further details concerning the major, contact H. O. Walker, Chairman of the major, 228 Administration Building.

SOIL AND WATER SCIENCE is the study of the chemistry, physics, and biochemistry of the soil-water-plant system, soil microbiology, water quality, hydrology, and land use planning. Soil and water resource development and use are critical to the welfare of nations. As population pressures increase, greater numbers of qualified persons will be needed to deal with the complex problems involved in proper management of these vital limited resources.

Excellent employment opportunities are available in managerial and technical positions—with agribusiness and associated enterprises, such as equipment and supply companies; private, state and federal agencies; and international organizations dealing with soil and water development, use and conservation. Those planning on graduate study will find that this program provides excellent preparation.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Resource Sciences curriculum)	Units
Biological sciences, including biology and botany (Biology 1, Botany 2)...	11
Physical sciences, including:	
Physics and chemistry (Physics 2A, 2B, 2C; Chemistry 1A, 1B, 1C***)	24
Mathematics	9
Social sciences and humanities, including:	
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; Rhetoric 1A, 1B)	8
Upper division social sciences in at least two of the following areas**: economics, geography, political science‡	12
Electives approved by adviser‡**	16
Renewable natural resources (Renewable Natural Resources 100, 190)...	6
Unrestricted electives**	24

MAJOR COURSES:

Additional biological sciences, including:

Plant Science	3
Soil-water-plant relationships, Soil and Water Science 104	4
Electives**	7

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

** These elective courses may be taken on a Passed or Not Passed basis.

*** Qualified students may take Chemistry 1A-7A-7B sequence instead of Chemistry 1A-1B-1C-5. Such students could then take four additional units of unrestricted electives.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

Additional physical sciences, including:

Physics 3A, 3B, 3C	3
Geology and/or physical geography	4
Introductory soil and water science, Soil and Water Science 1 and 2 ..	6
Physics of soil and water systems, Soil and Water Science 101	5
Soil and water chemistry, Soil and Water Science 102	5
Water quality, salt control, and reclamation, Soil and Water Science 103	4
Social sciences and humanities, including economics, 5 units†	
Soil and water science electives	9
Electives‡	20
Total units for the degree	180

See *Sample Program VIII*, p. 102. For further details concerning the major, contact V. V. Rendig, Chairman of the major, 251 Hoagland Hall.

TEXTILE SCIENCE studies the properties, uses, and care of fibers and fabrics, their use in design and the socio-economic aspects involved. The major combines scientific and creative disciplines, and can lead to many different careers in research and development, technical service, marketing, and product control. Other employment opportunities are in teaching, Extension Service, merchandising, design, and journalism. The major is part of the Family and Consumer Sciences curriculum.

Textiles and clothing are important in our lives and in the world economy. The use of textiles in clothing and in homes can affect appearance, safety, and comfort. Our clothing has an impact on the way we act and on the image we show others.

The major offers two options: one stresses the sciences and the other combines textile science and design. Courses in textiles and clothing cover the chemical and physical properties of fibers and fabrics, and the principles of clothing selection and construction.

Bachelor of Science Major Requirements*

CORE COURSES: (Requirements common to majors in the Family and Consumer Sciences curriculum)	<i>Units</i>
--	--------------

Natural Sciences:

Chemistry, one course

Physics, one course

Statistics or other mathematics, one course

One course in each of two biological sciences

Additional courses in the natural sciences to make a total of** 27

Social Sciences:

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

** These additional courses and other unrestricted electives may be taken on a Passed or Not Passed basis.

† May be used to satisfy the core social sciences and humanities requirement in part.

‡ These elective courses may be taken on a Passed or Not Passed basis.

One course in each of two of the following: psychology, sociology, and cultural anthropology	
One course: economics or political science†	
Additional courses in the social sciences to make a total of**	27
Humanities:	
English, 8 units	
One course in each of two of the following: foreign language, history †, literature, and philosophy	
One course: art, design, dramatic art, music, or rhetoric	
Additional courses in the humanities to make a total of**	27
MAJOR COURSES: Major requirements (see below) and electives	99
The following courses may be used to partially satisfy the above core requirements:	
Biology 1	
Chemistry 1A, 1B, 8A, 8B	
Consumer Economics 141	
Economics 1A, 1B	
Mathematics 13	
Psychology 1A	
Textiles and Clothing 7, 160, 160L, 161, 161L, 162, 162L, 172, 197	
Plus either Group A or Group B as follows:	
Group A:	Group B:
Bacteriology 2	Art 2
Chemistry 1C, 5	Design 143, 170A, 170B
Mathematics 15, 16A, 16B	Textiles and Clothing 370, 375
Physics 2A, 2B, 2C	Two courses in history of art or design

Total units for the degree 180

See *Sample Program VA*, p. 99. For further details concerning the major, contact Mary Ann Morris, Chairman of the major, 150 Home Economics Building.

WILDLIFE AND FISHERIES BIOLOGY prepares students for careers associated with public and private wildlife areas and fisheries. Emphasis is placed upon development of a balanced program in the social, biological, and physical sciences, and maintenance of flexibility in the selection and development of areas of specialization such as ecology, fisheries or wildlife.

There is an increasing need for graduates with the scientific knowledge essential to development and management of effective fish and wildlife programs. Creatures of the wildland, oceans, and stream areas not only provide recreation in the form of hunting and fishing but also hold considerable promise as an undeveloped, though potentially important, source of nourishment. Some 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

** These additional courses and other unrestricted electives may be taken on a Passed or Not Passed basis.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

their numbers must be controlled. A reasonable balance between the needs of man and wildlife must be maintained for the sake of future generations.

Students may prepare for careers as wildlife or fishery biologists, animal control specialists, park or forest rangers, land managers or game technicians or, following additional academic preparation, for careers in research and administration of those areas.

Bachelor of Science Major Requirements*

CORE COURSES: (Unit requirements common to majors in the Resource Sciences curriculum)	<i>Units</i>
Biological sciences, including biology and botany (Biology 1, Botany 2) . . .	11
Physical sciences, including:	
Chemistry and physics	24
Mathematics (Mathematics 13, 16A, 16B or 30)	9
Social sciences and humanities, including:	
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5; and/or Rhetoric 1A, 1B)	8
Upper division social sciences in at least two of the following areas ^{**} :	
economics, geography, political science†	12
Electives approved by adviser† ^{**}	16
Renewable natural resources (Renewable Natural Resources 100, 190) . .	6
Unrestricted electives ^{**}	24
 MAJOR COURSES:	
Additional biological sciences, including:	
Genetics (Genetics 100A, 100B or 115)	6
Nutrition, Wildlife and Fisheries Biology 108	4
Physiology (Physiology 101 and 101L; 110A and 110B; 111A)	6
Physiological chemistry (Biochemistry 101A-101B)	6
Plant taxonomy (Botany 108 or Range Management 100)	4
Vertebrate ecology (Zoology 125)	3
Wildlife management, Wildlife and Fisheries Biology 110A, 110B, 110C	9
Zoology (Zoology 2)	6
Additional physical sciences, including:	
General chemistry	10
Additional mathematics	1
Humanities and social sciences, Wildlife and Fisheries Biology 115†	
Electives approved by adviser	15
Total units for the degree	180

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

** These elective courses may be taken on a Passed or Not Passed basis.

† Satisfies two units of the electives in social science and humanities in the core requirements.

‡ Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the social sciences and humanities requirement.

See *Sample Program VIII*, p. 102. For further details concerning the major, contact J. M. Boda, Chairman of the major, TB-30.

SAMPLE PROGRAMS:

The core and major requirements allow for considerable flexibility, enabling the student to make certain selections in accordance with his academic preparation and his particular interests. Students may satisfy the requirements of the various majors by courses other than the ones listed in the Sample Programs. All requirements of *each* major may not be included. Students are strongly urged to consult the major adviser in planning their lower division preparatory course work.

SAMPLE PROGRAM I—Agricultural Biosciences

Majors: Agricultural Genetics (p. 66), Animal Science (p. 69), Entomology (p. 77), Plant Protection (p. 87), Plant Science (p. 88)

The following two-year program is offered only as a guide, and does not necessarily include all requirements for each major (for details see majors as noted above).

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Animal Science 1 and Plant Science 1	3	3	—
Biology 1	—	—	6
Chemistry 1A, 1B	5	5	—
English*	4	4	—
Electives or other requirements	3	3	9
	—	—	—
	15	15	15
<i>Sophomore Year</i>			
Bacteriology 2 or Botany 2	—	5	—
Chemistry 8A, 8B	3	3	—
Mathematics 13, 16A	4	3	—
Physics 2A, 2B, 2C	3	3	3
Electives or other requirements	5	1	12
	—	—	—
	15	15	15

6

SAMPLE PROGRAM II—Agricultural Economics and Business Management

Majors: Agricultural Business Management (p. 63), Agricultural Economics (p. 64)

The following two-year program is offered only as a guide, and does not necessarily include all requirements for each major (for details see majors as noted above).

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 1A	—	5	—
English 1 or 2; Rhetoric 1A or 1B	4	4	—
Physics 10	4	—	—

* English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5; and/or Rhetoric 1A, 1B, in addition to satisfaction of Subject A requirement.

<i>Freshman Year (cont.)</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Agriculture elective	—	3	3
Natural science elective (Biology 10)	—	—	4
Social science elective (Political Science 1A, 1B)	4	—	4
Electives or other requirements	3	3	4
	15	15	15
<i>Sophomore Year</i>			
Economics 1A, 1B	5	5	—
Economics 11A, 11B	4	3	—
Mathematics 15, 16A or equivalent	3	3	—
Agriculture elective	3	—	—
Natural science elective	—	4	4
Social science elective	—	—	4
Electives or other requirements	—	—	7
	15	15	15

SAMPLE PROGRAM III—Agricultural Education and Development

Majors: Agricultural Education (p. 65), International Agricultural Development (p. 82)

The following two-year program is offered only as a guide, and does not necessarily include all requirements for each major (for details see majors as noted above).

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Agricultural science (introductory)	3	—	—
Chemistry 1A, 1B	—	5	5
English*	4	4	—
Mathematics 13	—	4	—
Electives or other requirements	8	2	10
	15	15	15
<i>Sophomore Year</i>			
Biology 1	6	—	—
Chemistry 8A, 8B	3	3	—
Economics 1A	—	5	—
Physics 2A, 2B	—	3	3
Electives or other requirements	6	4	12
	15	15	15

SAMPLE PROGRAM IV—Agricultural Science and Management

Major: Agricultural Science and Management (p. 67)

The following two-year program is offered only as a guide, and does not necessarily include all requirements for the major (for details see major as noted above).

* English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5; in addition to satisfaction of Subject A requirement.

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Animal Science 1, 2	3	—	3
Chemistry 1A, 1B	—	5	5
English†	4	4	—
Mathematics 16A, 16B, 13	3	3	4
Plant Science 1, 2	—	3	3
Electives or other requirements	5	—	—
	<u>15</u>	<u>15</u>	<u>15</u>
<i>Sophomore Year</i>			
Agricultural Economics 1, 2	—	3	3
Bacteriology 2 or Botany 2	—	—	5
Biology 1	6	—	—
Chemistry 8A, 8B	3	3	—
Economics 1A, 1B	—	5	5
Physics 2A, 2B, 2C	3	3	3
Soil and Water Science 1, 2	3	3	—
	<u>15</u>	<u>17</u>	<u>16</u>

SAMPLE PROGRAM V—Family and Consumer Sciences

A. Majors: Dietetics and Nutrition (p. 76), Foods (p. 78), Home Economics (p. 80), Textile Sciences (p. 94)

The following two-year program is offered only as a guide, and does not necessarily include all requirements for each major (for details see majors as noted above).

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Art 2 and/or humanities requirement	4	4	—
Chemistry 1A, 1B or 1A, 1B, 1C	— (5)	5 —	5 —
Economics 1A or other social science	—	—	4-5
English*	4	4	—
Psychology 1A and/or other social science	4	—	4
Textile and Clothing 7 or elective	—	—	2-3
Electives or other requirements	3-4	3	—
	<u>15-16</u>	<u>16</u>	<u>15-17</u>
<i>Sophomore Year</i>			
Bacteriology 2 or other biological science	—	5	—
Biology 1	6	—	—
Chemistry 8A, 8B	3	3	—
Chemistry 5 or elective	—	—	4
Economics 1B and/or other social science	—	4-5	4-5
Mathematics 13	—	—	4
Physics 2A, 2B, 2C or Physics 10 and electives	3-4	3	3
Physiology or other biological science	4	—	—
	<u>16-17</u>	<u>15-16</u>	<u>15-16</u>

* English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5.

† English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5; and/or Rhetoric 1A, 11B.

B. Majors: Child Development (p. 73), Design (p. 74)

The following two-year program is offered only as a guide, and does not necessarily include all requirements for each major (for details see majors as noted above).

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Art, design and/or other humanities requirement	4-8	4	4
Biological science	-	-	4
Chemistry 1A	-	5	-
English*	4	4	-
Mathematics or statistics	-	-	4
Psychology 1A, 1B, 1C or 1A and other social science	4-8	4	4
	16	17	16
<i>Sophomore Year</i>			
Anthropology 2 and other social science	4	4	4
Art and other humanities requirement	4	4	4
Biological science	4	-	4
Physics 10	4	-	-
Electives or other requirements	-	8	4
	16	16	16

SAMPLE PROGRAM VI—Food Science**Major: Food Science (p. 79)**

The following two-year program is offered only as a guide, and does not necessarily include all requirements for the major (for details see major as noted above).

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Biology 1	-	-	6
Chemistry 1A, 1B, 1C	5	5	5
English†	4	4	-
Food Science 1	3	-	-
Mathematics 13	-	-	4
Electives or other requirements	3	6	-
	15	15	15
<i>Sophomore Year</i>			
Bacteriology 2	-	5	-
Chemistry 5	-	-	4
Chemistry 8A, 8B	3	3	-
Mathematics 16A, 16B, 16C	3	3	3
Physics 2A, 2B, 2C	3	3	3
Electives or other requirements	6	1	5
	15	15	15

* English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5.

† English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5; and/or Rhetoric 1A, 1B.

SAMPLE PROGRAM VII—Quantitative Biology**A. Major: Biochemistry (p. 72)**

The following two-year program is offered only as a guide. Student programs are developed on an individual basis, courses being determined by student's career goals.

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 1A, 1B, 1C	5	5	5
English†	4	4	—
Mathematics 21A, 21B, 21C	3	3	3
Physics 2A, 2B, 2C	3	3	3
Physics 3A, 3B, 3C	1	1	1
Electives or other requirements	—	—	3
	<hr/> 16	<hr/> 16	<hr/> 15

Sophomore Year

Bacteriology 2	—	5	—
Biology 1	6	—	—
Chemistry 5	—	—	4
Chemistry 112A, 112B	—	5	5
Mathematics 13	4	—	—
Electives or other requirements	5	5	6
	<hr/> 15	<hr/> 15	<hr/> 15

B. Major: Nutrition (p. 83)

The following two-year program is offered only as a guide. Student programs are developed on an individual basis, courses being determined by student's career goals.

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 1A, 1B, 1C	5	5	5
English†	4	4	—
Mathematics 13	—	—	4
Physics 2A, 2B, 2C	3	3	3
Physics 3A, 3B, 3C	1	1	1
Electives or other requirements	2	2	2
	<hr/> 15	<hr/> 15	<hr/> 15

Sophomore Year

Bacteriology 2	—	5	—
Biology 1	6	—	—
Chemistry 8A, 8B, 9	3	3	3
Mathematics 21A, 21B, 21C	3	3	3
Physiology 101, 101L	—	—	6
Electives or other requirements	3	4	3
	<hr/> 15	<hr/> 15	<hr/> 15

† English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5; and/or Rhetoric 1A, 1B.

C. Major: Physiology (p. 86)

The following two-year program is offered only as a guide. Student programs are developed on an individual basis, courses being determined by student's career goals.

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Biology 1	—	—	6
Chemistry 1A, 1B, 1C	5	5	5
English†	4	4	—
Mathematics 16A, 16B, 16C	3	3	3
Electives or other requirements	4	4	—
	<u>16</u>	<u>16</u>	<u>14</u>
<i>Sophomore Year</i>			
Chemistry 5, 8A, 8B	3	3	4
Mathematics 13	4	—	—
Physics 2A, 2B, 2C	3	3	3
Physics 3A, 3B, 3C	1	1	1
Physiology 101, 101L	—	—	6
Electives or other requirements	4	8	—
	<u>15</u>	<u>15</u>	<u>14</u>

SAMPLE PROGRAM VIII—Resource Sciences

Major: Atmospheric Science (p. 71), Park and Recreation Administration (p. 84), Range Management (p. 90), Renewable Natural Resources (p. 91), Soil and Water Science (p. 93), Wildlife and Fisheries Biology (p. 95).

The following two-year program is offered only as a guide, and does not necessarily include all requirements for each major (for details see major as noted above).

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Biology 1	—	—	6
Chemistry 1A, 1B	5	5	—
English*	4	4	—
Mathematics§‡	3	3	3
Plant Science 1	—	3	—
Required courses and electives	3	—	6
	<u>15</u>	<u>15</u>	<u>15</u>
<i>Sophomore Year</i>			
Botany 2	5	—	—
Chemistry 5 or 8A, 8B	(3—4)	(3)	(3—4)
Physics 2A, 2B, 2C‡	3	3	3
Soil and Water Science 1, 2	3	3	—
Required courses and electives	(0—4)	(6—9)	(8—9)
	<u>14—19</u>	<u>15—18</u>	<u>14—16</u>

* English—8 units to be chosen from: English 1, 2, 3, 4A, or 5; and/or Rhetoric 1A or 1B; in addition to satisfaction of Subject A requirement.

† Mathematics—9 units chosen from 13, 15, 16A, 16B or 16C, except for Atmospheric Science majors.

‡ English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5; and/or Rhetoric 1A, 1B.

§ Atmospheric Science major recommends Mathematics 21A, 21B, 21C, 22A, 22B, 22C; and Physics 4A, 4B, 4C, 4D. Renewable Natural Resources requires Physics 2A, 2B, 3A, 3B.

SAMPLE PROGRAM IX—Preforestry**A. Preparation for Major: General Forestry (p. 89)**

Suggested two-year program:

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 1A, 1B,	5	5	—
English*	4	4	—
Physics 2A, 2B, 2C	3	3	3
Electives	3	3	12
	—	—	—
	15	15	15

<i>Sophomore Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Biology 1	—	6	—
Botany 2	—	—	5
Economics 1A, 1B	5	5	—
Engineering 1	—	—	3
Geology 1	3	—	—
Mathematics 16A, 16B, 13	3	3	4
Electives	4	—	4
	—	—	—
	15	14	16

B. Preparation for Major: Wood Science and Technology (p. 89)

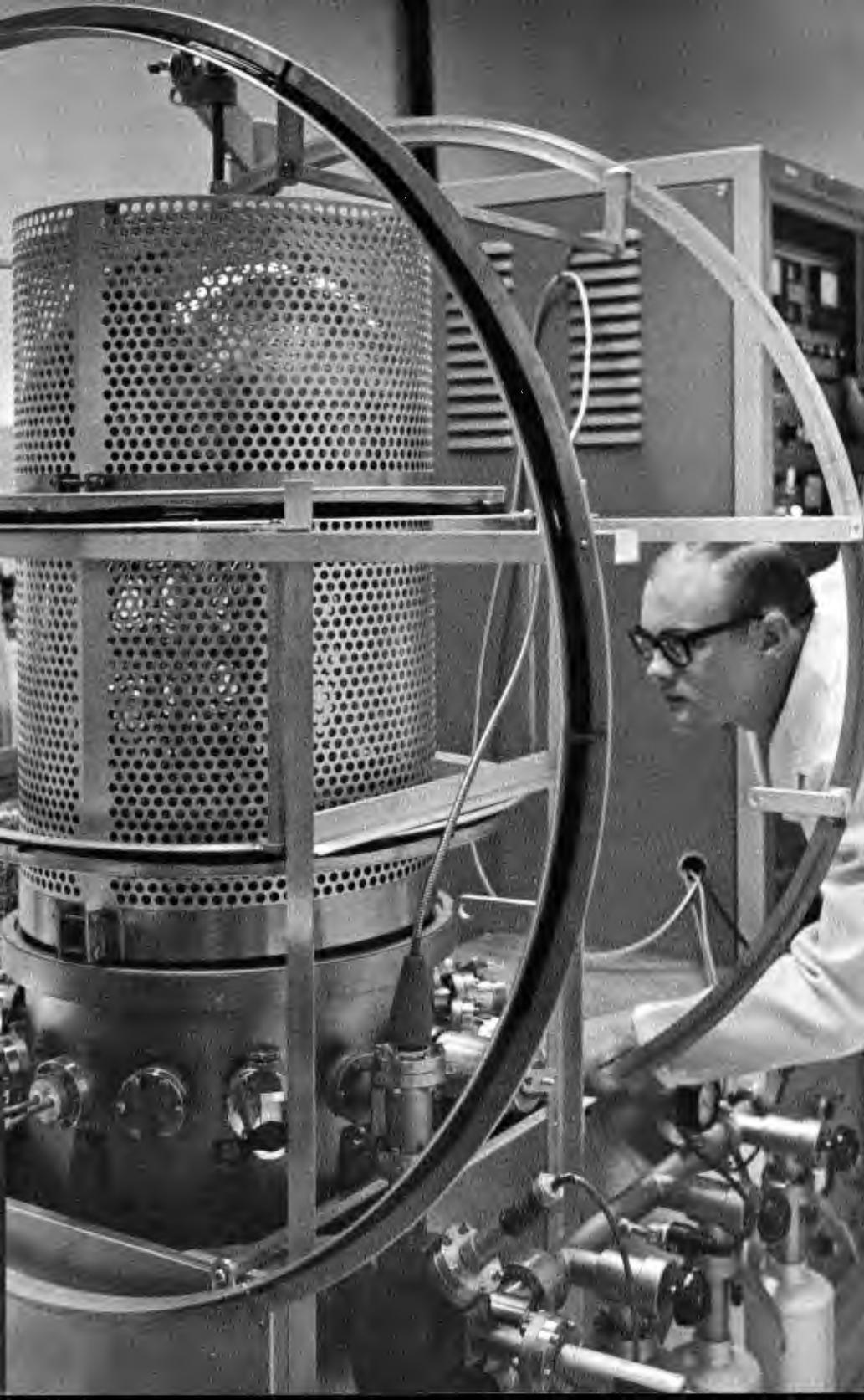
Suggested two-year program:

<i>Freshman Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 1A, 1B, 1C	5	5	5
Mathematics 21A, 21B, 21C	3	3	3
Physics 4A, 4B	—	4	4
Humanities and social science§	4	4	—
Electives	4	—	4
	—	—	—
	16	16	16

<i>Sophomore Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 8, 9	5	3	—
Mathematics 22A, 22B, 22C	3	3	3
Physics 4C, 4D, 4E	4	4	4
Biology 1	—	—	6
Humanities and social science	4	4	—
	—	—	—
	16	14	13

* English—8 units to be chosen from: English 1, 2, 3, 4A, 4B, or 5; and/or Rhetoric 1A, 1B.

§ A minimum of 15 units selected by the students from the following courses, including at least two courses from one of the departments: Anthropology 1, 2, 3; Art 1A, 1B, 1C, 1D; English; History 17A, 17B; Philosophy 6, 12; Psychology 1A, 33.



COLLEGE OF ENGINEERING

The University's curricula in engineering emphasize design, development, and research. Mathematical analysis, the basic sciences, and design are stressed in preparing the student for a professional engineering career.

Engineering curricula on the Davis campus include aerospace, agricultural, chemical, civil, electrical, materials science, and mechanical engineering. Each curriculum is a four-year undergraduate program leading to the Bachelor of Science degree. Graduate programs leading to the degrees Master of Engineering, Doctor of Engineering, Master of Science, and Doctor of Philosophy are offered.

Admission to Freshman Standing

General requirements for admission to the University are given on page 17.

High School Preparation for Engineering

It is important that students who plan to study engineering at the Davis campus include in their high school programs the following subjects:

	Units
Algebra*	2
Plane geometry*	1
Trigonometry*	$\frac{1}{2}$
Chemistry or physics (both are desirable)	1
Mechanical drawing	1

These subjects are prerequisite to certain basic courses in the freshman engineering program. A student who is admitted without all this preparation will be required to make up equivalent work while in college. As a result, he probably will be delayed in advancement to upper division status and in graduation.

Advancement to Upper Division Standing

The student who enters the College of Engineering in lower division standing is eligible for advancement to the upper division when he completes the lower division program with an overall grade-point average of at least 2.0.

Admission to Upper Division Standing

To qualify for admission to the College of Engineering in upper division standing, the applicant must have completed at least 56 semester units (or 84 quarter units), including the following subjects, with an overall C (2.0) average.

6
Minimum number of
semester units

Analytic geometry and calculus	12
Chemistry (for engineering and science students)	8
Physics (for engineering and science students)	10
Engineering (subjects such as graphics, properties of materials, surveying, engineering measurements, statics, and circuit theory)	10
Humanistic-social studies (must be selected from a list of course groups approved by the Committee on Undergraduate Study)	6

* Or equivalent integrated courses covering the same subject material.

*Minimum number of
semester units*

Unspecified subjects (6 units may be in humanistic-social studies; the remaining units should be in engineering, science, and mathematics, and may include units in mathematics, physics, chemistry and engineering in addition to the minimum numbers specified above. 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. None of these units may be in military science or physical education)	10
	<hr/> 56

The student admitted to upper division standing on this basis will not be required to take additional lower division courses except those which are prerequisite to upper division courses in his curriculum or are specified requirements for the B.S. degree.

Note that the above subject requirements are *minimum*. Students who enter with only 56 semester units will probably require more than six quarters to complete an upper division engineering curriculum in the University.

With certain minor exceptions noted in the lower division program, students registered in the College of Engineering are not permitted to enroll in upper division engineering courses until they have been admitted to upper division standing.

The Bachelor of Science Degree

GENERAL UNIVERSITY REQUIREMENTS

The degree of Bachelor of Science is awarded to those candidates who satisfy the requirements of the University (pages 31-33) in regard to:

- Subject A
- American History and Institutions
- Scholarship
- Residence
- Application for Degree Candidacy

COLLEGE OF ENGINEERING REQUIREMENTS

The candidate for the degree of Bachelor of Science in Engineering must:

1. Satisfactorily complete the subjects and units prescribed in one of the engineering curricula.
2. Attain a grade C average in all courses of upper division level taken in satisfaction of required technical subjects and technical electives in the curriculum.

HONORS WITH THE BACHELOR'S DEGREE

Honors at graduation may be awarded to students who achieve distinguished scholarship records in all work undertaken after admission to the upper division

as attested by recommendation of the Committee on Undergraduate Study of the College of Engineering. Students who display marked superiority may be awarded highest honors at graduation.

FACULTY ADVISERS AND STUDY-LIST REQUIREMENTS

Upon admission to the College, each student is assigned to a faculty adviser and is under the guidance of the Dean of the College of Engineering and the Committee on Undergraduate Study. All programs of study are arranged in conference with the adviser and must be approved by him. However, *the student is held responsible for planning his program and for the satisfactory completion of graduation requirements.* Questions regarding deviations from a regular program of study should be discussed with the adviser and resolved at the earliest possible date.

A student who gives full time to University responsibilities is expected to enroll for the number of units specified in the curriculum in which he intends to graduate. Students may not enroll for more than 19 units or less than 12 units, exclusive of physical education, without the approval of the Dean of the College.

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

HUMANISTIC-SOCIAL STUDIES

The curricula, in conformance with the regulations of the College of Engineering, include a minimum of 31 quarter units of study in the humanities and social sciences (exclusive of military science, physical education, Subject A, and any matriculation subjects). These studies are intended to help the student gain an understanding and appreciation of areas of learning other than engineering and the physical sciences. The 31 units of Humanistic-Social Studies must be selected from a list of courses or course groups approved by the Committee on Undergraduate Study and must include one or more specified courses in English and/or rhetoric as approved by the Faculty of the College of Engineering. At least 8 of the 31 units of Humanistic-Social Studies must be completed after the student has received credit for 84 units of college work.

COURSES TAKEN FOR PASSED OR NOT PASSED GRADE

An Engineering student in good standing, including entering students, may enroll in *one elective course each quarter* for a Passed or Not Passed grade, subject to the following conditions:

1. The study list must total at least 14 units.
2. Courses specified (required) in the curriculum may not be taken for a Passed/Not Passed grade. (English 1, 3, or Rhetoric 1A may not be taken Passed/Not Passed.)
3. Units earned with Passed grade are counted toward the degree, but the P or NP grade is disregarded in computing the grade-point average.

4. A grade of Passed shall be awarded only for work which would otherwise qualify for grade A, B, or C.

To enroll for a course on this basis the Engineering student must file a special application form with the Undergraduate Office, College of Engineering.

TECHNICAL ELECTIVES

Each upper division program includes a specified number of technical elective units, and lists suggested courses that may be taken as technical electives. With the adviser's approval, other appropriate upper division courses in engineering, science, or mathematics may be taken in partial satisfaction of the technical elective requirement. A student who wishes to combine two or more technical areas may arrange such a program with the help of his adviser. Students who expect to undertake graduate study should elect additional courses in mathematics, the sciences, and basic engineering subjects as early as possible in their undergraduate program. The entire upper division program should be planned, at least tentatively, early in the junior year. Careful attention should be given to course sequences so that prerequisite courses will be taken at the proper time.

Special Study Courses numbered 198 and 199 may not be taken for credit until the student has completed at least 84 units of credit toward the B.S. degree.

Lower Division Program

The lower division program is substantially the same for all engineering curricula except Chemical Engineering. It provides the beginning student with the fundamentals of science, mathematics, and engineering that are essential as preparation for the engineering sciences and professional studies of the upper division.

Courses required in the lower division program are listed below. Copies of a number of different program arrangements that have been worked out to fit various situations are available to the student through his adviser or in the College office. Students who wish to plan their own programs can do so by utilizing any combination of quarters listed in the last column.

Courses Common to All Curricula	<i>Quarter</i>	<i>Units</i>	<i>Usually Taken*</i>
Chemistry 1A-1B-1C (General Chemistry)	15	2-3-4 or 1-2-3	
Engineering 3 (Introduction to Engineering Systems)	3	1, 2, or 3	
Engineering 5A (Engineering Applications of Computers)	3	2, 3, or 5	
Engineering 35 (Statics)	3	4 or 5	
Mathematics 11† (Analytic Geometry)	2	1	
Mathematics 21A-21B-21C (Calculus)	9	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	

* Students majoring in Chemical Engineering generally use the last choice listed for each course.

† Students who have had analytic geometry in high school will substitute 2 units of free electives for Mathematics 11.

		Quarter
	Units	Usually Taken*
Humanities and social sciences:		
English 1 (Expository Writing)	4	Varies
English 3 (Introduction to Literature) or Rhetoric 1A (Introduction to Public Speaking)	4	Varies
Elective (in humanities and social sciences)	4	Varies
	<hr/>	
	76	

Additional Courses in Aerospace, Agricultural, Civil, Electrical, Materials Science, and Mechanical Engineering Curricula

Engineering 4 (Engineering Graphics in Design)†	3	1, 2, or 3
Engineering 17 (Circuits)§	3	5 or 6
Engineering 45 (Properties of Materials)	4	4 or 6
Mathematics 24 (Infinite Series)	2	6
Elective‡	3	Varies
	<hr/>	
	15	

Additional Courses in Chemical Engineering Curriculum

Chemistry 5 (Quantitative Analysis)	4	4
Chemistry 112A (Organic Chemistry)	5	6
Engineering 102A (Dynamics)§	3	6
Humanities and social sciences§	4	Varies
	<hr/>	
	16	

Upper Division Curricula

The upper division curricula in the several engineering areas (Aerospace, Agricultural, Chemical, Civil, Electrical, Materials Science, and Mechanical) are described in the following pages. Several courses required in the first quarter of the junior year are the same in most of the programs. The total undergraduate curriculum normally requires twelve quarters of study and leads to the Bachelor of Science degree.

AEROSPACE ENGINEERING CURRICULUM (183 Units)

Aerospace engineering is the application of scientific knowledge to flight in the atmosphere and beyond. Specific objectives are the design, development, and manufacture of airplanes, helicopters, missiles, rockets, satellites, and space stations. The undergraduate curriculum combines the study of basic engineering disciplines with courses in aerodynamics, guidance, propulsion, and structures. A broad range of technical elective courses is available from which the student

* Students majoring in Chemical Engineering generally use the last choice listed for each course.

† Students majoring in Electrical Engineering take 3 units of humanities and social sciences in place of Engineering 4.

‡ Students majoring in Civil Engineering take Civil Engineering 10 in place of 3 units of electives, usually in quarter 3 or 6.

§ These courses are included in the upper division programs of the other curricula.

may select subjects of a more specialized nature such as aeronautics, aerostructures, and astronautics.

The curriculum is organized to develop the student's ability to apply basic engineering principles in the design of engineering systems. This training is intended to prepare him for technical leadership in this rapidly changing field.

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 100 2	Engineering 101 2	Engineering 103B ... 3	
Engineering 102A ... 3	Engineering 102B ... 3	Engineering 104B ... 3	
Engineering 105A ... 3	Engineering 103A ... 3	Mechanical	
Humanities-Social	Engineering 104A ... 3	Engineering 111 .. 4	
Sciences 4	Engineering 105B ... 3	Mechanical	
Elective 3		Engineering 121 .. 3	
		Humanities-Social	
		Sciences 3	
	<u>15</u>	<u>14</u>	<u>16</u>
<i>Senior Year</i>			
Engineering 186 4	Engineering 190 3	Mechanical	
Electrical	Mechanical	Engineering 123B . 2	
Engineering 150 .. 3	Engineering 123A . 2	Technical Electives .. 6	
Mechanical	Mechanical	Humanities-Social	
Engineering 127 .. 3	Engineering 128 .. 3	Sciences 8	
Technical Electives .. 6	Technical Elective ... 3		
	Humanities-Social		
	Sciences 4		
	<u>16</u>	<u>15</u>	<u>16</u>

Suggested technical electives are: Applied Science 115, 135A, 144; Civil Engineering 131A, 131B, 135; Electrical Engineering 110A, 111A, 112A, 130A, 157A, 157B; Engineering 106, 180, 183, 187, 188; Mechanical Engineering 124, 125, 130, 135, 185A, 185B.

AGRICULTURAL ENGINEERING CURRICULUM (180 Units)

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 agricultural processing, power and machinery, structures and environment, or soil and water engineering.

Agricultural processing involves the transformation of raw agricultural products into different, more usable, or more valuable forms or materials. The fundamental concepts of drying, sorting, cleaning, handling, storage, size reduction, and heat and energy transfer, as well as the biological and physical character-

istics of agricultural materials, are considered as factors in research, development, and design for processing systems and operations.

The *power and machinery* area includes the design, development, and application of field machines and power units for soil preparation, crop production, and related activities. The economic aspects of mechanization and the effects of machines on soils and crops are considered. Procedures for developing machine components and synthesizing them into an engineering system are studied.

Engineering in *structures and environment* includes the design of agricultural structures and analysis of functional effectiveness, efficiency of space and labor utilization, and the 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 may also be studied.

Soil and water engineering 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 area of specialization is administered jointly by the departments of Agricultural Engineering and Water Science and Engineering.

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 102A . . .	3	Engineering 100	2
Engineering 104A . . .	3	Engineering 101	2
Engineering 105A . . .	3	Engineering 103A	3
Humanities-Social Sciences	3	Engineering 104B	3
Elective	3	Technical Electives*	5
	<hr/> 15		<hr/> 15
		<hr/> 15	<hr/> 15
<i>Senior Year</i>			
Mechanical Engineering 118 or Civil Engineering 131A . . .	3	Engineering 106	3
Engineering 131A . . .	3	Technical Electives*	8
Technical Electives*	7	Humanities-Social Sciences	4
Humanities-Social Sciences	4		
	<hr/> 14		<hr/> 15
		<hr/> 15	<hr/> 15

Suggested technical electives are:

Agricultural Processing—Agricultural Engineering 132, 141; Applied Science 115; Chemistry 109A; Electrical Engineering 150; Engineering 105B, 186; Food Science 100; Mathematics 105A; Mechanical Engineering 185A, 185B.

Power and Machinery—Agricultural Economics 140; Agricultural Engineering 110, 114, 116, 117, 118, 141; Applied Science 115; Engineering 105B, 184; Mathematics 105A; Mechanical Engineering 114, 115, 121.

* The technical electives must include at least 18 units from the courses whose numbers are in heavy type in the list of suggested technical electives. These 18 units must include at least 3 units in each of three of the four areas. 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.

Soil and Water—Applied Science 115; Civil Engineering 141, 142, 144; Soil and Water Science 2, 101; Water Science 110A, 110B, 141, 160.

Structures and Environment—Agricultural Engineering 106, 107, 125, 126; 132B, 132C, 134, 142, 148, 171; Applied Science 115; Atmospheric Science 20, 124; Civil Engineering 131B, 132A; Engineering 186.

Agricultural and Biological Sciences—Agronomy 100; Animal Science 2; Biology 10; Botany 2; Plant Science 2, 112; Physiology 149; Soil and Water Science 2; Vegetable Crops 100, 101.

CHEMICAL ENGINEERING CURRICULUM (182 units)

Chemical engineering is concerned with all processes and devices involving chemicals. The products of the process industries range from antibiotics to zirconium, from petroleum to plutonium, from agricultural chemicals and foods to synthetic plastics. Chemical engineers are increasingly concerned with chemical and engineering processes in animals and humans. 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 the student a sound knowledge of engineering and chemical sciences so that he may achieve competence in treating not only current technical problems but also those that will arise in the technologies of the future. In the upper division, attention is focused on basic engineering courses, particularly thermodynamics, fluid mechanics, and energy and mass transfer. In the senior year these fundamentals are drawn together and applied in process design and process dynamics. The program is strengthened and broadened with introductory courses in the electrical and mechanical sciences.

The curriculum includes several technical electives which allow for special training in an area of particular interest. For example, Davis offers a unique opportunity for specialization in biochemical engineering because of the extensive staff and facilities available in the biological and food sciences. By including elective courses from the Bacteriology, Biochemistry, and Food Science and Technology Departments, the student can obtain excellent preparation for graduate work or industrial employment in food processing and related biological fields.

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 103A . . . 3	Engineering 103B . . . 3	Engineering 17 3	
Engineering 104A . . . 3	Chemical	Engineering 186 4	
Chemical	Engineering 152A . 3	Chemical Engineering	
Engineering 151 . . . 3	Chemistry 110B 3	152B 3	
Chemistry 110A 3	Technical Elective* . 3	Chemistry 110C 3	
Chemistry 112D 3	Humanities-	Technical Elective* . 3	
	Social Sciences . . . 3		
<u>15</u>	<u>15</u>		<u>16</u>

* It is strongly recommended that two of the technical electives be chosen from Applied Science 115; Chemistry 111, 112E; Mathematics 118A, 118B, 130A, 130B. Other suggested technical electives are Bacteriology 2; Biochemistry 101A, 101B; Biology 1, 4; Chemistry 121, 124, 126, 131, 150A, 150B; Civil Engineering 142, 148; Electrical Engineering 110A, 110B, 112A, 130A, 130B; Food Science and Technology 101, 103, 104A, 104B, 106; Mathematics 119, 127A, 127B, 127C, 128A, 128B, 128C, 131A, 131B, 131C, 132A, 132B, 185A, 185B; Mechanical Engineering 125, 185A, 185B; Physics 115A, 115B, 121, 129A, 129B, 140.

<i>Senior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 100 2		Chemical Engineering 154B 3	Chemical Engineering 155B 2
Engineering 101 2		Chemical Engineering 155A 2	Chemical Engineering 156B 3
Chemical Engineering 154A 3		Chemical Engineering 156A 3	Chemical Engineering 157 3
Technical Elective* 3		Technical Elective* 3	Chemical Engineering 158 3
Humanities-Social Sciences 4		Humanities-Social Sciences 4	Humanities-Social Sciences 4
	<u>14</u>		<u>15</u>
			<u>15</u>

CIVIL ENGINEERING CURRICULUM (180 Units)

Areas of specialization in civil engineering are environment engineering, structural engineering and mechanics, and water resources engineering.

Environment Engineering is concerned with improving and maintaining the qualities of the air, land, and water environment that affect the health and well-being of man in the face of increasing population and expanding industrial activity. The program depends on a firm basic science and civil engineering foundation and emphasizes the design of waterborne, solid, and airborne waste-management systems, the design of potable water-supply systems, and environment monitoring.

Structural Engineering and Mechanics is concerned with the conception, design, and construction of structures. Structural engineering involves buildings, bridges, highways, dams, economics of the construction industry, and construction practices. Consideration is given to the response of structures not only to gravity loading but also to earthquake, wind, and blast loading. Structural mechanics emphasizes the more analytical aspects of structural engineering. Principles of structural analysis applicable to structures of all kinds, from office buildings to space vehicles, are examined. Special topics include the mechanics of deformable bodies and the theory of elasticity.

Water Resources Engineering includes programs in 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 system 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

* It is strongly recommended that two of the technical electives be chosen from Applied Science 115; Chemistry 111, 112E; Mathematics 118A, 118B, 130A, 130B. Other suggested technical electives are Bacteriology 2; Biochemistry 101A, 101B; Biology 1, 4; Chemistry 121, 124, 126, 131, 150A, 150B; Civil Engineering 142, 148; Electrical Engineering 110A, 110B, 112A, 130A, 130B; Food Science and Technology 101, 103, 104A, 104B, 106; Mathematics 119, 127A, 127B, 127C, 128A, 128B, 128C, 131A, 131B, 131C, 132A, 132B, 185A, 185B; Mechanical Engineering 125, 185A, 185B; Physics 115A, 115B, 121, 129A, 129B, 140.

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 the geography, economics, and politics of water resources.

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 100 2	Engineering 102B ... 3	Engineering 103B ... 3	
Engineering 101 2	Engineering 103A ... 3	Civil Engineering	
Engineering 102A ... 3	Engineering 104B ... 3	131A 3	
Engineering 104A ... 3	Engineering 105A ... 3	Civil Engineering	
Geology 1 3	Civil Engineering	132B 3	
Elective 3	132A 3	Civil Engineering 171 3	
		Humanities-Social Sciences	3
	16	15	15
<i>Senior Year</i>			
Civil Engineering	Engineering 106 3	Engineering 190 3	
131B 2	Civil Engineering 148 3	Technical Electives .. 8	
Civil Engineering 142 3	Humanities-Social Sciences	Humanities-Social Sciences	4
Civil Engineering 172 2	8		
Technical Elective ... 3			
Humanities-Social Sciences			
4			
14	14		15

Suggested technical electives are:

Environment Engineering: Agricultural Engineering 106; Bacteriology 2; Biochemistry 101A, 101B; Chemistry 8A, 110A, 110B; Civil Engineering 145, 146, 147, 149; Mechanical Engineering 185A, 185B; Park Administration 110.

Structural Engineering and Mechanics: Agricultural Engineering 125, 126; Applied Science 115; Civil Engineering 132C, 134, 135, 137, 138, 160, 173, 174; Engineering 122, 180, 183, 184, 187, 188; Mathematics 185A, 185B.

Water Resources Engineering: Applied Science 115; Chemistry 5; Civil Engineering 141, 143, 144, 145, 146; Electrical Engineering 112A, 150; Mechanical Engineering 185A, 185B; Soil and Water Science 103; Water Science 10, 110A, 116, 141, 150, 160.

ELECTRICAL ENGINEERING CURRICULUM (180 Units)

Present-day electrical engineering embraces a broad spectrum of disciplines based upon the physical and mathematical sciences. For example, the marvels of electronics are being applied to such diversified fields as automation and control, information processing and computers, micro-miniaturization of circuits and components, biomedical applications, communications and microwaves, and stimulated energy emission by means of quantum effects (masers and lasers).

The course of study in electrical engineering allows the student maximum freedom to develop himself in special technical areas of his choice, while required courses insure his attainment of a broad background in basic electrical

engineering. The common engineering core courses of the lower division provide a strong foundation for the specialized topics to follow. In addition, a specified group of upper division courses in network theory, field theory, systems, electronics, and communications theory prepares the student for the technical electives of his senior year.

Technical electives are a substantial part of the senior-year 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 information and data processing, control theory, computers, communications, electronics, biomedical engineering, system theory, solid state, and high-frequency phenomena and devices.

The variety of course offerings permits the student to prepare himself for graduate study in electrical engineering, or to stop at the bachelor level with a sound background in his specialty. In the electrical engineering curriculum close correlation between theory and experiment is emphasized.

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 100 2	Engineering 103A 3	Electrical	
Engineering 101 2	Engineering 105A 3	Engineering 110A 3	
Engineering 102A 3	Electrical	Electrical	
Engineering 104A 3	Engineering 112A 3	Engineering 111A 2	
Electrical	Electrical	Electrical	
Engineering 130A 3	Engineering 130B 3	Engineering 112B 3	
Elective 3	Humanities-Social Sciences 4	Physics 121 3	
		Humanities-Social Sciences 4	
—	—	—	—
16	16	15	
<i>Senior Year</i>			
Electrical	Electrical	Engineering 190 3	
Engineering 110B 3	Engineering 146 3	Electrical	
Electrical	Technical Electives 6	Engineering 133 2	
Engineering 111B 2	Mathematics or Physics Elective 3	Technical Electives 6	
Technical Elective 6		Humanities-Social Sciences 4	
Humanities-Social Sciences 4			
—	—	—	—
15	12	15	

Suggested technical electives are: Applied Science 115; Electrical Engineering 116, 117, 131A, 131B, 131C, 145A, 145B, 145C, 150, 157A, 157B, 172, 173, 184A, 184B; Engineering 106, 180; Mathematics 105A, 105B, 128A, 128B, 128C, 129, 131A, 131B, 131C, 132A, 132B, 151A, 151B, 185A, 185B; Mechanical Engineering 124; Physics 115A, 115B, 129A, 129B, 140.

MATERIALS SCIENCE CURRICULUM (181 Units)

Materials science is a new discipline which applies the basic principles of physics and chemistry to the understanding of the structure, properties, and behavior of metals and other materials. The modern engineering demand for materials in supersonic transport, deep submergence vehicles, aerospace appli-

cations and nuclear reactors has broadened the search for new and improved materials with capabilities well beyond those attainable with common metals and alloys. The development of these materials and the understanding of materials presently in use demands a thorough knowledge of the basic engineering and scientific principles such as structure and diffraction, elastic and plastic behavior of solids, thermodynamics, reaction kinetics, and physics of solids.

The undergraduate program provides the materials engineer with the background for activities in research, processing and utilization of materials and also preparation for graduate work in materials science. The curriculum can lead to challenging work in government and industrial research laboratories, the aeronautical industries, and a wide range of production industries involving use of materials in critical applications such as in corrosive or high vacuum atmospheres or at extreme temperatures or where subject to neutron irradiation.

The materials science curriculum is based on a common core of courses, basic to engineering, taken during the first two years. The third and fourth years are devoted to the further study of fundamental subjects and the introduction of specific materials courses. Electives are available in the fourth year so that students with broad interests can combine materials science with work in another engineering curriculum.

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 102A . . . 3	Engineering 103A . . . 3	Engineering 100 . . . 2	
Chemistry 110A 3	Engineering 104A . . . 3	Engineering 101 . . . 2	
Physics 104A 3	Engineering 105A . . . 3	Engineering 105B . . . 3	
Humanities-Social Sciences 4	Chemistry 110B 3	Chemistry 110C 3	
Elective 3	Physics 104B 3	Humanities-Social Sciences 4	
<hr/> 16	<hr/> 15	<hr/> 14	
<i>Senior Year</i>			
Electrical Engineering 150 3	Mechanical Engineering 123B 2	Engineering 188 4	
Mechanical Engineering 123A 2	Mechanical Engineering 140 4	Physics 140 4	
Mechanical Engineering 142 3	Physics 115B 3	Technical Elective 3	
Physics 115A 3	Technical Elective 3	Humanities-Social Sciences 4	
Humanities-Social Sciences 4	Humanities-Social Sciences 3		
<hr/> 15	<hr/> 15	<hr/> 15	

Suggested technical electives are: Applied Science 115; Electrical Engineering 145A, 145B, 145C; Engineering 103B, 104B, 106, 122, 180, 183, 184, 186, 187; Mathematics 118A, 118B, 119, 127A, 127B, 127C, 185A, 185B; Mechanical Engineering 118, 121; Physics 121, 129A, 129B.

MECHANICAL ENGINEERING CURRICULUM (183 Units)

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 conver-

sion systems, materials, and equipment for guidance and control. Preparation for this broad field of engineering requires a thorough knowledge of mathematics, physics, chemistry, fluid mechanics, thermodynamics, heat transfer, mass transfer, electricity, manufacturing processes, properties of materials, and economics.

The mechanical engineering curriculum is based on a common core of engineering courses taken in the first two years. The third year is spent in further study of fundamental courses, and in the fourth year the student may tailor his studies to his own interests by selecting courses in the fields of heat transfer, fluid mechanics, thermodynamics, mechanical design, or material science. With the range of electives available, the student can prepare himself for graduate study in mechanical engineering, or obtain a broad background for entering engineering practice at the bachelor's level.

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 100 2	Engineering 101 2	Engineering 103B ... 3	
Engineering 102A ... 3	Engineering 102B ... 3	Engineering 104B ... 3	
Engineering 105A ... 3	Engineering 103A ... 3	Mechanical	
Humanities-Social	Engineering 104A ... 3	Engineering 111 ... 4	
Sciences 4	Engineering 105B ... 3	Mechanical	
Elective 3		Engineering 121 ... 3	
		Humanities-Social	
		Sciences 3	
	<u>15</u>	<u>14</u>	<u>16</u>
<i>Senior Year</i>			
Engineering 186 4	Engineering 190 3	Mechanical	
Electrical	Mechanical	Engineering 123B . 2	
Engineering 150 .. 3	Engineering 123A . 2	Technical Electives .. 6	
Mechanical	Technical Electives .. 6	Humanities-Social	
Engineering 118 .. 3	Humanities-Social	Sciences 8	
Technical Electives .. 6	Sciences 4		
			<u>16</u>
	<u>16</u>	<u>15</u>	

Suggested technical electives are:

Heat transfer—fluid mechanics—thermodynamics option: Applied Science 115, 135A, 144; Electrical Engineering 110A, 111A, 112A, 130A, 157A, 157B; Engineering 106, 180; Mechanical Engineering 124, 125, 127, 128, 130, 135, 140, 185A, 185B.

Mechanical Design option: Agricultural Engineering 118; Applied Science 115; Civil Engineering 131A, 131B, 135; Electrical Engineering 110A, 111A, 112A, 157A, 157B, 172, 173; Engineering 122, 180, 183, 184, 187, 188; Mechanical Engineering 114, 115, 124, 129A, 129B, 140.

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



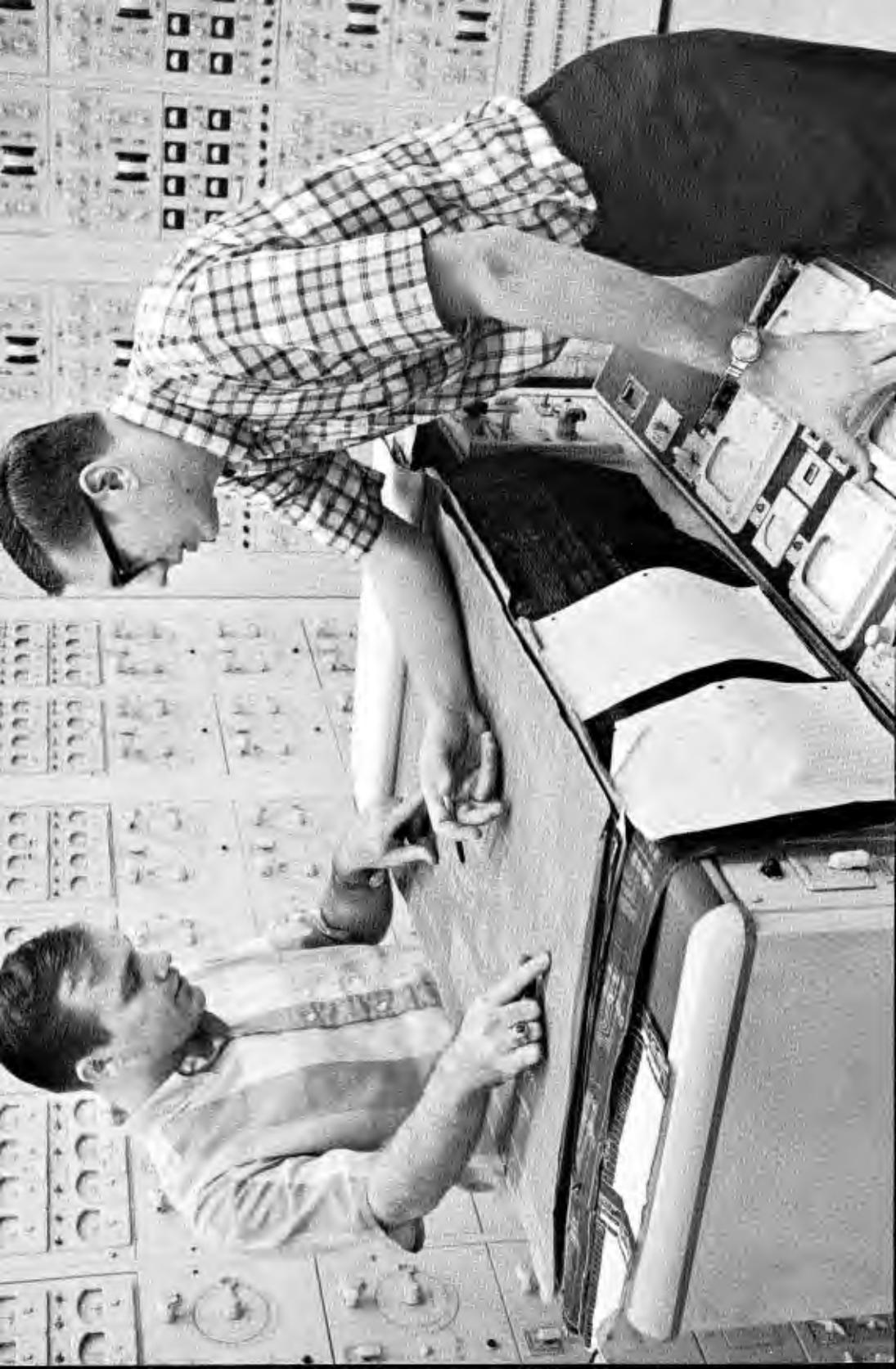
or analytical design. Professional programs emphasizing design and leading to the degrees of Master of Engineering and Doctor of Engineering are offered by the Departments of Agricultural Engineering, Civil Engineering, and Mechanical Engineering.

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

The graduate courses offered in the College of Engineering are described in the departmental listings (pages 223-243).

General information on graduate study may be found in the *Announcement of the Graduate Division* which can be obtained by writing to the Dean of the Graduate Division. Detailed information on graduate engineering programs is contained in the bulletin *Graduate Study in Engineering* obtainable from the Associate Dean, Graduate Studies, College of Engineering. Students interested in programs in Applied Science should request a copy of the *Announcement of the Department of Applied Science* from the Department of Applied Science.





COLLEGE OF LETTERS AND SCIENCE

The College of Letters and Science offers curricula that enable the student to pursue fundamental knowledge primarily for its own sake and to learn basic intellectual disciplines. Programs of study in the College expose the student to man's social, aesthetic, and material achievements, as well as to the challenge of his ethical, political, and physical environment. In many cases the pursuit of cultural truths will also lead the student to an appreciation of the individual's capacity for unique creative expression. Such a liberal education has increasing vocational value, since more and more career opportunities presuppose a basic letters and science degree; nevertheless, the main emphasis in the College rests on the ends of living rather than on the means. A well-balanced liberal education, including specialized knowledge in his major field, prepares the graduate for a satisfying life whatever his career.

Graduation from the College of Letters and Science presupposes fulfillment of the general University requirements. In addition, to achieve its educational objectives, the College has established certain specific standards relating to scholarship, senior residence, and unit distribution within the student's program of study. The two most important standards determining the unit-distribution pattern are those which relate to the Breadth Requirements, and to the Departmental Major Requirement. The *Breadth Requirements* are designed to provide a broad background of knowledge and to promote awareness of the variety of interdependences of knowledge. The *Major Requirement* enables the student to gain intellectual depth and competence in his chosen field of specialization. Requirements of the major program are determined and administered by the separate departments, or, in the case of interdepartmental or group 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 general University and College requirements, detailed on the succeeding pages. *Every student is responsible for seeing that he meets the University, College, and departmental or committee requirements for graduation.*

The study program or unit load may be easily changed within the established deadlines. Changes after the deadline must be justified by the student. In all cases, however, the student has the sole responsibility for initiating these changes by contacting his instructor and the Dean of the College. The student also has the full responsibility throughout the academic term to apprise himself of the quality of his performance by means of consultation with his instructors during their designated office hours.

The specific subject requirements for the bachelor's degree may be satisfied only by:

1. Courses in regular sessions of the University of California or University summer session courses identified with the letter "S."
2. Courses for which transfer credit is granted from another college or university.

Under exceptional circumstances, with prior written approval, the Dean of the College will permit students in residence to enroll in University Extension courses for elective credit only. Such units and courses cannot be applied to fulfillment of the breadth, foreign language or upper division requirements of the college. No grade points are assigned for courses completed in University Extension.

General University Requirements

All candidates for the bachelor's degree are obligated to satisfy the University requirements (pages 31-33) in regard to:

- ✓ Subject A
 - American History and Institutions
 - Scholarship
 - Maximum Unit Credit from Junior Colleges (see page 21)
 - Residence (for additional College stipulations, see page 124)
 - Application for Degree Candidacy

College of Letters and Science Requirements

✓ UNIT DISTRIBUTION REQUIREMENTS

Satisfactory completion of a minimum of 180 units is required for graduation from the College of Letters and Science.

A. At least 150 units must be completed in courses given by departments in the College of Letters and Science (page 135) so as to provide the following distribution:

1. *English Reading and Composition*
A.B. and B.S. degrees: Satisfied by passing an examination in English composition.^{*} The examination, administered by the English Department at announced intervals, may be taken no earlier than the final quarter of the sophomore year (completion of 70 units).

Prerequisite: Subject A.

- ✓ 2. Breadth Requirements.

- a. *Foreign Language* (for details of this requirement, see page 128).

A.B. degree: 18 units or the equivalent in one language.

B.S. degree: 18 units or the equivalent in one language begun in high school, or 12 units in one language begun in college.

- b. *Area Requirements* (see page 134 for classification of courses).

* The following categories of *continuing* students may elect to satisfy this requirement by completing two courses in English (English 1 and 2, 3, 4A, 4B, or 5, or the equivalent): all students who entered UCD, a) before September 1967; b) before September 1968, as B.S. candidates; c) before September 1969, with transfer credit from other collegiate institutions.

<i>A.B. degree:</i>	<i>Units</i>	<i>B.S. degree:</i>	<i>Units</i>
Humanities		Humanities	
Natural Sciences	52	Social Sciences	22
Social Sciences		Natural Sciences	90
(12 units in one area and 20 in each of the two remaining areas.)			
			—
			112
3.	At least 54 units must be in upper division courses in Letters and Science Teaching departments (see page 135). A minimum of 12 upper division units outside the major program is required for the A.B. degree (policy change under consideration at time of publication).		
B.	A total of 30 units may be offered toward the bachelor's degree from the following categories inclusively:		
1.	Units not offered by teaching departments in the College of Letters and Science (see page 135).		
2.	All military science courses.		
3.	Physical Education 5 and not more than 6 units in Physical Education 1.		
4.	Not more than 9 units in 300-400 series courses.		
C.	Credit in <i>special study courses</i> may not exceed 5 units per quarter unless special permission has been granted by the dean. Lower division courses in this category are numbered 38 (group study) or 39 (individual study). The upper division equivalents, numbered 198 and 199 respectively, may be taken for credit by a student having previously accumulated 84 quarter units of work toward the bachelor's degree.		

SCHOLARSHIP REQUIREMENTS

In addition to the general University requirement of a C average (2.0) for all University work, the College stipulates separate University averages of at least C for: 1) all courses required in the four-year major program, and 2) all upper division courses required for the major program.

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 DISMISSAL

(See page 30.)

READMISSION AFTER DISMISSAL

Dismissed students should contact the Dean of the College well in advance concerning the requirements to be met before their readmission can be considered.

PASSED OR NOT PASSED PRIVILEGE

New students and continuing students with a minimum University grade-point average of 2.0 (good standing), registered for at least 12 units, may take

any one course each quarter on a Passed or Not Passed basis. (A change in policy under consideration at time of publication.) A part-time student in good standing wishing to take a course on this basis must consult with the Dean's office. More than one course may be taken each quarter if a student has accumulated unused options (one option for each quarter completed on the Davis Campus with an overall University grade-point average of at least 2.0 since March, 1967).

P grades are awarded for work otherwise qualifying for A, B, or C grades. Passed units are counted toward the degree, but neither a Passed nor a Not Passed grade affects a student's grade-point average. The unit value of a Passed 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.

P/NP Enrollment Procedure: P/NP petitions are available in the Dean's Office, 160 Administration Building, only on the dates listed below and must be filed in person. No signature other than the student's is required on the petition.

With the permission of the dean, a student may change his enrollment in a particular course from the Passed/Not Passed basis to the regular grade, or vice versa up to the end of the fifth week of every quarter.

Quarter	Filing Dates (Dean's Office)	Final Filing Date and Final Date to Change Option
Fall 1969	Monday, November 3	Friday, November 7
Winter 1970	Monday, February 2	Tuesday, February 10
Spring 1970	Monday, April 27	Wednesday, May 6

Special courses may be authorized in which only Passed or Not Passed grades are given. Such courses may be taken in addition to the Passed or Not Passed option.

Graduating seniors as well as any other student planning to undertake graduate or professional studies should consult an adviser before enrolling in a required course on this basis.

SENIOR 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. While up to ten of the final 45 quarter units may be credited from another college in the University or from another four-year collegiate institution, any student planning to take senior-year work elsewhere should secure the approval at the Dean's Office before undertaking such work. He should realize that a delay in granting the degree may result since credit is not allowed until an official transcript is received from the institution attended.

Students entering the College in senior standing from another institution or from another college or school within the University, must include in the final 35 units at least 27 quarter units of work 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.

Students enrolled in the Education Abroad Program may satisfy the senior residence requirement by completing 35 of their final 90 units, including the final 12, in residence. This means that following study abroad, Program participants must return and complete 12 units in the College of Letters and Science.

REQUIREMENTS IN THE MAJOR

The number of upper division units a student must complete in the subject of his major varies among departments, the requirement ranging from 36 to 45 units. Major programs are designed by the Faculty of the College to insure that all students pursuing the same major will acquire certain knowledge in common. In addition, each student is encouraged to engage in independent study within the major.

A student must declare his major program by the time he has completed 84 units, but he may designate his preference at the beginning of his sophomore year.

A student may change from one major to another with the approval of the Dean of the College and with the consent of the department or committee in charge of the new major. Petitions for Change or Declaration of Major are obtainable in Room 160, Administration Building. After the beginning of the senior year, a student may not transfer from one major program to another, or from B.S. to A.B. (or vice versa). A student may not elect a group major after beginning the final quarter of his junior year.

Three types of programs satisfy requirements for the major: departmental, interdepartmental, and group major programs.

A. Departmental Majors. The requirements for departmental major programs are described in detail under departmental listings. Any student who fulfills the major requirements of two departments in the College of Letters and Science may elect to receive a bachelor's degree in both fields. 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*	Physical Education
Art	German	Physics*
Bacteriology*	Greek	Political Science
Botany*	History	Psychology*
Chemistry*	Italian	Rhetoric
Dramatic Art	Latin	Russian
Economics	Mathematics*	Sociology
English	Music	Spanish
French	Oriental Languages	Zoology*
Geography	Philosophy	

A Bachelor of Science degree is offered in Biochemistry (see page 194), Genetics (see page 272), Physiology (see page 331).

B. Interdepartmental Majors. These programs are intended for students interested in broader scope than that provided by a departmental major. Interdepartmental major programs leading to a Bachelor of Arts degree are offered in:

American History and Literature (see page 171)

Biological Sciences (see page 195)

International Relations (see page 294)

Linguistics (see page 299)

Physical Sciences (see page 325)

Russian and History (see page 362)

The Biological Sciences and the Physical Sciences programs also lead to a Bachelor of Science degree.

C. Group Majors. An interdepartmental group major may be organized for a student having a specific academic interest which involves two or more departments. A group major will consist of not fewer than 45 upper division units or more than 54. After preliminary consultation with the Dean of the College about this special program, the student plans his major with members of the departments in which he will do his work. He then submits the proposed program to the Dean with endorsements from faculty members from each department represented in his major at least four quarters before graduation for initial committee review and final approval by the Executive Committee of the College. This proposal must include: (1) a description of the special educational aims of the major and (2) a list of lower division prerequisites for the major and the required upper division courses. Group major request form and accompanying Petition for Change of Major are available at the Dean's Office.

BACHELOR'S DEGREE CANDIDATES

Senior Degree Check. At the beginning of his senior year, each student should request a *Degree Check* from the Dean's Office. A statement indicating any unfulfilled *University* and *College* degree requirements will be sent to the student. Information about progress in completing requirements in the *major* should be obtained by conferring with an academic adviser.

Filing for Candidacy. Each candidate for graduation must file an Announcement of Candidacy with the Registrar at the beginning of the quarter in which he plans to graduate. The dates for filing are published on pages 5-7 of this catalog.

Planning the Program

Before instruction begins each quarter, the student should prepare a tentative program of study and if needing academic counsel, meet with a faculty adviser to review his proposed program. The official study list must be filed with the Registrar according to the procedures described in the *Schedule and Directory*, available at the beginning of each quarter.

Undeclared Status. Entering freshmen and sophomores are officially designated as *Undeclared*. To insure counseling by an appropriate academic adviser, however, each student is asked to indicate a field of interest or unofficial major while in undeclared status. (Preprofessional students see page 129.)

Declaration of Major. A student may declare his official major at the end of his freshman year; he must do so by the end of his sophomore year. After obtaining a Petition for Change or Declaration of Major at the Dean's Office, he should report to the departmental office of his major choice to secure approval for admission to the major program. (Biological and Physical Science majors report to the Dean's Office.)

Study List Regulations. A study list totaling fewer than 12 units requires the approval of the Dean of the College, and will be allowed only in cases of poor health or regular outside employment. All freshmen as well as transfer students in their first quarter of residence may not undertake more than 17 units without special permission from the Dean. For purposes of calculating program load, the total number of units shown on the study list must include the unit value of repeated courses and of any course work not carrying degree credit (for example, Subject A and foreign language courses which duplicate high school training).

No course may be added to the study list after the tenth day of instruction, and, unless the written approval of the dean is secured, the student will receive a grade of F in any course dropped after the fifth week of instruction.

Faculty Advisers. The purpose of the faculty adviser in the College of Letters and Science is to counsel the student on his overall program and to insure that he acquires a meaningful liberal education, makes normal progress toward completion of degree requirements, and undertakes an appropriate program of studies. The student should consult an adviser or the Dean of the College about any additional academic problems.

1. *Entering freshmen who participate in the summer advising program* are assisted in planning their fall quarter program by a temporarily assigned summer adviser. During the fall or subsequent quarter, students wishing academic advice should proceed to the departmental office of their major choice and request assignment to an adviser. Offices are listed in the *Schedule and Directory*.

2. *Other entering lowerclassmen* are assigned faculty advisers following the Letters and Science Assembly scheduled during Orientation Week at the beginning of each quarter.

3. *New upperclassmen* report directly to the departmental office of their major during Orientation Week. (Biological and Physical Science majors report to the Dean's Office.)

4. *Limited students and special students* are under the supervision of the Dean of the College. Their study lists must be presented to the Dean each quarter for approval.

5. *All new students* are assigned to a faculty adviser. During their first three quarters in residence they are expected to consult their adviser every quarter and receive approval of their proposed programs.

6. *Continuing students* having completed three quarters in residence in the College are no longer obligated to consult an adviser; they can elect to see an adviser when in need of counsel.

ENTERING FRESHMEN

Because of the wide choice of subjects open to the Letters and Science student, a sample first-year program is not feasible. The entering freshman should, however, be able to plan his first-year program satisfactorily by keeping in mind the following points.

1. After the Subject A requirement has been met, most students should consider taking English 1 during their first year and English 2, 3, 4A, 4B or 5 their second year in preparation for the English Composition Examination. The Examination may be taken no earlier than the final quarter of the sophomore year, i.e., upon successful completion of at least 70 units.

2. The foreign language requirement should be completed by the end of the first or second year, as program priorities permit. It may be satisfied by examination or by completion of language courses.

a. *Placement Examination:* A student with only high school preparation may validate his knowledge of a foreign language by earning a satisfactory score on this examination. (Further information given below.)

b. *Course Completion:* A.B. degree—18 units in one language, or in most languages, through the fifth quarter course. B.S. degree—18 units in one language begun in high school or 12 units in a language begun in college, or through the third quarter course.

c. *Proficiency Examination:* A student who has not completed the required level language course, but assumes he has attained equivalent knowledge, may elect to satisfy the language requirement by passing this examination.

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, 112 (see page 134 for the three Area Lists).

These area requirements are particularly important for the entering freshman who has not decided on a major. Careful consultation with his adviser and thoughtful selection from each of the three groups will help the student to determine his preference for a major. Entering freshmen who feel certain of their major field should consult the requirements of that major in planning their first-year program, as a first-year course may be a prerequisite for further studies in that field.

FOREIGN LANGUAGE PLACEMENT EXAMINATION

A student electing to continue a language studied in high school must take the Foreign Language Placement Test in that language. The placement test does not yield unit credit; it only determines whether the requirement has been met or whether additional work in the language is required. Students whose scores place them below the course level expected on the basis of high school preparation (see table below) will receive reduced unit credit as follows:

**Foreign Language Placement and Duplication of Credit
for French, German, Italian, Latin, and Spanish***

Year-Level High School Language Completed	Normal Continuation Course	Credit Allowed for Courses Taken Below Normal Placement
1	Courses 1 or 2	(No deduction for duplication of credit)
2	Course 3	Course 2—allow 2 units Course 1—allow no credit
3	Course 4	Course 3—allow 2 units Courses 1 or 2—allow no credit
4	Course 5	Course 4—allow 1.5 units Courses 1, 2 and 3—allow no credit

If there has been a time lapse in language preparation between high school and college, a student may wish to attend an appropriate level language course for no credit (audit) for one quarter before taking the Placement Examination. This can often lead to improved placement in the examination which a student may take only once in each language.

A student with advanced standing in a language does not qualify to take the Placement Examination. He should consult his status card, which is issued by the Dean's Office prior to admission to the College, for indication of further language study required.

Inquiries about the language requirement or the possibility of credit being withheld for duplicated work should be made at the Dean's Office, Room 160, Administration Building.

Preparation for Admission to Professional Schools

Since preprofessional programs are not major programs, students preparing for admission to a professional school are expected to follow the procedures governing the declaration of majors outlined on page 127 and to select courses which fulfill College requirements as well as their professional needs.

Since there are no specially designated preprofessional advisers in the College of Letters and Science, students planning to seek admission to a professional school should communicate as early as possible with the deans of the professional schools of their choice for precise admission requirements. Official announcements of admission requirements for the following schools within the University of California may be obtained from the Admission's Office:

Business Administration	Nursing
Dental Hygiene	Optometry
Dentistry	Pharmacy
Law (see page 137)	Physical Therapy
Medicine (see page 141)	

* A student continuing a language not listed above should consult the Dean of the College of Letters and Science if placement or credit is in question. For placement in Russian, see page 360.

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT EXAMINATION CREDIT

Students earn 10 units credit toward their bachelor's degree for each CEEB Advanced Placement Examination satisfactorily passed during the junior year or senior year in high school. See chart below for details regarding course equivalences and breadth credit allowed toward graduation.

EXAMINATION	SCORE	UCD COURSE EQUIVALENCES*	CONTINUING COURSE	BREADTH CREDIT ALLOWED	REMARKS
English					
English	5, 4, 3	English 1 and 3		4 units	No exemption from English Composition Examination.
Foreign Languages					
French	5, 4, 3	French 6	French 30A or 46A or concurrent enrollment.	4 units	
German	5, 4, 3	German 6A, 6B or 7	Any upper division course; German 101 strongly recommended.	4 units	
Latin 4	5, 4, 3	Latin 103	Determined by consultation with Classics adviser.	4 units	
Latin 5	5, 4, 3	Latin 102A or 102B	Determined by consultation with Classics adviser.	8 units	
Spanish	5, 4, 3	Spanish 6	Spanish 26A; 101A may be taken concurrently.	4 units	
Humanities					
American History	5, 4, 3	History 17A, 17B		10 units	Satisfies American History and Institutions Requirement.
European History	5, 4, 3	History 4B, 4C		10 units	
Natural Sciences					
Biology	5, 4	Biology 1, Botany 2, Bacteriology 2, Zoology 2	Any upper division course or, by option, any Biological Sciences "2" course.	10 units	Student has option of taking Bacteriology 2, Botany 2 and Zoology 2 for full unit credit.
	3	Biology 1	Any Biological Sciences course except "10" series.	10 units	
Chemistry	5, 4, 3	Chemistry 1A, 1B	See "Remarks"	10 units	Credit for Chemistry 1A and 1B equivalence may serve as prerequisite to 1C or 7A with instructor's consent; 1A and/or 1B, may, however be taken for full credit.
Mathematics	5, 4, 3	Mathematics 21A, 21B	Mathematics 21C	10 units	
Physics	5	Physics 10 or 2A, 2B	Determined by consultation with Physics adviser.	10 units	For score of 5 or 4, credit may equate with Physics 4A, 4B or 4A, respectively. Credit for Physics "4" courses given only with consent of Physics adviser.
	4	Physics 10 or 2A	Determined by consultation with Physics adviser.	10 units	
	3	Physics 10		10 units	

* 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. See exception for biology and chemistry under REMARKS.

Those curricula preparing students for admission as undergraduates to professional schools in the University of California (Bay Area) are described below. (Scholarship stipulations refer to students with permanent legal residence in California.)

Business Administration

Completion of 90 quarter units of unduplicated college work, and fulfillment of the following specific requirements:

- a. English 1, 3; 4 additional units in the Departments of English, Rhetoric or Dramatic Art.
- b. Mathematics: 21A or 16A (may be counted toward the natural science requirement).
- c. Statistics: Mathematics 13 or Economics 12.
- d. Foreign Language: 12 units (through 3rd-quarter course) in one language, or the high school equivalent (6 units for the first two years, 6 units for each subsequent year). See additional requirement for B.S. degree in Business Administration.
- e. Natural Sciences: 2 courses (see additional degree requirement).
- f. Social Sciences: Economics 1A-1B, 11A-11B; Psychology 1A or Sociology 1, and one additional course in psychology, sociology or cultural anthropology.

Dental Hygiene

Completion of 90 quarter units of unduplicated college work and fulfillment of the following specific requirements:

- a. English 1, 3.
- b. Chemistry 1A, 1B; 8A, 8B.
- c. Biology 1; Zoology 2.
- d. Psychology 1A and one additional psychology course.
- e. Social Science, humanities or foreign language: 30 units must be selected from these fields.

Dentistry

Completion of 90 quarter units of unduplicated college work, and fulfillment of the following specific requirements:

- a. English 1, 3.
- b. Chemistry: 1A, 1B, 1C; 5, 8A, 8B.
- c. Physics: 2A, 2B, 2C; 3A, 3B, 3C.
- d. Biology 1; Zoology 2.
- e. Humanities, Social Science or Foreign Language: 20 units must be selected from these fields (including at least one, one-year sequence in one of these). A maximum of one course of mathematics may be substituted in partial satisfaction of this requirement.

Medicine (San Francisco Medical Center)

Completion of 135 quarter units of unduplicated college work, and fulfillment of the following specific requirements:

- a. English 1, 3.
- b. Chemistry: 1A, 1B, 1C; 5, 8A, 8B.
- c. Physics 2A, 2B, 2C; 3A, 3B, 3C.
- d. Biology 1; Zoology 2, 100.
- e. Foreign Language: 12 units (through third-quarter course) in one language, or three years of one language in high school.
- f. Humanities and/or Social Sciences: 18 units.
- g. Electives (to complete total of 135 units): recommended are courses satisfying Letters and Science College and departmental major requirements, but not anatomy, physiology, or bacteriology, which are part of the Medical School curriculum.

Nursing

Completion of 90 quarter units of unduplicated college work, and fulfillment of the following specific requirements:

- a. English 1, 3.
- b. Chemistry 1A, 1B; 8A, 8B.
- c. Biological Sciences: Biology 1; Physiology 2, 2L; Human Anatomy 102.
- d. Foreign Language: 15–16 units (through 4th-quarter course) in one language, or the high school equivalent.
- e. Humanities: 16 units.
- f. Social Sciences: 16 units, including Psychology 1A and Sociology 1.

Optometry

Completion of 90 quarter units of unduplicated college work, and fulfillment of the following specific requirements:

- a. English 1, 3.
- b. Mathematics 16A–16B.
- c. Physics 2A, 2B, 2C; 3A, 3B, 3C.
- d. Psychology 1A–1B.
- e. Biology 1; Physiology 2, 2L.
- f. Chemistry 1A, 1B; 8A, 8B.
- g. American History and Institutions.

Pharmacy

Completion of 90 quarter units of unduplicated college work, and fulfillment of the following specific requirements:

- a. English 1, 3.
- b. Chemistry 1A, 1B, 1C.
- c. Physics 2A, 2B, 2C; 3A, 3B, 3C.
- d. Mathematics 16A, 16B, 16C.
- e. Biology 1; Botany 2; Zoology 2.
- f. Humanities, Social Science or Foreign Language: three quarter courses (or 12 units if preferred) must be selected from these fields.

Physical Therapy

Completion of 135 quarter units of unduplicated college work, and fulfillment of the following specific requirements:

- a. English 1, 3.
- b. Chemistry 1A-1B.
- c. Physics 10.
- d. Psychology 1A, 168.
- e. Foreign Language: 15-16 units (through 4th-quarter course) in one language or the high school equivalent. (This may be counted from high school at the rate of 4 quarter units per year in the same foreign language.)
- f. Physiology 2, 2L; Human Anatomy 102.
- g. Humanities: 16 units (may include 4 units of American History and Institutions requirement).
- h. Social Sciences: 16 units (may include Psychology 1A and 168).

Preparation for postgraduate training in *Medical Technology* can be accomplished by completing the regular undergraduate major programs in Bacteriology and Biological Sciences (see pages 191 and 195).

Students preparing for postgraduate training in *Social Welfare* are referred to the introduction to Sociology course offerings (see page 364).

The Teaching Credential

The teacher-training program is administered by the Graduate Division. Certain undergraduate courses, however, are required as preparation for the program. Students interested in obtaining the elementary or general secondary teaching credential should consult the appropriate adviser in the Department of Education as early as possible, preferably by the end of the freshman year (see also page 157).

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 the Administration Building. The fall quarter list is included in the *Student Directory*.

HONORS PROGRAMS

Special programs for honors students 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.

A student on the honors list may enroll, upon recommendation of his major adviser, in the honors program in his major at any time not later than the first quarter of his senior year.

BACCALAUREATE HONORS

The awarding of honors at graduation is based on the following minimum criteria: 1) completion of 68 units in this College or 90 units in the University of California; 2) a grade-point average of 3.3 for work taken within this college; 3) an overall grade-point average of 3.3 for all collegiate work undertaken; 4) recommendation by the major department or committee supervising interdepartmental majors and the Honors Committee.

AWARDS FOR ACADEMIC EXCELLENCE

In addition to eligibility for the University Medal (see page 34) graduating seniors with distinguished scholastic records in the College may be recommended by the faculty for the Herbert A. Young Letters and Science Medal. Academic excellence is the primary basis for choosing the recipient of this award.

Area Requirement Lists

The undergraduate courses in the subjects listed below will be accepted in fulfillment of the area requirements of the College. No course applied toward satisfaction of one area requirement may be offered to satisfy another. No courses marked with an "H," or numbered 38, 39, 48, 198 or 199 may be counted toward the breadth requirements.

HUMANITIES

Art.	Latin. All courses except 1, 2, 3, 4, 5.
Classics.	Linguistics.
Dramatic Art.	Music.
English. All courses except 25 and 26 and <i>first</i> freshman-level course (i.e., English 1, 2, 3, 4A, 4B, or 5) completed. All subsequent courses in English counted toward humanities requirement.	Oriental Languages. All courses except Chinese 1, 2, 3, 4, 5; Hebrew 1, 2, 3, 4, 5; Japanese 1, 2, 3, 4, 5; Tamil 20; Telugu 1T.
French. All courses except 1, 2, 3, 4, 5.	Philosophy.
German. All courses except 1, 2, 3, 4, 4R, 5, 5R.	Portuguese. All courses beyond 18 units.
Greek. All courses except 1, 2, 3, 101.	Rhetoric.
History.	Russian. All courses except 1, 2, 3, 4.
Italian. All courses except 1, 2, 3, 4, 5.	Sanskrit.
Spanish. All courses except 1, 2, 3, 4, 5.	

NATURAL SCIENCES

Animal Physiology.	Biology.
Anthropology. Accepted: 1, 151, 152, 153, 154A, 154B, 155, 156.	Botany.
Astronomy.	Chemistry.
Bacteriology.	Entomology. Accepted: 1, 10.
Biochemistry and Biophysics.	Genetics.
	Geography. Accepted: 1, 3.

Geology.	Psychology. Accepted: 1B, 106, 108, 131, 131L, 150, 150L.
Mathematics.	
Physics.	Zoology.
Physiology.	

SOCIAL SCIENCES

Anthropology. All courses except 1, 13, 151, 152, 153, 154A, 154B, 155, 156, 195, 196.	Political Science.
Economics. All courses except 12.	Psychology. All courses except 1B, 3, 106, 108, 131, 131L, 150, 150L, 165.
Education. All courses except 114.	Sociology. All courses except 46A, 46B, 46C, 106.
Geography. All courses except 1, 3, 105, 161.	

TEACHING DEPARTMENTS IN COLLEGE OF LETTERS AND SCIENCE

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

A minimum of 54 upper division units (courses numbered 100-199) must be completed in courses offered by departments listed above. Courses offered in military science are acceptable only in the 30-unit limitation (see page 123).



SCHOOL OF LAW

The School of Law offers a three-year professional curriculum leading to the degree of Juris Doctor.

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 covers a broad spectrum. For example, in addition to instruction aimed at developing proficiency in the practice of law, the curriculum includes courses transmitting the historical and cultural traditions of the law and courses reflecting the Davis campus interests in natural resources and agriculture and the proximity of the state government in Sacramento. Interdisciplinary work, both within traditional law courses and in formal interdisciplinary courses, is in its early stages of development. The School emphasizes research and writing seminars and similar programs which bring students into direct contact with the legal profession. An integral part of the teaching program is the publication by the students of a legal periodical. This periodical strongly emphasizes student writing and research.

The School has received provisional accreditation by the American Bar Association and has been admitted to membership in the Association of American Law Schools.

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. Degrees from the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science are all acceptable. The individual student's college record and Law School Admission Test score must, of course, demonstrate that he is qualified for law study.

Prelegal 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. It is most important that prelegal 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.

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 have received a bachelor's degree or an equivalent degree from a college or university of approved standing before beginning their work in the School of Law. The applicant's college record must be of sufficiently high quality to demonstrate that he is qualified for the study of law. The work of the last two college years will be considered more heavily than that of earlier years.

The applicant must also achieve a satisfactory score on the Law School Admission Test. All applications are reviewed by the Law School Admissions Committee. Students are admitted only on a full-time basis and only in September.



Law School Admission Test

All applicants are required to take the Law School Admission Test administered by the Educational Testing Service. Testing centers have been established for the convenience of applicants in all parts of the United States and in many foreign countries. Applicants are urged to take the test as early as possible, and in any event not later than February in the academic year prior to that in which they seek admission to the School.

Applicants should write to: Law School Admission Test, Educational Testing Service, Princeton, New Jersey 08540, to obtain application forms and information about the test 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 should be made on forms which will be supplied by the School and should be addressed to: Dean, School of Law, University of California, Davis, California 95616. *The application must be accompanied by a \$10 nonrefundable 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 is May 1 of the year in which admission is sought, but earlier filing is strongly recommended.

2. Two copies of transcripts of college work through the first semester or quarter of the applicant's senior year should accompany or immediately follow his application forms. As soon as they are available, the applicant should submit two copies of supplementary transcripts to cover any work he completes *after* making application.

3. The applicant should take the Law School Admission Test and request that his score be reported to the School of Law.

4. Acceptance by the School of Law is always subject to the admissions action taken by the Graduate Division of the University. Normally, applicants accepted by the School of Law will also be accepted by the Graduate Division.

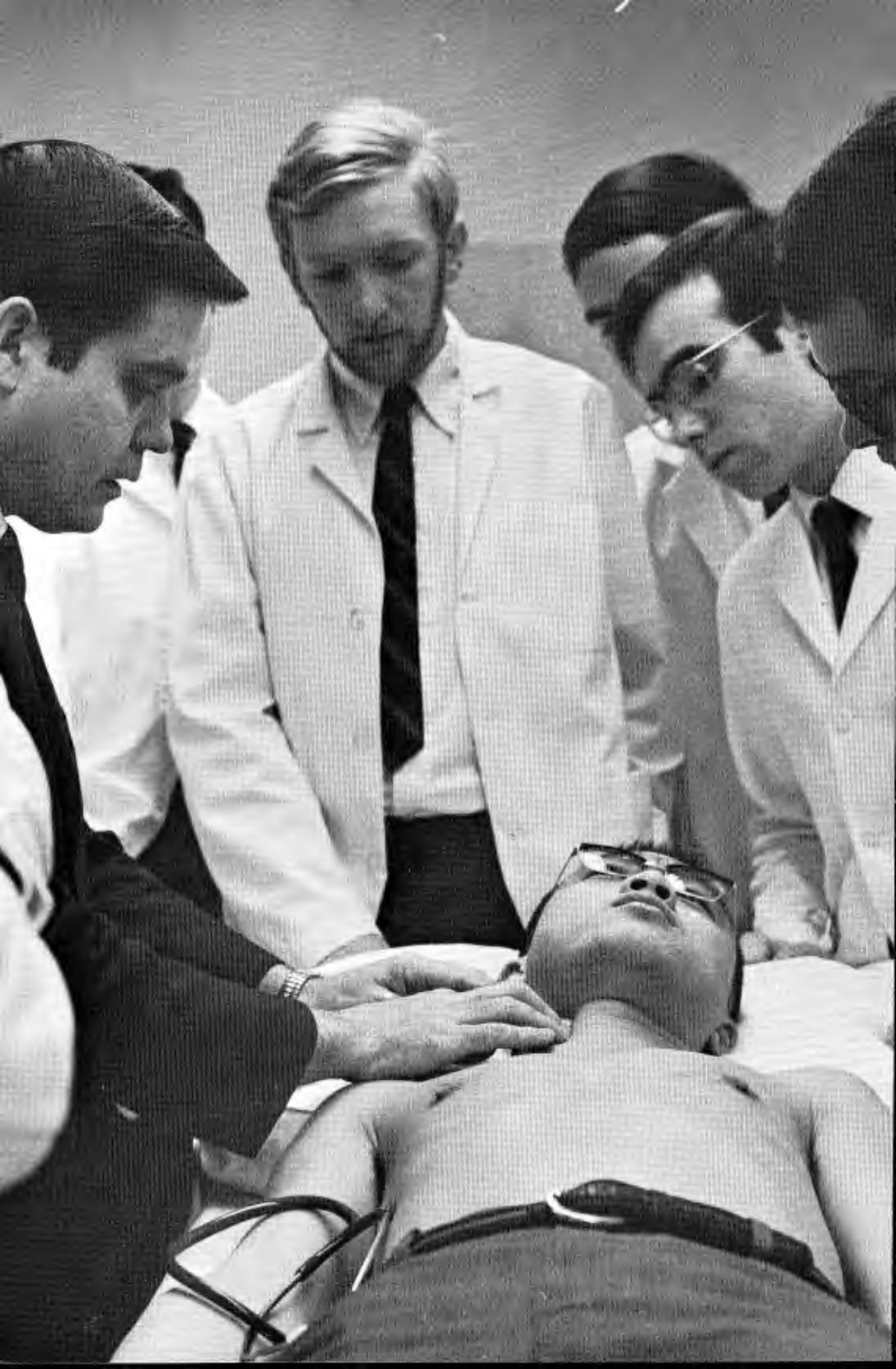
Professional Curriculum and Degree

The course of study in the professional curriculum requires nine quarters for completion and extends over a period of three years. The work of the first year is prescribed; courses constituting the first-year curriculum are listed on page 296. 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 curriculum for the second and third years is almost wholly elective. It is set forth on page 297. The curriculum of the School is designed for full-time students only.

Students who fail to attain satisfactory grades may be required to withdraw from the School at the end of any academic year.

Students who have been admitted to the School as candidates for the professional degree and who have completed satisfactorily the professional curriculum and the required period of resident study will be recommended for the degree of Juris Doctor.





SCHOOL OF MEDICINE

The School of Medicine will admit its second class to a course of professional instruction commencing in the fall quarter 1969.

The degree of Doctor of Medicine requires the satisfactory completion of a four-year course of study comprised of 15 quarters. Initially, course work will be conducted in the temporary Medical School facilities on the Davis Surge Campus and in nearby affiliated hospitals. The current main clinical teaching unit is the recently renovated 600-bed Sacramento Medical Center. Permanent facilities will be available in 1973 with the completion of the combined Human Medicine—Veterinary Medicine Health Sciences Complex. Construction of a University hospital will be completed in 1975. An adjoining 740-bed Veterans Administration Hospital is proposed for concurrent construction. This building complex will provide a unique physical expression of the philosophical concept of a closely correlated exposition of health and disease in man as well as other species.

Premedical Requirements

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. However, in most instances completion of a four-year course of study leading to a bachelor's degree is recommended. A maximum of two years (60 semester units; 90 quarter units) of junior college work may be credited toward this requirement. Although a specific major in science is not necessary, the following course content is required:

- One year of English composition or its equivalent
- One year of biological science or its equivalent
- One year of general chemistry or its equivalent
- One year of organic chemistry* or its equivalent
- One year of physics or its equivalent
- Mathematics, *through* integral calculus

The student is strongly encouraged to fill out his program with course work in the humanities and social sciences.

A prospective student must have completed the Medical College Admission Test (MCAT) at such a time as to permit the availability of MCAT score results when the application is considered. This examination is given twice yearly, in May and October, at many colleges and universities. Further information may be obtained by writing: Medical College Admission Test, Psychological Corporation, 304 East 45th Street, New York, New York 10017.

Application

Application forms will be made available June 1, 1969. All information must be completed and submitted no later than December 31, 1969. Early return of the completed application will enable early processing, which is normally advantageous. Application forms and additional information are available from the

* This course must be the one normally offered for chemistry majors rather than one of a brief, or survey, character.

Admission's Office, School of Medicine, University of California, Davis, California 95616.

Transcripts of all college work should be sent directly from the school of origin to the Admissions Office. For undergraduate applicants not registered at a campus of the University of California, transcript of high school records is required. Final college transcripts should include a statement of good standing or honorable dismissal from the last college attended.

Admission Procedure

Commencing with the second class, entering fall 1969, enrollment will be limited to 52 students selected on the basis of intellectual achievement and personal characteristics which would lead the Admissions Committee to believe there was a reasonable likelihood of satisfactory completion of the requirements of the medical curriculum and subsequent effective discharge of the considerable demands of the profession. Factors taken into consideration include the applicant's scholastic record to date, MCAT performance, and reports of his teachers and advisers with regard to intellectual capacity, motivation, emotional stability and personal dedication.

A personal interview will normally be required. Prospective students whose applications are rejected during the initial screening procedure will be so notified and will not be called for an interview. Out-of-state interviews may be arranged in occasional cases in which a trip to Davis would be considered an undue hardship; in rare instances the Admissions Committee may waive the requirement for interview entirely.

Applicants may be requested to authorize their student health service or personal physician to send pertinent health information to the Admissions Committee.

In accordance with approved procedures of the Association of American Medical Colleges, applicants will usually be notified of the status of their application as early as September 15 of the year preceding that for which admission is sought. In some instances, a decision may not be made until March 31; however, an effort will be made to reach an early decision and to notify the applicant promptly.

The majority of places in each entering class will be awarded to students who are legal residents of the State of California; however, a certain number will be awarded to out-of-state students. This School of Medicine will also participate 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 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, whose address is University East Campus, 30th Street, Boulder, Colorado 80300.

Graduates of foreign universities will be considered on an individual basis by the Admissions Committee. Certain additional requirements apply to such applicants and detailed information is available from the Admissions Office.

Medical Curriculum and Degree

The course of professional study covers a period of 15 consecutive academic quarters extending over four calendar years. Successful completion of the prescribed curriculum will normally result in a recommendation by the faculty and the Dean leading to the award of the degree of Doctor of Medicine.

The faculty of this new school accepts the principle that it is impossible for the student to master in its entirety the rapidly expanding body of knowledge comprising modern medical science and that the gap between developing knowledge and an individual's ability for assimilation will widen each year. Accordingly, the curriculum will be presented in the context of *problem solving*, based on a foundation in the sciences basic to medicine and the application of the scientific method to diagnosis, therapy and research in health and disease states. Correlation of the basic and clinical sciences will be emphasized during all stages of the professional program. Teaching by the faculty will be carried out by means of integrated exercises utilizing appropriate modern instructional methods and including the facilities of multidiscipline laboratories. To promote a habit of self-education throughout his professional life, the student will be encouraged to seek out individually available source material pertaining to the problems under consideration. Sufficient free time will be scheduled to permit pursuit of such studies in depth.

In general, the curriculum is designed around a core program of instruction in basic, behavioral and clinical sciences during the first three years, with the fourth year consisting of elective courses under faculty guidance. A graduate student orientation will prevail throughout the curriculum. At the same time, individual attention to the student will be emphasized. Elective courses will be offered during the four years, both on the general and medical campuses.

The *first academic year* (quarters 1, 2, 3) consists of a formal core program designed to equip the student with the vocabulary, tools, techniques and concepts of the Sciences Basic to Medicine, including molecular and cell biology, organ and system biology, and behavioral and environmental biology. Supplementing this is an introduction to clinical medicine designed to introduce the student to the patient, the history and physical examination, and to correlate the basic science with clinical problems at the earliest feasible time. A limited number of electives will be available.

The *second academic year* (quarters 4, 5, 6, 7) consists of a presentation of representative clinical problems illustrating the correlation of the basic and clinical sciences in understanding both the normal and abnormal states. Instruction stresses the definition of the problem and the steps taken to solve it rather than the presentation of a large body of factual detail. Free time for study in depth is provided as well as an introduction to electives in areas of developing individual interest. There is a general orientation toward the principles of community medicine, including exposure to family practice, with consideration of the impact of psychosocial factors on the individual and his disease.

The *third academic year* (quarters 8, 9, 10, 11) consists of clinical clerkships oriented toward a problem-solving approach to disease by bringing the student

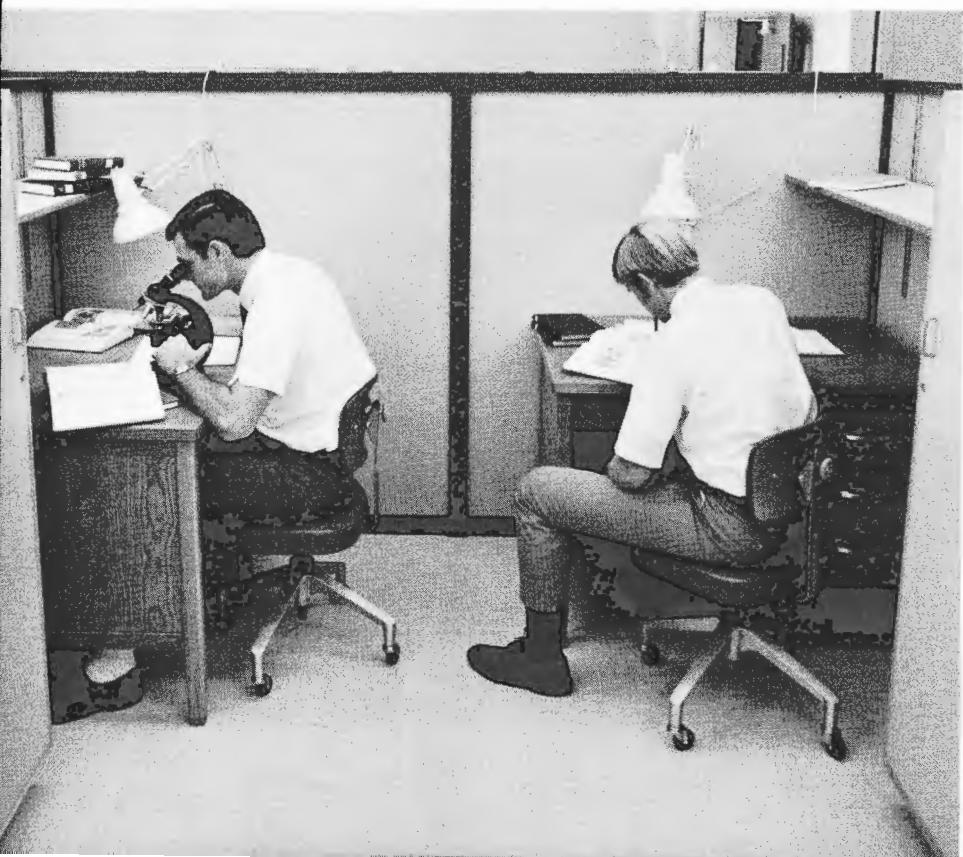


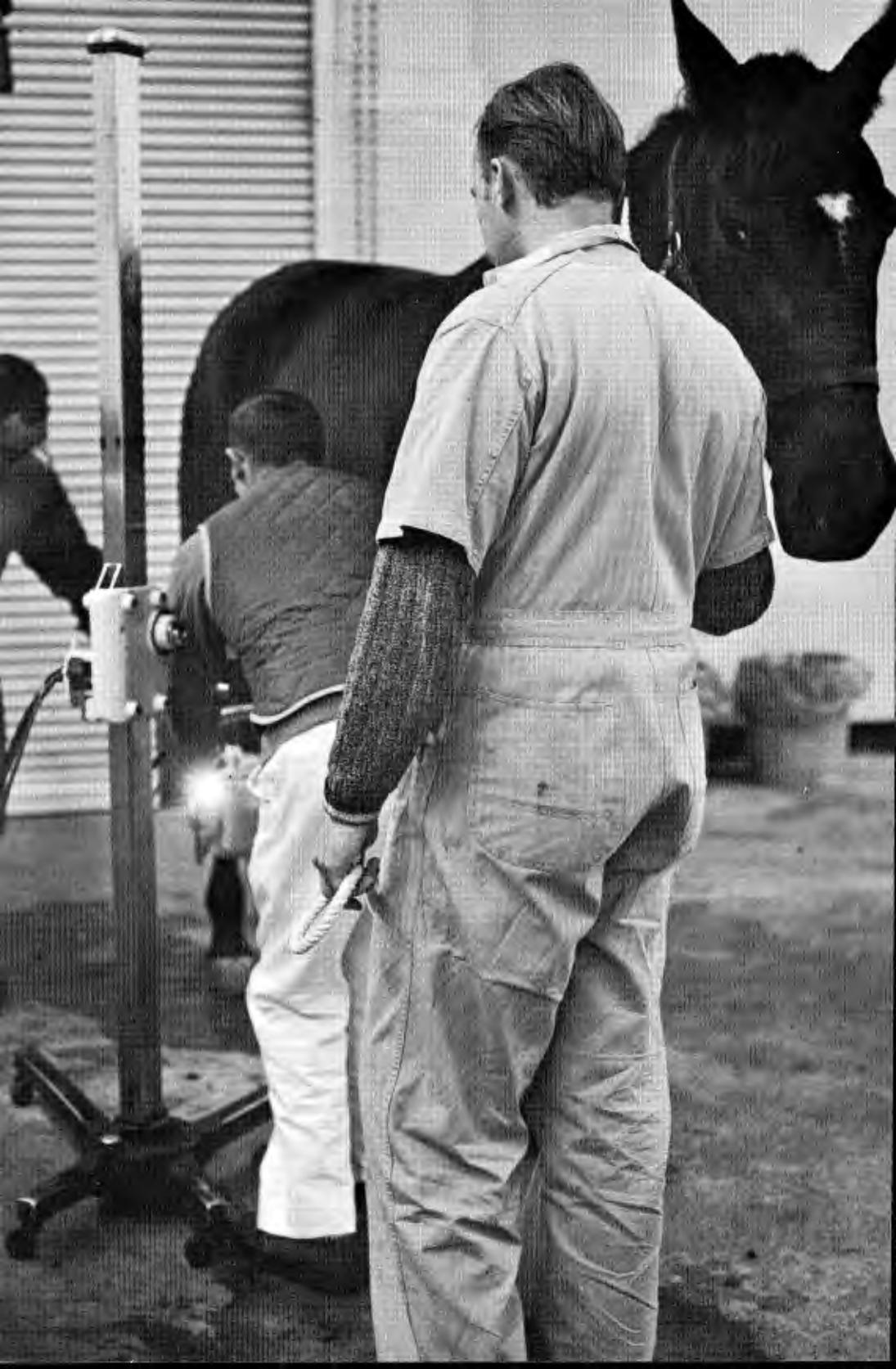
into direct contact with the patient and emphasizing the responsibilities of patient care. The concept of continuity of student-patient relationships is stressed, including follow-up of the patient's course. The student is also introduced to the principles of ambulatory care through the outpatient facilities.

The *fourth academic year* (quarters 12, 13, 14, 15) presents an opportunity for widely varied electives offered by the Medical School faculty and other schools of the Davis Campus. Faculty guidance (preceptor) is provided for each student in planning his elective program for this year. Emphasis will be placed on rounding out the needs of the individual student in order that he may proceed toward his goal. Where necessary the elective courses may be used to strengthen areas of recognized deficiencies.

By means of the above curriculum, the faculty intends to develop in the student the ability to pursue a plan of postgraduate studies leading to a career in private practice, teaching, research, preventive medicine, administration or any combination of these. It seeks to provide a comprehensive foundation upon which the individual student can more effectively realize his own interests, abilities and personal motivation. It is believed that through this approach the individual patient and the public may best be served.

Detailed information on the curriculum is available through periodic announcements of the School of Medicine issued by the office of the Dean, School of Medicine.





SCHOOL OF VETERINARY MEDICINE*†

The degree Doctor of Veterinary Medicine may be obtained by pursuing a course of study requiring a minimum of six years. The final four years must be spent in the professional veterinary medical curriculum.

Students planning a career in veterinary medicine should consider broadening their educational experience by completing the baccalaureate degree before applying to the professional school.

Preveterinary Medical Requirements

Students must complete a minimum of 90 quarter units (60 semester units) of college work including the required courses listed in the preveterinary medical curriculum (page 148) before they will be admitted to the School of Veterinary Medicine. Those who have met these requirements with excellent scholastic achievement may be admitted at the end of two years of study. However, all preveterinary medical students, in addition to satisfying the preprofessional course requirements, should plan their program so they can obtain a baccalaureate degree in four years. The School of Veterinary Medicine will accept the passed or not passed option (subject to general campus and individual school and college requirements) only in courses taken under the restricted electives in social sciences and humanities and the additional electives in social sciences, humanities, or agriculture (see page 90).

Application

Students are admitted to the School of Veterinary Medicine in the fall of each year. Application forms may be obtained after October 1 from the Admissions Officer, University of California, Davis 95616. The completed application must be filed with the Admissions Officer between January 1 and February 28 in order to be considered for the fall of the year in which application is made. Students may apply before completing all the requirements. However, they must submit a detailed list of courses in progress and a list of all courses to be completed by June 15 of the year they wish to be considered. *Applications lacking this information will not be processed.*

Admission to the School of Veterinary Medicine

Enrollment is limited, and applicants are selected primarily on the basis of scholarship with particular emphasis placed on achievement in chemistry, physics, and zoology. In addition, candidates should have sufficient experience with animals to justify their decision to pursue a lifetime career in veterinary medicine.

Personal qualifications also receive consideration. An interview may be required to enable the Committee on Admissions to make the most accurate judgment possible. Applicants will be notified before July 15 of their admission status.

Scholastic achievement, particularly in the required courses, is a very important criteria for admission to the School of Veterinary Medicine. Preveterinary medical students are, therefore, cautioned to use the passed or not passed option as sparingly as possible.

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

† For course listings for the School of Veterinary Medicine, refer to page 161.

The School of Veterinary Medicine at the University of California participates in the student program administered by the Western Interstate Commission for Higher Education (WICHE). Students residing in western states without a school of veterinary medicine who wish to participate in this program must be certified by their home state. For addresses of state certifying officers, write to the Western Interstate Commission for Higher Education, University East Campus, 30th Street, Boulder, Colorado 80300.

AFTER ADMISSION

After admission to the School of Veterinary Medicine, the student completes a four-year professional curriculum leading to the degree Doctor of Veterinary Medicine. At the end of the first two years of the professional curriculum, students who do not hold a baccalaureate are eligible to receive a Bachelor of Science degree in Veterinary Science.

Preveterinary Medical Curriculum

Applicants for admission to the School of Veterinary Medicine must complete:

1. Mathematics through trigonometry*; Subject A; and American History and Institutions.

2. At least 90 quarter units or 60 semester units of credit in the University of California or other accredited institution, including the prescribed subjects listed below. (Minor shortages may be waived by the Admissions Committee of the School of Veterinary Medicine.)

3. Subject Requirements:

	<i>Quarter Units</i>
Chemistry (general, qualitative, organic, and quantitative)	25
Physics (general)	9
Biology, zoology, embryology	17
English composition and additional English or rhetoric	8
Animal science†	3
Restricted electives in social sciences and humanities‡	17§
Additional electives in social sciences, humanities or agriculture ..	<u>11§</u>
	90

Students completing the preveterinary medical requirements in institutions other than University of California, Davis, are urged to check the catalog of their college carefully to be sure they are taking equivalent courses.

<i>Freshman Year</i>	<i>Plan of Study</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 1A, 1B, 1C	5	5		5
English 1 and additional English or rhetoric	4	4		-
Biology 1	-	-		6
Animal science	-	-		3
Electives	6	6		1
	<u>15</u>	<u>15</u>		<u>15</u>

* Should be completed in high school.

† May be waived if not available.

‡ Art, anthropology, economics, foreign languages, geography, history, music, philosophy, political science, psychology, sociology, and/or additional English, rhetoric, and mathematics.

§ See page 68.

<i>Sophomore Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Physics 2A, 2B, 2C	3	3	3
Chemistry 8A, 8B, 5	3	3	4
Zoology 2	—	6	—
Zoology 100 (vertebrate embryology)	—	—	5
Electives	9	3	3
	—	—	—
	15	15	15

Requirements for the Degree Doctor of Veterinary Medicine

1. The candidate for the degree Doctor of Veterinary Medicine must have completed the general University requirements for a baccalaureate degree (pages 31-33).

2. He must possess good moral character.

3. He must have studied veterinary medicine for the equivalent of twelve quarters of twelve weeks each. The last six quarters must have been spent in the University of California School of Veterinary Medicine.

4. He must have completed the required work, satisfactorily fulfilled all special requirements, and received throughout the entire veterinary medical curriculum satisfactory grades as determined by the Faculty of the School and by the Graduate Council.

Plan of Study

<i>First Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Anatomy 140	2	Anatomy 155	2
Anatomy 150	2	Anatomy 156	2
Anatomy 151	4	Anatomy 157	2
Genetics 100A	3	Physiological Sciences 101B	3
Physiological Sciences 101A	4	Physiological Sciences 102B	2
Physiological Sciences 102A	1	Physiological Sciences 140A	5
	—	Physiological Sciences 141A	2
	16	—	—
		18	17

Second Year

Pathology 122A	5	Epidemiology and Preventive Medicine 140	2	Anatomy 180	4
Physiological Sciences 124	4	Pathology 122B	5	Clinical Sciences 103. 4	4
Veterinary Microbiology 120	2	Veterinary Microbiology 122	4	Pathology 122C	4
Veterinary Microbiology 121	3	Veterinary Microbiology 123	3	Veterinary Microbiology 125	5
Animal Nutrition 109. 3		Veterinary Microbiology 124	2		
	—		—		—
	17		16		17

<i>Third Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Clinical Pathology 201 . 3	Epidemiology and Preventive Medicine 208 3	Clinical Sciences 204B 4	Clinical Pathology 202 3
Clinical Sciences 204A 3	Clinical Sciences 210B 1	Clinical Sciences 204C 3	Clinical Sciences 210C 1
Clinical Sciences 210A 1	Clinical Sciences 220 . 4	Clinical Sciences 210C 1	Clinical Sciences 222. 5
Clinical Sciences 220 . 4	Clinical Sciences 210B 1	Epidemiology and Preventive Medicine 240 3	Epidemiology and Preventive Medicine
Clinical Sciences 230 . 6	Clinical Sciences 221 . 5	250 2	Epidemiology and Preventive Medicine 250 2
	Clinical Sciences 260 . 2		
	Veterinary Microbiology 201 . 2		
<hr/> 17	<hr/> 17	<hr/> 17	<hr/> 17
<i>Fourth Year</i>			
Epidemiology and Preventive Medicine 209 2	Clinical Pathology 250B 1	Clinical Pathology 250C 1	Clinical Pathology
Clinical Pathology 250A 1	Clinical Sciences 204E 3	Clinical Sciences 204F 3	Clinical Sciences 250B 8
Clinical Sciences 204D 5	Clinical Sciences 250B 8	Clinical Sciences 250C 7	Clinical Sciences 250C 1
Clinical Sciences 250A 8	Clinical Sciences 270 . 1	Pathology 250C 1	Electives 5
Pathology 250A 1	Pathology 250B 1		
	Electives 3		
<hr/> 17	<hr/> 17	<hr/> 17	<hr/> 17

Requirements for the Degree Bachelor of Science

Upon recommendation of the Faculty of the School of Veterinary Medicine the degree Bachelor of Science with a major in Veterinary Science is granted to students in the School of Veterinary Medicine who do not hold a baccalaureate and who:

1. Satisfy the general University requirements (pages 31-33).
2. Complete in the School of Veterinary Medicine all courses prescribed in the first two years of the professional curriculum. Exceptions may be made to students admitted in advanced standing.

Admission in Advanced Standing

An applicant requesting admission to advanced standing in the School of Veterinary Medicine may be accepted under the following conditions:

1. He must furnish evidence that he was eligible for admission to the first quarter of the School of Veterinary Medicine.
2. He must show that he has satisfactorily completed courses equivalent in kind and amount to those given in the School of Veterinary Medicine in the quarter or quarters preceding that in which admission is desired.
3. He may be required to pass examinations in any or all subjects for which credit is asked.

Graduate Study

The graduate study program of the School of Veterinary Medicine provides varied opportunities for advanced professional training and for launching careers in research.

Master of Preventive Veterinary Medicine Program

Applicants must hold the degree of Doctor of Veterinary Medicine or equivalent degree from an accredited school of veterinary medicine and be recommended for admission by the faculty committee in charge of the program. The program, consisting of a group of required core courses and optional electives, is scheduled over one full year from September to August. Specific fields of emphasis are Epidemiology, Medical Statistics, Information Retrieval and Analysis, and Disease Control and Eradication.

		Plan of Study*				
			Fall	Winter	Spring	Summer
Math 13	Elementary Statistics			4		
EPM 101	Perspectives in					
102	Veterinary Medicine	NC**				
	Biomedical Information					
	Retrieval		3			
103A, 103B, 103C	Medical Statistics	1	3	3		
210	Advanced					
	Epidemiology	5				
212	Epidemiology of the					
	Zoonoses		3			
214	Comparative					
	Epidemiology of					
	Noninfectious Diseases		3			
216	Mass Screening for					
	Diseases in Populations	3				
218	Disease Control and					
	Eradication		4			
290	Seminar in					
	Epidemiology and					
	Preventive Medicine	1	1	1		
298	Group Study	1		1		
299	Research	1	1	2	NC**	

Other graduate degrees offered beyond the D.V.M. are 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 Dean of the Graduate Division, Davis.

Additional detailed information may be obtained by writing the chairman of the department in which the candidate wishes to study.

* Substitutions may be permitted under special circumstances to provide specialized training in related fields.

** NC—Non credit.



GRADUATE DIVISION

Graduate study and research are administered by the Graduate Council, elected by the Academic Senate at Davis, and by the Dean of the Graduate Division. A University-wide Coordinating Committee on Graduate Affairs determines certain policies and establishes common procedures. Detailed information appears in the *Announcement of the Graduate Division*.

Advanced Degrees

On the Davis campus the following advanced degrees are offered: Master of Arts, Master of Science, Master of Education (in Agriculture), Master of Engineering, Juris Doctor, Master of Preventive Veterinary Medicine, Doctor of Engineering, Doctor of Veterinary Medicine, Doctor of Medicine and Doctor of Philosophy.

The majors for graduate study and the advanced degrees offered in each are shown below:

Organization of Graduate Study

Agricultural Chemistry (Ph.D.)	Genetics (M.S., Ph.D.)
Agricultural Economics (M.S., Ph.D.)	Geography (M.A., Ph.D.)
Agricultural Education (M.Ed.)	Geology (M.S., Ph.D.)
Agricultural Science and Management (M.S.)	German (M.A., Ph.D.)
Agronomy (M.S.)	History (M.A., Ph.D.)
Anatomy (M.S., Ph.D.)	Home Economics (M.S.)
Animal Science (M.S.)	Horticulture (M.S.)
Anthropology (M.A., Ph.D.)	International Agricultural Development (M.S.)
Art (M.A.)	Irrigation (M.S.)
Biochemistry (M.A., Ph.D.)	Law (J.D.)
Biophysics (Ph.D.)	Linguistics (M.A.)
Botany (M.S., Ph.D.)	Mathematics (M.A., Ph.D.)
Chemistry (M.S., Ph.D.)	Medicine (M.D.)
Comparative Pathology (M.S., Ph.D.)	Microbiology (M.A., Ph.D.)
Comparative Pharmacology and Toxicology (M.S., Ph.D.)	Music (M.A.)
Dramatic Art (M.A.)	Nutrition (M.S., Ph.D.)
Ecology (M.S., Ph.D.)	Philosophy (M.A., Ph.D.)
Economics (M.A., Ph.D.)	Physical Education (M.A.)
Education (M.A.)	Physics (M.A., Ph.D.)
Endocrinology (M.A., Ph.D.)	Physiology (M.S., Ph.D.)
Engineering (M.Eng., D.Eng., M.S., Ph.D.)	Plant Pathology (M.S., Ph.D.)
English (M.A., Ph.D.)	Plant Physiology (M.S., Ph.D.)
Entomology (M.S., Ph.D.)	Political Science (M.A., Ph.D.)
Food Science (M.S.)	Poultry Science (M.S.)
French (M.A., Ph.D.)	Preventive Veterinary Medicine (M.P.V.M.)
	Psychology (M.A., Ph.D.)

Range Management (M.S.)
 Russian (M.A.)
 Sociology (M.A., Ph.D.)
 Soil Science (M.S., Ph.D.)

Spanish (M.A., Ph.D.)
 Vegetable Crops (M.S.)
 Veterinary Medicine (D.V.M.)
 Zoology (M.A., Ph.D.)

This list is under constant revision as graduate work expands into new areas of study, and prospective students seeking further information should consult the Graduate Division Office. The general requirements for these degrees are published in the *Announcement of the Graduate Division*, and the specific requirements are generally available from the office of the department concerned. The group majors, those which are sponsored by more than one department, are listed below and if a student is interested in one or more of these he should write to the group chairman as shown for more information as to specific requirements for the advanced degree.

- Agricultural Chemistry—John R. Whitaker, Ph.D., Chairman, 106 Roadhouse Hall
 Agricultural Science and Management—William C. Weir, Ph.D., Chairman, 162 Animal Science
 Anatomy—Larry Z. McFarland, D.V.M., Ph.D., Chairman, 1042 Haring Hall
 Biochemistry—Jerry L. Hedrick, Ph.D., Chairman, 5206 Storer Hall
 Biophysics—Richard S. Griddle, Ph.D., Chairman, 555 Hutchison Hall
 Botany—Elizabeth G. Cutter, Ph.D., Chairman, 278 Robbins Hall
 Comparative Pathology—Larry Z. McFarland, D.V.M., Ph.D., Chairman, 1072 Haring Hall
 Comparative Pharmacology and Toxicology—Stuart A. Peoples, M.D., 2147 Haring Hall
 Ecology—Robert S. Loomis, Ph.D., Chariman, 271 Hunt Hall
 Endocrinology—Irving I. Geschwind, Ph.D., 220 Animal Science
 Food Science—Lloyd M. Smith, Ph.D., Chairman, 204 Roadhouse Hall
 Genetics—Robert W. Allard, Ph.D., Chairman, 201B Hutchison Hall
 Horticulture—Dillon S. Brown, Ph.D., Chairman, 1043 Wickson Hall
 International Agricultural Development—Lynn D. Whittig, Ph.D., Chairman, 167 Hoagland Hall
 Linguistics—Benjamin E. Wallacker, Ph.D., Chairman, 331 Voorhies Hall
 Microbiology—Herman J. Pfaff, Ph.D., Chairman, 217 Cruess Hall
 Nutrition—William C. Weir, Ph.D., Chairman, 162 Animal Science
 Physiology—James M. Boda, Ph.D., Chairman, 118 Animal Science
 Plant Physiology—Harlan K. Pratt, Ph.D., Chairman, 104 Louis Mann Laboratory
 Preventive Veterinary Medicine—Calvin W. Schwabe, D.V.M., Chairman, 2086 Haring Hall
 Range Management—R. Merton Love, Ph.D., Chairman, 131 Hunt Hall
 Soil Science—Delbert W. Henderson, Ph.D., Chairman, 223 Veihmeyer 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 or the department in which the applicant wishes to pursue an advanced degree may deny him admission if his scholastic record or his undergraduate program of study is judged not adequate 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. Individual departments may have special requirements for admission to graduate status, and certain departments and schools require an additional and special application for admission to their advanced-degree program.

Application for Admission

Students seeking admission for graduate work may obtain application forms from the Office of the Graduate Division of the University at Davis. Applications should be filed as early as twelve weeks before the date of registration but in no case later than July 15, 1969, November 14, 1969, and February 13, 1970, for the fall, winter, and spring quarters respectively. The application must be accompanied by a money order or bank draft for \$10.00, made payable to The Regents of the University of California, in payment of the application fee, which will not under any circumstances be refunded. If the complete record as specified below is not filed in time, the student may not be allowed to register or he may be allowed to register late on payment of an additional fee of \$10.00.

Official transcripts of record covering all college and university work completed to date, together with official evidence of degrees conferred, must accompany or immediately follow the application. A separate original and official record must be presented from each institution previously attended. Unless all of these are on file in the Graduate Division, registration cannot be permitted. In addition, the student should have in his possession a second copy of his official records for his use in conference with departments.

A separate and additional application is required for admission to the School of Law, School of Medicine, and the School of Veterinary Medicine. Students are referred to pages 138, 141, and 147 for further details.

Every new student and every student returning to the University after an absence of one or more quarters must satisfy the medical requirements as described under "Medical Evaluation" (see page 45).

Readmission

Persons formerly registered in a regular session as graduate students who wish to return after an absence must apply for readmission. The form for this purpose is obtainable from the Registrar, and no fee is charged.

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 as early as six months before the date of intended enrollment to permit processing of their records.

Students whose undergraduate preparation has been in a language other than English should furnish positive evidence that their command of both spoken and written English will permit them to profit by the instruction offered and to compete with American students. Certificates of proficiency in English by individuals (usually professors) are helpful, and consular testing at the time the I-20 form is processed is valuable, but neither of these is standardized or quantitative. A number of other tests given by authorized examiners abroad are 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 (A.U.L.C.) Test. Prospective students are encouraged, however, to submit scores on the Test of English as a Foreign Language (TOEFL) administered by the Educational Testing Service for the College Board. These tests are given at many testing centers abroad three times a year, and full information is available from the Educational Testing Service, Princeton, New Jersey 08540.

On arrival all international students take the special University examination in English; those who do not pass are assigned to remedial courses which may delay their graduate program. Even though the student has been admitted, his registration may be delayed until he acquires an adequate command of English.

Admission Without an Advanced Degree Objective

Students who do not wish to become candidates for a higher degree may be admitted to a specified field of study for course work only. Their 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. All such students who are not residents of the State of California will have to pay the regular tuition fee.

Program of Study

When the student registers and declares his degree objective, he is assigned to the appropriate adviser, who will advise him on his program of study. This will depend to some degree on the undergraduate training, and the student may be assigned to undergraduate courses to complete deficiencies.

Each student must satisfy the specific requirements for the degree sought as published in the *Announcement of the Graduate Division*. The general 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 con-

siderable flexibility is permitted to suit the individual student's needs or main interest. More detailed information is available from the department or group concerned. Undergraduates at Davis who plan to pursue graduate study should confer with their major adviser early in their senior year to guarantee adequate preparation.

Teacher Credential Program

Programs leading to a Standard Teaching Credential with specialization in elementary teaching and in secondary teaching are offered under the jurisdiction of the Graduate Division. Graduate students who are prospective candidates for an advanced degree may take special professional courses and qualify for the junior college teachers credential.

The curricula for teacher education are offered by the Department of Education and the Department of Applied Behavioral Sciences, and interested students should obtain detailed information at either department. The courses in professional education required for the credential are specified in this catalog under the Departments' listing of courses of instruction (see pages 186 and 221). Subject-matter requirements for the teaching major and minor are specified with departmental offerings.

Only students who have completed the bachelor's degree are eligible, and they must be admitted to the program by the Graduate Division. Final filing dates and the application forms may be obtained from the Graduate Division Office. The student must maintain a scholarship record of 2.75 or better in all graduate work undertaken. In addition to the Graduate Division application, an application for the Department of Education is necessary for those who wish to be admitted for the credential program. Application for the 1969-70 program should be made in Room 228 Voorhies Hall before November 1. Exceptions to this rule are made only at the discretion of the Head of Teacher Education.

Since the requirements for the credential are set up both by the State Department of Education and by the University, all students who intend to work for the credential are urged to consult the adviser in one of the departments named above early in their undergraduate career (preferably by the end of their freshman year).

Curricula are offered which lead to the Standard Teaching Credential with a specialization in elementary teaching or in secondary teaching and to the secondary credentials required for teaching classes reimbursed under the National Vocation Acts. Two routes for obtaining each type of credential are available: a student-teaching program (the usual route) and an internship program (limited in enrollment). Application for the intern program should be made to the department early in the senior year.

Intercampus Exchange Program

A graduate student registered on any campus of the University may become an Intercampus Exchange Student with the approval of his graduate adviser and the Dean of the Graduate Division on both the home and the host campus.

The Intercampus Exchange Student has library, infirmary, and other student privileges on the host campus but is considered as a graduate student in residence on his home campus. The grades obtained in courses on the host campus are transferred to his home campus and entered on his official record. Forms for application for the intercampus exchange may be obtained at the office of the Dean of the Graduate Division.

Fellowships, Assistantships, and Loans

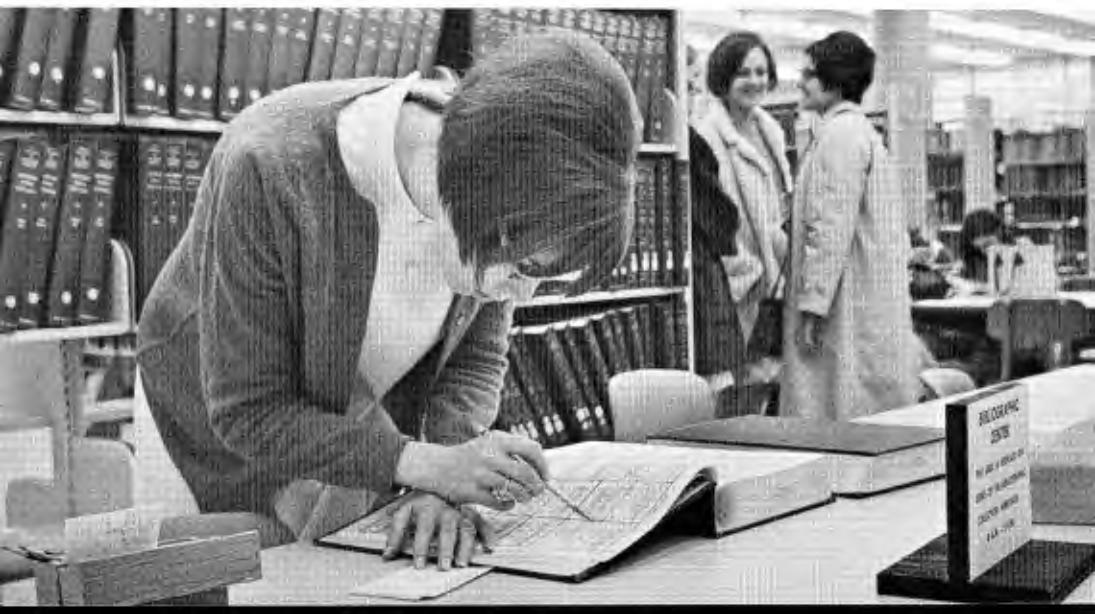
Fellowships are awarded by the Fellowship Committee of the Graduate Council on the bases of scholarship and promise of outstanding academic and professional contribution. For further information as to the awards available and application forms the student may consult the Fellowship announcement published in November for the following academic year. Applications with all the supporting records should be filed by February 1 to receive consideration.

Requests for application forms from students in foreign countries will not be honored *after* January 1 and will not be sent by airmail unless the applicant forwards *in advance* international postal coupons equivalent to 60 cents U.S. postage.

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.

Certain departments may be authorized to offer a limited number of fellowships under the National Defense Education Act and traineeships under the National Science Foundation or the National Institute of Health. For these the student may write directly to the department or to the Graduate Division of the University. Information regarding Graduate Fellowships supported by various federal agencies and others is also available at the Office of the Graduate Division.

Application for loan funds for graduate students should be addressed to the Office of the Dean of Students (see page 39).



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Courses of Instruction

Explanatory Note

Credit for academic work undertaken at the University is evaluated in terms of units. The value of a course is reckoned at the rate of one unit for three hours' work per week per quarter, on the part of the student. Included in these three hours may be one hour of lecture or discussion, or two to three hours of laboratory. For most courses, it is expected that the average student will spend two hours in preparation for one hour of lecture or recitation. If the number of hours of lecture or discussion given in the catalog is less than the number of units of credit assigned to the course, this means that some form of additional non-classroom work (for example, a term paper) is required of the student in that course. Students should inquire of the instructor at the first class meeting concerning this point.

The credit value of each course in quarter units is indicated for each quarter by a number in parentheses following the title.

The quarter in which the course is given is shown as follows: I, fall quarter (September to December); II, winter quarter (January to March); III, spring quarter (April to June); IV, summer quarter (June to August) for students in the School of Medicine only.

When a course is listed as offered in even-numbered years or odd-numbered years, this refers to the calendar year in which the involved quarter occurs. For example:

"Philosophy 132. III. Offered in odd-numbered years," would be given in the spring quarter of 1969, 1971, and so on, whereas

"Philosophy 174. III. Offered in even-numbered years," would be given in the spring quarter of 1968, 1970, and so on.

Information concerning class hours and room numbers is given in the *Schedule and Directory*.

A course number followed by two or three letters (for example, Mathematics 131A-131B-131C) is continued through three successive quarters, ordinarily from September to June; occasionally, however, a course of two quarters may begin in the winter quarter (for example, Spanish 101A-101B). The first quarter of such courses is prerequisite to the second, and the second to the third. Where A and B portions of a course are listed separately (for example, Economics 100A and Economics 100B), the A course is not prerequisite to B unless it is specifically mentioned in the listing of the B course.

Classification and Numbering

Courses are classified and numbered as follows:

Undergraduate courses. These are of two kinds, *lower division* (numbered 1-49) and *upper division* (numbered 100-199). Freshman and sophomore students are not normally encouraged to take upper division courses.

Faculty 48 courses offer opportunity for a professor or lecturer to lead the exploration of a subject with a group of interested students. The subject matter

considered may be broad in scope or relatively narrow and specialized. Admission is by consent of the instructor, and all students are eligible.

Freshman Seminars are numbered 49. These 2-unit Letters and Science courses provide freshmen with experience in discussion of substantive ideas in the atmosphere of a small group and under the guidance of a regular faculty member.

Special study courses numbered 38 and 39 are designed for group study and individual study by lower division students. Courses numbered 198 and 199 are designed for upper division students having an adequate background in the subject proposed for special study. To be eligible a student must have completed 84 or more units of work toward his bachelor's degree. Credit in these special study courses may not exceed 5 units per quarter and admission is by consent of the instructor.

Departments may offer special *honors courses* (marked H) in reading and research, with credit to be determined by the instructors in charge, according to the performance of the individual students, subject to such general restrictions as may be imposed by the department, the college, or the Committee on Courses of Instruction of the Academic Senate. The work of the student in an honors course may consist of additional work in connection with other courses of instruction.

Graduate courses. Graduate courses (numbered 200-299) are open only to students who have adequate preparation; admission is subject to the approval of the instructor in charge.

Professional teacher-training courses in the Department of Education and courses in other departments that are specially intended for teachers or prospective teachers are numbered 300-399.

Professional courses in departments other than the Department of Education are numbered 400-499.

Extra-session courses. Extra-session courses (laboratory, field, or other individual work done out of session under the direction of a department of instruction) may be accepted upon the recommendation of the department in partial fulfillment of the residence requirement for the bachelor's degree.

University Extension courses. Simultaneous enrollment in resident courses and in extension courses is permitted only when the entire program of the student is duly approved by the appropriate dean or study-list authority.

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.

SYMBOLS

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

- ¹ Absent on leave, 1969-70.
- ² Absent on leave, fall quarter 1969.
- ³ Absent on leave, winter quarter 1970.
- ⁴ Absent on leave, spring quarter 1970.
- * Not to be given, 1969-70.
- † Not to be given, fall quarter 1969.
- ‡ Not to be given, winter quarter 1970.
- § Not to be given, spring quarter 1970.
- # To be given if a sufficient number of students enroll.

AGRICULTURAL CHEMISTRY (A Graduate Group)

John R. Whitaker, Ph.D., *Chairman of the Group*
Group Office, 238A Cruess Hall

Graduate Courses

290. Seminar (1) I, II.

Seminar—1 hour. Prerequisite: consent of instructor.

The Staff

299. Research. (1-9) I, II, III, (Summer).

Prerequisite: graduate standing and consent of instructor. Open to qualified graduate students who wish to pursue original investigation. Arrangements should be made well in advance with a member of the Group in Agricultural Chemistry who will supervise the research and determine the credit value.

The Staff

AGRICULTURAL ECONOMICS

J. Herbert Snyder, Ph.D., *Chairman of the Department*
Department Office, 117 Voorhies Hall

Professors:

- Harold O. Carter, Ph.D.
- Gerald W. Dean, Ph.D.
- Daniel B. DeLoach, Ph.D., D.Lit.
- Jerry Foytik, Ph.D.
- Benjamin C. French, Ph.D.
- Trimble R. Hedges, Ph.D.
- Gordon A. King, Ph.D.
- Sylvia Lane, Ph.D.
- Chester O. McCorkle, Jr., Ph.D.
- J. Herbert Snyder, Ph.D.
- Stephen H. Sosnick, Ph.D.
- James M. Tinley, Ph.D. (*Emeritus*)

Associate Professors:

- Warren E. Johnston, Ph.D.
- Samuel H. Logan, Ph.D.

Assistant Professors:

- Hoy F. Carman, Ph.D.
- Alexander F. McCalla, Ph.D.
- Quirino Paris, Ph.D.

◇ ◇ ◇

Assistant Professor:

- Gorden C. Rausser, M.S. (*Acting*)

Lecturer:

- Alice R. Taylor, LL.B. (*Business Law*)

Department Major Advisers.—See Schedule and Directory Listing.

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

Lower Division Courses**1. Economic Basis of the Agricultural Industry. (3) II.**

Lecture—3 hours. Prerequisite: Economics 1A. Brief history of agriculture and man; the agricultural industry and its relation to the United States and world economies; production and supply, marketing and demand for agricultural products.

Mr. McCorkle

2. Economic Basis of the Agricultural Industry. (3) III.

Lecture—3 hours. Prerequisite: course 1. Nature of agricultural land, capital, and labor markets; economic and social problems of agriculture in an urban and industrialized economy, particularly those relevant to California.

Mr. Snyder

18. Business Law. (4) I.

Lecture—4 hours. Prerequisite: sophomore standing. Not open to students with credit for Business Administration 18. Introduction to law; contracts, sales, and agency.

Mrs. Taylor

49. Field Practice. (1) II.

Field trip during Spring recess to observe aspects of the production, processing, handling, and distribution of agricultural products.

Mr. Sosnick

Upper Division Courses**100A. Economic Analysis in Agriculture. (3) I.**

Lecture—3 hours. Prerequisite: Economics 1A, 1B; Mathematics 16A (may be taken concurrently). Theory of individual consumer and market demand; theory of production and supply of agricultural products, with particular reference to the individual firm; pricing, output determination, and employment of resources under pure competition.

Mr. McCorkle

100B. Economic Analysis in Agriculture. (3) II.

Lecture—3 hours. Prerequisite: course 100A. Pricing, output determination, and employment of resources under conditions of monopoly, oligopoly, and monopolistic competition.

Mr. Carter

100C. Economic Analysis in Agriculture. (3) III.

Lecture—3 hours. Prerequisite: course 100B. Theory of regional specialization, location, and trade for agricultural products; general economic equilibrium.

Mr. Logan

106A. Quantitative Methods in Agricultural Economics. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 13 or equivalent. Statistical methods for analyzing quantitative agricultural economics data: descriptive statistics, probability, hypothesis testing, statistical inference, and sampling.

Mr. Logan

106B. Quantitative Methods in Agricultural Economics. (3) III.

Lecture—3 hours. Prerequisite: course 106A or equivalent. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis.

Mr. Foytik

112. Fundamentals of Business Organization. (4) I.

Lecture—4 hours. Principles and practices of business organizations; goals; financial and personnel requirements; selection of form of organization—single ownership, partnership, corporation, and cooperative—to facilitate attainment of goals; taxation, industry structure; legal, political, and social problems.

Mr. DeLoach

113. Fundamentals of Business Management. (4) II.

Lecture—4 hours. Recommended: course 112. Management principles and their application to all forms of business including cooperatives; the planning function; procurement, sales, finance, and personnel; case studies of agriculturally related businesses.

114. Production Management. (4) III.

Lecture—4 hours. Recommended: course 113. Principles and procedures for the efficient use of resources in processing and handling of agricultural products; plant layout; work scheduling; inventory control; coordination of production and sales; location.

Mr. Carman

117. Managerial Accounting. (4) III.

Lecture—4 hours. Prerequisite: Economics 11A-11B; course 112 recommended. Basic concepts of accounting as a managerial tool; procedures for financial reporting; systems and internal control; cost accounting; budgeting; interpretation of administrative reports.

Mr. Hedges

120. Agricultural Policy. (3) I.

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. The agriculture of the principal countries of the world, with special reference to the influence of food supply upon the development of man.

Mr. Hedges

130. Agriculture Marketing. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A or equivalent. The nature, function, organizational structure, and operation of agricultural markets; prices, costs, and margins; market information, regulation, and controls; cooperative marketing.

Mr. French

140. Farm Management. (5) III.

Lecture—4 hours; laboratory—2 hours. Farm organization and resources; economic and tech-

nological principles in decision making; analytical techniques and management control; problems in organizing and managing the farm business.

145. Farm and Rural Resources Appraisal. (3) I.

Lecture—3 hours. Principles of farm and ranch appraisal; land utilization in relation to problems of development and valuation. One field trip is required.

148. Economic Planning for Regional and Resource Development. (3) II.

Lecture—3 hours. Relation of resources to economic growth, including regional problems; planning economic development with particular emphasis on resource use in agriculture; selected resource development programs in the United States and certain foreign countries, including land reform experiences. Mr. Dean

150. Agricultural Labor. (3) II.

Lecture—2 hours; discussion—1 hour. Problems, attitudes, and characteristics of agricultural employers, employees, and labor contractors. Impact of mechanization; determinants of productivity; wage levels and structures; evolution and efficiency of the labor market; placement and supervision; off season and in season unemployment; organization and conflict; relevant legislation. Mr. Sosnick

155. Quantitative Analysis for Business Decisions. (3) I.

Lecture—3 hours. Prerequisite: course 106A; Mathematics 16A. Introduction to selected topics in operations research, including mathematical programming, applied decision theory, game theory, and inventory models. Mr. Foytik

160. Advanced Agricultural Marketing. (3) III.

Lecture—3 hours. Recommended: course 155. The marketing firm in its economic context: market structures; pricing and price policies; empirical demand analysis; marketing cost and efficiency; public policies toward marketing. Mr. King

170. Advanced Farm Management. (3) III.

Lecture—3 hours. Prerequisite: course 155 or equivalent. The farm firm in its economic context: resource and enterprise combinations; size of firm; uncertainty considerations; replacement policies; demand for inputs; nonfarm influences. Mr. Paris

176. Economic Analysis in Resource Use. (3) III.

Lecture—3 hours. 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.

190A-190B. Senior Research Project. (2-2)

I-II, II-III.

Supervised individual research. The research report begun in 190A will be revised and completed in 190B. (Course 190A to be Passed or not Passed grading only.)

I-II. Mr. Snyder; II-III. Mr. Hedges

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

Prerequisite: consent of instructor. The Staff

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

Prerequisite: junior or senior standing and consent of instructor. Limited to students with adequate preparation in Agricultural Economics. The Staff

Graduate Courses

200A-200B-200C. Economics of Agricultural Production, Consumption, and Trade. (3-3) I-II-III.

Lecture—3 hours. Theory of the firm and industry, with particular reference to production; market structures, single and multiple products, uncertainty; theory of demand and consumption; and location theory and interregional trade.

I. Mr. French; II. Mr. King; III. Mr. Sosnick

210. Econometric Methods. (4) III.

Lecture—4 hours. Prerequisite: Mathematics 130B. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. Mr. Rausser

211. Advanced Econometric Methods. (3) I.

Lecture—3 hours. Prerequisite: course 210. Econometric models and their use in estimation of static and dynamic structural relationships. Special problems in the theory and application of econometrics. Mr. Rausser

220A-220B. Agricultural Policy. (3-3) II-III.

Lecture—3 hours. An appraisal, using criteria of social welfare and economic efficiency, of economic policy for agriculture in developed and developing nations; its place in general national and international economic policy under changing politico-economic conditions.

Mr. McCalla

250. Institutional Setting for Agricultural Business. (3) I.

Lecture—3 hours. Study of economic and social influences of the institutional environment on agriculture-related industries; historical development and present structure of the American economy; governmental activities; financial aspects; labor problems. Mr. DeLoach

253A-253B. Quantitative Analysis of Operational Problems. (3-3) I-II.

Lecture—3 hours. Selected topics in operations research, including mathematical program-

ming, decision theory, inventory, waiting line, and replacement models; simulation of business operations; statistical quality control.

I. Mr. Carter; II. Mr. Paris

257. Production Planning and Market Analysis. (3) III.

Lecture—3 hours. Quantitative analysis of production systems by statistical, economic, and engineering methods; sales analysis for the individual firm; problems of investment, location, scale of operations.

Mr. Carman

260. Administrative Organization and Policy Formation. (3) III.

Lecture—3 hours. Concepts and techniques of administration in the business firm; formulation and implementation of management goals; plan-

ning, procuring, organizing, and controlling physical factors and personnel. Mr. Foytik

280A-280B-280C. Analysis of Research in the Economics of Agriculture. (3-3-3) I-II-III.

Lecture—3 hours. Current research problems and methods of analysis in agricultural economics. A comprehensive approach to economic problems of agriculture, including analysis of production, supply, and demand for firm and industry; regional economics, and interregional trade.

I. Mr. Dean; II. Mr. Logan; III. Mr. French

299. Individual Study. (1-4) I, II, III. The Staff

299D. Special Study for Doctoral Dissertation. (1-12) I, II, III. The Staff

AGRICULTURAL EDUCATION—See Applied Behavioral Sciences

AGRICULTURAL ENGINEERING—See also Engineering: Agricultural

AGRICULTURAL ENGINEERING*

John R. Goss, M.S., *Chairman of the Department*
Department Office, 2030 Engineering I

Professors:

Norman B. Akesson, M.S.

Kinsell L. Coulson, Ph.D.

Coby Lorenzen, Jr., M.S.

Loren W. Neubauer, Ph.D. (*Agricultural Engineering and Engineering*)

Michael O'Brien, Ph.D.

Herbert B. Schultz, Ph.D. (*Agricultural Engineering and Lecturer in Geography*)

*Wesley E. Yates, M.S.

Associate Professors:

¹Roger E. Garrett, M.S.

John C. Harper, D.Sc.

², ³Stanton R. Morrison, Ph.D.

Assistant Professor:

Leonard O. Myrup, Ph.D.

◇ ◇ ◇

Professors:

Roy Bainer, M.S. (*Engineering, Emeritus*)

John R. Goss, M.S., (*Engineering*)

Samuel A. Hart, Ph.D. (*Engineering*)

S. Milton Henderson, M.S. (*Engineering*)

Clarence F. Kelly, M.S., Sc.D. (*Engineering Berkeley campus*)

Robert A. Kepner, B.S. (*Engineering*)

Associate Professors:

William J. Chancellor, Ph.D. (*Engineering*)

Robert B. Fridley, M.S. (*Engineering*)

Lecturers:

John B. Dobie, M.S.

Joe P. Gentry, M.S.

Bachelor of Science Major Program and Graduate Study (College of Engineering). See pages 81 and 133.

Lower Division Course

12. Engineering in Agricultural Operations. (3) II.

Lecture—3 hours. Introduction of engineering principles to tillage, harvesting, application of power, utilization of heat, materials handling, processing, structures, environment control, and systems concept. Mr. Lorenzen, Mr. Dobie

Upper Division Courses

103. Agricultural Power. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Physics 2A-2B or 4A-4B; open to qualified lower division students with consent of instructor. Principles of operation, construction, and utilization of internal-combustion engines; tractors and electric motors. Mr. Chancellor

*Courses listed here are in the College of Agricultural and Environmental Sciences. For further course offering, see Engineering, page 224.

¹Absent on leave, 1969-70.

²Absent on leave, fall quarter 1969.

³Absent on leave, winter quarter 1970.

104. Agricultural Machinery. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Physics 2A or 4A. Principles of construction, operation, selection, and utilization of equipment for tillage, planting, harvesting, and the application of agricultural chemicals.

105. Farm Structures. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Physics 2A or 4A. Functional and structural design of unified physical plants for livestock production and other enterprises; principles of feed mills, materials conveying, water and electrical systems, feed storage; labor-efficiency studies; materials for and design of beams, columns, trusses, and tanks.

Mr. Neubauer

***106. Micrometeorology in Agriculture. (3) II.**

Lecture—3 hours. Prerequisite: Mathematics 16B or equivalent. Solar and terrestrial radiation; temperature and moisture fields near the surface; momentum and turbulent transfers; energy balance near the surface; practical applications to agriculture and air pollution.

Mr. Coulson

107. Agricultural Meteorology. (3) I.

Lecture—3 hours. Prerequisite: Geography 1 or 3 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). Mr. Schultz

110. Principles of Application of Agricultural Chemicals. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 13, Physics 2A-2B (or consent of instructor). Principles of fluid flow and atomization in relation to formulations and machine applications. Small particle behavior, microweather, chemical drift. Analysis of ground machines and aircraft systems for application of defoliants, fertilizers, pesticides and

trace chemicals. Metering and calibration. Economics.

Mr. Akesson

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

Prerequisite: consent of the instructor.

The Staff (Mr. Goss in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**298. Group Study. (1-5) I, II, III.**

The Staff (Mr. Goss in charge)

299. Research. (1-12) I, II, III.

The Staff

Professional Courses**314A. Agricultural Engineering Problems and Techniques for Teachers. (3) II.**

Laboratory—9 hours. Prerequisite: Agricultural Education major or consent of instructor. The application of engineering and mechanical principles to the construction, maintenance, and repair of agricultural structures, machinery, and utilities. Offered in even-numbered years.

Mr. O'Brien

314B. Agricultural Engineering Problems and Techniques for Teaching. (3) II.

Laboratory—9 hours. Prerequisite: Agricultural Education major or consent of instructor. The application of engineering and mechanical principles to the construction, maintenance, and repair of agricultural structures, machinery, and utilities. Offered in odd-numbered years.

Mr. Gentry

317. Problems in Teaching Farm Mechanics. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: 12 units in Agricultural Engineering, including courses 314A, 314B; Physics 2A-2B or 4A-4B. Demonstrations of and practice in the methods of teaching farm mechanics in secondary schools. School-shop planning including the selection, arrangement, and management of equipment. Curriculum planning, including the relation of teaching materials, references, and visual aids.

Mr. O'Brien

AGRICULTURAL GENETICS—See Genetics, pages 66 and 272**AGRICULTURAL PRACTICES**

Harry O. Walker, Ed.D., *Chairman of the Department*

Department Office, 105 TB-10

Agriculturist:

Harry O. Walker, Ed.D.

Associate Agriculturists:

George F. Hanna, M.Ed.

¹Gene E. Rapp, M.Ed.

^o Not to be given, 1969-70.

¹ Absent on leave, 1969-70.

Lower Division Course**49. Field Practice in Agriculture.**

(No credit) I, II, III.

Laboratory—3 hours. Prerequisite: consent of instructor. Operation and maintenance of tractors and specialized equipment used for producing and harvesting food and forage crops; familiarization with basic soil, water,

and land management techniques. For students planning careers in production, processing, dis-

tribution, or service elements of the agricultural industry.

The Staff

AGRICULTURAL SCIENCE AND MANAGEMENT

Major Advisers.—See *Schedule and Directory Listing*.

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

Lower Division Course

11. Natural and Social Sciences in Agriculture (Summer Laboratory). (1).

Lecture—2 hours. A survey of major activities of the departments in the College of Agricultural and Environmental Sciences and tours of departmental facilities. Contributions of the natural, physical, and social sciences to agricultural research, education, and management. The importance of agriculture to our society and the opportunities it has to offer.

Mr. Bureau

Upper Division Courses

190. Proseminar in Agricultural Science and Management. (1) I, II, III.

Seminar—I hour. Prerequisite: senior standing in Agricultural Science and Management or consent of instructor. Reports and discussion of current developments in the agricultural industry. (Passed/Not Passed grading only.)

The Staff (Mr. Weir in charge)

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

Discussion—1-5 hours. Prerequisite: senior standing. Selected topics relating to application of science and management techniques to problems of the agricultural industry.

The Staff (Mr. Weir in charge)

Graduate Courses

290. Seminar. (1) I.

Seminar—I hour.

The Staff (Mr. Weir in charge)

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

The Staff (Mr. Weir in charge)

299. Research. (1-6) I, II, III.

The Staff (Mr. Weir in charge)

Agricultural Economics

Lower Division Courses

1. Economic Basis of the Agricultural Industry. (3) II.

Lecture—3 hours. Prerequisite: Economics 1A. Brief history of agriculture and man; the agricultural industry and its relation to the U. S. and world economies; production and supply, marketing and demand for agricultural products.

Mr. McCorkle

2. Economic Basis of the Agricultural Industry. (3) III.

Lecture—3 hours. Prerequisite: course 1. Nature of agricultural land, capital and labor markets; economic and social problems of agriculture in an urban and industrialized economy, particularly those relevant to California.

Mr. Snyder

Animal Science

Lower Division Courses

1. Domestic Animals and Man. (3) I.

Lecture—2 hours; laboratory—2 hours. Animal domestication and factors affecting their characteristics and distribution. Animal use by man for food, work, fiber, drugs, research and recreation; projected effects of population expansion and urbanization. Demonstrations of beef and dairy cattle, poultry, sheep, swine and horses.

The Staff (Mr. Weir in charge)

2. Introductory Animal Science. (3) III.

Lecture—2 hours; laboratory—2 hours. Recommended: course 1; Biology 1. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals; the application of sciences to animal production.

The Staff (Mr. Bradford in charge)

Plant Science

Lower Division Courses

1. Plants and Man. (3) II.

Lecture—3 hours. Plants as a basic resource for food, fiber, shelter, and recreation; their use and effect on man, past, present, and future.

Mr. Harris, Mr. Smeltzer

2. Production of Cultivated Plants. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 1. Principles of crop improvement, propagation, production, processing, storage, and marketing; conservation and utilization of land and water resources.

Mr. Flocker, Mr. Lider

Soil and Water Science

Lower Division Courses

1. Soil, Water, and Air Resources. (3) I.

Lecture—3 hours. Prerequisite: Biology 1 or consent of instructor. Interrelationships of man and environmental factors; utilization and development of renewable natural resources; characteristics of soil, water, and air and their relation to management and planning concepts. Open to non-majors.

Mr. D. Henderson

2. Soil, Water, and Air Resources. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 1; Biology 1; Physics 2A recommended. Development and properties of soils; source and properties of water; properties of the atmosphere; soil, water, and air management in relation to crop production; planning concepts related to agricultural development and production.

Mr. Munns

Food Science and Technology**Upper Division Course*****100. Processing Agricultural Products. (5) I.**

Lecture—4 hours; laboratory—3 hours. Prerequisite: Biology 1; Chemistry 8B. Processing of foods, feeds, and fibers to provide desirable qualities such as convenience, economy and utility. Principles used in raw product selection, conversion, preservation, and quality control.

Mr. Miller, Mr. Dunkley

AGRICULTURAL TOXICOLOGY—See Environmental Toxicology**AGRONOMY—See Plant Sciences****AMERICAN HISTORY AND LITERATURE**

Robert H. Hopkins, Ph.D., *Chairman of the Committee*

Committee Office, 222 Sproul Hall

Committee in Charge:**Professors:**

Joseph A. Baird, Jr., Ph.D. (*Art*)

James J. Murphy, Ph.D. (*Rhetoric*)

Associate Professors:

Paul Goodman, Ph.D. (*History*)

Robert H. Hopkins, Ph.D. (*English*)

John R. Owens, Ph.D. (*Political Science*)

Daniel E. Snyder (*Dramatic Art*)

Group Major Adviser.—Mr. Goodman.

The Major with Honors.—See description, page 133.

Major Adviser.—See *Schedule and Directory Listing*.

The subject matter of this major is confined to materials within the history and literature of the United States. Its focus is upon that area of investigation where the departments of English and History share a common interest in method and interpretation. Literary texts are subjected to a descriptive, analytical, and evaluative examination within the intellectual and cultural context of the history of the United States.

Preparation for the Major.—Required: History 17A, 17B, and English 30A, 30B, 30C. In addition, History 4A, 4B, 4C is required for students electing History in Group 3. Recommended: English 46A, 46B, 46C for those electing History in Group 3; History 4A, 4B, 4C for those electing literature in Group 3.

The Major Program.—A total of 52 units in upper division courses, distributed as follows:

Group 1. Sixteen units of history selected from the following courses: History 170A, 170B,

170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 176A, 176B, 178A, 178B, 179A, 179B.

Group 2. Sixteen units of literature selected from the following courses: English 140, 141, 142, 143, 144, 146, 147, 152, 158A, 158B, 175; Dramatic Art 150.

Group 3. In consultation with his adviser, the student must select 20 additional units in either English or History.

The Honors Program.—Students admitted to the honors program will take American History and Literature 194H and 197H in the senior year. These courses will count in Group 3.

Teaching Major.—Elementary and Secondary Credentials.

Subject Representative: Mr. Jacobson

Teaching Major.—Requirements are the same as for the departmental major. There is no teaching minor in American History and Literature.

Upper Division Courses**194H. Special Study for Honors Students.**

(4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: enrollment limited to honors students in American History and Literature. The Staff

197H. Special Study for the Comprehensive Examination for Honors Students.

(4) I, II, III.

Prerequisite: completion of all other major requirements for the A.B. degree in American History and Literature. The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

* Not to be given, 1969-70.

ANATOMY

Walter S. Tyler, D.V.M., Ph.D., *Chairman of the Department*

Department Office, 1042 Haring Hall

Professors:

Logan M. Julian, D.V.M., Ph.D.
Walter S. Tyler, D.V.M., Ph.D.

Associate Professor:

Larry Z. McFarland, D.V.M., Ph.D.

Assistant Professors:

Raymond D. Barnes, Ph.D.
Leslie J. Faulkin, Jr., Ph.D.
Benjamin L. Hart, D.V.M., Ph.D.



Lecturer:

Marjan Merala, Ldo.Vet., M.S. (*Medical Bibliography*)

Upper Division Courses

100. Systematic Anatomy. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2. Lectures and dissections emphasizing the typical structure of the anatomical systems of the dog, rat and monkey. Offered in odd-numbered years.

Mr. McFarland, Mr. Barnes

140. Neuroanatomy of Domestic Animals. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: freshman standing in School of Veterinary Medicine. A functional, comparative consideration of gross, subgross and microscopic anatomy of the central nervous system and special senses of common domestic animals.

Mr. Hart

150. Functional Comparative Anatomy of the Locomotor System of Domestic Animals. (2) I.

Lecture—2 hours. Prerequisite: freshman standing in School of Veterinary Medicine, or Zoology 100 and consent of instructor. Gross, subgross, light microscopic and electron microscopic anatomy of the locomotor systems of domesticated mammals.

Mr. Julian, ———

151. Functional Comparative Anatomy of the Locomotor System of Domestic Animals. (4) I.

Laboratory—12 hours. Prerequisite: course 150 (should be taken concurrently). Dissection of the locomotor system. Microscopic anatomy of the basic tissue types as represented in the locomotor system.

Mr. Julian, ———

155. Functional Comparative Anatomy of Internal Organ Systems: Lecture. (2) II.

Lecture—2 hours. Prerequisite: freshman standing in School of Veterinary Medicine, or

embryology and consent of instructors. Functional comparative gross, subgross, light microscopic, and electron microscopic anatomy of the organs in the abdomen and thorax.

Mr. Tyler, Mr. Faulkin, ———

156. Functional Comparative Anatomy of Internal Organ Systems: Gross Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 155 (to be taken concurrently). Dissection and demonstration of organ systems in abdomen and thorax.

Mr. Tyler, Mr. Faulkin, ———

157. Functional Comparative Anatomy of Internal Organ Systems: Microscopic Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 155 (to be taken concurrently). Laboratory study and demonstration of microscopic and submicroscopic structure of organs of abdomen and thorax.

Mr. Fraulkin, Mr. Tyler, ———

160. Functional Comparative Anatomy of Poultry and Experimental Animals. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: freshman standing in School of Veterinary Medicine or consent of instructor. Gross and microscopic anatomy of poultry and conventional laboratory mammals.

Mr. Julian, Mr. Barnes

170. Principles of Normal and Abnormal Animal Behavior. (3) III.

Lecture—3 hours. Prerequisite: course 150 and Physiological Sciences 140B or consent of instructor. An examination of normal behavioral patterns of domestic animals with emphasis on the historical, environmental, and organismic determinants of behavior. An analysis of factors contributing to abnormal behavior in domestic animals.

Mr. Hart

180. Surgical Anatomy. (4) III.

Laboratory—12 hours. Prerequisite: second-year standing in the School of Veterinary Medicine. Topographical, radiological, and regional anatomy as applied to the clinical sciences.

Mr. McFarland

198. Directed Group Study. (2–5) I, II, III.

Laboratory—6–15 hours. Prerequisite: consent of instructor.

The Staff

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

Laboratory—3–15 hours. Prerequisite: consent of instructor.

The Staff

Graduate Courses**200. Comparative Neuroanatomy. (5) I.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: one of the following: course 100, 201; Anthropology 155; Physiology 110A–110B, 120A; Psychology 108; Zoology 106A, 106B, 107, or the equivalent. A comparative gross, subgross, and microscopic study of the central nervous system of mammals and birds with emphasis on function. Mr. Hart

201. Regional Anatomy. (4) II.

Laboratory—12 hours. Prerequisite: course 100 or equivalent. Detailed dissections comparing the regional anatomy of the sheep, cat, rabbit, chicken and man. Offered in even-numbered years. Mr. Barnes, Mr. McFarland

202. Organology. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157, and consent of instructor. The comparative development, growth patterns, and composition of selected animal organs: liver, kidney, lung, brain, a viscus and a skeletal muscle. Offered in odd-numbered years. The Staff (Mr. Julian in charge)

204. Functional Comparative Anatomy of the Reproductive Systems. (3) I.

Lecture—3 hours. Gross, microscopic, and ultramicroscopic structure of the male and female reproductive systems in birds and mammals. Offered in odd-numbered years. Mr. McFarland, Mr. Faulkin

205. Ultramicroscopic Anatomy. (3) I.

Lecture—3 hours. Prerequisite: Zoology 107 or equivalent. The electron microscopic appear-

ance of cells, tissues, and organs of animals emphasizing the structural basis for their physiological functions. Offered in even-numbered years. Messrs. Tyler, McFarland, Faulkin

210. Principles of Histochemistry. (2) I.

Lecture—1 hour; 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. Mr. Tyler

217. Experimental Endocrinology. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Animal Science: Physiology 130. Gross, microscopic, and ultramicroscopic structure of the endocrine organs, and the applications of basic techniques used to demonstrate the physiological effects of these organs. Offered in even-numbered years. Mr. Faulkin, Mr. McFarland

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff

297. Advanced Group Study in Surgical Anatomy. (2–4) I, II, III.

Laboratory—6–12 hours. Prerequisite: course 180. Selected topics in topographical, radiological, or regional anatomy as they apply to the clinical sciences. Mr. McFarland

298. Advanced Group Study. (2–5) I, II, III.

Laboratory—6–15 hours. Prerequisite: consent of instructor. The Staff

299. Research (2–12) I, II, III.

Laboratory—6–36 hours. Prerequisite: consent of instructor. The Staff

ANIMAL HUSBANDRY—See Animal Sciences**ANIMAL SCIENCES****Participating Departments:****ANIMAL SCIENCES**

Magnar Ronning, Ph.D., *Chairman of the Department*

Department Office, 126 Animal Science Building

Professors:

- Floyd D. Carroll, Ph.D.
- Harold H. Cole, Ph.D. (*Emeritus*)
- Perry T. Cupps, Ph.D.
- Irving I. Geschwind, Ph.D.
- Harold Goss, Ph.D. (*Emeritus*)
- Paul W. Gregory, Sc.D. (*Emeritus*)
- Hubert Heitman, Jr., Ph.D.
- Carroll E. Howell, M.S. (*Emeritus*)

Max Kleiber, LLD. Sc. D. (*Emeritus*)

Robert C. Laben, Ph.D.

Glen P. Lofgreen, Ph.D.

Sylvester W. Mead, M.S. (*Emeritus*)

James H. Meyer, Ph.D.

Wade C. Rollins, Ph.D.

Magnar Ronning, Ph.D.

William C. Weir, Ph.D.

James F. Wilson, M.A., LL.D. (*Emeritus*)

Associate Professors:

Ransom L. Baldwin, Jr., Ph.D.
 G. Eric Bradford, Ph.D.
 William N. Garrett, Ph.D.
 James Morris, Ph.D.

Assistant Professors:

Charles R. Ashmore, Ph.D.
 J. Warren Evans, Ph.D.

Graham A. E. Gall, Ph.D.

David W. Robinson, Ph.D.

◇ ◇ ◇

Professor:

James M. Boda, Ph.D. (*Animal Physiology*)

Lecturer:

Verne E. Mendel, Ph.D.

ANIMAL PHYSIOLOGY

James M. Boda, Ph.D., *Chairman of the Department*

Department Office, TB-30

Professors:

James M. Boda, Ph.D.
 Walter E. Howard, Ph.D.
 Frederick W. Lorenz, Ph.D.
 Arthur H. Smith, Ph.D.
 Irving H. Wagman, Ph.D.

Associate Professor:

Harry W. Colvin, Jr., Ph.D.

Assistant Professors:

Robert W. Brocksen, Ph.D.
 John M. Horowitz, Jr., Ph.D.
 Dorothy E. Woolley, Ph.D.

Associate Professors:

Ransom L. Baldwin, Jr., Ph.D. (*Animal Sciences*)

Ronald J. Baskin, Ph.D., (*Zoology*)
 Victor W. Burns, Ph.D. (*Physiological Sciences*)

Frank X. Ogasawara, Ph.D. (*Poultry Husbandry*)

Barry W. Wilson, Ph.D. (*Poultry Husbandry*)

Assistant Professor:

David W. Deamer, Ph.D. (*Zoology*)

Lecturers:

Alex J. Calhoun, Ph.D.

Verne E. Mendel, Ph.D., (*Animal Science*)
^{2,3}Stanton R. Morrison, Ph.D. (*Agricultural Engineering*)

Robert G. Schwab, Ph.D.

Charles Winget, Ph.D.

Professors:

Ray E. Burger, Ph.D. (*Poultry Husbandry*)
 Perry T. Cupps, Ph.D. (*Animal Science*)
 Edward A. Rhode, Jr., D.V.M., (*Clinical Sciences*)

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NUTRITION

Fredric W. Hill, Ph.D., *Chairman of the Department*

Department Office, 231 Home Economics Building

Professors:

Myron Brin, Ph.D.
 Fredric W. Hill, Ph.D.
 Lucille S. Hurley, Ph.D.

Aloys L. Tappel, Ph.D. (*Food Science and Technology*)

Associate Professor:

Frances J. Zeman, Ph.D.

Associate Professor:

Richard A. Freedland, Ph.D. (*Physiological Sciences*)

Assistant Professor:

Susan M. Oace, Ph.D.

Assistant Professor:

Quinton R. Rogers, Ph.D. (*Physiological Sciences*)

◇ ◇ ◇

Professors:

Robert E. Hungate, Ph.D. (*Bacteriology*)
 Magnar Ronning, Ph.D. (*Animal Science*)

Lecturers:

Rocco J. Della Rosa, Ph.D. (*Physiological Sciences*)

Marvin Goldman, Ph.D. (*Physiological Sciences*)

² Absent on leave, fall quarter, 1969.

³ Absent on leave, winter quarter 1970.

POULTRY HUSBANDRY

Wilbor O. Wilson, Ph.D., *Chairman of the Department*

Department Office, 109 Poultry Husbandry Building

Professors:

- Ursula K. Abbott, Ph.D.
- Hans Abplanalp, Ph.D.
- Vigfus S. Asmundson, Ph.D., LL.D.
(Emeritus)
- Ray E. Burger, Ph.D.
- C. Richard Grau, Ph.D.
- F. Howard Kratzer, Ph.D.
- Samuel Lepkovsky, Ph.D., LL.D. *(Emeritus, Berkeley Campus)*
- Lewis W. Taylor, Ph.D. *(Emeritus, Berkeley Campus)*
- Wilbor O. Wilson, Ph.D.

Associate Professors:

- Frank X. Ogasawara, Ph.D.
- Daniel W. Peterson, Ph.D.
- Barry W. Wilson, Ph.D.

◇ ◇ ◇

Associate Professor:

- Pran N. Vohra, Ph.D. *(Acting)*

Lecturers:

- A. Wade Brant, Ph.D. *(Food Science and Technology)*
- Leo C. Norris, Ph.D.

Major Advisers.—See *Schedule and Directory listing.*

Bachelor of Science Major Program and Graduate Study.—See pages 56 and 153.

Animal Science

Lower Division Courses

1. Domestic Animals and Man. (3) I.

Lecture—2 hours; laboratory—2 hours. Animal domestication and factors affecting their characteristics and distribution. Animal use by man for food, work, fiber, drugs, research and recreation; projected effects of population expansion and urbanization. Demonstrations of beef and dairy cattle, poultry, sheep, swine and horses. The Staff (Mr. Weir in charge)

2. Introductory Animal Science. (3) III.

Lecture—2 hours; laboratory—2 hours. Recommended: course 1; Biology 1. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals; the application of sciences to animal production.

The Staff (Mr. Bradford in charge)

10. Poultry Production. (4) II.

Lecture—4 hours. A survey of principles and practices involved in poultry production. Designed for students not specializing in avian sciences.

Mr. Ogasawara

11. Laboratory in Poultry Production. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 10 (may be taken concurrently) or consent of instructor. Laboratory studies in poultry biology; techniques and economics of poultry production. Mr. Ogasawara

12. Survey of Poultry and Allied Industries. (3) III.

Lecture—2 hours; conference—1 hour. A survey of industries concerned with poultry products in the U. S. A. and various regions of the world: hatchery industry, feed industry, egg and meat production, poultry products, specialized enterprises.

Mr. Peterson

21. Livestock and Dairy Cattle Judging. (2) III.

Laboratory—6 hours. Prerequisite: courses 1 and 2. Conformation, finish and quality in relation to ideal type. Relationship of form to function. Change in body proportions with growth and maturity. Correlation between type in live meat animals and carcass quality.

Mr. Cupps, Mr. Mendel

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

Prerequisite: consent of instructor. Selected topics relating to the animal (including avian) sciences. The Staff (Mr. Ronning in charge)

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

Prerequisite: consent of instructor. Problems in animal (including avian) biology; nutrition, breeding, and physiology of livestock and poultry and their products.

The Staff (Mr. Ronning in charge)

Upper Division Courses

111. Type Evaluation in Livestock and Dairy Cattle. (2) I.

Laboratory—6 hours. Prerequisite: course 21. Studies of recognized type evaluation in livestock and dairy cattle. Critical evaluation of the bases for the criteria used in establishing these standards.

Mr. Carroll

114A-114B. Advanced Dairy Cattle Production.

(3-3) II-III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; Nutrition 110; Physiology 110B. The principles of milk production and sources of variation in milk yield and

composition. Current knowledge in ruminant nutrition, feeds and feeding practices, breeding and genetics, milk secretion, reproductive physiology, and herd management considered in relation to production.

Mr. Laben

115. Horse Production. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 100B; Nutrition 103 or 110; Physiology 110B. Feeding, breeding, and management of horses; application of the principles of basic animal sciences to problems of production of all classes of horses.

Mr. Evans

116A–116B. Meat Animal Production. (3–3) II–III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; Nutrition 103 or 110; Physiology 110B. Application of the sciences of nutrition, physiology and genetics to the development of efficient management programs for beef, sheep, and swine production. Similarities and differences among these species affecting management practices. Methods of improving carcass and meat quality.

Mr. Bradford, Mr. Garrett

118A. Range Livestock Production. (3) II.

Lecture—3 hours. Prerequisite: Nutrition 103 or 110; Animal Science 1 and 2, Genetics 100B recommended. Not open for credit to Animal Science majors. The application of scientific knowledge to the improvement and production of beef cattle and sheep. Reproduction, including artificial insemination; breeding plans; management; supplementary feeding; marketing.

Mr. Carroll

118B. Intensive Livestock Production. (3) III

Lecture—3 hours. Prerequisite: Nutrition 103 or 110. Recommended: Animal Science 1, 2 and 118A; Genetics 100B. Not open for credit to Animal Science majors. Principles and practices involved in feedlot, dairy and swine operations. Growth and fattening; lactation; feeding practices; methods of evaluating body composition of meat animals; housing and equipment; waste disposal.

Mr. Carroll, Mr. Heitman

121. Poultry Products Technology. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. Physical, chemical, and nutritional composition of poultry products; quality criteria and standards; physical, chemical, and microbiological factors influencing keeping quality.

Mr. Peterson, Mr. Brant

149. Environmental Management of Domestic Animals. (1) III.

Discussion—1 hour. Prerequisite: Physiology 149 (may be taken concurrently). Application of physiological principles to environmental management of domestic animals. Mr. W. O. Wilson

190. Proseminar in Animal Science. (1) I, II, III.

Seminar—1 hour. Prerequisite: senior stand-

ing in Animal Science or consent of instructor. Reports and discussions of recent advances in animal science.

Mr. Heitman

194H. Special Study for Honors Students.

(1–5) I, II, III.

Prerequisite: open only to animal science majors who are honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis.

The Staff (Mr. Ronning in charge)

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

Prerequisite: consent of instructor. Selected topics relating to the animal (including avian) sciences.

The Staff (Mr. Ronning in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

Prerequisite: consent of instructor. Problems in animal (including avian) biology related to nutrition, breeding, and physiology of large domestic livestock and poultry and their products.

The Staff (Mr. Ronning in charge)

Graduate Courses

202. Experimental Incubation and Avian Teratology. (3) II.

Lecture—3 hours. Prerequisite: Chemistry 8B; Zoology 100; Zoology 107 recommended. Problems of embryonic development, causes of embryonic mortality and terata in poultry. Offered in odd-numbered years.

Mrs. Abbott

202L. Laboratory in Avian Experimental Embryology and Teratology. (3) II.

Laboratory—9 hours. Prerequisite: course 202 (may be taken concurrently). The causes of abnormal morphogenesis in avian embryos including genetic, chemical, and physical-environmental factors; the application of transplantation, organ culture, and other experimental techniques. Offered in odd-numbered years.

Mrs. Abbott

240. Statistical Inference in Animal Experimentation. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: Mathematics 13; a knowledge of Fortran recommended. A development of hypothesis-testing techniques for specific application to problems involving large animal research and related areas. Particular emphasis on principles of inference and prediction. Laboratory exercises in statistical analysis utilizing computer techniques.

Mr. Gall

290A. 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.

The Staff (Mr. Ronning in charge)

290B. Seminar. (1) I, II, III.

Seminar—1 hour. Reports and discussions of recent advances and selected topics of current interest in avian genetics, physiology, nutrition, and poultry technology.

The Staff (Mr. W. O. Wilson in charge)

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

Prerequisite: consent of instructor. Lectures and discussions of advanced topics in the animal (including avian) sciences.

The Staff (Mr. Ronning in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Ronning in charge)

Animal Biochemistry**Upper Division Course****102. Animal Biochemistry Laboratory. (4) II.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biochemistry 101B (may be taken concurrently). Laboratory procedures employed in the study of physiological and biochemical processes.

Mr. Baldwin

Graduate Courses**201. Protein Biochemistry. (3) II.**

Lecture—3 hours. Prerequisite: Biochemistry 201C. Chemical, physical, and biological properties of amino acids, peptides, and proteins. The biological aspects include protein function, biosynthetic and biodegradative pathways, and nutritional requirements for amino acids.

Mr. Geschwind

230. Biochemical Aspects of Endocrinology. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101B; Physiology 110B. The chemistry and function of animal hormones, with special reference to the isolation and structure of those of vertebrate origin. Assay, mechanism of action, biosynthesis, and metabolism of hormones. Biochemical lesions in congenital and other endocrinopathies. Offered in odd-numbered years.

Mr. Geschwind

Animal Genetics**Upper Division Courses****107. Animal Breeding and Genetics. (3) I.**

Lecture—3 hours. Prerequisite: Genetics 100B; Mathematics 13. Qualitative and quantitative inheritance in relation to animal breeding; review of selection and breeding experiments with reference to livestock and poultry improvement.

Mr. Abplanalp

107A. Mammalian Genetics Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: Genetics 100B or 115; Mathematics 13 recommended.

Experiments in qualitative and quantitative genetics, using the laboratory mouse. Segregation; linkage; evaluation of effects of inbreeding, selection and maternal influence on different kinds of traits.

Mr. Bradford

107B. Animal Breeding Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 107. Laboratory exercises in quantitative genetics using computer generated herd records. Selection, progeny testing, and inbreeding experiments with statistical analyses using collected data. Evaluation of environmental effects.

Mr. Gall

107C. Discussion of Animal Breeding Experiments and Methods. (1) III.

Discussion—1 hour. Prerequisite: course 107. Review of literature and discussion relating to animal breeding experiments and programs. Emphasis on cattle, sheep and swine. Mr. Rollins

107D. Discussion of Poultry Breeding Experiments and Methods. (1) II.

Discussion—1 hour. Prerequisite: course 107. A discussion of genetic experiments and breeding plans specifically related to poultry.

Mr. Abplanalp

108. Methods in Quantitative Animal Breeding. (3) II.

Lecture—3 hours. Prerequisite: course 107. Principles, methods and procedures in quantitative animal breeding; heritability, intra- and inter-population selection methods, including selection index, family, pedigree and progeny selection; genetic correlation; relationship and inbreeding.

Mr. Rollins

108L. Animal Breeding Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 108 (may be taken concurrently). Estimation of heritabilities, genetic correlations and repeatabilities, calculation of inbreeding and relationship co-efficients, adjustment of data for environmental effects, construction of selection indexes, estimation of selection response and hybrid vigor.

Mr. Rollins

109. Developmental Genetics in Animals. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: Genetics 100B, Zoology 100. Genes and gene action in vertebrates; the gene in relation to genetic background and developmental environment.

Mrs. Abbott

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. Mr. Abplanalp

299. Research. (1-12) I, II, III.

The Staff (Mr. Bradford in charge)

Nutrition

Lower Division Course

10. Discoveries and Concepts in Nutrition. (3) II.

Lecture—3 hours. Nutrition as a science; historical development of nutrition concepts; properties of nutrients and foods. Not open for credit to students who have taken an upper division course in nutrition. Mr. Hill

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 Nutrition 110 and 111. Introduction to the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism; nutrient requirements of man. Miss Oace

102L. General Nutrition Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 102A; course 102B (should be taken concurrently); not open for credit to students who have taken 111L. Laboratory study of the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism. Miss Oace

103. Animal Nutrition and Feeding. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 8B. The basic principles of animal nutrition as they are applied to livestock feeding; the composition and uses of feedstuffs in their relation to the feeding of farm animals and poultry; the balancing of rations. Not open for credit to animal science majors. Mr. Garrett

109. Nutritional Principles of Livestock

Feeding. (3) I.

Lecture—3 hours. Prerequisite: second-year standing in School of Veterinary Medicine or consent of instructor. The principles of nutrition and their application to the solution of problems in animal feeding. Nutritive requirements for maintenance and productive functions, nutritional disorders, composition and use of feedstuffs. Mr. Morris

110. Principles of Nutrition. (5) II.

Lecture—4 hours; discussion—1 hour. Prerequisite: Biochemistry 101B (may be taken concurrently); a course in physiology or zoology. The fundamental principles of the nutrition of

man and other animals. The nutrients in relation to physiological processes of growth, maintenance, and reproduction. Nutritional disorders. Mr. Robinson, Mr. 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. Mrs. Hurley

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.

Mrs. Hurley, Mr. Vohra

***114. Nutrition and Development. (4) I.**

Lecture—4 hours. Prerequisite: course 110 or 102B. The role of nutritional factors in embryonic and postnatal development. Mrs. Hurley

116. Diet Therapy. (5) I.

Lecture—5 hours. Prerequisite: course 111 or 102B; Biochemistry 101B or Physiological Sciences 101B. Biochemical and physiological bases for therapeutic diets. Problems in planning diets for normal and pathological conditions.

117. Experimental Nutrition. (5) III.

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.

121. Animal Nutrition Laboratory. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 110. Studies, demonstrations, and exercises in the measurement of nutritional values of feeds, nutrient requirements for physiological functions, and ration formulation. Students who have completed course 122 and/or 123 will have units of credit reduced by one unit per course. Mr. Heitman

122. Ruminant Nutrition. (3) III.

Lecture—3 hours. Prerequisite: course 110; Bacteriology 2; Physiology 110B. A study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant. Students who have completed course 121 may only receive 2 units of credit.

Mr. Morris

123. Nutrition of Non-Ruminant Animals. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110. Application of nutrition principles to the feeding of non-ruminant species, including swine, poultry and laboratory

* Not to be given, 1969-70.

animals. Students who have completed course 121 may only receive 2 units of credit.

Mr. Robinson, Mr. Kratzer

125. Metabolism and Food Utilization. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110; Physiology 110B. Bioenergetics; a study of energy expenditures of animals and of factors influencing the utilization of food energy. Mr. Ronning

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: open only to animal science majors who are honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. The Staff (Mr. Hill in charge)

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

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses

201A. Advanced General Nutrition. (4) I.

Lecture—4 hours. Prerequisite: Bacteriology 2; Biochemistry 101B; Physiology 110B; a course in nutrition. Advanced studies of protein and amino acid metabolism; animal energetics and energy metabolism. Comparative aspects. The Staff (Mr. Hill in charge)

201B. Advanced General Nutrition. (3) II.

Lecture—3 hours. Prerequisite: Bacteriology 2; Biochemistry 101B; Physiology 110B; a course in nutrition. Advanced studies of problems in nutrition with emphasis on minerals; water balance. Comparative aspects. The Staff

201C. Advanced General Nutrition. (3) III.

Lecture—3 hours. Prerequisite: Bacteriology 2; Biochemistry 101B; Physiology 110B; a course in nutrition. Advanced studies of metabolic function and nutritional importance of vitamins; essential fatty acids; deficiency and degenerative diseases. Comparative aspects. The Staff

*250. Concepts of Animal Nutrition. (3) II.

Lecture—3 hours. Prerequisite: courses 201A, 201B, 201C. Dynamic interrelationships between food, animal, and environment, including concepts in food intake, digestion, absorption, and utilization of nutrients.

290. Seminar. (1) I, II, III.

Seminar—1 hour. Discussion and critical evaluation of advanced topics in nutrition research. The Staff (Mr. Grau in charge)

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

The Staff (Mr. Weir in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Weir in charge)

Physiology

Upper Division Courses

100A-100B. General Physiology. (3-3) I-II.

Lecture—3 hours. Prerequisite: Biology 1; Chemistry 8B; Physics 2C. Chemical, mathematical, and physical characteristics of the life process common to living things, with particular reference to the cell and its regulatory mechanisms.

Mr. Colvin, Mr. Smith, Mr. B. W. Wilson

100L. General Physiology Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 100B (may be taken concurrently). Laboratory in the physical and chemical processes of cells and tissues. Mr. Colvin, Mr. B. W. Wilson

101. Functions of Organ Systems. (4) III.

Lecture—4 hours. Prerequisite: Biology 1. Physiology of organ systems; concepts of integrative and homeostatic mechanisms, especially in adaptation, growth, and reproduction.

Mr. Lorenz, Mrs. Woolley

101L. Organ Function Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 101 (should be taken concurrently). Dissections, primarily of domestic animals, and selected experiments to illustrate functional relationships.

Mr. Lorenz, Mrs. Woolley

102. Physiology of Growth. (3) III.

Lecture—3 hours. Prerequisite: course 101, 101L; or equivalent. Biological physical, and chemical aspects of the growth of cells, organisms, and populations. Mr. Smith

103. Physiology of Animal Cells. (3) III.

Lecture—3 hours. Prerequisite: course 100B; Biochemistry 101B. Recommended: Bacteriology 130; Mathematics 16B; Zoology 121. Organization of metazoan systems at the cellular level; cell and tissue culture; tissue regulation; embryonic development. Mr. B. W. Wilson

104. Relationships of Form and Function. (3) II.

Lecture—3 hours. Prerequisite: courses 101 and 101L, or Zoology 2. Relationships between form and function of biological systems from the molecular to the animal levels as exemplified by the adaptations of birds and other animals.

Mr. B. W. Wilson

107. Avian Physiology. (3) III.

Lecture—3 hours. Prerequisite: courses 101 and 101L, or Zoology 2. Physiology of the various systems of birds with emphasis on digestion, respiration, excretion, and the nervous system.

Mr. Burger

* Not to be given, 1969-70.

107L. Avian Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 107 (may be taken concurrently); and consent of instructor. Selected problems in the physiology of birds. Mr. Burger

108. Biodynamics. (4) III.

Lecture—4 hours. Prerequisite: course 110B; Mathematics 16B; Physics 2C. Rates and dynamics of physiological processes. Mr. Morrison

110A–110B. Mammalian Physiology. (3–3) I–II.

Lecture—3 hours. Prerequisite: course 101 and 101L, or Zoology 2; Chemistry 8B. The physiology of the neuromuscular, central nervous, circulatory, respiratory, digestive, endocrine, reproductive, and excretory systems of mammals.

Messrs. Horowitz, Burger, Mendel, Boda

111A–111B. Mammalian Physiology Laboratory. (2–2) I–II.

Discussion—1 hour; laboratory—3 hours including independent carrel instruction. Prerequisite: course 110A–110B (may be taken concurrently). Selected experiments in depth on the neural, cardiovascular, respiratory, renal, and endocrine systems. Emphasis on modern conceptual and methodological approaches using several species in demonstrating the physiology of organ systems.

Messrs. Horowitz, Burger, Mendel, Boda

120A. Comparative Physiology. (3) I.

Lecture—3 hours. Prerequisite: courses 101 and 101L. Comparisons of physiological functions in the animal kingdom: neural and humoral integrative mechanisms.

Mr. Lorenz, Mrs. Woolley

120B. Comparative Physiology. (3) II.

Lecture—3 hours. Prerequisite: course 101 and 101L. Comparisons of physiological functions in the animal kingdom: respiration and circulation.

Mr. Smith, Mr. Rhode

120C. Comparative Physiology. (3) III.

Lecture—3 hours. Prerequisite: course 101 and 101L. Comparisons of physiological functions in the animal kingdom: digestion and excretion.

Mr. Colvin, Mr. Boda

121. Physiology of Reproduction. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 110B. The physiological mechanisms related to reproduction, breeding efficiency, and fertility, with special reference to domestic animals.

Mr. Cupps

130. Physiology of the Endocrine Glands. (5) I.

Lecture—4 hours; discussion—1 hour. Prerequisite: course 110B. Control of endocrine secretion and the physiological effects of the

hormones, with emphasis on endocrine problems relating to domestic animals.

149. Environmental Physiology of Domestic Animals. (3) III.

Lecture—3 hours. Prerequisite: courses 101 and 101L, or Zoology 2. The influences of environmental factors on physiological processes related to domestic animals. Mr. W. O. Wilson

194H. Special Study for Honors Students. (1–5) I, II, III.

(1–5) I, II, III.

Prerequisite: open only to animal science or physiology majors who are honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis.

The Staff (Mr. Boda in charge)

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

The Staff (Mr. Boda in charge)

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

(1–5) I, II, III.

The Staff (Mr. Boda in charge)

Graduate Courses**200A. Advanced General Physiology. (3) I.**

Lecture—3 hours. Prerequisite: course 100B or Zoology 158, Biochemistry 101B and Chemistry 110B; or consent of instructor. Physicochemical bases of living systems with emphasis on recent investigations in membrane physiology. Offered in odd-numbered years.

Mr. Deamer

200B. Advanced General Physiology. (3) II.

Lecture—3 hours. Prerequisite: course 100B or Zoology 158, Biochemistry 101B and Chemistry 110B; or consent of instructor. Physicochemical bases of living systems with emphasis on recent investigations in cellular dynamics. Offered in even-numbered years. Mr. B. W. Wilson

210. Advanced Systemic Physiology. (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. The Staff (Mr. Horowitz in charge)

214. Neurophysiology. (4) II.

Lecture—4 hours. Prerequisite: courses 110B, 111B; course 100B recommended. Electrical activity of neurons and neuroeffector junctions; physiology of the nervous system as studied by its electrical activity.

Mr. Wagman

215. Neurophysiology Laboratory. (6) II.

Discussion—2 hours; laboratory—12 hours. Prerequisite: course 214. Mr. Wagman

216. Neurophysiology Literature. (2) III.

Discussion—2 hours. Prerequisite: course 214. Critical reading and group discussion of current and classic original papers in neurophysiology. Mr. Wagman

220. General and Comparative Physiology of Reproduction. (3) I.

Lecture—3 hours. Prerequisite: course 110B; Biochemistry 101B; Genetics 100B. Basic phenomena of sexual and asexual reproduction and comparisons of processes in a wide variety of animals: gamete formation, structure, and metabolism; fertilization; neuroendocrine mechanisms in maturation and reproductive cycles; behavioral aspects. Mr. Ogasawara, Mr. Cupps

225. Physiology of Lactation. (3) III.

Lecture—3 hours. Prerequisite: course 110B; Biochemistry 101B. The physiology and biochemistry of milk formation, with special reference to the metabolic pathways leading to the synthesis of milk in various species of mammals. Offered in even-numbered years. Mr. Baldwin

231. Selected Topics in Neuroendocrinology. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 120A or 130 or consent of instructor. Neural-endocrine interactions; neurosecretion; neural regulation of endocrine systems; hormonal modifications of neural development and activity. May be repeated once for credit. Mrs. Woolley

242. Physiological Rhythmicity. (1) I.

Lecture—1 hour. General aspects and basic mechanisms of biological rhythms; the importance of rhythm desynchronization in areas of pharmacology and space medicine; telemetry; mathematical methods; chronometry; tidal, lunar, and annual periods; periodic desynchronization. Mr. Winget

***251. Physiological Basis of Higher Nervous Function. (4) III.**

Lecture—4 hours. Prerequisite: course 110A or Psychology 108, or consent of instructor. Relations between the structure and function of the brain and problems of emotion, motivation, and learned behavior.

†290. Seminar. (1) I, II, III.

Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. The Staff (Mr. Boda in charge)

***291. Seminar in General Physiology. (1) III.**

Seminar—1 hour. Discussion of selected topics concerning the physical and chemical processes of cells and tissues.

Mr. Colvin, Mr. Burns

†298. Group Study. (1-5) I, II, III.

The Staff (Mr. Boda in charge)

†299. Research. (1-12) I, II, III.

The Staff (Mr. Boda in charge)

ANTHROPOLOGY

Daniel J. Crowley, Ph.D., *Chairman of the Department*

Department Office, 331 Voorhies Hall

Professors:

Martin A. Baumhoff, Ph.D.

Daniel J. Crowley, Ph.D. (*Anthropology and Art*)

David L. Olmsted, Ph.D.

Assistant Professors:

Kenne H-K Chang, Ph.D.

Edwin A. Cook, Ph.D.

Warren G. Kinzey, Ph.D.

Donald G. Lindburg, Ph.D.

¹Melvin K. Neville, Ph.D.

Delbert L. True, Ph.D.

◇ ◇ ◇

Assistant Professors:

Richard T. Curley, B.A. (*Acting*)

William G. Davis, A.B. (*Acting*)

Departmental Major Advisers for Bachelor of Arts Degree.—Mr. Davis, Mr. Curley.

Departmental Major Adviser for Bachelor of Science Degree.—Mr. Kinzey.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Anthropology 1, 2, 3, 13, and Geography 1.

Upper Division Courses.—Required: courses 102, 103A, 110B, 110C or 120, 128A, 195 or equivalent; 4 units of physical anthropology; 4 units of ethnography; and 8 additional units of other upper division courses selected from the following: any upper division anthropology course, Art 150, 151, Genetics 110A, 110B, 115.

Bachelor of Science Major Program

Lower Division Courses.—Required: courses 1, 2, 3; Biology 1; Chemistry 1A-1B, 8A-8B; Geology 1, 1L, 3, 3L; Mathematics 13, 16A,

¹Absent on leave, 1969-70.

^aNot to be given, 1969-70.

^bThese courses are offered jointly by the Department of Animal Physiology, College of Agricultural and Environmental Sciences, and the Department of Human Physiology, School of Medicine.

16B; Zoology 2. Recommended: Physics 2A-2B-2C; Psychology 1A-1B.

Upper Division Courses.—A minimum of 48 units including three courses in physical anthropology and three additional courses in anthropology chosen in consultation with the adviser. Twenty-four additional units 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.

Bachelor of Science List of Courses

Physical Anthropology: courses 151, 152, 153, 154A, 154B, 155, 156.

Upper Division Courses outside the Department: Anatomy 100, 100L; Biochemistry 101A, 101B; Epidemiology 103A, 103B, 103C; Genetics 100A, 100B, 103, 105, 115; Geology 106, 107, 140; Human Anatomy 102; Physiology 110A, 110B, 111A, 111B; Psychology 108, 112, 150, 180; Zoology 100, 106A, 106B, 107, 125, 125L, 134, 147, 148, 155, 156.

Graduate Study.—The department offers a program of study leading to the M.A. and Ph.D. degrees in anthropology. Further information regarding graduate study may be obtained at the department office and at the Graduate Division.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Required: 30 quarter units of anthropology.

Subject Representative: Mr. Davis.

Lower Division Courses

1. Physical Anthropology. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Human biology and physical anthropology; the relation of man and the animals; the origin and antiquity of man; fossil man; anthropometry, the criteria of race and racial classification; current racial theories; race problems.

Mr. Kinzey, Mr. Lindburg

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. Mr. Davis, Mr. Curley

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; prehistory and growth of culture; the origins and early development of civilization in the Old and New World.

Mr. True

5. The Relevance of Human Biology. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: consent of instructor. The interrelation between biological and cultural adaptations to man's environment. (Passed/Not Passed grading only.)

Mr. Kinzey

13. Quantitative Method in Anthropology. (4) I.

Lecture—3 hours; discussion—1 hour.

Mr. Baumhoff

Upper Division Courses

102. Ethnology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Major theories of culture; survey of principal culture types and their distribution; discussion of ethnological problems.

Mr. Curley

103A. Archaeological Theory and Method. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 3, and 13. Theory and method of prehistoric archaeology.

Mr. True

103B. Old World Archaeology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103A. Comparative prehistory and archaeology of the Eastern Hemisphere.

Mr. Baumhoff

103C. New World Archaeology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103A. Comparative prehistory and archaeology of the Western Hemisphere.

Mr. True

***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.

***105B. The Indians of South America. (4) III.**

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.

110A. Elementary Linguistic Analysis. (3) I.

Lecture—2 hours. Phonetics and phonemics.

Mr. Olmsted

110B. Intermediate Linguistic Analysis. (3) II.

Lecture—2 hours. Prerequisite: course 110A. Morphophonemics, morphemics and tactics.

Mr. Olmsted

110C. Comparative Linguistics. (3) III.

Lecture—2 hours. Prerequisite: course 110B. Linguistic prehistory, historical linguistics and reconstruction; dialect geography.

Mrs. Webb

* Not to be given, 1969-70.

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. Mr. Cook

***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. Mr. Cook

120. Language and Culture. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110B. Language and thought; classification of languages; linguistic aspects of culture; language, nation, and state. Mr. Cook

121. Folklore. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or literary preparation acceptable to the instructor. Theory and method in the study of folktales, myths, legends, proverbs, riddles, songs, and other forms of verbal tradition. Mr. Crowley

122. Economic Anthropology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Economic behavior in nonindustrial societies; its social and cultural setting, and its modern changes.

Mr. Davis

124. Comparative Religion. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An anthropological analysis of the origins, elements, forms, and symbolism of religion; functional interpretation with stress on ethnographic materials. Mr. Curley

128A. 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. Mr. Davis

***128B. Kinship and Social Organization. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 128A. Methodological: demonstration of field methods and discussion of analytic models. Primary emphasis will be placed on componential and transformational analysis. Mr. Cook

139. Peoples of Africa. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor.

Peoples and cultures of Africa: survey and comparative analysis of representative societies and cultures in the area. Mr. Curley

***140. Peoples of Afroamerica. (4) II.**

Lecture—3 hours; discussion—1 hour. A study of the cultural implications of slavery and the contribution of Africans to the national cultures of the Americas. Mr. Crowley

***143. Peoples of India. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Development of Indian cultural traditions; social organization and social trends.

***147A. Peoples of the Pacific. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. The aboriginal cultures of Australia and Melanesia in prehistoric and modern times; changes arising from European contact and colonization. Mr. Cook

***147B. Peoples of the Pacific. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. The aboriginal cultures of Polynesia and Micronesia in prehistoric and modern times; changes arising from European contact and civilization. Mr. Cook

148. Ecological Anthropology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of theories, methods, and applications of the ecological perspective to cultural and physical attributes of human populations. Mr. Chang

***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. Mr. Neville

***152. Human Evolution and Fossil Man. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Nature and results of the evolutionary processes involved in the formation and differentiation of mankind. Mr. Lindburg

***153. Living Races of Man. (4) III.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1; and either course 13, Mathematics 13 or equivalent. Physical characters, distribution, and relationships. Mr. Neville

154A. Primate Behavior and Ecology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. The social behavior and ecology of the prosimians, monkeys, and apes, and their relevance to the evolution of human behavior and social groupings. Mr. Lindberg

* Not to be given, 1969-70.

154B. Primate Behavior and Ecology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 154A and consent of instructor. The intensive study of theoretical problems arising in connection with primate behavior and ecology. Certain primate species will be discussed in depth, and laboratory work will involve individual projects on primate groups or special problems.

Mr. Lindburg

155. Comparative Primate Anatomy. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Zoology 2. The functional anatomy of the locomotor, digestive, reproductive, and nervous systems of monkeys and apes. Emphasis on the anatomical evidence for their interrelationships.

Mr. Kinzey

156. Human Osteology. (4) I.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or equivalent. Introductory study of the human skeleton, including bone growth, pathology, radiology, microscopy, dentition, and variations in race, sex, and age.

Mr. Kinzey

***160A. Contemporary Civilization. (4) II.**

Lecture—3 hours; discussion—1 hour. The application of anthropological concepts and methods to the study of contemporary civilization. Emphasis will be placed on the development and evolution of American culture from its beginnings to the present.

***160B. Contemporary Civilization. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 160A. An anthropological analysis of special problems in contemporary civilization, such as family and kinship organization, community organization, and political integrations. Comparisons of American culture with other societies in contemporary civilization.

162. Peasant Society and Culture. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Comparative study of peasant communities, utilizing historical and ethnographic sources; analysis of urban rural relations; problems of economic development and culture change.

Mr. Chang

165. Culture Change. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Introduction to the analysis of socio-cultural stability and change; theories of innovation, diffusion, acculturation, and cultural evolution; problems of social planning.

Mr. Chang

***190. Cultures of China and Korea. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor.

^a Not to be given, 1969-70.

Ethnological and comparative treatments of two cultures with emphasis on the village level.

Mr. Chang

191. Culture of Japan. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Development of Japanese cultural traditions; social structure and social trends.

Mr. Chang

***192. Peoples and Cultures of Southeast Asia. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or equivalent or consent of instructor. The development of major cultural traditions, the patterns of ecological relationships, and comparative social organization of ethnic and regional groups in Southeast Asia.

Mr. Davis

195. Field Course in Archaeological Method.

(3) I, III.

Laboratory—8 hours. Prerequisite: course 3. Lectures, museum preparation, and weekend excavations. Enrollment limited to twenty students. May be repeated for credit with consent of instructor.

Mr. Baumhoff, Mr. True

196. Archeological 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. Enrollment limited to eighteen students. May be repeated for credit with consent of instructor.

Mr. Baumhoff

***198. Directed Group Study. (3) I, III.**

Discussion—3 hours. Prerequisite: consent of instructor. Directed reading and group discussion of selected anthropological problems.

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Olmsted 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. Required of all first-year graduate students in anthropology.

The Staff (Mr. Lindburg in charge)

209. Objectives and Methods for College Teaching of Anthropology. (2) I.

Discussion—2 hours. Prerequisite: normally limited to teaching assistants in anthropology. Analysis of the elements of effective teaching, drawing upon the students' experience in the classroom situation.

Mr. Olmsted

***210. Aspects of Culture Structure. (4) III.**

Seminar—3 hours. Analysis of various phases of culture, such as religion, economics, law, and folklore.

216. Problems in Archaeological Method. (4) III.

Seminar—3 hours. Techniques for analyzing archaeological data; application to various prehistoric cultures.

Mr. 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. Discussion will be directed toward the use of the resources of this region to test archaeological theory and to propose problem oriented studies that will work in this direction.

Mr. True

***219. Culture and Personality. (4) I.**

Seminar—3 hours.

Mr. Cook

220. Field Course in Linguistics. (4) III.

Seminar—2 hours; laboratory—2 hours. Prerequisite: courses 110A and 110B. Techniques of eliciting, recording, and analyzing; work with a native speaker.

Mr. Olmsted

***222. Ethnemics. (4) II.**

Seminar—3 hours; Prerequisite: course 120 or consent of instructor. Application of linguistic, cognitive psychological, and related analytical models to folk taxa.

Mr. Cook

223. Economic Anthropology. (4) III.

Seminar—3 hours. Prerequisite: course 122, or consent of instructor. Selected current methodological and theoretical problems in the analysis of nonindustrial economic systems.

Mr. Davis

***225. Kinship and Social Structure. (4) II.**

Seminar—3 hours. Componential analysis of kinship systems and discussion of descent group and alliance theories.

Mr. Curley

***226. Evolution of Social Organization. (4) II.**

Seminar—3 hours. Diachronic and synchronic analyses of social organization.

239. Problems in African Society and Culture. (4) I.

Seminar—3 hours. Diachronic analyses of traditional institutions in sub-Saharan Africa.

Mr. Curley

***242. Problems in African Prehistory. (4) III.**

Seminar—3 hours.

Mr. 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.

Mr. Olmsted

247. Peoples and Cultures of Oceania. (4) III.

Seminar—3 hours.

Mr. Cook

250. Theory and Method of Anthropology. (4) II.

Seminar—3 hours.

Mr. Cook

253. Concepts and Problems in Physical Anthropology. (4) II.

Seminar—3 hours.

Mr. Kinzey

254. Primate Social Behavior. (4) III.

Seminar—3 hours. Prerequisite: course 154B or equivalent. Analysis of primate social behavior, with particular emphasis on field studies.

Mr. Lindburg

265. Concepts and Problems in Applied Anthropology. (4) I.

Seminar—3 hours. Prerequisite: course 165 or equivalent or consent of instructor. Advanced study in culture change; case studies of directed culture change; problems of planning and evaluation; uses of anthropological theory and data in professional fields such as agriculture, public health, administration, and international technical assistance.

Mr. Chang

***292. Seminar in Anthropological Linguistics. (4) II.**

Seminar—3 hours.

Mr. Olmsted

299. Research. (3-8) I, II, III.

The Staff (Mr. Olmsted in charge)

APPLIED BEHAVIORAL SCIENCES (See also Family and Consumer Sciences)

Orville E. Thompson, Ph.D., Chairman of the Department

Department Office, 206 Walker

Professors:

Frederick L. Griffin, M.S. (*Emeritus*)
 Elwood M. Juergenson, Ph.D. (*also Coordinator of Vocational Teacher Education*)

Sidney S. Sutherland, M.S. (*Emeritus*)
 Orville E. Thompson, Ph.D.

* Not to be given, 1969-70.

Assistant Professor:

Mary C. Regan, Ph.D.

**Lecturer:**

Arline Johnson, M.S.

Departmental Major Advisers—See *Schedule and Directory Listing*.

Credential Counselors: _____.

Secondary Credentials—*Agriculture*.—Mr. Juergenson

Secondary Credentials—*Homemaking*.—Miss Johnson

Junior College Credentials—*Agriculture*.—Mr. Juergenson

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

Agricultural Education

Upper Division Courses**160. Vocational Education. (3) III.**

Lecture—3 hours. Philosophy and organization of vocational education, with particular reference to educational principles for agriculture, commerce, home economics, and industry.

Mr. Thompson

***188. Technical Journalism. (4) I.**

Lecture—4 hours. Style structure, organization, and presentation of technical information. Includes mass communication theory, mass media analysis, and audience analysis.

Miss Regan

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

The Staff (Mr. Thompson in charge)

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

The Staff (Mr. Thompson in charge)

Graduate Courses**290. Seminar. (2) I, II, III.**

Discussion—2 hours. Reports and discussions of topics of interest in the fields of agricultural education, home economics education, agricultural extension, and adult education.

Mr. Thompson, Miss Regan

ART

Richard D. Cramer, M.F.A., *Chairman of the Department*

Department Office, 103 Art

Professors:Joseph A. Baird, Jr., Ph.D. (*Acting*

*Director, Laboratory for Research in
Fine Arts and Museology*)

299. Research. (1-6) I, II, III.

Research in agricultural education, home economics education, vocational education, agricultural extension, or adult education.

The Staff (Mr. Thompson in charge)

Supervised Teaching Courses**320A. Introduction to Teaching. (1) I, II, III.**

Lecture—1 hour. Observations and participation in some form of public school work.

Mr. Juergenson

320B. Instructional Materials and**Procedures. (3) III.**

Lecture—2 hours; laboratory—3 hours. Introduction to the materials and procedures used in teaching. Use of audio-visual, radio and other teaching aids. Preparation of teaching materials; collecting, organizing, processing, and evaluating community resources.

Mr. Juergenson

320C. Supervised Teaching: Sec. 1,**Agriculture. (12) I, II, III.**

Field work—student teaching—36 hours. Prerequisite: course 320A; course 320E must be taken concurrently. Directed teaching for candidates for the credential in agriculture

Mr. Juergenson

320C. Supervised Teaching: Sec. 2. Home**Economics. (12) I, II, III.**

Field work—student teaching—36 hours. Prerequisite: course 320A; course 320E must be taken concurrently. Directed teaching for candidates for the credential in home economics.

Miss Johnson

320E. Curriculum and Instruction Procedures: Sec.**1. Agriculture. (3) I, II, III.**

Discussion—3 hours. Prerequisite: all students enrolled in 320E must enroll in 320C concurrently. Planning and organizing an effective curriculum. Selection, organization, evaluation, and use of resource material for teaching.

Mr. Juergenson

320E. Curriculum and Instruction Procedures: Sec.**2. Home Economics. (3) I, II, III.**

Discussion—3 hours. Prerequisite: all students enrolled in 320E must enroll in 320C concurrently. Planning and organizing an effective curriculum. Selection, organization, evaluation, and use of resource material for teaching.

Miss Johnson

^aRichard D. Cramer, M.F.A.

Daniel J. Crowley, Ph.D. (*Art and Anthropology*)

^bNot to be given, 1969-70.

^cAbsent on leave, fall quarter 1969.

Seymour Howard, Ph.D.
 Richard L. Nelson, M.A. (*Emeritus*)
 Daniel Shapiro
 Wayne Thiebaud, M.A.

Associate Professors:

Tio L. Giambruni, M.A.
 Ruth J. Horsting, M.A.
 Ralph M. Johnson, M.A.
 Roland C. Petersen, M.A.

Assistant Professors:

Robert C. Arneson, M.F.A.
 Roy R. DeForest, M.A.
 Susan R. McKillop, Ph.D.
 William T. Wiley, M.F.A.

◇ ◇ ◇

Assistant Professor:

José A. Arguelles, M.A. (*Acting*)

Lecturer:

Charles M. Muskatitch, H.D., F.I.I.C.
*(Curator, Laboratory for Research
 in the Fine Arts and Museology)*

Associate:

Jane B. Garritson, M.A.

Departmental Major Advisers.—See the Schedule and Directory.

Preparation for the Major:

Practice of Art: *3 courses from the following list: Art 2, 3, 4, 14A, 14B, 15, 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 may apply for advanced standing by submitting examples of their work for faculty review.

History of Art: Courses 1A, 1B, 1C, 1D; one course in drawing, graphics, or painting; and one course in sculpture or ceramics.

The Major Program:

Practice of Art: *18 units of Group A courses under three different artists; course 148 or 149; 8 units from Group C; and 6 units chosen from Group A, B, or C.

History of Art: Two art history courses within each of two periods (e.g., 154A, 154B, and 178B, 178C); courses 180, 189, and 12 units chosen from Group C. Students planning to do advanced 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.

Graduate Study.—The Department of Art offers a program of study and research leading to the Master's degree in art practice. Detailed information regarding graduate study may be

obtained from the *Announcement of the Graduate Division*.

Teaching Major.—The A.B. degree with a major in the practice of art or in the history of art. Depending on the credential, certain other courses are required. For information see the subject representative.

Teaching Minor.—30 units in Art. These must be selected in consultation with the subject representative.

Subject Representative: Mrs. Garritson.

Lower Division Courses

1A. History of Art: Prehistoric through Early Christian. (4) I.

Lecture—4 hours. Art from 1500 B.C. to 500 A.D.: Lascaux, Jericho, Ur, Thebes, Knossos, Troy, Mycenae, Corinth, Athens, Pergamum, Cerveteri, Rome, and Ravenna; Imhotep, Phidias, Polykleitus, Praxiteles, Scopas, Lysippus, Agesander, and Apollodorus. Mr. Howard

1B. History of Art: Byzantine through Renaissance. (4) II.

Lecture—4 hours. European art from the seventh through the sixteenth centuries: Sutton-Hoo, Constantinople, Aachen, Hildesheim, Chartres, Salisbury, Florence, Siena, Rome, Venice; Giotto, the van Eycks, Brunelleschi, Donatello, Piero della Francesca, Botticelli, Leonardo, Michelangelo, Titian, Dürer, and El Greco.

Mrs. McKillop

1C. History of Art: Post-Renaissance to the Present. (4) III.

Lecture—4 hours. Development of art in Europe after the Reformation. In addition to a consideration of the works of the major masters—Caravaggio, Rembrandt, Bernini, Goya, Blake, Gericault, Monet, Seurat, etc., consideration will be given to the ways in which the various masters have contributed to the development of visual perception. Mr. Arguelles

1D. History of Art: Oriental Art. (4) I.

Lecture—4 hours. The art of India, China, and Japan.

2. Elementary Form and Color. (4) I, II, III.

Laboratory—12 hours. Form in composition using black and white media. Introduction to color in composition.

The Staff

* Students interested in drawing and painting should take courses 2, 3, 4; course 14A is recommended.

Students interested in sculpture, should take courses 14A, 14B, and 15; course 2 recommended.

Students preparing for graduate work in any of the environmental design professions should take courses 2, 14A, 16, 121A, 121B, 121C, 149, 168, 184.

3. Intermediate Form and Color. (4) I, II, III.

Laboratory—12 hours. Prerequisite: course 2. Color and form in composition. The Staff

4. Introductory Figure Painting. (4) I, II, III.

Laboratory—12 hours. Prerequisite: course 2. Form in composition, with the human figure as subject. The Staff

10. Introduction to Art: History and Appreciation.

(3) I, II, III.

Lecture—3 hours. The understanding and appreciation of painting, sculpture, architecture, and industrial art. Illustrated lectures. Intended for students not specializing in art. Mr. Nelson

11. Introduction to Art: Practice. (3) I, II, III.

Lecture—1 hour; laboratory—4 hours; 2 hours to be arranged. Individual explorations in various media. Intended for students not specializing in Art. Not open for credit to students who have had Art 2, 14A, or 16. The Staff

14A. Elementary Sculpture. (4) I, II, III.

Laboratory—12 hours. Form in space using clay and plaster. Mr. Giambruni, Mrs. Horsting

14B. Intermediate Sculpture. (4) II, III.

Laboratory—12 hours. Prerequisite: course 14A. Form in space using clay and plaster.

Mr. Giambruni, Mrs. Horsting

15. Introductory Figure Sculpture. (4) III.

Laboratory—12 hours. Prerequisite: course 14A. Form in space with the human figure as subject. Mr. Giambruni, Mrs. Horsting

16. Descriptive Drawing and Rendering. (3) I, II.

Lecture—1 hour; laboratory—6 hours. Methods of objective drawing and of space description; rendering in various media.

Mr. Muskavitch

Upper Division Courses**Group A: Practice of Art*****101. Painting: Materials and Carriers. (3) I.**

Laboratory—9 hours. Prerequisite: course 3. Experimentation in media and their supports; fresco, egg tempera, Renaissance oil and mixed techniques, watercolor, gouache, traditional oil lacquers, acrylics. Mr. Petersen

102. Advanced Drawing and Painting. (3) I, II, III.

Laboratory—9 hours. Prerequisite: courses 3, 4. Drawing and painting in various media including oil and polymers. May be repeated for credit. Messrs. DeForest, Johnson, Peterson, Shapiro, Thiebaud, Wiley

104. Advanced Form and Figure Composition.

(3) II, III.

Laboratory—9 hours. Prerequisite: course 4.

* Not to be given, 1969–70.

Problems of light, color and space that involve the human figure and its environment. May be repeated for credit. Messrs. DeForest, Johnson, Peterson, Shapiro, Thiebaud, Wiley

***110. Photography. (3) II.**

Laboratory—9 hours. Prerequisite: courses 3 or 128A. Photography as a creative medium using the view camera and the miniature camera. Mr. Petersen

112A. Ceramics. (4) I, II, III.

Laboratory—12 hours. Prerequisite: course 2 or 14A. Beginning ceramics; an introduction to ceramic forms and processes. Mr. Arneson

112B. Ceramics. (4) II, III.

Laboratory—12 hours. Prerequisite: course 112A. Beginning ceramics; introduction to ceramic color and glaze. Mr. Arneson

121A. Architectural Design. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: two courses in art practice or design; or consent of instructor. Studio projects in architectural design. Mr. Cramer

121B. Architectural Design. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 121A. Studio projects in architectural design. Mr. Cramer

***121C. Architectural Design. (3) III.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: 121B. Studio projects in architectural design. Mr. Cramer

128A. Graphic Arts. (3) I, II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: two courses in art practice. Beginning experimental methods in relief and intaglio printmaking, etching, engraving, aquatint, woodcut, and related media. Mr. Shapiro

128B. Graphic Arts. (3) II, III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 128A. Intermediate experimental methods in relief and intaglio printmaking, etching, engraving, aquatint, woodcut, and related media. Mr. Shapiro

128C. Graphic Arts. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 128B. Advanced experimental methods in relief and intaglio printmaking, etching, engraving, aquatint, woodcut, and related media. Mr. Shapiro

141. Sculpture: Materials and Methods. (3) I.

Laboratory—9 hours. Prerequisite: course 14B. Influences of material and technique on sculptural form; clay, wood, metal, plastics. Mrs. Horsting

142. Advanced Figure Sculpture. (3) III.

Laboratory—9 hours. Prerequisite: courses 15, 141. Problems of shape, surface, and space using the human figure as subject. May be repeated for credit. Mr. Giambruni, Mrs. Horsting

143. Casting Techniques and Theories of Cast Sculpture. (3) II.

Laboratory—9 hours. Prerequisite: course 14B. Projects in various casting techniques and media with emphasis on bronze and the lost wax process. May be repeated for credit.

Mr. Giambruni, Mrs. Horsting

144. Advanced Sculpture. (3) II, III.

Laboratory—9 hours. Prerequisite: course 141. Problems of form and space in relief and in the round. May be repeated for credit.

Mr. Giambruni, Mrs. Horsting

146. Ceramic Sculpture. (3) II, III.

Laboratory—9 hours. Prerequisite: course 12B. Clay as material for sculpture in round and relief. May be repeated for credit. Mr. Arneson

Group B: Theory and Criticism**148. Theory and Criticism: Painting and Sculpture. (4) II.**

Lecture—3 hours. Prerequisite: course 2 or 14A, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces.

Mr. Thiebaud

149. Theory and Criticism: Architecture. (4) III.

Lecture—3 hours. Prerequisite: course 2 or 14A; one art lecture course, or consent of instructor. Aesthetic theories of design styles, historic and contemporary.

Mr. Cramer

Group C: History of Art**150. The Arts of Africa, Oceania, and Prehistoric Europe. (4) II.**

Lecture—3 hours. The traditional arts of Africa and Oceania and of the prehistoric and folk populations of Europe and Asia in their cultural contexts.

Mr. Crowley

151. The Arts of the Indians of the Americas. (4) I.

Lecture—3 hours. Arts of the extinct societies of Mexico, Peru, and related regions, and contemporary Indian arts and crafts.

Mr. Crowley

154A. Greek Art: The Helladic through Archaic Periods. (4) I.

Lecture—3 hours. The art of Classical Greece to the Persian invasions. The Geometric, Orientalizing, and Archaic styles: the Doric temple, black- and red-figure vase painting, the *Kore*

and *Kouros*. Corinth, Selinus, Paestum, Polymedes, Kleitias, Exekias, Epictetus, Euthymides, Kritios, and Kalamis.

Mr. Howard

154B. Greek Art: The Gold and Silver Ages. (4) II.

Lecture—3 hours. Greek art from the time of Pericles to that of Alexander: Olympia, the Athenian, Acropolis, Bassae, Epidaurus, Halicarnassus; Myron, Phidias, Polykleitos, the Achilles Painter, Praxiteles, and Scopas.

Mr. Howard

154C. Greek Art: The Hellenistic Age. (4) III.

Lecture—3 hours. Art in the Greek world from 322 B.C. until the time of Imperial Rome: Pergamum, Alexandria, Priene, and Delos—Lysippus, Polyeuctus, Boethus, Agesander, Philoxenus, and Nikeratus.

Mr. Howard

155. Roman Art. (4) II.

Lecture—3 hours. The art of Republican and Imperial Rome, its buildings, portraiture, historic reliefs, and murals: Pompeii, Nimes, Praeneste, Ostia, Baalbeck, Palmyra, Petra, Spoleto, Trier; Forum Romanum, Ara Pacis, Pont du Gard, Colosseum, Pantheon, Baths of Caracalla, and the Arch of Constantine.

Mr. Howard

***160. History of Minor Art. (4) I.**

Lecture—3 hours. Great periods, masters, and masterworks of minor art, such as Tutankhamen's throne, harp of Ur, Tanagra figurines, Portland vase, Bayeux tapestry, Suger's chalice, Majolica; Pisanello, Cellini, Chippendale, Adam, Wedgwood, Morris, Tiffany, Eames, and others.

162. History of Graphic Media. (4) I.

Lecture—3 hours. The development of multiple copy image processes from the late Medieval Period to the present: book illustration, popular prints, graphics as "High Art," photography, advertising. Emphasis will be placed on understanding the relation between technique and perceptual effect.

Mr. Arguelles

***168. The History of Urban Form. (4) II.**

Lecture—3 hours. An historical investigation of the evolution of great cities; physical forms of town planning in the past as a guide to modern urban developments. Consideration of Rome, Constantinople, Venice, Paris, London, and New York. The relation of European and American planning concepts. Field trips.

Mr. Baird

176A. Art of the Middle Ages: Early Christian to Romanesque. (4) II.

Lecture—3 hours. The art of Christian Europe from the founding of Constantinople to the tenth century; the early Christian, Byzantine, Carolingian, and Ottonian periods; the Basilica of St. Peter's, St. Mark's in Venice, Hagia Sophia, St. Gall, Sutton-Hoo, and the Lindisfarne Gospels.

* Not to be given, 1969-70.

176B. Art of the Middle Ages: Romanesque through Gothic. (4) III.

Lecture—3 hours. The arts in Christian Europe from the eleventh to the fifteenth centuries: St. Sernin, Gislebertus, Poitiers, Caen, St. Ambrose, St. Denis, Chartres, Rheims, Salisbury, Cologne, Santa Croce, Strasbourg, Naumburg, Claus Sluter, and Villard de Honnecourt.

177A. Northern Renaissance Art. (4) I.

Lecture—3 hours. Art of the Lowlands in the fifteenth and sixteenth centuries. The van Eycks, Master of Flemalle, Roger van der Weyden, Bouts, Geertgen, Bosch, and Bruegel.

Mrs. McKillop

177B. Northern Renaissance Art. (4) III.

Lecture—3 hours. Art between the Rhine and the Danube in the fifteenth and sixteenth centuries: Multscher, Riemenschneider, Witz, Schongauer, Durer, Grunwald, Cranach, Alt-dorfer, and Holbein.

178A. Italian Renaissance Art. (4) I.

Lecture—3 hours. Art of the Trecento: Nicola and Giovanni Pisano, Cimabue, Giotto, Duccio, the Lorenzetti, Simone Martini. Emphasis on Assisi, Florence, and Siena.

Mrs. McKillop

178B. Italian Renaissance Art. (4) II.

Lecture—3 hours. Art of the fifteenth century: Ghiberti, Brunelleschi, Masaccio, Donatello, Fra Angelico, Piero della Francesca, Botticelli, Mantegna, and the Bellini. Emphasis on Florence, Northern Italy, and Venice.

Mrs. McKillop

178C. Italian Renaissance Art. (4) III.

Lecture—3 hours. Art of the sixteenth century: Leonardo, Michelangelo, Raphael, Bramante, Giorgione, Titian, Correggio, Pontormo, and Tintoretto. Emphasis on Rome, Florence, and Venice.

Mrs. McKillop

179A. Baroque Art. (4) I.

Lecture—3 hours. Architecture, sculpture, and art of the garden, from formative stages of the Baroque in the sixteenth century to creation of the Rococo. Emphasis on western Europe; prototypes and developments. Bernini, Mansart, and other major artistic personalities.

Mr. Baird

179B. Baroque Art. (4) II.

Lecture—3 hours. Painting from 1590 to 1720. Such Italian, Spanish, Flemish, French, and English masters as Caravaggio, Velasquez, Rubens, Van Dyck, Claude, and Poussin will receive particular attention. Some attention to painting and drawing for the theater and other spectacles.

Mr. Baird

180. Readings in Art Historical Methods. (4) III.

Lecture—3 hours. Works by major art chroniclers, historians, and theorists of the historic and recent past: Plutarch, Pliny, Lucian,

Suger, Alberti, Vasari, Bellori, Winckelmann, Ruskin, Wölfflin, Berenson, Riegl, and Panofsky.

The Staff

183A. Developmental History of Media and Visual Perception: the Industrial Age. (4) I.

Lecture—3 hours. A historical consideration of interrelationships in the development of visual media—painting, photography, and graphics—as they reflect the development of visual perception from the late eighteenth to the mid-nineteenth centuries. The influence of media technics on visual experience. Mr. Arguelles

183B. Developmental History of Media and Visual Perception: the Age of Materialism. (4) II.

Lecture—3 hours. Visual media from the Impressionist painters to the First World War: painting, photography, graphics, and advertising art. The influence on art of its mutual development with science in altering the nature of art in the twentieth century. Mr. Arguelles

183C. Developmental History of Media and Visual Perception: into the Space Age. (4) III.

Lecture—3 hours. Visual media from World War I to the present. The continuing development of interrelationships among the various media and an examination of the changing concept/function of art in terms of perceptual immediacy.

Mr. Arguelles

184. Architecture in the Twentieth Century. (4) II.

Lecture—3 hours. The forms and substyles of modern architecture, with emphasis on the development of organicism in the works of Frank Lloyd Wright and of the international style in the work of Le Corbusier and Mies van der Rohe.

Mr. Cramer

***188A. The Art of Latin America. (4) I.**

Lecture—3 hours. Emphasis on architecture, sculpture, and paintings of Mexico from colonial times to the present; the American Southwest, colonial art in Peru, and eighteenth century to modern architecture in Brazil. European backgrounds and creative originality in the New World.

Mr. Baird

188B. The Art of the United States. (4) II.

Lecture—3 hours. A survey of three centuries of American building arts, with emphasis on colonial, Georgian, nineteenth and twentieth century architecture. Particular attention to California (especially northern California). Field trips.

Mr. Baird

***188C. The Art of the United States. (4) III.**

Lecture—3 hours. Emphasis on painting and sculpture. The great eras from colonial to contemporary; notable masters and schools. Special

* Not to be given, 1969-70.

attention to pictorial art since 1850; some attention to the leading figures in California of the later nineteenth and early twentieth centuries. Field trips. Mr. Baird

189. Museum Methods and Connoisseurship. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: basic art history courses; or consent of instructor. The history of collecting; problems of media and connoisseurship, especially in painting, drawing, and graphic arts. Study of iconography, techniques of preservation and restoration, museum registration and storage. Preparation of an exhibition at Davis, with printed catalogue. Field trips.

Mr. Baird, Mr. Muskatitch

Special Study Courses

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

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff

ASTRONOMY—See Physics

ATMOSPHERIC SCIENCE—See Resource Sciences

AVIAN MEDICINE—See Epidemiology and Preventive Medicine

BACTERIOLOGY

Allen G. Marr, Ph.D., *Chairman of the Department*

Department Office, 156 Hutchison Hall

Professors:

Robert E. Hungate, Ph.D.

John L. Ingraham, Ph.D.

Allen G. Marr, Ph.D.

Herman J. Phaff, Ph.D. (*Bacteriology and Food Science and Technology*)

Mortimer P. Starr, Ph.D.

Associate Professors:

Clifton E. Dowell, Ph.D.

Donald M. Reynolds, Ph.D.

Assistant Professor:

Donald P. Kessler, Ph.D.

◇ ◇ ◇

Associate Professor:

Martin W. Miller, Ph.D. (*Food Science and Technology*)

Major Advisers.—Mr. Reynolds, Mr. Kessler.

Graduate Courses (Group A, B, or C)

201. Drawing and Painting in Selected Media. (4)

I, II, III.

Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit. The Staff

202. Sculpture in Selected Media. (4) I, II, III.

Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit. The Staff

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

299. Individual Study. (1-6) I, II, III.

The Staff

Professional Course

300. Practice and Principles of Art Education.

(3) II, III.

Lecture—2 hours; laboratory—4 hours. Prerequisite: senior or graduate standing; or consent of instructor. Art education and practice of techniques used in elementary and secondary schools.

Mrs. Garritson

The Major Program

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. The Bachelor of Science program offers greater emphasis in mathematics and physical science. 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; Biology 1; Botany 2, or Zoology 2; Chemistry 1A-1B-1C, 8A-8B; Mathematics 16A-16B and either 13, 16C, or 36A-36B; Physics 2A-2B-2C.

Upper Division Courses.—Bacteriology 110, 130 or 131, 140; Biochemistry and Biophysics 101A-101B-101L; Chemistry 5; Genetics 100A-100B; and one course from the following group: Bacteriology 150; Biology 162; Botany 114, 118, 119A-119B; Zoology 110; and two additional units in bacteriology which may include Veterinary Microbiology 127.

Bachelor of Science Major Program

Lower Division Courses.—Bacteriology 2; Biology 1; Chemistry 1A-1B-1C, 5; Mathematics 21A-21B-21C, 13; Physics 4A-4B-4C. Recommended: elementary courses in French or German.

Upper Division Courses.—Bacteriology 110, 130 or 131, 140, 160 or 170; Biochemistry and Biophysics 101A-101B-101L; Chemistry 110A-110B-110C, 112A-112D-112E; Genetics 100A-100B; and one course from the following group: Bacteriology 150; Biology 162; Botany 114, 118, 119A-119B; Zoology 110.

Honors and Honors Program (see page 133).

Graduate Study (see page 153).—The Graduate Group in Microbiology offers programs of study and research leading to the M.A. and Ph.D. degrees in general microbiology, including bacteriology. The offerings of the Department of Bacteriology are augmented by courses and faculty of the Departments of Biochemistry and Biophysics, Botany, Food Science and Technology, Genetics, Viticulture and Enology, and the Schools of Veterinary Medicine and of Medicine. For detailed information regarding graduate study in microbiology, address the Chairman, Graduate Group in Microbiology, Department of Bacteriology.

Teaching Major.—Requirements for the principal teaching major are the same as those for the departmental major.

Teaching Minor.—30 units selected from the B.A. or B.S. Bacteriology major programs, as approved by the Department Subject Representative.

Subject Representative: Mr. Reynolds

Lower Division Course

2. Introduction to Microbiology. (5) I, II, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biology 1; Chemistry 1A. A general introduction to the biology of bacteria and of other microorganisms. The Staff

Upper Division Courses

110. Structure and Function of Bacteria. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 2. Analysis of the structure and ultrastructure of bacteria in relationship to physiological function; osmotic behavior of bacterial cells. Mr. Marr

130. Bacterial Physiology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2; Biochemistry 101B; Mathematics 16A. Growth of bacteria; biochemical and genetic regulation of metabolism; effects of the physical and chemical environment.

Mr. Ingraham

131. Bacterial Metabolism. (3) I.

Lecture—3 hours. Prerequisite: course 2; Biochemistry 101A. Anaerobic and aerobic metabolism of organic and inorganic foods by bacteria, including pathways of synthesis. The Staff

132. Bacterial Metabolism Laboratory. (3) I.

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 2; Biochemistry 101A. Discussion and quantitative experiments in microbial metabolism, using selected methods of microchemical analysis, manometry liquid and gas phase chromatography, spectrophotometry, and isotopic tracers. The Staff

140. Bacterial Diversity and Ecology. (5) III.

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: course 2; Chemistry 8B. Principles of bacterial diversity and bacterial ecology. Survey of the major systematic groups of bacteria, with intensive study of selected microorganisms and habitats. Mr. Starr

150. Protistology. (3) II.

Lecture—3 hours. Prerequisite: course 2 and Botany 2; or Zoology 2. A survey of protozoa and yeasts, including selected physiological topics.

Mr. Hungate, Mr. Phaff

151. Protistology Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 150 (may be taken concurrently). Experiments on the taxonomy, physiology, and ecology of selected yeasts and protozoa.

Mr. Hungate, Mr. Phaff

160. Bacterial Viruses. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 130; Biochemistry 101B. Structure of viruses; physiology and biochemistry of viral infections; genetics of viruses; lysogeny.

170. Bacterial Genetics. (4) II.

Lecture—4 hours. Prerequisite: course 2; Genetics 100B; Biochemistry 101B. Mutation and genetic recombination in bacteria and bacteriophages. Mechanisms of replication, recombination, and gene expression. Mr. Kessler

171. Bacterial Genetics Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 170 (may be taken concurrently). Selection of mutants and analysis of genetic recombination in bacteria and bacteriophages. Mr. Kessler

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

Prerequisite: consent of instructor. The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. The Staff

Graduate Courses

230. Bacterial Physiology. (4) III.

Lecture—4 hours. Prerequisite: course 130; Biochemistry 101B; course 170 recommended. Economics of bacteria growth; biochemical and genetic regulation of metabolism.

Mr. Ingraham, Mr. Marr

240. Bacterial Diversity and Ecology. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 140 (preferably taken concurrently). Intensive study of selected microorganisms and habitats in relation to diversification factors.

Mr. Starr

241. Bacterial Taxonomy. (2) III.

Lecture—2 hours. Prerequisite: courses 140 and 240 recommended. Principles and procedures of bacterial taxonomy.

Mr. Starr

250. Yeasts and Related Organisms. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: a general course in microbiology, botany, biochemistry, and consent of instructor. Recommended: a course in cryptogamic botany. Morphology, development, classification, and distribution of yeasts; relation to other fungi; growth requirements; physiological activities.

Mr. Phaff, Mr. Miller

BEHAVIORAL BIOLOGY—See Medicine

BIOCHEMISTRY—See Also Animal Science

BIOCHEMISTRY (A Graduate Group)

Jerry L. Hedrick, Ph.D., *Chairman of the Group*

Group Office, 5206 Storer Hall

Graduate Study.—The Graduate Group in Biochemistry offers programs of study and research leading to the M.A. and Ph.D. degrees. For detailed information regarding graduate study in biochemistry address the chairman of the group.

BIOCHEMISTRY AND BIOPHYSICS

Sterling Chaykin, Ph.D., *Chairman of the Department*

Department Office, 554 Hutchison Hall

Professors:

Sterling Chaykin, Ph.D.

Eric E. Conn, Ph.D.

Lloyd L. Ingraham, Ph.D.

Jack Preiss, Ph.D.

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.

The Staff

292. Seminar in Bacterial Physiology. (1) I, II, III.

Seminar—1 hour. A review and discussion of the current literature and developments in bacterial physiology with presentations by individual students.

Mr. Marr, Mr. Ingraham

293. Seminar in Bacterial Genetics. (1) I, II, III.

Seminar—1 hour. A review and discussion of the current literature and developments in bacterial genetics with presentations by individual students.

Mr. Kessler

294. Seminar in Bacterial Virology. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. An examination of current topics in the structure, replication, and genetics of bacterial viruses.

Mr. Dowell

***295. Seminar in Microbial Ecology. (1) I, II, III.**

Seminar—1 hour. Prerequisite: consent of instructor. A review and discussion of the current literature in the ecology of protists and bacteria with presentations by individual students.

Mr. Hungate

298. Group Study. (1-5) I-II-III.

Prerequisite: consent of instructor. The Staff

299. Research. (1-12) I, II, III.

The Staff

* Not to be given, 1969-70.

Assistant Professors:

George E. Bruening, Ph.D.
Irwin H. Segel, Ph.D.

**Professors:**

Robert E. Feeney, Ph.D. (*Food Science and Technology*)
John R. Whitaker, Ph.D. (*Food Science and Technology*)

Associate Professor:

Mendel Mazelis, Ph.D. (*Food Science and Technology*)

Lecturers:

Ray C. Huffaker, Ph.D. (*Agronomy and Range Science*)
Tsune Kosuge, Ph.D. (*Plant Pathology*)
Frances E. Rudert, M.S.

Departmental Major Advisers.—See *Schedule and Directory* listing.

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

The department offers two essentially identical undergraduate majors in Biochemistry: Bachelor of Science, College of Letters and Science; and Bachelor of Science, College of Agricultural and Environmental Sciences. These majors are designed to provide a broad background in the biological, mathematical and physical sciences, and are suitable for students who plan to do graduate work in a biological science or who wish to pursue a professional career in biochemistry.

The Major Program (College of Agricultural and Environmental Sciences) See p. 72.

The Major Program (Letters and Science)

Lower Division Courses.—Required: Chemistry 1A-1B-1C and 5, or 1A and 7A-7B; at least 12 units of mathematics (suggested courses: 16A-16B-16C and one additional course [for example: 13, 15, 30, 22A] or 21-A-21B-21C and one additional course, for example: 13, 15, 30, 22A, 22B, 22C, etc.); Physics 2A-2B-2C and 3A-3B-3C, or 4A-4B-4C-4D-4E; Biology 1; at least one course from the following group: Bacteriology 2, Botany 2, or Zoology 2.

Upper Division Courses.—Required: Biochemistry 101A-101B, 101L; Chemistry 110A-110B-110C, 112A-112B-112C; Genetics 100A-100B. The student must also take an additional 16 units of courses from the areas of biology, chemistry, biochemistry, physics, mathematics or engineering. (Biochemistry 108, 122, 190, 199 and 194H are strongly recommended.) At least one course of the 16 units should be in a biological science. In addition to the courses listed above, the student must also complete those courses satisfying the College and University requirements summarized on page 59.

Upper Division Courses**101A. General Biochemistry. (3) I, II.**

Lecture—3 hours. Prerequisite: Chemistry 8B or 112B. Recommended: introductory course in bacteriology, botany, or zoology. Introduction to the chemistry and metabolism of biologically important compounds; dynamic aspects of biochemistry with examples from animals, plants, and microorganisms. Mr. Conn, Mr. Segel

101B. General Biochemistry. (3) II, III.

Lecture—3 hours. Prerequisite: course 101A. A continuation of 101A. Mr. Conn, Mr. Segel

101L. General Biochemistry Laboratory. (5) I, III.

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 101B (may be taken concurrently); Chemistry 5. Introduction to laboratory methods and procedures employed in studying biochemical processes. Designed for students who require limited experience in the use of biochemical techniques as laboratory tools.

Mr. Criddle, Mr. Doi, Mr. Preiss

108. Biochemical Control Mechanisms. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101B. The mechanisms by which metabolism is regulated in living cells. The role of variations in the intracellular levels of intermediates, activators, and inhibitors; enzyme induction and repression; and multiple forms of enzymes.

Mr. Doi, Mr. Segel

122. Plant Biochemistry. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101B. The chemistry of important plant constituents and processes such as photosynthesis and respiration; carbohydrate, fat, and nitrogen metabolism.

Mr. Stumpf, Mr. Conn

190. Proseminar in Biochemistry. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Discussion of the historical developments of modern biochemistry.

The Staff (Mr. Segel in charge)

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 of the staff. Completion will involve the writing of a senior thesis.

The Staff

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

Prerequisite: consent of instructor. The Staff

Graduate Courses**201A-201B-201C. Advanced General Biochemistry. (3-3-3) I-II-III.**

Lecture—3 hours. Prerequisite: course 101B or consent of instructor; Chemistry 109B or 110C, 112C. Physical and chemical properties of amino acids, proteins, lipids, carbohydrates and nucleic acids; methods of isolating pro-

teins; enzymes, including kinetics, cofactors, and type reactions; and the study of organized cell structures. The Staff (Mr. Chaykin in charge)

202A-202B. Advanced Biochemistry Laboratory. (6-6) II-III.

Lecture—1 hour; laboratory—15 hours. Prerequisite: course 201A; Chemistry 5. Laboratory methods and procedures used in biochemical research. Critical evaluation of experimental design and data is stressed.

The Staff (Mr. Hedrick in charge)

203. Carbohydrates. (3) I.

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 even-numbered years.

Mr. Preiss

204. Nucleic Acids. (3) III.

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 even-numbered years.

Mr. Bruening, Mr. 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.

Mr. Ingraham

206. Physical Biochemistry of Macromolecules. (3) I.

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.

Mr. Criddle

BIOLOGICAL SCIENCES

Everett W. Jameson, Jr., Ph.D., *Chairman of the Committee*

Committee Office, 4345 Storer Hall

Major Advisers.—See Schedule and Directory.

The Major Program

The major programs in biological sciences provide the opportunity to study a broader area of biology than is possible with most departmental programs. The programs prepare for a career in professions such as teacher, laboratory technician, medical technologist, etc. Both Plan I and Plan II serve as a basis for training in professional schools (Medicine, Dentistry,

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, steroids. Offered in odd-numbered years.

Mr. Stumpf

***220. Principles of Comparative Biochemistry. (3) I.**

Lecture—3 hours. Prerequisite: Biochemistry 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. Mr. Feeney, Mr. Hedrick

***240. Selected Topics in Biochemistry. (2) I.**

Lecture—2 hours. Prerequisite: course 201C or consent of instructor.

Mr. Chaykin

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.

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.

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.

Mr. Criddle

299. Research. (1-9) I, II, III.

The Staff

° Not to be given, 1969-70.



plating medical technology, Veterinary Microbiology 127 and courses such as medical microbiology and parasitology are recommended in addition to the above.

The Committee in Charge has issued a list of upper division courses acceptable in the major. Copies can be obtained from advisers and from the committee office.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Bacteriology 2; Biology 1; Botany 2; Chemistry 1A-1B, 8A-8B; Zoology 2; 6 units of mathematics. Recommended: Chemistry 1C; Geology 3; Physics 2A-2B-2C or equivalent.

Upper Division Courses.—Required: A total of 36 units in biological sciences including Genetics 100A-100B; and at least one course or course sequence from each of the following groups including one course in plant science and one in animal science:

a) Organismal Biology.—Bacteriology 140; Botany 105, 108, 114, 116, 118, 119A-119B; Entomology 101, 103; Zoology 100, 106A, 106B, 112, 133, 134.

b) Population Biology.—Botany 117; Entomology 104; Genetics 105; Zoology 125, 147.

c) Evolutionary Biology.—Botany 140; Genetics 103; Geology 115; Zoology 148.

d) Physiology.—Bacteriology 130, 131; Biochemistry 101A-101B or Physiological Sciences 101A-101B; Botany 111; Entomology 102; Physiological Sciences 140A-140B; Physiology (Animal Science) 100A-100B, 103, 110A-110B; Zoology 142.

e) Cell Biology.—Botany 130A; Zoology 121.

Bachelor of Science Major Program, Plan I

Lower Division Courses.—Required: Bacteriology 2; Biology 1; Botany 2; Chemistry 1A-1B-1C or 1A and 7A-7B, and 8A-8B or 112A-112B-112C or 112A-112D-112E; Mathematics 15, and 16A-16B or 16A-16B-16C, and 13 or 131A; Physics 2A-2B-2C; Zoology 2. Recommended: Chemistry 5; Geology 3; Physics 3A-3B-3C.

Upper Division Courses.—Required: A total of 45 units in biological sciences including Biochemistry 101A-101B or Physiological Sciences 101A-101B, and Genetics 100A-100B; and of these 45 units a minimum of 30 units are to include one course or course sequence from each of the following groups including one course in each of animal science, microbial science and plant science:

a) Organismal Biology—Bacteriology 140; Botany 105, 108, 114, 116, 118, 119A-119B; Entomology 101, 103; Zoology 100, 106A, 106B, 112, 133, 134.

b) Population Biology—Botany 117; Entomology 104; Genetics 105; Zoology 125, 147.

c) Evolutionary Biology—Botany 140; Genetics 103; Geology 115; Zoology 148.

d) Physiology—Bacteriology 130, 131; Bot-

any 111; Entomology 102; Physiological Sciences 140A-140B; Physiology (Animal Science) 100A-100B, 103, 110A-110B; Zoology 142.

e) Cell Biology—Botany 130A; Zoology 121.

Bachelor of Science Major Program, Plan II

Lower Division Courses.—Required: Bacteriology 2; Biology 1; Botany 2; Chemistry 1A-1B-1C and 5, or 1A and 7A-7B; Mathematics 21A-21B-21C and 13 or 131A; Physics 4A-4B-4C-4D-4E; Zoology 2. Recommended: Geology 3; Mathematics 22A, 22B, 22C.

Upper Division Courses.—Required: A total of 45 units in biological sciences including Biochemistry 101A-101B-101L or Physiological Sciences 101A-101B-102A; Chemistry 109A-109B or 110A-110B-110C and 112A-112B-112C or 112A-112D-112E; Genetics 100A-100B; and of these 45 units a minimum of 15 units are to include one course from groups a, b, and c and one course from group d or e.

a) Organismal Biology—Bacteriology 140; Botany 105, 108, 114, 116, 118, 119A-119B; Entomology 101, 103; Zoology 100, 106A, 106B, 112, 133, 134.

b) Population Biology—Botany 117; Entomology 104; Genetics 105; Zoology 125, 147.

c) Evolutionary Biology—Botany 140; Genetics 103; Geology 115; Zoology 148.

d) Physiology—Bacteriology 130, 131; Botany 111; Entomology 102; Physiological Sciences 140A-140B; Physiology (Animal Science) 100A-100B, 103, 110A-110B; Zoology 142.

e) Cell Biology—Botany 130A; Zoology 121.

The Honors Program.—Students on the honor list may enroll in an Honors Program of courses leading to honors with the bachelor's degree (see page 133).

A special study course (194H) involving either independent research or reading on an appropriate topic, followed by preparation of an honors thesis (course 195H) based primarily on the work done in the prerequisite course, must be completed.

Teaching Major.—A degree in Biological Sciences satisfies the requirement for a teaching major in the life sciences for both elementary and secondary teaching credentials, except that for the elementary credential Entomology 1 or 10 must be included.

Teaching Minor.—A minimum of 30 units of biology, including the undergraduate core: Biology 1, Botany 2, Zoology 2, and Bacteriology 2.

Subject Representative: _____

Upper Division Courses

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. Mr. Stebbins

194H. Special Study for Honors Students. (3-6)

I, II, III.

Prerequisite: enrollment limited to honors students. Independent research and/or reading on selected topics.

The Staff (Committee Chairman in charge)

BIOLOGICAL CHEMISTRY—See Medicine

BIOLOGY (Interdepartmental Courses)

Biology courses offered jointly by two or more departments or groups are listed below. Information concerning instructors is given under the individual departments.

Lower Division Courses

1. Principles of Biology. (6) I, II, III.

Lecture—4 hours; laboratory—6 hours. Prerequisite: Chemistry 1B. An interdisciplinary course designed for majors in the biological sciences. Emphasis on the unity of basic biological principles as related to cell structure and function, reproduction, genetics, growth and differentiation, evolution, ecology, and taxonomy.

I. Mr. Ketellapper (Botany),
II. _____ (Zoology),

III. Mr. Marr (Bacteriology)

(Offered by Bacteriology, Botany, and Zoology)

195H. Honors Thesis. (2) I, II, III.

Prerequisite: course 194H. Preparation of comprehensive thesis incorporating studies undertaken in course 194H.

The Staff (Committee Chairman in charge)

10. General Biology. (4) I, 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.

I. Mr. Spieth (Zoology),

III. Mr. Ketellapper (Botany)

(Offered by Botany and Zoology)

Upper Division Course

162. General Virology. (3) I.

Lecture—3 hours. Prerequisite: course 1. An integrated presentation of the nature of animal, bacterial, and plant viruses, including their structure, replication and genetics.

Mr. Bruening (Biochemistry),

Mr. Shalla (Plant Pathology)

BOTANY

C. Ralph Stocking, Ph.D., *Chairman of the Department*

Department Office, 143 Robbins Hall

Professors:

- Floyd M. Ashton, Ph.D.
Daniel I. Axelrod, Ph.D.
Alden S. Crafts, Ph.D. (*Emeritus*)
Herbert B. Currier, Ph.D.
Elizabeth G. Cutter, Ph.D., D.Sc.
Ernest M. Gifford, Jr., Ph.D.
C. Ralph Stocking, Ph.D.
John M. Tucker, Ph.D.
Grady L. Webster, Ph.D.
T. Elliot Weier, Ph.D. (*Emeritus*)

Associate Professors:

- Paul A. Castelfranco, Ph.D.
Hendrik J. Ketellapper, Ph.D.
Donald W. Kyhos, Ph.D.
Norma J. Lang, Ph.D.
Jack Major, Ph.D.
Kenneth Wells, Ph.D.

Assistant Professors:

- Michael G. Barbour, Ph.D.
Bruce A. Bonner, Ph.D.
Robert F. Norris, Ph.D.
Thomas E. Ragland, Ph.D.

Robert M. Thornton, Ph.D.

◇ ◇ ◇

Lecturers:

- David E. Bayer, Ph.D.
Oliver A. Leonard, Ph.D.

Departmental Major Adviser.—Mr. Wells

The Major Programs

The Bachelor of Science major program should be elected by those students who plan advanced study in botany, who wish to obtain general secondary teaching credentials, or who wish training for a position requiring a detailed knowledge of plants. Students who wish a less intensive program in botany, but one that acquaints the students with plant life and its importance, should elect the Bachelor of Arts major program.

Bachelor of Science Major Program

Lower Division Courses.—Required: Biology 1; Botany 2; Zoology 2; Chemistry 1A, 1B, 8B; Physics 2A, 2B, 2C; plus 8 additional units in related natural science subjects. German or French is the required language. Recommended: Bacteriology 2; Chemistry 1C; and Mathematics 13, 16A, 16B, 16C.

Upper Division Courses.—Required: Botany 105, 108, 111, 116, 118 or 119A and 119B; Genetics 100B; 6 (3 if Botany 119A and 119B are selected) additional units in botany; plus 8 units in related natural science courses. Recommended: Biochemistry 101A and 101B.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Biology 1; Botany 2; Zoology 2; Chemistry 1A, 1B. Recommended: Chemistry 8B.

Upper Division Courses.—Required: 36 units in botany and allied areas; 12 upper division units from the humanities or the social sciences, in addition to the college breadth requirements.

Honors and Honors Program (see page 133).

—Students on the honors list may elect to substitute a maximum 5 units of 194H for 5 upper division units of the regular major; however, recommendations for high honors and highest honors at graduation are not dependent on the completion of 194H.

Teaching Major.—The requirements for the teaching major are the same as for the departmental major for degree (A.B. or B.S.).

Teaching Minor.—Botany 2; and a minimum of 23 units in botany or closely related subjects. Students must consult with subject representative.

Subject Representative: Mr. Wells

Graduate Study.—Graduate programs leading to M.S., and Ph.D. degrees are offered in cytology, plant physiology, anatomy, morphology, taxonomy, ecology, mycology, phycology, and allied areas. The resources of the department are augmented by appropriate courses in related departments.

Lower Division Course

2. General Botany. (5) I, II, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biology 1. Structure, physiology, and taxonomy of plants, with special emphasis on seed plants.

The Staff

Upper Division Courses

105. Plant Anatomy. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Structure and growth of meristems; development and structure of cells, tissues, and tissue systems; comparative anatomy of stem, root, and leaf.

Miss Cutter

107. Weed Control. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2; Chemistry 8B. Introduction to the physiological and chemical principles underlying control of weeds; principles of preventive, cultural, and biological weed control; identification of common weeds.

Mr. Norris

108. Systematic Botany of Flowering Plants. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Laboratory and field studies of the characters and relationships of the principal families and orders of flowering plants. Principles of taxonomy. Practice in identification of species by means of keys.

Mr. Tucker

111. Introduction to Plant Physiology. (5) I.

Lecture—5 hours. Prerequisite: course 2; Chemistry 8B (may be taken concurrently). The fundamental activities of plants such as absorption, transpiration, synthesis of foods, respiration, growth, and reproduction.

Mr. 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, 119A, or 119B. An introduction to the morphology, taxonomy, evolution, and physiology of the fungi and the algae.

Miss Lang, Mr. Wells

***115. Mosses and Liverworts. (3) II.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 2. Morphology, taxonomy, and ecology of mosses and liverworts. Field trips.

116. Organization and Phylogeny of Vascular Plants. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Structure, reproduction, and phylogeny of the major groups of living and extinct vascular plants; special emphasis given to seed plants.

Mr. Gifford

117. Plant Ecology. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 111. Study of individual plants, species, and vegetation in relation to environment and of modification of the environment by vegetation.

Mr. Barbour, Mr. Major

118. Phycology. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Morphology, physiology, genetics, evolution, distribution, cultivation, and economic importance of algae; field trip.

119A. Mycology. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. Introduction to structure, relationships, ontogeny, and genetics of selected species of Ascomycetes, Myxomycetes, Plasmodiophoromycetes, Chytridiomycetes, Phycomycetes, and Ascomycetes.

Mr. Wells

119B. Mycology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 119A. Introduction to structure, relationships, ontogeny, and genetics of

* Not to be given, 1969-70.

selected species of Basidiomycetes and Fungi Imperfeci, ultrastructure of fungi; genetics of mating systems; mycorrhizae. Mr. Wells

120A. Plant Physiology. (3) I.

Lecture—3 hours. Prerequisite: course 111; Biochemistry 101A (may be taken concurrently). Cellular physiology, plant water relations, and translocation. Mr. Currier

120B. Plant Physiology. (3) II.

Lecture—3 hours. Prerequisite: course 111; Biochemistry 101A, 101B (may be taken concurrently). Mineral nutrition, photosynthesis, respiration, and general plant metabolism. Mr. Ragland

120C. Plant Physiology. (3) III.

Lecture—3 hours. Prerequisite: course 111; Biochemistry 101A. Recommended: courses 120A and 120B; Biochemistry 101B. Internal and environmental regulation of plant growth and development. Mr. Bonner

121A. Plant Physiology Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 120A (may be taken concurrently). Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 120A.

121B. Plant Physiology Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 120B (may be taken concurrently); Chemistry 5. Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 120B. Mr. Ragland

121C. Plant Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 120C (may be taken concurrently). Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 120C. Mr. Bonner

130A. General Cytology. (4) I.

Lecture—2 hours; laboratory—6 hours. 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 zone and their relationship to the metabolic nucleus. (Same course as Zoology 130A.) —, Mr. Wolfe

130B. General Cytology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 130A. An analysis of the structure and function of cells during mitosis, meiosis, gametogenesis and fertilization at cellular and subcellular levels. (Same course as Zoology 130A.) —, Mr. Wolfe

140. Paleobotany. (4) I.

Lecture—2 hours; laboratory—6 hours; one mandatory field trip. Prerequisite: senior standing. Development of modern vegetation with emphasis on centers of origin and radiation, rates of evolution, and community evolution. Guiding principles underline analyses of succeeding floral assemblages recorded in Cretaceous and Cenozoic fossil floras. (Same course as Geology 140.) Mr. Axelrod

141. Plant Geography. (3) II.

Lecture—3 hours. Prerequisite: course 108 or 116, course 117 recommended; or consent of instructor. Analysis of the distribution patterns of the vascular plant groups, and consideration of the factors which account for the present diversity of flora and vegetation. Mr. Webster

155. Plant Microtechnique. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 116 or course 105. Introduction to practical laboratory methods in preparing plant materials for microscopic examination; special emphasis on paraffin and chromosome smear techniques; introduction to techniques of tissue culture and photomicrography.

Mr. Gifford

180. Biological Evaluation of Herbicides. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 107 and 111 (may be taken concurrently). Principles dealing with the physical, chemical, and physiological aspects of herbicides. Laboratory, greenhouse and field studies illustrating these principles in herbicide evaluation; emphasis upon biological assays and upon the interpretation of biological data. Mr. Bayer

194H. Special Study for Honors Students. (1-5)

I, II, III.

Prerequisite: open only to majors of senior standing on honors list. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. The Staff

198. Directed Group Study. (1-5) II.

Prerequisite: consent of instructor. The Staff

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

The Staff

Graduate Courses

201A. Ecological Theory. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology. The 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.)

The Staff (Mr. Salt and Mr. Major in charge)

201B. Analysis of a Selected Ecosystem. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 201A or consent of instructor. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit. (Same course as Ecology, Geology, and Zoology 201B)

The Staff (Mr. G. L. Webster in charge)

201C. The Changing Biosphere. (3) III.

Lecture—2 hours; 1 assigned problem. Prerequisite: courses 201A, 201B; or consent of instructor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical and physical changes on living systems, changes in species diversity, effects on human population increase, and related topics. (Same course as Ecology, Geology, and Zoology 201C).

The Staff (Mr. Myrup in charge)

***210. Cell Physiology-Protoplasmatics. (3) III.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Selected plant physiological topics treated on the cellular level: water relations, plasmolytic phenomena, cytoplasmic movements, transport mechanisms, vital staining, responses of cells to high and low temperatures, wound reactions, effects of poisons. Microscopic techniques are stressed.

Mr. Currier

211. Plant Cell Metabolism. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: consent of instructor. Plant cell physiology, dealing particularly with the roles of plastids, mitochondria, microsomes, and nuclei in cellular metabolism. Isolation and study of these particulates, using centrifugation, gasometric, chromatographic, and spectroscopic methods. Detailed consideration of photosynthesis and respiration.

Mr. Stocking, Mr. Castelfranco

212. Physiology of Herbicidal Action. (3) I.

Lecture—3 hours. Prerequisite: courses 107, 120A, 120B, 120C. A study of the fundamental processes involved in the physiological action of herbicides. Detailed consideration of the fate of herbicides in plants and soils.

Mr. Ashton

214. Mechanisms of Toxic Action. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B and consent of instructor. Biochemical and physiological mechanisms underlying toxicity and detoxification.

Mr. Castelfranco, Mr. Kilgore

***215. Light and Plant Growth. (3) I.**

Lecture—3 hours. Prerequisite: courses 120A, 120B, 120C; Physics 2B. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis.

Mr. Bonner

216. Advanced Morphology of Vascular Plants. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 116. Evolution of form, structure, and reproduction of fossil and extant types through Cycadophytes.

Mr. Gifford

***218. Experimental Phycology. (3) I.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 118. Special problems in development, physiology, and genetics using algae as experimental organisms. Topics to be investigated will be selected according to the interests of individual students.

Miss Lang

***220. Plant Morphogenesis. (3) III.**

Lecture—3 hours. Prerequisite: course 105 or 116; course 155 recommended. A 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.

Miss Cutter, Mr. Gifford

***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.

Miss Cutter, Mr. Gifford

221. Selected Topics in Plant Physiology. (2) I, II,**III.**

Lecture—2 hours. Evaluation of the most recent research in plant physiology. Coverage of the entire field in a three-year period. Lectures and discussions by specialists in the areas of their research interests. May be repeated for credit.

The Staff

***231. Advanced Microtechnique. (4) III.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: one of the following: course 105, 116, 130A; Zoology 107. Recommended: course 155 or Zoology 104. Autoradiography, thin sectioning, freeze drying, micrurgy, Feulgen staining, cytospectrophotometry, and similar techniques. Laboratory work involving techniques of special interest to the student.

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

^a Not to be given, 1969-70.

the way in which various disciplines—anatomy, embryology, biochemistry, etc.—elucidate problems of taxonomic relationship, mainly of genera and higher categories.

Mr. Tucker

***256A. Experimental Plant Taxonomy. (2) II.**

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 108. Recommended: course 117; Genetics 103. The application of experimental techniques to the elucidation of taxonomic problems and evolutionary relationships in higher plants.

Mr. Kyhos

***256B. Experimental Plant Taxonomy. (2) III.**

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 256A. A continuation of course 256A. The study of variation in natural populations in relation to taxonomy; the application of population sample analysis, cytogenetics, transplant studies, etc., to the solution of taxonomic problems and the clarification of relationships.

Mr. Kyhos

***257. Plant Autecology. (3) I.**

Lecture—3 hours. Prerequisite: course 117, Mathematics 13. Evaluation of biotic and abiotic environmental factors in the distribution of plant species.

Mr. Major, Mr. Barbour

258. Plant Synecology. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 108, 117; Soil Science 120A

recommended. Theories and techniques involved in the study of structure, composition, boundaries, ecology, and classification of vegetation, with particular emphasis on California plant communities.

Mr. Major

290. Seminar (1) I, II, III.

Seminar—1 hour.

The Staff

291. Seminar in Plant Morphology. (1) I, II, III.

Seminar—1 hour.

The Staff

292. Seminar in Plant Physiology. (1) I, II, III.

Seminar—1 hour.

The Staff

293. Seminar in Weed Science. (1) II.

Seminar—1 hour.

The Staff

294. Seminar in Cytology and Cytobiochemistry.

(1) III.

Seminar—1 hour. Survey of current research developments in the fields of cytology and biochemistry with special reference to plants. Discussion of the fine structure of cells in relation to biochemical function.

The Staff

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

The Staff

299. Research. (1-9) I, II, III.

The Staff

CHEMISTRY

Raymond M. Keefer, Ph.D., *Chairman of the Department*

Department Office, 108 Chemistry Building

Professors:

- Thomas L. Allen, Ph.D.
- Lawrence J. Andrews, Ph.D.
- Albert T. Bottini, Ph.D.
- Robert K. Brinton, Ph.D.
- Raymond M. Keefer, Ph.D.
- Richard E. Kepner, Ph.D.
- Edgar P. Painter, Ph.D.
- Harold G. Reiber, Ph.D.
- Leo H. Sommer, Ph.D.
- David H. Volman, Ph.D.
- George S. Zweifel, Sc.D.

Kenneth G. Hancock, Ph.D.

R. Bryan Miller, Ph.D.

W. Kenneth Musker, Ph.D.

Peter A. Rock, Ph.D.

John W. Root, Ph.D.

James S. Vincent, Ph.D.

Major Subject Advisers.—Mr. Bottini, Mr. Harrington, Mr. Kepner, Mr. Maciel, Mr. Painter, Mr. Rock, Mr. Vincent.

The Major Programs

Students who are interested in chemistry as a profession should elect the program leading to the Bachelor of Science degree, which meets the standards recommended by the American Chemical Society for professional training in chemistry. Students desiring a less intensive program in chemistry or wishing to emphasize biochemistry should elect the program leading to the Bachelor of Arts degree. High school students should note that the preparation for either degree is simpli-

Associate Professors:

- Rodney E. Harrington, Ph.D.
- Hakon Hope, Cand. real
- Gary E. Maciel, Ph.D.
- Charles P. Nash, Ph.D.
- James H. Swinehart, Ph.D.

Assistant Professors:

- William H. Fink, Ph.D.
- Edwin C. Friedrich, Ph.D.

* Not to be given, 1969-70.

fied 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 1A, 7A, 7B; Physics 4A, 4B, 4C, 4D, 4E; Mathematics 11, 21A, 21B, 21C, 22B, and either 22A or 22C; and a reading knowledge of German.

Upper Division Courses.—Required: Chemistry 105A, 105B, 110A, 110B, 110C, 111, 112A, 112B, 112C, and 8 units of any additional courses in chemistry (one of which must include laboratory work) except Chemistry 109A or 109B.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Chemistry 1A, 1B, 1C, 5 or 1A, 7A, 7B; Physics 2A, 2B, 2C, 3A, 3B, 3C; Mathematics 11, 21A, 21B, 21C, or 16A, 16B, 16C.

Upper Division Courses.—Required: 36 units in chemistry, biochemistry, or physics, including Chemistry 110A, 110B, 110C, 112A, 112B, and 112C or 112E.

Honors and Honors Program (see page 133).—The honors program comprises 6 units of course 194H.

Graduate Study.—The Department of Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees in chemistry. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Chemistry.

Teaching Major.—The teaching major is satisfied by either the A.B. or B.S. major in chemistry.

Teaching Minor.—Chemistry 1A, 1B, 1C, 5, 8A, 8B, 9, 109A, 109B. With the approval of the representative some substitution may be permitted.

Subject Representative: Mr. Nash

Lower Division Courses

1A. General Chemistry. (5) I, II.

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: high school chemistry; or high school physics and three years of high school mathematics (with an average grade of B or higher); or second-quarter standing. Fundamental principles of chemistry. Stoichiometry, properties and theory of gases, first law of thermodynamics, atomic and molecular structure, colligative properties of solutions.

The Staff

(I. Mr. Keefer, Mr. Allen, and
Mr. Vincent in charge;
II. ————— in charge)

1B. General Chemistry. (5) II, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 1A. Continuation of course 1A. Chemical equilibria, oxidation-reduction processes, electrochemistry, introduction to qualitative analysis.

The Staff (II. Mr. Brinton and Mr. Volman in charge; III. ————— in charge)

1C. General Chemistry. (5) I, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 1B. Continuation of course 1B. Chemical kinetics, structures and reactions of complex ions and molecules, application of principles of chemistry to problems of qualitative analysis.

The Staff (I. Mr. Maciel in charge,
III. Mr. Brinton in charge)

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 credit for Chemistry 7B. An introduction to the principles and methods of quantitative chemical analysis, with emphasis on the application of equilibrium theory to analytical problems.

I. Mr. Hope, III. —————

7A. General Chemistry. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 1A, Mathematics 21A or 16A (may be taken concurrently). Admission based on performance in course 1A. The fundamental principles of chemistry with emphasis in the laboratory on quantitative work. Courses 1A—7A—7B are equivalent to the sequence Chemistry 1A—1B—1C—5 as a prerequisite for further courses in chemistry

7B. General Chemistry. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 7A. Continuation of course 7A.

8A. Organic Chemistry, Brief Course. (3) I, II.

Lecture—3 hours. Prerequisite: course 1B or 7A with a grade of C or higher. With course 8B an introduction to the nomenclature, structure, chemistry, and reaction mechanisms of organic compounds. Intended for students majoring in areas other than chemistry.

I. Mr. Sommer, II. —————

8B. Organic Chemistry, Brief Course. (3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 8A. Continuation of course 8A. The laboratory is concerned primarily with the study of the properties and chemistry of the common classes of organic compounds.

I. —————, II. Mr. Sommer,
III. Mr. Hancock

9. Methods of Organic Chemistry. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 8B. Emphasis is placed on a study of the basic experimental techniques of organic synthesis.

Mr. Kepner

Upper Division Courses**105A–105B. Advanced Quantitative Analysis. (3–3)**

II, III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 109B or 110C (may be taken concurrently). Instrumental methods of analysis, emphasizing chromatographic, electrochemical, and spectrophotometric techniques.

II. ———, III. Mr. Hope

109A. Physical Chemistry, Brief Course. (2) I.

Lecture—2 hours. Prerequisite: course 5 or 7B or consent of instructor; Mathematics 21C and 11 or equivalent, or 16C; one year of college physics. Special topics in physical chemistry, with emphasis on spectroscopy, molecular structure, and principles of chemical thermodynamics. Intended for students majoring in areas other than chemistry.

Mr. Harrington

109B. Physical Chemistry, Brief Course. (3) II.

Lecture—3 hours. Prerequisite: course 109A or 110A. Continuation of course 109A, with emphasis on equilibrium, electrochemistry, and chemical kinetics.

Mr. Hope

110A. Physical Chemistry. (3) I, III.

Lecture—3 hours. Prerequisite: course 5 or 7B; Mathematics 21C and 11 or equivalent, or 16C; one year of college physics. A development of the principles of classical thermodynamics; emphasis on criteria for the existence and maintenance of equilibrium.

I. Mr. Brinton, Mr. Rock; III. Mr. 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. ———; II. Mr. Allen, Mr. Fink

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. ———; III. Mr. Fink

111. Physical Chemistry. (4) I, III.

Lecture—1 hour; laboratory—9 hours. Prerequisite: course 109B or 110C (may be taken concurrently). Physicochemical measurements and laboratory experiments illustrating some of the important principles of physical chemistry.

I. Mr. Nash, III. ———

112A. Organic Chemistry. (5) I, II, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 1C or 7B with a grade of C or higher. Introduction to the basic concepts of organic chemistry; the chemistry of hydrocarbons. Designed primarily for majors in chemistry.

I. Mr. Bottini, II. Mr. Zweifel, III. Mr. Miller

112B. Organic Chemistry. (5) I, II, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 112A or 8B and 9. Continuation of course 112A with emphasis on aromatic and aliphatic substitution reactions, elimination reactions, and the chemistry of carbonyl compounds. Introduction to the application of spectroscopic methods to organic chemistry.

I. Mr. Zweifel, II. ———, III. ———

112C. Organic Chemistry. (5) I, II, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 112B. Continuation of course 112B with emphasis on enolate condensations and the chemistry of amines and phenols; selected biologically important compounds.

I. Mr. Kepner, II. Mr. Hancock,
III. Mr. Sommer

112D. Organic Chemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 112A or 8B and 9; and consent of instructor. Equivalent to the lecture part of 112B. Intended primarily for students in fields other than chemistry.

I. Mr. Zweifel, II. ———, III. ———

112E. Organic Chemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 112B or 112D; and consent of instructor. Equivalent to the lecture part of 112C. Intended primarily for students in fields other than chemistry.

I. Mr. Kepner, II. Mr. Hancock,
III. Mr. Sommer

121. Introduction to Molecular Structure and**Spectra. (4) III.**

Lecture—4 hours. Prerequisite: course 110C. Modern theoretical and experimental methods used to study problems of molecular structure and binding; emphasis on spectroscopic techniques.

Mr. Vincent

124. Advanced Inorganic Chemistry. (4) I.

Lecture—4 hours. Prerequisite: course 109B or 110C; 112C or 112E. Modern interpretations of bonding, structure, and reactivity of inorganic compounds; emphasis on the chemistry of the first- and second-row elements and transition metals.

Mr. Musker

124L. Advanced Inorganic Chemistry Laboratory.**(2) II.**

Laboratory—6 hours. Prerequisite: course 124. Synthesis and characterization of inorganic compounds.

Mr. Musker

126. Nuclear Chemistry. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 110B (may be taken concurrently with consent of instructor). Introduction to experimental and theoretical nuclear chemistry including nuclear properties, nuclear spectroscopy, radiation effects, radioactive decay, and nuclear reactions. Both the lectures and the laboratory stress applications of nuclear phenomena in chemistry. Mr. Root

130. Qualitative Organic Analysis. (4) III.

Lecture—1 hour; laboratory—9 hours. Prerequisite: course 5 or 7B; 112C or 112E. The application of physical and chemical techniques to the qualitative identification of organic compounds. Mr. Zweifel

131. Advanced Organic Chemistry. (4) II.

Lecture—4 hours. Prerequisite: course 109B or 110B; 112C or 112E. Application of current knowledge of reaction mechanisms and molecular structure to problems of organic synthesis. Mr. Friedrich

150A. Chemistry of Natural Products. (3) I.

Lecture—3 hours. Prerequisite: courses 109B and 112C or 112E, or consent of instructor. Chemistry of carbohydrates and lipids: structure proof, stereochemistry, conformation, substitutions, and rearrangements of model systems. Mr. Painter

150B. Chemistry of Natural Products. (3) II.

Lecture—3 hours. Prerequisite: courses 109B and 112C or 112E, or consent of instructor. Structure, reactions, and physical properties of proteins, amino acids, nucleic acids, and related nitrogen compounds. Mr. Painter

194H. Undergraduate Research. (2-5) I, II, III.

Prerequisite: course 110C (may be taken concurrently) and honors status. Original research and a written report of the investigation. Unit value to be determined by instructor supervising the research. The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics. The Staff

Graduate Courses**204. Chemical Kinetics. (3) III.**

Lecture—3 hours. Basic theories describing rate processes, with special emphasis on the interpretation of activation parameters. An intensive study of the relationship between rate law and mechanism. Mr. Keefer

205. Quantum Chemistry I. (3) II.

Lecture—3 hours. Introduction to quantum chemistry, with emphasis on molecular electronic structure. Mr. Maciel

206. Quantum Chemistry II. (3) III.

Lecture—3 hours. Prerequisite: course 205. A quantum mechanical description of the fundamental nature of the interaction between electromagnetic radiation and matter, emphasizing molecular spectroscopy; consideration of vibrational, rotational, electronic, and magnetic aspects. Offered in even-numbered years.

207. Quantum Chemistry III. (3) III.

Lecture—3 hours. Prerequisite: course 205. An advanced course in the quantum theory of molecular electronic structure. Offered in odd-numbered years. Mr. Fink

214. Chemical Thermodynamics. (4) I.

Lecture—4 hours. Development of thermodynamic relations; applications to chemical systems. Mr. Volman

215. Advanced Physical Chemistry—Statistical Methods. (3) III.

Lecture—3 hours. Prerequisite: course 214. Probability and statistical methods; introduction to partition functions and statistical thermodynamics; heat capacities; chemical equilibrium; statistical theory of reaction rates; liquids and solutions; matter in fields. Mr. Nash

216. Statistical Thermodynamics. (3) I.

Lecture—3 hours. Prerequisite: course 215. Development of the laws of molecular assemblies; ensemble theory; fluctuations; imperfect gases; quantum effects; cooperative phenomena. Offered in even-numbered years. Mr. Harrington

220. Organic Chemistry. (3) II.

Lecture—3 hours. Selected topics of current interest concerning the structure and synthesis of naturally-occurring organic compounds. Offered in odd-numbered years. Mr. Miller

221. Organic Chemistry. (3) III.

Lecture—3 hours. Selected topics of current interest concerning the synthesis and reactions of heterocyclic compounds. Offered in even-numbered years. Mr. Friedrich

222. Organic Chemistry. (3) II.

Lecture—3 hours. Selected topics of current interest concerning the synthesis and reactions of small-ring compounds. Offered in even-numbered years. Mr. Bottini

223. Organometallic Compounds. (3) III.

Lecture—3 hours. Selected topics concerning the preparation and utilization of organometallic compounds in organic synthesis, including the application of metal hydrides as reducing agents. Offered in odd-numbered years. Mr. Zweifel

224. Inorganic Chemistry. (3) III.

Lecture—3 hours. Prerequisite: course 124. A development of the modern theories related to the structural, optical, and magnetic properties of inorganic compounds and complexes. Offered in odd-numbered years. Mr. Swinehart

225. Inorganic Chemistry. (3) III.

Lecture—3 hours. Prerequisite: course 124. Application of kinetic and thermodynamic principles to the interpretation of inorganic systems. Offered in even-numbered years. Mr. Musker

226. Advanced Nuclear Chemistry. (3) III.

Lecture—3 hours. Prerequisite: courses 126 and 205 or consent of instructor. Detailed discussion of nuclear models, decay processes, nuclear reactions, and interaction of radiations with matter with emphasis on chemical applications. Offered in odd-numbered years. Mr. Root

233A-233B. Physical Organic Chemistry. (2-2) I-II.

Lecture—2 hours. Modern concepts of substitution, elimination, and addition reactions, rearrangements, and stereochemistry.

Mr. Andrews

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Mr. Friedrich, Mr. Vincent

298. Group Study. (1-5) I, II, III.**299. Research. (1-12) I, II, III.**

The laboratory is open to qualified graduate students who wish to pursue original investigation. Students wishing to enroll should communicate with the department well in advance of the quarter in which the work is to be undertaken.

The Staff

CHINESE—See Oriental Languages**CLASSICS**

Department Office, 615 Sprout Hall

Associate Professors:

Richard E. Grimm, Ph.D.
Wesley E. Thompson, Ph.D.

Assistant Professor:

Frederick H. van Doorninck, Ph.D.

**Lecturer:**

H. Phelps Gates, Jr., M.A.

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, 4, and 5 or their equivalents.

Upper Division Courses.—Required: at least 36 units of upper division courses, including 121A-121B-121C.

Honors and Honors Program (see page 133).—The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination.

* Not to be given, 1969-70.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Requirements for the teaching minor in Latin: Latin 1, 2, 3, 4, 5 or their equivalents; at least 18 units of upper division work, including Latin 121A-121B-121C. Recommended: History 111C.

Subject Representative: Mr. Grimm

Classics**Lower Division Courses*****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.

17A. Greek Archaeology. (3) III.

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.

Mr. van Doorninck

17B. Greek Archaeology. (3) I.

Lecture—3 hours. The archaeological monuments of Archaic and Classical Greece. Selections from Greek literature are related to the archaeological remains.

Mr. van Doorninck

***17C. Roman Archaeology. (3) III.**

Lecture—3 hours. The development of Rome and its Empire as illustrated by the monuments.
Mr. van Doorninck

Upper Division Courses**139A. Greek Literature in Translation. (4) I.**

Lecture—3 hours. The Homeric epic and fifth-century drama. Reading of the Iliad, Odyssey, and selected plays of Aeschylus, Sophocles, and Euripides. Lectures on the early Greek epic and classical Athenian drama.
Mr. Gates

***139B. Greek Literature in Translation. (3) II.**

Lecture—3 hours. The development of historical writing in Greece: Herodotus, Thucydides, and selections from the minor historians. Offered in even-numbered years. Mr. Thompson

140. Latin Literature in Translation. (4) III.

Lecture—3 hours. Prerequisite: English 1. Readings in Lucretius, Roman lyric poets, Vergil, Livy, Seneca, Petronius, Tacitus, and Juvenal. Lectures on Roman literary history from Ennius to the late Empire. Offered in odd-numbered years.
Mr. Grimm

***141. Greek and Roman Comedy. (4) II.**

Lecture—3 hours. Readings in Aristophanes, Menander, Plautus, and Terence; lectures on the development of ancient comedy. Offered in odd-numbered years.
Mr. Grimm

150. Athenian Political and Social Institutions. (3) II.

Lecture—2 hours; discussion—1 hour. Politics and government, marriage and kinship, religious societies, and the demographic and economic basis of Athenian democracy. Offered in odd-numbered years.
Mr. Thompson

175. Topography and Monuments of Ancient Athens. (4) II.

Lecture-discussion—4 hours. Prerequisite: course 17A–17B or consent of instructor. The history of Athens as an urban center from the Bronze Age through the late Roman period. Student reports on major monuments with emphasis placed on restoration, chronology, and on the relating of documentary to excavational evidence. Offered in odd-numbered years.
Mr. van Doorninck

Greek

Departmental Major Adviser.—Mr. Thompson.

Lower Division Courses**1. Elementary Greek. (5) I.**

Lecture—4 hours.

Mr. Grimm

2. Elementary Greek. (5) II.

Lecture—4 hours. Prerequisite: course 1. A continuation of course 1. Mr. Grimm

3. Elementary Greek. (5) III.

Lecture—4 hours. Prerequisite: course 2. A continuation of course 2. Mr. van Doorninck

Upper Division Courses**100. Attic Orators. (4) I.**

Lecture—3 hours. Prerequisite: course 3.
Mr. Thompson

***101. Plato. (4) I.**

Lecture—3 hours. Prerequisite: course 3.
Mr. Grimm

***102. Euripides. (4) II.**

Lecture—3 hours. Prerequisite: course 101.
Mr. Gates

103. Homer. (4) III.

Lecture—3 hours. Prerequisite: course 102.
Mr. Gates

104. Menander. (4) II.

Lecture—3 hours; one contact hour in form of term paper to be graded by instructor. Prerequisite: course 3.
Mr. Thompson

***111. Sophocles. (4) III.**

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years. Mr. Grimm

***112. Aristophanes. (4) III.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years. Mr. Grimm

***113. Thucydides. (4) I.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years. Mr. Thompson

***114. Lyric Poetry. (4) I.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years. Mr. Grimm

***115. Aeschylus. (4) II.**

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years. Mr. Grimm

116. Herodotus. (4) II.

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.
Mr. van Doorninck

***120A-120B. Greek Composition. (2-2) II-III.**

Lecture—2 hours. Prerequisite: course 103.
Mr. Thompson

194H. Special Study for Honors Students. (5) I, II, III.

Prerequisite: open only to honors students.
The Staff

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

The Staff

^a Not to be given, 1969-70.

Latin

Departmental Major Adviser.—Mr. Grimm.

Duplication of Credit.—A student will not receive unit credit for Latin 1, 2, 3, 4, or 5 when these duplicate courses previously completed in secondary school (see page 130), or at another university or college.

Lower Division Courses

1. Elementary Latin. (4) I.

Lecture—4 hours.

The Staff

2. Elementary Latin. (4) II.

Lecture—4 hours. Prerequisite: course 1. A continuation of course 1.

The Staff

3. Elementary Latin. (4) III.

Lecture—4 hours. Prerequisite: course 2. A continuation of course 2.

The Staff

4. Intermediate Latin. (3) I.

Lecture—3 hours. Prerequisite: course 3 or equivalent.

The Staff

5. Intermediate Latin. (3) II.

Lecture—3 hours. Prerequisite: course 4 or equivalent. Continuation of course 4.

The Staff

10. The Structure of Latin. (4) I.

Lecture—4 hours. Prerequisite: not open to students who have received credit for any other course in Latin. A survey of the Latin language, with special emphasis on the morphology and syntactical relationships of classical Latin.

Mr. Thompson

Upper Division Courses

*101. Livy. (4) I.

Lecture—3 hours. Prerequisite: course 5. Offered in odd-numbered years.

Mr. Thompson

*102A. Plautus. (4) II.

Lecture—3 hours. Prerequisite: course 5. Offered in even-numbered years.

Mr. Grimm

*102B. Terence. (4) I.

Lecture—3 hours. Prerequisite: course 5. Offered in even-numbered years.

Mr. Grimm

*103. Vergil: Aeneid. (4) III.

Lecture—3 hours. Prerequisite: course 5. Offered in even-numbered years.

Mr. Gates

*104. Sallust. (4) I.

Lecture—3 hours. Prerequisite: course 5. Offered in even-numbered years.

Mr. Thompson

*105. Catullus. (4) II.

Lecture—3 hours. Prerequisite: course 5. Offered in odd-numbered years.

Mr. Grimm

*106. Horace: Odes and Epodes. (4) I.

Lecture—3 hours. Prerequisite: course 5. Offered in odd-numbered years.

Mr. Grimm

*108. Horace: Satires and Epistles. (4) II.

Lecture—3 hours. Prerequisite: course 5. Offered in odd-numbered years.

Mr. Grimm

*109. Roman Elegy. (4) III.

Lecture—3 hours. Prerequisite: course 5. Offered in odd-numbered years.

Mr. Grimm

*111A-111B-111C. Silver Age Latin. (4) I, II, III.

Lecture—3 hours. Prerequisite: course 5. Selections from Tacitus, Pliny, Petronius, Juvenal, Martial, and other writers of the Silver Age. Offered in odd-numbered years.

Mr. Thompson

*114. Cicero: Philosophical Works. (4) I.

Lecture—3 hours. Prerequisite: course 5. Offered in odd-numbered years.

Mr. Gates

115. Lucretius. (4) II.

Lecture—3 hours. Prerequisite: course 5. Offered in even-numbered years.

Mr. Gates

116. Vergil: Eclogues and Georgics. (4) III.

Lecture—3 hours. Prerequisite: course 5. Offered in even-numbered years.

Mr. Gates

*121A-121B-121C. Latin Composition. (2) I, II, III.

Lecture—2 hours. Prerequisite: course 5. Survey of classical Latin syntax; extensive practice in prose composition. Offered in odd-numbered years.

Mr. Grimm

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

199. Special Study for Advanced Undergraduates.

(2-5) I, II, III.

The Staff

Graduate Courses

201. Introduction to Classical Philology. (4) I.

Seminar—3 hours. A survey of major contemporary areas of classical scholarship with special attention devoted to current problems in literary and textual criticism.

Mr. Thompson

202. Lucretius. (4) II.

Seminar—3 hours. Selected topics, with emphasis on the relationship between Lucretius and earlier Epicureans.

Mr. Gates

203. Vergil. (4) III.

Seminar—3 hours. Reading of selected books of the *Bucolics*, *Georgics*, and *Aeneid*. Emphasis will be placed on the study of Vergilian poetic language.

Mr. Grimm

299. Research. (2-5) I, II, III.

The Staff

* Not to be given, 1969-70.

Sanskrit**Upper Division Courses*****191. Elementary Sanskrit. (4) I.**

Discussion—3 hours. Introduction to the study of the Sanskrit language; analysis of its structure and history. Offered in even-numbered years. Mr. Gates

***192. Elementary Sanskrit. (4) II.**

Discussion—3 hours. Prerequisite: course

191. Continuation of course 191. Offered in odd-numbered years. Mr. Gates

***193. Elementary Sanskrit. (4) III.**

Discussion—3 hours. Prerequisite: course 192. Continuation of course 192. Offered in odd-numbered years. Mr. Gates

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Mr. Gates

CLINICAL PATHOLOGY

Oscar W. Schalm, D.V.M., Ph.D., *Chairman of the Department*

Department Office, 1163 Haring Hall

Professors:

Donald E. Jasper, D.V.M., Ph.D.
Jiro J. Kaneko, D.V.M., Ph.D.
Oscar W. Schalm, D.V.M., Ph.D.

Assistant Professor:

Nemi C. Jain, M.V.Sc., Ph.D.

**Lecturers:**

Edward J. Carroll, Ph.D.
Jerry P. Lewis, M.D.

Upper Division Course**199. Special Study for Undergraduates. (1-4)**

I, II, III. The Staff

Graduate Courses**201. Clinical Hematology. (3) I.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: third-year standing in the School of Veterinary Medicine or consent of instructor. Hematological techniques and interpretation as applied to the study of disease in animals.

Mr. Schalm, Mr. Jain

202. Clinical Biochemistry. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Biochemical methods in the diagnosis of disease. Special emphasis on electrolyte balance, liver function, kidney function, urinalysis, osteological diseases, thyroid function, and disorders of carbohydrate, protein, and lipid metabolism.

Mr. Kaneko

203. Biochemistry of Metabolic Diseases. (3) II.

Lecture—3 hours. Prerequisite: biochemistry and physiology or consent of instructor. The biochemistry of inborn and acquired errors of metabolism in animals and man. Offered in even-numbered years. Mr. Kaneko, —

204. Morphological Hematology. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Morphological and interpretive clinical hematology for graduate students. Offered in even-numbered years.

Mr. Schalm, Mr. Jain

250A-250B-250C. Clinical Pathology Laboratory.

(1-1-1) I-II-III.

Prerequisite: fourth-year standing in School of Veterinary Medicine. Application of laboratory methods to the diagnosis of animal disease.

The Staff

261. The Bovine Mammary Glands in Health and Disease. (2) II.

Lecture—2 hours; two 2-hour laboratory sessions. Prerequisite: consent of instructor. Ontogeny, embryology, anatomy and physiology of the mammary glands; relationship of mastitis and milk quality; infectious causes and the influence of environment, milking machines and management on mastitis; pathogenesis of mastitis; cellular and humoral defense mechanisms; mastitis diagnosis and control.

Mr. Jasper, Mr. Schalm

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. (1-9) I, II, III. The Staff**

* Not to be given, 1969-70.

CLINICAL SCIENCES

Edward A. Rhode, Jr., D.V.M., *Chairman of the Department*
Department Office, 1315 Haring Hall

Professors:

- Robert M. Cello, D.V.M.
- John F. Christensen, D.V.M., Ph.D.
(Emeritus)
- John P. Hughes, D.V.M.
- John W. Kendrick, D.V.M., Ph.D.
- Blaine McGowan, Jr., D.V.M.
- William R. Pritchard, D.V.M., Ph.D., J.D.
- Edward A. Rhode, Jr., D.V.M.
- John D. Wheat, D.V.M.

Associate Professors:

- Murray E. Fowler, D.V.M.
- Jerry R. Gillespie, D.V.M., Ph.D.
- Charles A. Hjerpe, D.V.M.
- Terrell A. Holliday, D.V.M., Ph.D.
- Jack A. Howarth, D.V.M., Ph.D.
- Robert L. Leighton, V.M.D.
- Bud C. Tennant, D.V.M.
- Gordon H. Theilen, D.V.M.

Assistant Professors:

- Alexander A. Ardans, D.V.M.
- Maarten Drost, D.V.M.
- Gary O. Ewing, D.V.M.
- Ronald D. Schechter, V.M.D.
- Peter F. Suter, D.V.M., Ph.D.

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Professor:

- Joe P. Morgan, D.V.M. (*Acting*)

Assistant Professor:

- Gerald V. Ling, D.V.M. (*Acting*)

Associate Professors:

- George H. Stabenfeldt, D.V.M., Ph.D.
(Acting)
- Ira M. Courley, D.V.M., Ph.D. (*Acting*)

Lecturers:

- John C. Bartley, D.V.M., Ph.D.
- Alfred G. Edward, D.V.M.
- Laurence R. Enos, Pharm.D.
- Charles E. Grayson, M.D. (*Radiology*)
- Peggy L. Horn, D.V.M.
- Thomas G. Kawakami, Ph.D.
- Sigmund T. Rich, D.V.M.
- Alida P. Wind, M.V.D.
- Floyd W. Wilcox, M.S. (*Radiology*)

Lower Division Courses

10. Introduction to Biomedical Terminology. (2) III.

Lecture—1 hour; discussion—1 hour. An introduction to the basic terminology of animal biology and medicine, with practice in term analysis.

Upper Division Courses

102. Recognition and Identification of Poisonous Plants. (1) III.

Lecture-discussion — 1 hour. Prerequisite: sophomore standing in School of Veterinary Medicine or consent of instructor. General introduction to plant nomenclature and principles of taxonomy. Poisonous plant species will be discussed systematically according to families. The use of keys and other devices will be used to teach recognition of these species. Mr. Fowler

103. Introductory Medicine. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Pathology 122B and Physiological Sciences 140B. Lectures on the principles of clinical diagnosis of animal diseases, with special emphasis on history taking and identification and interpretation of symptoms. The laboratory will provide practice in physical examination of normal and abnormal animals.

Mr. Rhode

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff (Mr. Rhode in charge)

Graduate Courses

202. Laboratory Animal Preventive Medicine. (2) I.

Lecture—2 hours; discussion—optional. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Lectures and discussion of the principles of animal facility design, husbandry and legal aspects of laboratory animal care.

Mr. Edward, Mr. Rich, Mr. Bustad

204A. Medicine (3) I.

Lecture—3 hours. Prerequisite: course 103. A study of the medical diseases of domestic animals. The Staff (Mr. Ewing in charge)

204B. Medicine. (4) II.

Lecture—4 hours. Prerequisite: course 204A. A study of the medical diseases of domestic animals. The Staff (Mr. Howarth in charge)

204C. Medicine. (3) III.

Lecture—3 hours. Prerequisite: course 204B. A study of the medical diseases of domestic animals. The Staff (Mr. Tennant in charge)

204D. Medicine. (5) I.

Lecture—5 hours. Prerequisite: course 204C. A study of the medical diseases of domestic animals. The Staff (Mr. Rhode in charge)

204E. Medicine. (3) II.

Lecture—3 hours. Prerequisite: course 204D. A study of the medical diseases of domestic animals. The Staff (Mr. Holliday in charge)

204F. Medicine. (3) III.

Lecture—3 hours. Prerequisite: course 204E. A study of the medical diseases of domestic animals. The Staff (Mr. Hjerpe in charge)

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 courses 204 and 250. Some special techniques of neurological examination, electroencephalography, electromyography, and neuroradiography. Discussions emphasizing the anatomical, physiological, and pathological basis of the techniques and interpretation of the results.

Mr. Holliday

206. Clinical Oncology. (2) II.

Lecture—1 hour; laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. A study of neoplastic diseases of animals. Mr. Theilen

207. Ecological Factors of Animal Disease. (1) III.

Lecture—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.

Mr. McGowan

208. Advanced Small Animal Surgery. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. A comprehensive review of the surgical diseases encountered with particular attention to those of the cat. Illustrated by slides, demonstrations, and current cases from the Veterinary Medical Teaching Hospital.

Mr. Leighton

209. Reproduction in the Equine. (1) II.

Lecture—1 hour. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. A discussion of special problems of equine reproduction with emphasis on methods of diagnosis and the interpretation of clinical and laboratory findings. Mr. Hughes

210A. Medical Rounds. (1) I.

Laboratory—2 hours. Prerequisite: course 103. Discussion of selected cases from the clinic. The Staff (Mr. Holliday in charge)

210B. Medical Rounds. (1) II.

Laboratory—2 hours. Prerequisite: course 204A. Discussion of selected cases from the clinic. The Staff (Mr. Holliday in charge)

210C. Medical Rounds. (1) III.

Laboratory—2 hours. Prerequisite: course 204B. Discussion of selected cases from the clinic. The Staff (Mr. Holliday in charge)

211A. Medical Rounds in Laboratory Animal Medicine. (1) I.

Laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Cases from the campus Experimental Animal Resource Facility as well as the Primate Center and Radiobiology Laboratory will be selected for discussion of history, interpretation of symptoms, treatment and disposition.

The Staff (Mr. Edward in charge)

211B. Medical Rounds in Laboratory Animal Medicine. (1) II.

Laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Cases from the campus Experimental Animal Resource Facility as well as the Primate Center and Radiobiology Laboratory will be selected for discussion of history, interpretation of symptoms, treatment and disposition.

The Staff (Mr. Edward in charge)

211C. Medical Rounds in Laboratory Animal Medicine. (1) III.

Laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Cases from the campus Experimental Animal Resource Facility as well as the Primate Center and Radiobiology Laboratory will be selected for discussion of history, interpretation of symptoms, treatment and disposition.

The Staff (Mr. Edward in charge)

212. Special Problems in Bovine Medicine. (2) II.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Economics and husbandry practices of the California cattle-feeding industry are outlined. Potential contributions by the practicing veterinarian to the success of the individual cattlefeeder are explored, with emphasis on the "herd approach" and disease prevention.

Mr. Hjerpe

213. Veterinary Ophthalmology. (2) III.

Lecture—2 hours. Prerequisite: course 204E or consent of instructor. Selected topics relating to the eye and its diseases.

Mr. Cello

214. Ophthalmic Surgery. (1) III.

Laboratory—2 hours. Prerequisite: consent of instructor. Techniques of eye surgery in domestic animals.

Mr. Cello

215. Selected Topics in Zoo Medicine. (2) III.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Lectures or selected topics related to the health of zoo animals. These will include nutritional requirements, housing, sanitation, restraint, anesthesia, surgery, and specific disease problems.

Mr. Fowler

220. Introductory Surgery. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Pathology 122C, Physiological Sciences 140B. Principles of surgery and surgical technique.

Mr. Leighton, Miss Wind

221. Large Animal Surgery. (5) II.

Lecture—5 hours. Prerequisite: course 220. Surgical diseases of large animals.

Mr. Wheat
Miss Wind, Mr. Gourley

230. Reproduction, Genital Diseases and Obstetrics. (6) I.

Lecture—5 hours; laboratory—3 hours. Prerequisite: Pathology 122C, Physiological Sciences 140B. A course in the diagnosis, treatment, and control of diseases affecting the reproductive organs; the normal and disturbed physiology of reproduction; and obstetrics.

Messrs. Drost, Hughes, Kendrick, Stabenfeldt

231. Pathophysiology of Mammalian Reproductive Processes. (3) III.

Lecture—3 hours. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. Physiological and pathological aspects of reproductive failure in mammals concerning gonadal function, fertilization, implantation, prenatal mortality, neonatal mortality, environmental factors, anatomical and hereditary defects, intersexuality and behavior.

Mr. Stabenfeldt

249. Clinics. (Summer) (2-8).

Diagnosis and treatment of animal diseases. Students are responsible for case records, care of patients, physical examinations, and participation in surgery. Laboratory exercises in restraint, diagnostic and therapeutic procedures and surgical techniques.

The Staff (Mr. Rhode in charge)

250A. Clinics. (8) I.

Laboratory—24 hours. Prerequisite: courses 204C, 220, 230, 260.

The Staff (Mr. Rhode in charge)

250B. Clinics. (8) II.

Laboratory—24 hours. Prerequisite: courses 204C, 220, 230, 260.

The Staff (Mr. Rhode in charge)

250C. Clinics. (7) III.

Laboratory—21 hours. Prerequisite: courses 204C, 220, 230, 260.

The Staff (Mr. Rhode in charge)

260. Radiology. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 103, 220. The physics and practical operation of x-ray and fluoroscopic equipment; the development and interpretation of radiographs, radiation therapy, and radiobiology.

Mr. Morgan

261. Special Radiographic Procedures. (3) I, II, III.

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 260 or consent of instructor. The theory of selected radiographic techniques, contrast media, and special radiographic equipment.

Mr. Morgan

262. Advanced Radiographic Interpretation.

(1-3) I, II, III.

Discussion—1-3 hours. Prerequisite: course 260 or consent of instructor. Principles of radiographic interpretation in the diagnosis of disease of small and large animals. Current cases will be utilized when possible.

Mr. Morgan

263. Advanced Radiation Therapy. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 260 or consent of instructor. Principles of radiation therapy. The application of X-, beta-, and gamma-radiation on selected clinic cases.

Mr. Morgan

270. Jurisprudence and Law for the Veterinarian.

(1) II.

Lecture—1 hour. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. The student is introduced to the principles of veterinary medical jurisprudence and the legal concepts pertinent to professional activities.

Mr. Pritchard

280. Advanced Pulmonary Physiology. (3) II.

Lecture—3 hours. Prerequisite: Comparative Physiology 120B, Physiology 210 or Physiological Sciences 141B. Advanced study of physiology of mammalian respiration with emphasis on mechanisms of ventilation, gas distribution, diffusion and blood perfusion.

The Staff (Mr. Gillespie in charge)

280L. Advanced Pulmonary Physiology. (1) II.

Laboratory—4 hours. Prerequisite: Comparative Physiology 120B, Physiology 210 or Physiological Sciences 141B. Advanced study of physiology of mammalian respiration with emphasis on mechanisms of ventilation, gas distribution, diffusion and blood perfusion. Laboratory exercises illustrate modern functional concepts and procedures.

The Staff (Mr. Gillespie in charge)

290. Seminar in Veterinary Medicine. (1) I, II, III.

The Staff (Mr. Gillespie in charge)

298. Group Study. (1-2) I, II, III.

The Staff (Mr. Rhode in charge)

299. Research. (1-9) I, II, III.

The Staff (Mr. Rhode in charge)

CONSUMER ECONOMICS—See Family and Consumer Sciences**DESIGN—See Family and Consumer Sciences****DRAMATIC ART***, Chairman of the Department*

Douglas McDermott, Ph.D., Vice Chairman of the Department

Department Office, 222 Dramatic Art

Professor:

'Theodore J. Shank, Ph.D.

Associate Professors:

Everard d'Harnoncourt, Ph. D.

Daniel E. Snyder

Alan A. Stambusky, Ph.D.

Assistant Professors:

Gene A. Chesley, M.A.

Douglas McDermott, Ph.D.

'Alfred A. Rossi, Ph.D.

Robert K. Sarlos, Ph.D.

Lecturers: ◇ ◇ ◇

George Cozyris, M.A.

Phyllis Kress, M.F.A.

Howard Poyourow, M.A.

Donald West, B.A.

David P. Wyatt, B.A.

Major Adviser.—Mr. McDermott.

Lower Division Courses.—Twenty-four quarter units in Dramatic Art consisting of the following: 10A, 10B, 10C (Principles of Acting); 20 (Introduction to Dramatic Art); 24 (Visual Aspects of Dramatic Art); and 27 (Creative Principles 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); 158A, 158B (World Drama); 159 (Contemporary Drama); 160A (Principles of Playwriting); either 127B (Principles of Directing) or 160B (Principles of Playwriting).

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.

To qualify for graduation, each major student will be required to pass a comprehensive examination in Dramatic Art, administered during the third quarter of the student's senior year. In some instances, with the adviser's consent, the student may petition to substitute a thesis for

part or all of the comprehensive examination. The thesis may be based upon a research project or upon a creative project in acting, design, directing, or playwriting.

In addition each major student is required to participate in departmental dramatic productions.

Teaching Major.—The requirements for the teaching major are the same as for the undergraduate major.

Teaching Minor.—At least 30 quarter units, including Dramatic Art 10A, 10B, 20, and 24; and 127A–127B and two courses from the sequence 158A, 158B, 159. Participation in departmental dramatic productions is recommended.

Subject Representative: Mr. Stambusky.

Master of Arts Degree**Graduate Adviser.**—Mr. d'Harnoncourt

Candidates who meet the requirements of the Graduate Division and the Department of Dramatic Art will be admitted to graduate studies. After admission, students will be required to complete a background examination in Dramatic Art.

Candidates for the degree must complete the following requirements:

1. At least one graduate course in each of the following groups:

Group A: Dramatic Art 230, 232, 234, 235, 240, 242, 244.

Group B: Dramatic Art 250, 259, 265.

Group C: Dramatic Art 210, 224A, 224B, 227, 228, 260.

Group D: Dramatic Art 280, 299.

2. Graduate students who lack experience in some phase of dramatic production will be given assignments to make up their deficiencies. Beyond this, student participation, while highly encouraged, is voluntary.

3. A reading knowledge of French or German (or another language approved by the Department). Demonstration of the student's ability to apply his knowledge of that language in a graduate course will satisfy the foreign language requirement.

4. The requirements of one of the following plans must be fulfilled:

¹ Absent on leave, 1969-70.

* Absent on leave, spring quarter 1970.

Plan I

Candidates must complete a minimum of 30 units of upper division and graduate courses in Dramatic Art and allied fields, take an oral examination lasting not less than two hours, and submit a thesis that has been approved by the faculty committee in charge. The thesis may be of either type described below:

The Creative Thesis records an artistic accomplishment involving research and public performance in one of the following areas: Acting, Design, Directing, or Playwriting.

The Research Thesis presents the results of an historical or critical investigation of an important aspect of Dramatic Art.

Plan II

Candidates must complete a minimum of 36 units in Dramatic Art and allied fields, of which at least 18 are in graduate courses, and take a written comprehensive examination not less than nine hours in length.

Master of Fine Arts and Doctor of Philosophy Degrees

For information regarding these programs, contact 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.

Lower Division Courses**10A. Principles of Acting. (4) I, II.**

Lecture—2 hours; laboratory—4 hours. The physical and psychological resources for acting; fundamentals of creative mime, improvisation, stage speech and movement. Reading and analysis of selected plays to illustrate principles involved. Field trips included.

Mr. Poyourow, Mr. West

10B. Principles of Acting. (4) II, III.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 10A. Methods of characterization in the realistic style. Reading and analysis of contemporary plays; theory and practice of acting with emphasis on realistic and naturalistic character analysis and interpretation. Field trips included.

Mr. Poyourow, Mr. West

10C. Principles of Acting. (4) III.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 10B or consent of instructor. Methods of characterization in non-realistic styles. Reading and analysis of plays of differ-

ent types and forms selected from various periods; theory and practice of acting with emphasis on period styles. Field trips included.

Mr. Poyourow

15. The Art of the Cinema. (4) I, III.

Lecture—3 hours; laboratory—2 hours. The cinema as an art form; its relation to other arts; its evolution with emphasis on the significant modern contributions.

Mr. Cozyris

20. Introduction to Dramatic Art. (4) I, III.

Lecture—3 hours; discussion—1 hour. Understanding and appreciation of plays in their cultural contexts. The plays will be selected from the major periods of dramatic art.

Mr. McDermott,

24. Visual Aspects of Dramatic Art. (4) III.

Lecture—3 hours; laboratory—2 hours. Understanding and appreciation of the visual aspects of dramatic art: theatre architecture, scenery, lighting, costume, and makeup.

Mr. Snyder

27. Creative Principles of Dramatic Art. (4) II.

Lecture—4 hours. Understanding and appreciation of both the distinctive and collaborative contributions of playwright, actor, director, and designer to the total work of dramatic art.

30. Theatre Laboratory. (1-5) I, II, III.

Prerequisite: consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit up to a total of 8 units.

The Staff

Upper Division Courses**110. Advanced Acting. (4) I.**

Lecture—2 hours; laboratory—4 hours. Prerequisite: courses 10A, 10B and 10C, and consent of instructor. Advanced theory and practice of acting with emphasis on special problems. Detailed study of the Stanislavski system of acting and other acting theories. Field trips included.

Mr. Rossi

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.

Mr. Cozyris

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.

Mr. Chesley

124B. Principles of Theatrical Design. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 124A. Analysis of plays in terms of scene design, elements of design, execution of designs for modern and period plays.

Mr. Snyder

124C. Principles of Theatrical Design. (3) III.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 24; or consent of instructor. Theories of lighting the stage, equipment and control systems, execution of lighting plots.

Mr. Chesley

124D. Principles of Theatrical Design. (3) III.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 24; or consent of instructor. Source materials for theatrical costuming, selecting fabrics, elements of design, analysis of plays in terms of costume design, execution of designs for modern and period plays. Miss Kress

***125. History of Scene Design and Staging Methods. (4) II.**

Lecture—4 hours. Study of scenic developments from the Renaissance to the present.

Mr. Sarlos

127A. Principles of Directing. (5) I.

Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: courses 10A and 10B. The director's creative approach to the play and to its staging.

Mr. Stambusky

127B. Principles of Directing. (3) II.

Lecture—1 hour; laboratory—2 hours; rehearsal. Prerequisite: course 127A. The director's creative approach to the actor.

Mr. Stambusky

***150. American Drama. (4) III.**

Lecture—4 hours. Selected plays and the history of the theatre from ancient Greece to Neoclassicism.

Mr. Sarlos

158A. World Drama. (5) I.

Lecture—4 hours; papers and conferences. Selected plays and the history of the theatre from ancient Greece to Neoclassicism. Mr. Sarlos

158B. World Drama. (5) II.

Lecture—4 hours; papers and conferences. Selected plays and the history of the theatre from Neoclassicism to Naturalism. Mr. Sarlos

159. Contemporary Drama. (5) III.

Lecture—4 hours; papers and conferences. Selected plays and the history of the theatre from Naturalism to the present. Mr. McDermott

160A-160B. Principles of Playwriting. (4-4) I-II.

Lecture-Seminar—4 hours. Prerequisite: two courses in Dramatic Art or related courses in other departments. Analysis of dramatic structure; preparation of scenarios; the composition of plays.

Mr. d'Harnoncourt

165. Dramatic Theory and Criticism. (4) III.

Lecture—Seminar—4 hours. Changing concepts of drama from Aristotle to the present.

Mr. McDermott

180. Theatre Laboratory. (1-5) I, II, III.

Prerequisite: upper division standing and 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

198. Directed Group Study. (1-4) I, II, III.

Lecture—1-4 hours. Prerequisite: consent of instructor.

The Staff

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

(1-5) I, II, III.

Prerequisite: consent of instructor. The Staff

Graduate Courses**200. Methods and Materials in Theatre Research. (4) I.**

Seminar—3 hours. Essential research tools in theatre and related fields; bibliographies, primary sources; methods of evaluating and presenting evidence; delineating research areas in the field.

Mr. Sarlos

210. Special Problems in Advanced Acting. (4) II.

Seminar—2 hours; laboratory—4 hours. Study of specialized advanced-acting problems arising from differences in the type and style of dramatic production as they relate to the history, theory, and practice of acting through the ages.

Mr. Rossi

224A. Advanced Principles and Theories of Theatrical Design. (4) I.

Seminar—3 hours. Selected problems in the visual and auditory aspects of theatrical production.

Mr. Snyder

224B. Advanced Principles and Theories of Theatrical Design. (4) II.

Seminar—3 hours. Selected problems in the design of stage scenery and costumes; practice in design.

Mr. Chesley

224C. Advanced Principles and Theories of Theatrical Design. (4) III.

Seminar—3 hours. Design of a production for three different types of theatres: open stage, arena, and proscenium.

Mr. Snyder

227. Advanced Directing. (4) III.

Seminar—2 hours; laboratory—2 hours. Advanced directing techniques; specialized procedures in styles of drama. Projects in directing scenes from dramas of different types and periods.

Mr. Stambusky

* Not to be given, 1969-70.

228. Seminar in Directing. (4) II, III.

Seminar—3 hours. Prerequisite: course 227; or consent of instructor. Development of directorial conceptions for hypothetical contemporary productions of classical and modern plays.

Mr. Rossi

***230. Greek and Roman Theatre. (4) I.**

Seminar—3 hours. The classical theatre, with emphasis on the relationship of the dramas of the period to the physical circumstances under which they were produced.

Mr. Sarlos

232. Medieval Theatre. (4) I.

Seminar—3 hours. The theatre and drama of the Middle Ages; the significant liturgical and secular influences upon the evolution of dramatic art from the fall of the Roman Empire to the Renaissance. Offered in even-numbered years.

Mr. Stambusky

***234. Theatre of the Italian Renaissance. (4) II.**

Seminar—3 hours. The Italian theatre after the rediscovery of classical antiquity, with emphasis on courtly spectacles and the emergence of a theatrical tradition characterized by proscenium arch, unified perspective setting, and changeable scenery. Offered in odd-numbered years.

Mr. Sarlos

***235. Elizabethan-Jacobean Theatre. (4) III.**

Seminar—3 hours. The theatre under the Tudors and Stuarts, with emphasis on the dominant dramatic and theatrical traditions and the relationship between the plays and the physical circumstances under which they were performed.

Mr. Sarlos

240. French Seventeenth-Century Theatre. (4) I.

Seminar—3 hours. The theatre under Louis XIII and Louis XIV. The manifestation of the classical ideal. Special study of the dramatic productions of plays by Corneille, Racine, and Molière. Offered in even-numbered years.

Mr. d'Harnoncourt

***242. English Restoration and Eighteenth Century Theatre. (4) I.**

Seminar—3 hours. The history of the British

ECOLOGY (A Graduate Group)

R. S. Loomis, Ph.D., *Chairman of the Group*
Group Office, 271 Hunt Hall

Graduate Courses**201A. Ecological Theory. (3) I.**

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology. The 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

theatre in its attempt to accommodate such changes as the rise of sentiment in the drama, the dominance of the middle-class in the audience, and the introduction of changeable scenery. Offered in odd-numbered years.

Mr. McDermott

244. The European Theatre of the Eighteenth and Nineteenth Centuries. (4) III.

Seminar—3 hours. The development of such dramatic genres as domestic tragedy and melodrama, and the corresponding rise of scenic illusion, with the culmination of these trends in romanticism and realism.

Mr. Sarlos

***250. Realism in the Contemporary Theatre. (4) I.**

Seminar—3 hours. The realistic drama in its theatrical context.

Mr. Sarlos

259. Contemporary Nonrealistic Trends in the Theatre. (4) II.

Seminar—3 hours. Nonrealistic drama in the twentieth century and related movements in the theatre.

Mr. d'Harnoncourt

260. Advanced Playwriting. (4) I, II, III.

Seminar—3 hours. Dramatic structure, character, and dialogue. Advanced projects in playwriting.

Mr. d'Harnoncourt

***265. Theory of Dramatic Art. (4) I.**

Seminar—3 hours. Theory and aesthetic principles of dramatic art as a fine art.

Mr. McDermott

280. Theatre Laboratory. (1-12) I, II, III.

Advanced practice in acting, design, directing, playwriting, and technical theatre.

The Staff

298. Group Study. (1-4) I, II, III.

Seminar—1-3 hours. Prerequisite: consent of instructor.

The Staff

299. Individual Study. (1-12) I, II, III.

The Staff

environment and its fluctuations. (Same course as Botany, Geology and Zoology 201A.)

The Staff (Mr. Salt and Mr. Major in charge)

201B. Analysis of A Selected Ecosystem. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: 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

* Not to be given, 1969-70.

in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit. (Same course as Botany, Geology and Zoology 201B.) The Staff (Mr. G. L. Webster in charge)

201C. The Changing Biosphere. (3) III.

Lecture—2 hours; 1 assigned problem. Pre-requisite: courses 201A, 201B; or consent of in-

structor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical and physical changes on living systems, changes in species diversity, effects on human population increase, and related topics. (Same course as Botany, Geology and Zoology 201C.) The Staff (Mr. Myrup in charge)

ECONOMICS

Frank C. Child, Ph.D., *Chairman of the Department*

Department Office, 378 Voorhies Hall

Professors:

Frank C. Child, Ph.D.
Bruce Glassburner, Ph.D.
Thomas Mayer, Ph.D.

Associate Professors:

Andrzej Brzeski, Ph.D.
Hiromitsu Kaneda, Ph. D.
Martin P. Oettinger, Ph.D.
Tsung-yuen Shen, Ph.D.
Elias H. Tuma, Ph.D.
Henry Y. Wan, Jr., Ph.D.
Leon L. Wegge, Ph.D.

Assistant Professors:

Kenneth D. Goldin, Ph.D.
W. Eric Gustafson, Ph.D.

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Assistant Professor:

Victor P. Goldberg, M.A. (*Acting*)

Lecturer:

C. Daniel Vencill, M.A.

Departmental Major Advisers.—Mr. Brzeski, Mr. Goldberg, Mr. Goldin, Mr. Gustafson, Mr. Kaneda, Mr. Oettinger, Mr. Vencill.

Graduate Advisers.—Mr. Glassburner, Mr. Oettinger, Mr. Shen, Mr. Tuma, Mr. Wan, Mr. Wegge.

The American History and Institutions requirement may be satisfied in part by Economics 111. (See also page 32).

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. 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 requirement. Approval from a

departmental adviser is required in all such cases. 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 are strongly urged to take Mathematics 15, 16A, and 16B.

Upper Division Courses.—Required: A total of 36 units of economics including (1) Economics 100A, 100B, 101A, 101B; (2) either Economics 110A, 110B, or 111; and (3) one of the following sequences of courses: 110A–110B, 110A–111, or 110B–111; 115A–115B; 116–117; 121A–121B; 130A–130B; 135A–135B–135C; 150–151, or 150–152; 160–161.

It is recommended that Economics 100A, 100B, 101A, and 101B be taken during the junior year; 101A and 101B may be taken before, concurrently with, or prior to 100A or 100B. Except under extraordinary circumstances, not more than three economics courses may be taken in any one quarter.

Graduate Study.—Students who meet the admission requirements of the Graduate Division and the Department of Economics may pursue studies leading to the M.A. and Ph.D. degrees. Fields of emphasis for graduate study include: Economic Theory, Monetary Economics, Economic Development, Economic History, International Economics, Labor Economics, Industrial Organization, Economic Systems, Public Finance, Mathematical Economics, and Quantitative Methods (Econometrics).

For information about admission to graduate study, degree requirements, and financial aid, students should consult the *Announcement of the Graduate Division* and contact the chairman of the departmental graduate committee.

Teaching Major and Minor.—Economics is acceptable for the secondary credential.

Teaching Major.—Same as for the undergraduate major for the A.B. degree.

Teaching Minor.—Thirty units in economics including Economics 1A, 1B; or 2A, 2B, 2C; and 12. The student should consult with the subject representative.

Subject Representative: Mr. Brzeski.

Lower Division Courses**1A. Principles of Economics. (5) I, III.**

Lecture—3 hours; discussion—2 hours. Prerequisite: courses 1A and 1B may be taken in either order. Analysis of the allocation of resources and the distribution of income through a price system; competition and monopoly; the role of public policy; comparative economic systems. ———, Mr. Child

1B. Principles of Economics. (5) II, III.

Lecture—3 hours; discussion—2 hours. Prerequisite: courses 1A and 1B may be taken in either order. Analysis of the economy as a whole; determinants of the level of income, employment, and prices; money and banking, economic fluctuations, international trade, economic development; the role of public policy. ———, Mr. Vencill

2A-2B-2C. Principles of Economics. (4-3-3)

I-II-III.

Lecture—3-2-2 hours; discussion—1-1-1 hour. Same as Economics 1A and 1B. Students enrolling for a full year of Principles of Economics must complete either 1A-1B or 2A-2B-2C. ———, Mr. Gustafson

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. ———

11B. Elementary Accounting. (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 11A. Continuation of course 11A. ———

12. Introduction to Quantitative Methods in Economics. (5) I, III.

Lecture—4 hours; laboratory—2 hours. Prerequisite: two years of high school algebra. Not open to students having credit for Mathematics 13 or Psychology 3. Methods of analyzing quantitative economic data including descriptive statistics; sampling and statistical inference index numbers, correlation, and time series. Emphasis on the logic of procedures, interpretation, and application. ———, Mr. Brzeski, Mr. Gustafson

38. Group Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. The Staff

39. Individual Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. The Staff

49. Lower Division Seminar. (1-3) III.

Seminar—1-3 hours. Prerequisite: lower division standing; consent of instructor. The Staff

Upper Division Courses**100A. Micro Theory: Welfare and Competition. (3) I, II.**

Lecture—3 hours. Prerequisite: courses 1A and 1B; or consent of instructor. Price and distribution theory; the firm and the industry under conditions of perfect competition; welfare economics. ———, Mr. Kaneda, ———

100B. Micro Theory: Imperfect Competition. (3) II, III.

Lecture—3 hours. Prerequisite: course 100A. Price and distribution theory; the firm and the industry under conditions of monopoly, imperfect competition, and bilateral monopoly; economic welfare considerations. ———, Mr. Shen, Mr. Kaneda

101A. Macro Theory: Statics. (3) I, III.

Lecture—3 hours. Prerequisite: courses 1A and 1B; or consent of instructor. Theory of income, employment, and prices under static conditions. ———, Mr. Vencill

101B. Macro Theory: Dynamics. (3) I, II.

Lecture—3 hours. Prerequisite: courses 12 and 101A. Theory of income, employment, and prices under dynamic conditions; analysis of economic fluctuations and growth. ———, Mr. Wan

102. Advanced Economic Theory. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A and one course in calculus. Mathematical analysis in economic theory; determinants of the aggregate level of output and employment and the allocation of resources. Includes advanced value and distribution theory and a brief examination of modern monetary theory. ———, Mr. Wan

103. Theory of Economic Optimization and Dynamic Processes. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100B, 101A; Mathematics 16A, 16B (may be taken concurrently). Study of the analytical concepts used in characterizing optimal decision for consumers and firms. Elements of activity analysis. Theory of dynamic systems used in business cycle theory, inflation and economic growth. ———, Mr. Wegge

105. History of Economic Thought. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B; or consent of instructor. Historical survey of economic doctrine: the Classical School and its antecedents, Neoclassical thought, criticism of classical thought, emergence of modern economic thought. ———, Mr. Glassburner

110A. Economic History. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B or consent of in-

structor. Survey of economic change in Europe prior to the year 1700; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

110B. Economic History. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B 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.

111. Economic History. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B 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.

115A-115B. Economic Development. (4-4) I-II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B. Theories of economic development and underdevelopment, economic policy for growth and development. Contemporary and historical case studies.

Mr. Glassburner

116. Economic Systems. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B; or consent of instructor. Critical examination of major economic systems, their goals and institutions; capitalism, fascism, and varieties of socialism; problems of economic planning in USSR, India, China, and other industrializing economies.

Mr. Brzeski

117. The Soviet Economy. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B; or consent of instructor. Survey of Soviet economic development: economic organization, methods of planning, and performance.

Mr. Brzeski

121A. Industrial Organization. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B; or consent of instructor. An appraisal of the role of competition and monopoly in the American economy; market structure, conduct, and economic performance of a variety of industries.

Mr. Goldberg

121B. Industrial Organization. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 121A. Public policy in a private enterprise economy; antitrust and other policies toward industry; economies of regulated industries.

Mr. Goldberg

125. Urban Economics. (4) II.

Lecture—3 hours; discussion—1 hour. Pre-

requisite: courses 1A, 1B. The structure of the metropolitan economy. The process of urban economic growth. Major problems such as: urban poverty and decay, housing, transportation, land-use planning and financing public services.

130A-130B. Economics of the Public Sector. (4-4) I-II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B; or consent of instructor. Impact of the public sector on income, employment, prices, allocation of resources, and distribution of income; related topics such as the budgetary process, public debt, revenue and expenditure problems, fiscal institutions.

Mr. Goldin, Mr. Goldberg

134. Corporation Finance. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A and 1B; or consent of instructor. 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.

135A. Money, Income, and Monetary Policy. (3) I.

Lecture—3 hours. Prerequisite: courses 1A and 1B; or consent of instructor. Monetary institutions, the banking system, money creation, the Federal Reserve System, the tools of monetary policy.

Mr. Vencill

135B. Money, Income, and Monetary Policy. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 101A and 135A. Monetary theory; the impact of changes in the quantity of money and of liquid assets on money income.

Mr. Vencill

135C. Money, Income, and Monetary Policy. (3) III.

Lecture—3 hours. Prerequisite: course 135B. Evaluation of monetary policy, its impact on the economy and past performance, the problem of inflation.

Mr. Mayer

150. Trade Unions and the Labor Market. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A-1B; or consent of instructor. Theory and philosophy of labor movements in America, Western Europe and the developing world. The structure and government of labor unions. Current labor market issues.

Mr. Oettinger

***151. Wage Determination. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A and 101A; or consent of instructor. The theory and practice of wage determination on the micro and macro level. The impact of legal minimum wages. Wage-price and wage-employment relationships. Offered in odd-numbered years.

Mr. Oettinger

* Not to be given, 1969-70.

152. Labor and Public Policy. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 150; or consent of instructor. The economic impact of labor legislation. Collective bargaining, strikes, dispute settlement and Government intervention. Manpower and welfare programs. Offered in even-numbered years.

Mr. Oettinger

16A, 16B; or consent of instructor. Macrodynamic theory of income, employment, and prices.

Mr. Shen

201. History of Economic Thought. (4) III.

Lecture—3 hours; discussion—1 hour. Development of economic thought from classical Greece to modern times.

Mr. Shen

202. Topics in Economic Theory. (4) I.

Seminar—4 hours. Prerequisite: courses 200A, 200B, 200C, 200D; or consent of instructor. Recent developments in economic theory.

Mr. Wegge

203A. Advanced Economic Theory. (4) II.

Seminar—4 hours. Prerequisite: course 200B. Advanced topics in the theory of the firm; distribution theory; welfare economics.

Mr. Wan

***203B. Advanced Economic Theory. (4) III.**

Seminar—4 hours. Prerequisite: courses 200B and 200C. General equilibrium theory; capital theory; growth theory.

Mr. Wan

207. Special Topics in Mathematical Economics. (4) III.

Seminar—3 hours. Prerequisite: courses 203A and 203B or consent of instructor. Advanced topics in mathematical economics. Contents may vary from one year to another.

Mr. Wan

210A. Economic History. (4) I.

Seminar—3 hours. Method and theory of economic history. Critical analysis of the methodology of economic history and theories of economic change as illustrated by major economic phenomena drawn from the history of different countries.

Mr. Tuma

210B. Economic History. (3) II.

Lecture-discussion—3 hours. Problems in economic history of the eastern hemisphere from the beginning of the Middle Ages up to the end of the eighteenth century; emphasis on Europe.

Mr. Tuma

210C. Economic History. (3) III.

Lecture-discussion—3 hours. Problems in economic history of the eastern hemisphere since the eighteenth century; emphasis on England, France, and Germany.

Mr. Tuma

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.

215A-215B. Economic Development. (4-4) I-II.

Lecture—3 hours; discussion—1 hour. Theories of economic development, policies for growth, problems from selected areas.

Mr. Glassburner

* Not to be given, 1969-70.

160. International Trade. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B; or consent of instructor. International trade theory: impact of trade on the domestic and the world economies; public policy toward external trade. Mr. Kaneda

161. International Finance. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B; or consent of instructor. International money and capital markets and their impact on the domestic and world economies; international financial institutions and policies.

Mr. Kaneda

190. Senior Seminar. (5) III.

Seminar—4 hours. Prerequisite: open only to economics majors with senior standing; consent of instructor. Selected topics in economic analysis and public policy.

Mr. Gustafson

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

Prerequisite: consent of instructor; upper division standing.

The Staff

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

The Staff

Graduate Courses**200A. Economic Theory. (4) II.**

Lecture—3 hours; laboratory—2 hours. Prerequisite: Mathematics 16A or consent of instructor. Price and value theory; behavior of firms and households under competitive conditions; price determination, resource allocation, and income distribution; fundamentals of welfare economics.

Mr. Kaneda

200B. Economic Theory. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: courses 103 and 200A; Mathematics 16A, 16B; or consent of instructor. A continuation of course 200A with reference to non-competitive conditions.

Mr. Wegge

200C. Economic Theory. (4) I.

Lecture—3 hours; laboratory—2 hours. Microstatic theory of income, employment, and prices.

Mr. Mayer

200D. Economic Theory. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: courses 103 and 200C; Mathematics

216. Economic Systems. (4) II.

Lecture—4 hours. Comparative study of economic systems, with reference to their organization and institutions, their values and goals, and their economic performance. Mr. Brzeski

217. Economics of Planning. (4) III.

Lecture—4 hours. Theories and principles of economic planning under various economic systems. Mr. Brzeski

218. Development Programming. (4) III.

Seminar—3 hours. Prerequisite: courses 215B and 217; Mathematics 15 and 16B. Analytical formulation of growth and development goals including the optimal growth models; problems and practices in implementing such development policies. Mr. Shen

221A. Industrial Organization. (4) II.

Lecture—2 hours; seminar—2 hours. Analysis of market structure, business behavior, and economic performance under conditions of limited government interference. Mr. Goldberg

221B. Industrial Organization. (4) III.

Lecture—2 hours; seminar—2 hours. Prerequisite: course 221A. Social standards and public policies toward the business sector of the economy. Mr. Goldberg

230. Public Finance. (4) I.

Lecture—2 hours; seminar—2 hours. Role of the public sector; tax and expenditure theories; related topics. Mr. Goldin

231. Problems of the Public Sector. (4) III.

Lecture—2 hours; seminar—2 hours. Prerequisite: course 230. Public sector institutions, problems, and policies. Mr. Goldin

235A-235B-235C. Monetary Economics. (3-3-3)**I-II-III.**

Lecture—3 hours. Monetary theory, policy, and problems. Mr. Mayer

EDUCATION

Julius M. Sassenrath, Ph.D., *Chairman of the Department*

Douglas L. Minnis, Ed.D., *Head of Teacher Education*

Dorothy S. Blackmore, Ed.D., *Associate Head of Teacher Education*

Department Office, 228 Voorhies Hall

Professors:

Hugh C. Black, Ph.D.

Julius M. Sassenrath, Ph.D.

Assistant Professors:

V. Kenneth Shrable, Ph.D.

Leroy F. Troutner, Ph.D.

George D. Yonge, Ph.D.

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240A. Econometrics: Principles. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103; Mathematics 130B or 131C (Mathematics 131C may be taken concurrently). General linear model, auto-correlation, multicollinearity, heteroscedasticity. Simultaneous equation problems. Mr. Wegge

240B. Econometrics: Advanced Topics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A and Mathematics 131C, or consent of instructor. Special problems in the theory and the applications of econometrics. Mr. Wegge

250A. Labor Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 150 and 151. Philosophy and theory of the labor movement; union structure and organization under changing labor market conditions; labor market issues. Mr. Oettinger

250B. Labor Economics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 150 and 151. Theory of the labor market; analysis of wage-employment, wage-investment, and wage-price relationships. Mr. Oettinger

260A. International Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Economic structure and factors that underlie international trade; policies for regulating external trade. Mr. Child

260B. International Economics. (4) II.

Lecture—3 hours; discussion—1 hour. Significance of international transactions for the national income; international monetary mechanisms. Mr. Child

299. Individual Study. (1-6) I, II, III.

The Staff

Lecturers in and Supervisors of Teacher Education:

Harvey L. Barnett, M.A.

Dorothy S. Blackmore, Ed.D.

Larry D. Estes, M.A.

Maryann E. Gatheral, B.A.

Robert E. Hapworth, M.A.

R. Ross Hempstead, Ph.D.

Burt Liebert, M.F.A.

Raymond J. Lippincott, M.A.
 Walter T. Mara, M.S.
 Douglas L. Minnis, Ed.D.
 Victor A. Perkes, Ed.D.
 Shirley J. Skinner, M.A.

Credentials Counselors:

Elementary.—Mr. Barnett, Mrs. Blackmore,
 Mrs. Gatheral, Mr. Hapworth, Mr. Lippincott,
 Mrs. Skinner.

Secondary.—Mr. Estes, Mr. Hempstead, Mr.
 Mara, Mr. Liebert, Mr. Perkes.

Junior College.—Mr. Mara.

Curricula for Teacher Education.—(See page 157). For a statement of complete requirements and appointments with credential counselors, apply to the departmental office. Applicants for the intern program should consult the department early in the fall quarter of the senior year.

Required courses in the "Professional Preparation" part of the requirements:

For Secondary Teaching: courses 320A (for student teachers, as early as junior year; for interns, spring quarter of senior year), 110, 120, 320C, and 320E.

For Elementary Teaching: courses 110, 120, 300, 302, 303, 330A, 330C, and 330E.

Lower Division Courses**20. Field Experiences in Education. (1) I, II, III.**

Seminar—1 hour; 3-hour field experience each week. A course to improve the field work of volunteers and teacher candidates who tutor and counsel educationally disadvantaged children in schools and study centers. May be repeated three times for credit. Mr. Liebert

38. Directed Group Study. (1-5) II.

Lecture—2 hours; discussion—2 hours.

The Staff (Mr. Liebert in charge)

Upper Division Courses**110. Introduction to Educational Psychology. (4) I, II, III.**

Lecture—4 hours. Prerequisite: Psychology 1A. The learning process; physical, mental, and social development; individual differences and their measurement; mental hygiene; the role of the teacher in guidance and counseling.

Mr. Sassenrath, Mr. Shrable, Mr. Yonge

114. Quantitative Methods in Educational Research. (4) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: two years of high school algebra. Problems and methods in data analysis. Design of research projects. Emphasis will be on procedures suited to digital computers. Mr. Yonge

119. Tests and Measurements. (4) II.

Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). A critical survey

of teacher-made and standardized tests; principles and functions of measurement in education, current practices in school marks; supervised work in test administration, scoring, and interpretation.

Mr. Yonge

120. Educational Sociology. (4) I, II, III.

Lecture—4 hours. The school as a social institution; historical development of purposes and programs of education; the role of the teacher.

Mr. Black, Mr. Troutner

163. Guidance and Counseling. (4) III.

Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). Nature and scope of pupil personnel services; basic tools and techniques of guidance; theory and practice of counseling psychology, with emphasis on educational and vocational adjustment. Mr. Shrable

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

Prerequisite: consent of instructor.

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.**Graduate Courses****201. History and Philosophy of Education: Ancient Period. (4) I.**

Lecture—2 hours; seminar—2 hours. The scope, influence, and significance of the major educational ideas from selected ancient societies and cultures with emphasis upon the historical and philosophical contexts.

Mr. Price

202. History and Philosophy of Education: Middle Period. (4) II.

Lecture—2 hours; seminar—2 hours. The scope, influence, and significance of the major educational ideas from selected societies and cultures of the middle period (through the eighteenth century) with emphasis upon the historical and philosophical contexts.

Mr. Price

203. History and Philosophy of Education: Modern Period. (4) III.

Lecture—2 hours; discussion—2 hours. A critical analysis and study of the contemporary educational scene from the historical and philosophical perspectives.

Mr. Troutner

210. Learning and Instruction. (3) I.

Seminar—3 hours. Prerequisite: course 110 or equivalent and consent of instructor. Critical readings and seminar reports of selected problems and procedures in the experimental study of learning and instruction.

Mr. Sassenrath

211. Thinking and Problem Solving. (3) II.

Seminar—3 hours. Prerequisite: course 110 or equivalent and consent of instructor. Critical consideration of thinking with special reference to concept development, problem-solving, home, school, and personality influences.

Mr. Yonge

219. Advanced Educational Measurement. (3) III.

Seminar—3 hours. Prerequisite: course 119 or equivalent and consent of instructor. Critical study and evaluation of an advanced level of measurement procedures used in educational research, including such topics as test theory, item analysis, and factor analysis. Mr. Sassenrath

290. Seminar. (3) I, II, III.

Seminar—3 hours.

The Staff

299. Research. (1-6) I, II, III.

The Staff

Professional Courses**300. Reading and Language Arts in the Elementary School. (4) I, II, III.**

Lecture—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. Principles, procedures and curriculum materials for the teaching of reading and the oral and written language arts. Includes phonics and other developmental reading skills.

Mrs. Blackmore, Mrs. Skinner, Mrs. Gatheral

302. Elementary School Curriculum: Social Studies. (2) I, II, III.

Lecture—2 hours. Current conceptions of the elementary school curriculum, with emphasis on the contributions from the social sciences and on effective teaching methods.

Mr. Lippincott, Mr. Minnis

303. Elementary School Curriculum: Science. (2) II, III.

Lecture—2 hours. Current conceptions of the elementary school curriculum with emphasis on the role of science and on effective teaching methods.

Mr. Hapworth

313. Middle Grade School Curriculum: Science and Social Science. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. Current conception of middle grade school curriculum and effective teaching in science and social science. Mr. Perkes, Mr. Estes

***320A. Introduction to Teaching in Secondary Schools. (2) I, II, III.**

Lecture—1 hour; discussion—1 hour. Lectures, conferences, and field work in secondary teaching. Observations and participation in some form of public school work.

Mr. Estes, Mr. Mara, Mr. Minnis

***††320C. Supervised Teaching in Secondary Schools. (4-12) I, II, III.**

Prerequisite: course 320A; course 320E must be taken concurrently. Directed teaching for candidates for the secondary credential. May be repeated for credit up to a total of 12 units.

The Staff

††320E. Methods of Teaching in Secondary Schools.

(2) I, II, III.

Lecture—2 hours. Prerequisite: course 320A; course 320C must be taken concurrently. Methods of teaching in the secondary school; selection, organization, and evaluation of teaching materials including the use of audio-visual aids and the services of counseling and guidance programs. May be repeated for credit up to a total of 4 units.

The Staff

323. Secondary School Curriculum: Science. (2) I.

Lecture—2 hours. Current conceptions of secondary school curriculum and effective teaching in the biological and physical sciences.

Mr. Perkes

***330A. Introduction to Teaching in Elementary Schools. (2) I, II, III.**

Lecture—1 hour; discussion—1 hour. Lectures, conferences, and field work; observation of and participation in classroom activities in the public elementary schools. Mrs. Blackmore

***††330C. Supervised Teaching in Elementary Schools. (4-12) I, II, III.**

Prerequisite: course 330E must be taken concurrently. Directed teaching for candidates for the elementary credential.

The Staff

***††330E. Methods of Teaching in Elementary Schools. (1-2) I, II, III.**

Lecture—1-2 hours. Prerequisite: course 330C must be taken concurrently. Selection, organization, and evaluation of teaching materials including audio-visual aids. May be repeated for credit up to a total of 3 units.

The Staff

***††340. Supervised Teaching in Junior Colleges. (5) I, II, III.**

Discussion—1 hour. Prerequisite: consent of instructor. Directed teaching for candidates for the standard teaching credential with specialization in junior college teaching.

The Staff

341. Teaching in the Junior College. (3) II.

Lecture—3 hours. Prerequisite: consent of instructor. The junior college: organization and functions, role in higher education, characteristics of students, trends and issues in curricula, instructional procedures and materials.

Mr. Mara

^a Students must make their own transportation arrangements for observations and student teaching.

^b 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, 1969, will begin on or about September 2. For the spring quarter, they will end on or about June 5. Students should make arrangements accordingly.

ENGINEERING

Roy Bainer, M.S., *Dean of the College*

Clyne F. Garland, M.S., *Associate Dean of the College*

John B. Powers, Ph.D., *Associate Dean of the College*

College Office, 2132 Engineering I



Assistant Professors:

John R. Beljan, M.D. (*School of Medicine*)

Phillip R. Yarnell, M.D. (*School of Medicine*)

Lower Division Courses

1. Plane Surveying. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: plane trigonometry. Not open to students in Engineering. Principles of measurement of horizontal distances, horizontal angles, elevations and leveling, including stadia methods. Field problems, including mapping with special reference to agricultural and landscaping applications.

Mr. Goss

3. Introduction to Engineering Systems. (3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 21A (may be taken concurrently). An introduction to the profession of engineering. A study of selected engineering problems. Field trips may be scheduled.

Mr. Brush

4. Engineering Graphics in Design. (3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: mechanical drawing. Principles of descriptive geometry and of mechanical and free-hand drawing; their application in the representation, visualization and solution of engineering problems. Introduction to engineering design.

Mr. J. M. Henderson

5A. Engineering Applications of Computers. (3) II, III.

Lecture—2 hours; discussion—1 hour. Prerequisite: Mathematics 21B (may be taken concurrently); Physics 4A (may be taken concurrently); not open for credit to students who have completed Mathematics 30. Introduction to digital computer structure, computer languages, and time sharing systems; programming digital computers with applications to engineering problems of both numerical and non-numerical natures.

Mr. Loomis, Mr. Kozdrowicki

17. Circuits. (3) I, III.

Lecture—3 hours. Prerequisite: Mathematics 22B (may be taken concurrently); Physics 4C. Basic circuit analysis techniques; transient and steady-state solutions using differential equations.

Mr. LaPatra, Mr. Owen

35. Statics. (3) I, II, III.

Lecture—3 hours. Prerequisite: Mathematics 21C; Physics 4A. Force systems and equilibrium conditions with emphasis on engineering problems.

The Staff

45. Properties of Materials. (4) I, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: sophomore standing in engineering. An introductory course on the properties of engineering materials and their relation to the internal structure of the materials.

Mr. Mukherjee, Mr. Moon

Upper Division Courses

100. Electronics. (2) I, II.

Lecture—2 hours. Prerequisite: course 17. Characteristics of vacuum and semiconductor devices; graphical analysis and the development of small signal equivalent circuits.

Mr. LaPatra, Mr. Hsia

101. Electrical Laboratory. (2) I, II.

Laboratory—6 hours. Prerequisite: course 100 (may be taken concurrently). Laboratory use of basic electronic devices and measuring instruments. Problem topics include passive and active circuits, electromechanical devices, signal analysis, and nonlinear components.

Mr. Owen

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.

Mr. J. M. Henderson

102B. Dynamics. (3) II, III.

Lecture—3 hours. Prerequisite: course 102A. Topics in rigid body dynamics; elementary dynamics of vibrating systems; introduction to energy methods.

Mr. J. M. Henderson

103A. Elementary Fluid Mechanics. (3) I, II.

Lecture—3 hours. Prerequisite: course 102A. Fluid properties; fluid statics; continuity and linear momentum equations for control volumes; flow of incompressible fluids in pipes; dimensional analysis; laminar, transition, and turbulent flow regimes.

Mr. Dwyer

103B. Elementary Fluid Mechanics. (3) II, III.

Lecture—3 hours. Prerequisite: course 103A. Potential flow; open channel flow; boundary layer flow; one dimensional compressible flow.

Mr. Dwyer

104A. Mechanics of Materials. (3) I, II.

Lecture—3 hours. Prerequisite: course 35; Mathematics 22A, 22B, 22C (may be taken concurrently). Concepts of stress, strain, elasticity; stress and deformation analysis for axially loaded members, torsion of round shafts, bending and shear of beams; combined stresses.

The Staff

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

105A. Thermodynamics. (3) I, II.

Lecture—3 hours. Prerequisite: Mathematics 22B, 22C. Equations of state and thermodynamics of one-component systems; first and second laws; phase equilibria.

Mr. Giedt

105B. Thermodynamics. (3) II.

Lecture—3 hours. Prerequisite: course 105A. Gas mixtures; work-producing and work-absorbing cycles (vapor and gas); measures of performance. Recent developments.

Mr. Giedt

106. Engineering Economics. (3) II.

Lecture—3 hours. Prerequisite: senior standing in engineering. The analysis of problems in engineering economy; the selection of alternatives; replacement decisions. Compounding, tax, origins and cost of capital, economic life, and risk and uncertainty are applied to methods of selecting most economic alternatives.

Mr. Hart

122. Introduction to Mechanical Vibrations. (3) I.

Lecture—3 hours. Prerequisite: course 102B. Free and forced vibrations in lumped-parameter systems with and without damping; vibrations in coupled systems; electromechanical analogs; use of energy conservation principles.

Mr. Kemper

180. Engineering Analysis. (3) I.

Lecture—3 hours. Prerequisite: senior standing in engineering. The analysis of steady-state and nonsteady-state problems for discrete and continuous systems; analytic and approximate solutions. Typical engineering problems in heat transfer, fluid mechanics, electrical networks, mechanical vibrations, and elasticity.

Mr. McKillop

ENGINEERING: AGRICULTURAL—See also Agricultural Engineering**ENGINEERING: AGRICULTURAL**

John R. Goss, M.S., *Chairman of the Department*
Department Office, 2030 Engineering I

Professors:

Roy Bainer, M.S. (*Engineering and Agricultural Engineering, Emeritus*)

John R. Goss, M.S.

Samuel A. Hart, Ph.D.

S. Milton Henderson, M.S.

Robert A. Kepner, B.S.

Loren W. Neubauer, Ph.D., (*Engineering and Agricultural Engineering*)

183. Intermediate Mechanics of Materials. (3) II.

Lecture—3 hours. Prerequisite: course 104B; Mathematics 24. Stresses and deformations of curved beams; beams on elastic foundations; torsion of non-circular bars; introduction to plates and shells; thick-walled cylinders.

Mr. Hutchinson

184. Experimental Stress Analysis. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 104B. Experimental methods for the analysis of stress and strain, including photoelasticity, brittle lacquers, mechanical and electrical strain gages and instrumentation.

Mr. Beadle

186. Heat Transfer. (4) I, III.

Lecture—4 hours. Prerequisite: course 103B (may be taken concurrently). Fundamental concepts of heat transfer: conduction, convection and radiation.

Mr. Whitaker

187. Introduction to Theory of Elasticity. (3) I.

Lecture—3 hours. Prerequisite: course 104B. Fundamental equations of elasticity in three dimensions; plane stress and plane strain; flexure and torsion of bars of various shapes.

Mr. Hutchinson

188. Physical Metallurgy Principles. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 45, 105A; Physics 4B. The physical principles in metallurgy are outlined. The elementary theory of metals, rate of approach to equilibrium, thermal behavior of metals, structure and free energy of alloy phases, diffusion phenomenon and strengthening mechanisms in solids are discussed.

Mr. Mukherjee

190. Professional Responsibilities of Engineers.**(3) II, III.**

Lecture—2 hours; discussion—1 hour. Organization of the engineering profession; engineering and management; introduction to contracts, specifications, and business law; oral presentations by class members on the interaction between engineering and society.

Mr. Kemper

**Professors:**

William J. Chancellor, Ph.D.

Robert B. Fridley, M.S.

Michael O'Brien, Ph.D., (*Agricultural Engineering*)

Wesley E. Yates, M.S. (*Agricultural Engineering*)

Associate Professors:

¹Roger E. Garrett, M.S. (*Agricultural Engineering*)

^{2, 3}Stanton R. Morrison, Ph.D. (*Agricultural Engineering*)

Assistant Professor:

Leonard O. Myrup, Ph.D.

Lecturers:

Pictiaw (Paul) Chen, Ph.D.

Joe P. Gentry, M.S.

Henry E. Studer, M.S.

Upper Division Courses

114. Principles of Farm Machinery. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 102B. Functional requirements, basic principles, and performance characteristics of field machines; cost analysis; general design considerations; laboratory studies and tests with specific machines. Mr. Kepner

116. Agricultural Power. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 105B. Sources and systems for supplying energy to agricultural operations: internal combustion engines; fuels; electric power; solar energy; power transmission systems; muscle physiology; traction and vehicle mechanics; implement control systems.

Mr. Chancellor

117. Developing and Evaluating Farm Machines. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 114; Mechanical Engineering 118. Design procedures; effects of biological factors, labor requirements, crop values, and annual use upon the design approach; designing a production unit; hydraulic controls and power transmission in farm machines; testing and evaluating machine performance and durability.

Mr. Gentry

118. Development Engineering. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mechanical Engineering 118 (may be taken concurrently). Failure modes; determination of the causes of systems malfunction by analysis of interactions and variations in effects; experiment design; development procedures.

Mr. Studer

125. Agricultural Structures and Sanitation. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 35 and 104A. Functional and material requirements of storage and pro-

duction structures; lighting, heating, insulating, and ventilating; water supply and sanitation for the farm home and for animal structures; methods and economics of farm waste disposal.

Mr. Neubauer

126. Design of Agricultural Structures. (3) III.

Lecture—3 hours. Prerequisite: course 125; Civil Engineering 131A. Agricultural building loads and codes; design with steel, concrete, and timber; glued-laminated and plywood box beams; pole buildings and connections; lumber rigid frames; arches.

Mr. Neubauer

132. Unit Operations in Agricultural Processing. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103A and 105A. Thermodynamics and mass transfer principles applied to such processes as drying, dehydration, refrigeration, size reduction, separation, and materials handling.

Mr. Henderson

141. Engineering Properties of Agricultural Materials. (3) I.

Lecture—2 hours; laboratory—3 hours. Selected topics, with emphasis on mechanical and rheological properties and design applications. Techniques for measuring and recording static and dynamic properties.

Mr. Fridley

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

Prerequisite: consent of the instructor.

The Staff (Mr. Kepner in charge)

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

The Staff

Graduate Courses

215. Soil-Machine Relations in Tillage and Traction. (3) II.

Lecture—3 hours. Prerequisite: courses 114 and 116; Civil Engineering 171 and Soil and Water Science 101 recommended. Mechanics of interactions between agricultural soils and tillage and traction devices; determination of relevant physical properties of soil; analyses of stresses and strains in soil due to machine-applied loads; experimental and analytical methods for synthesizing characteristics of overall systems.

Mr. Chancellor

225. Advanced Agricultural Structures Design. (3) II.

Lecture—3 hours. Prerequisite: course 126. Recommended: Civil Engineering 132B and 132C. Critical evaluation of codes as applied to agricultural structures; safe design criteria, load sharing, and statistical reliability concepts; computer analysis of indeterminate wood structures; stressed skin construction; ultimate strength design in reinforced concrete; applications of new materials and methods.

¹Absent on leave, 1969-70.

²Absent on leave, fall quarter 1969.

³Absent on leave, winter quarter 1970.

235. Advanced Unit Operations in Agricultural Processing. (3) III.

Lecture—3 hours. Prerequisite: course 132 or equivalent. Basic engineering procedures applicable to agricultural processing; e.g., size reduction, fluidization of granular particles, heat and mass transfer applications to drying and freezing, respiration of biomaterials.

Mr. Henderson

with municipal and industrial wastes management; environment quality considerations.

Mr. Hart

255. Environmental Engineering in Agriculture. (3) III.

Lecture—3 hours. Prerequisite: Engineering 186. The description, methods of measurement and effect on man, animals and plants of physical environmental factors, and the design of systems for their control.

Mr. Morrison

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff (Mr. O'Brien in charge)

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

The Staff (Mr. Henderson in charge)

299. Research. (1-12) I, II, III.

The Staff

245. Agricultural Waste Management. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 125; Civil Engineering 147 recommended. The wastes problem in agriculture: types, quantities, and characteristics. Practices and procedures for wastes management; coordination of agricultural wastes management

ENGINEERING: APPLIED SCIENCE

Wilson K. Talley, Ph.D., *Acting Chairman of the Department*

John Killeen, Ph.D., *Vice-Chairman of the Department*

Department Office, 228 Walker

Professors:

- Stewart D. Bloom, Ph.D.
- Richard J. Borg, Ph.D.
- John Killeen, Ph.D.
- Edward Teller, Ph.D. (*Professor at Large*)

David N. Pipkorn, Ph.D.

Jacques B. Read, Ph.D.

Harry L. Sahlin, Ph.D.

John J. Walton, Ph.D.

Frederick O. Wooten, Ph.D.

Assistant Professors:

- Carl A. Jensen, Ph.D.
- George D. Sauter, Ph.D.
- Wilson K. Talley, Ph.D.
- Lowell L. Wood, Ph.D.

Davis**Upper Division Courses****115. Introduction to the Use of Computers.** (3) I, II, III.

Lecture—3 hours. Prerequisite: Engineering 5A; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.

Mr. Talley, Mr. Jensen

Professor:

- Richard F. Post, Ph.D. (*In Residence*)

Lecturers:

- Berni J. Alder, Ph.D.
- Frank M. Chilton, Ph.D.
- Sidney S. Fernbach, Ph.D.
- Joseph A. Fleck, Ph.D.
- John G. Fletcher, Ph.D.
- John C. Garrison, Ph.D.
- Michael W. Guinan, Ph.D.
- Laurence Hall, Ph.D.
- William G. Hoover, Ph.D.
- Tony Huen, Ph.D.
- Montgomery H. Johnson, Ph.D.
- Roger N. Keeler, Ph.D.
- Ray E. Kidder, Ph.D.
- Cecil E. Leith, Ph.D.
- Gilbert Leppelmeier, Ph.D.
- Kenneth G. Moses, Ph.D.

135A. Introductory Nuclear Science and Technology. (3) II.

Lecture—3 hours. Prerequisite: Physics 121 or equivalent. Interaction of gamma rays, electrons, and heavy particles with matter; energy loss and multiple scattering formulae and their application in various media. Introductory aspects of nuclear phenomena: nuclear masses, size, energies, and decay modes.

Mr. Sauter

144. Introduction to Nuclear Technology. (3) III.

Lecture—3 hours. Prerequisite: course 135A. Nuclear reactions and their applications: nuclear energy sources, radiation detection; nuclear instrumentation. Nuclear particle accelerators. High vacuum technology.

Mr. Sauter

Graduate Courses**230A-230B-230C. Structure of Matter.**

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 110C. Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative effects. Mr. Jensen

240A-240B-240C. Nuclear Reactor Analysis.

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 110C. The physical concepts and mathematical techniques used in the analysis of nuclear reactors. Mr. Sauter

245A-245B. Nuclear Reactor Systems. (3-3) I-II.

Lecture—3 hours. Prerequisite: course 240A. Those aspects of fluid dynamics, thermodynamics, heat transfer, and thermal stress analysis that apply to the engineering design of nuclear reactors. Radiation shielding, fuel cycles, and isotope separation. Mr. Sauter

246. Nuclear Explosives: Phenomenology. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 220A. The phenomenology of nuclear explosives; the theoretical and empirical laws for such effects; the scientific uses of such phenomena. Offered in odd-numbered years. Mr. Talley

260A-260B. Statistical Theory of Equilibrium and Transport Phenomena. (3-3) I-II.

Lecture—3 hours. Prerequisite: courses 110A and 120B. Statistical mechanical formulation of thermodynamics with application to the various states of matter. Statistical foundation of irreversible phenomena; evaluation of the transport coefficients in fluids and metals. Mr. Talley

271. Electrodynamics of Continuous Media. (3) I.

Lecture—3 hours. Prerequisite: course 230A; Electrical Engineering 230A; Chemistry 110A. Solutions of Maxwell's equations in continuous media. Stresses and mechanical potentials of matter in constant and time varying fields. Thermodynamically based phenomenological description of electromagnetic fields in matter. Quantum mechanical interpretation of the properties of conductive and dispersive media. Mr. Chilton

290. Seminar. (1-2) I, II, III.

Seminar—2 hours.

The Staff

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

Lecture—1-5 hours. Such topics as neutron physics, nuclear technology, advanced hydrodynamics, plasma physics, or advanced mathematics. The Staff

299. Research. (1-12) I, II, III.

The Staff

Livermore**Upper Division Courses****105. Special Topics in Applied Science. (2) I.**

Lecture—2 hours. Use of laws and concepts covered in undergraduate curricula in applied science. The variety of subjects covered will include problems of space physics, a discussion of gravity and capillary waves, and some problems in optics such as lasers. Mr. Teller

110A. Vectors and Tensors. (4) I.

Lecture—4 hours. Prerequisite: ordinary differential equations. Algebra and calculus of finite and infinite dimensional vectors; orthonormal functions; introduction to linear equations. Mr. Killeen

110B. Complex Variables and Calculus of Variations. (4) II.

Lecture—4 hours. Prerequisite: course 110A. Analytic functions; contour integrals; power series, conformal mapping; Laplace transform; calculus of variations. Mr. Killeen

110C. Linear Equations. (4) III.

Lecture—4 hours. Prerequisite: course 110B. Solution of linear algebraic, differential, and integral equations by orthonormal expansion and Green's functions; approximation methods. Mr. Killeen

115. Introduction to the Use of Computers. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5A; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems. Mr. Wood

120A-120B. Chemistry for Physicists and Engineers. (3-3) I-II.

Lecture—3 hours. Prerequisite: Chemistry 1C; Mathematics 22B. Concepts of chemistry and physical chemistry, including atomic and molecular structure and the properties of liquids and solids. Mr. Borg

123A-123B-123C. Structural Chemistry. (1-1-1) I-II-III.

Lecture—1 hour. Prerequisite: freshman chemistry and modern physics. A factual descriptive course relating chemical and physical properties of substances to their molecular or crystal structure. Selected examples of organic compounds, minerals, refractory oxides and carbides, and complex ions. Generalizing correlations between structure, chemical reactivity, solubility, melting temperatures, etc. Mr. Borg

135A. Introductory Nuclear Science and Technology. (3) I.

Lecture—3 hours. Prerequisite: Physics 121 or equivalent. Interaction of gamma rays, electrons, and heavy particles with matter; energy

loss and multiple scattering formulae and their application in various media. Introductory aspects of nuclear phenomena: nuclear masses, size, energies, and decay modes. Mr. Bloom

135B-135C. Introductory Nuclear Science and Technology. (2-2) II-III.

Lecture—2 hours. Prerequisite: course 135A. Radiation detection, charged particle technology, radiation chemistry, neutron technology, magnetic moment and spin measurement, vacuum technology. Mr. Bloom

Graduate Courses

210A-210B-210C. Advanced Mathematical Methods.

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 110C. Classification of partial differential equations, elliptic and hyperbolic equations, initial value problems in two or more independent variables, difference and Monte Carlo methods; applications to problems in hydrodynamics, magnetohydrodynamics, shock waves, transport theory, and plasma physics. Mr. Killeen

211. Computer Mathematics. (3) I.

Lecture—3 hours. Prerequisite: course 110C; 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 systems. Mr. Fletcher

212A-212B. Computer Languages. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 211. The basic tools in the use of computers for processing data are covered. These include common subroutines such as sorting and filing, assemblies and relocatable codes, algorithmic notations and construction of algorithms. Considerations evolving from special hardware are discussed. Mr. Fletcher

213A. Switching Theory. (3) II.

Lecture—3 hours. Prerequisite: course 211. This course will cover minimization techniques, switching function realization with electronic circuits, trees, storage devices, and elementary sequential machines. Mr. Fletcher

213B. Computing Machines. (3) III.

Lecture—3 hours. Prerequisite: course 212A. This course will cover computing machine organization, memory systems, arithmetic units and input-output systems. Mr. Fletcher

214. Computing with Symbolic Expressions. (3) I.

Lecture—3 hours. Prerequisite: course 211. Theory and practice of computing with symbolic expressions. The LISP programming language, function composition, conditional expressions,

recursive functions. Writing programs to manipulate symbolic expressions. Interpreters, compilers, proving the equivalence of algorithms. Survey of symbol manipulation languages.

Mr. Fletcher

215. Artificial Intelligence. (3) II.

Lecture—3 hours. Prerequisite: course 211. An organized description of attempts to get computers to behave intelligently. Programs play games, solve problems, prove theorems, and deduce answers to questions from given facts. Programs that learn to make evaluations and to recognize patterns.

216. Automata Theory. (3) III.

Lecture—3 hours. Prerequisite: course 212A. This course will cover the elements of finite automata including models, graphical and table representation, equivalence, minimization, identification. Time permitting, infinite automata will be introduced and computability discussed.

220. Physical Chemistry of Solids. (3) III.

Lecture—3 hours. Prerequisite: courses 120B, 260B. Equations of state—heterogeneous equilibria—phase diagrams—two-body potential functions, the Debye model statistical thermodynamics of solid solutions, phase transformations and order—disorder phenomena—surface thermodynamics. Mr. Borg

221A-221B-221C. Materials Science. (3-3-3)

I-II-III.

Lecture—3 hours. Prerequisite: courses 120B, 260B. The facts and theories of crystal defect physics and their application to such problems as the mechanical properties of solids, radiation damage, phase transformations, etc. Covers thermodynamics of point defects, diffusion, elasticity dislocation theory.

Mr. Borg, Mr. Guinan

230A-230B-230C. Structure of Matter.

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 110C. Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative effects. Mr. Johnson

231A-231B-231C. Theory of the Solid State.

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 230C. Structure binding and mechanical properties of crystals; dielectrics, electrons in metals, metals and alloys; magnetism, superconductivity, and semiconductors. Mr. Leppelmeier

232. Solid-State Electronics. (3) I.

Lecture—3 hours. Prerequisite: course 231C. Theory of semiconductors and semiconductor devices (transport properties, optical properties,

p-n junctions, transistor devices, and surface states). An introduction to microwave magnetic devices and superconducting memory devices.

Mr. Huen

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.

Mr. Bloom

237A-237B. Neutron Physics. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 135A. Properties of neutrons, cross-sections and nuclear structure, fast neutrons, neutron resonances, fission process, thermal neutrons, neutron optics, diffraction, applications of neutron diffraction and optics to studies of the structure of matter. Offered in odd-numbered years.

Mr. Sauter

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.

Mr. Read

243A-243B. Nuclear Technology. (3-3) II, III.

Lecture—3 hours. Prerequisite: courses 135A and 110C. Physics of chain reacting systems, neutron diffusion theory, neutron moderation, transport theory, homogeneous reactors statics and dynamics, instrumentation and control, critical assemblies, pulsed neutron techniques, prompt burst reactors. Offered in even-numbered years.

Mr. Sauter

250A-250B. Continuum Mechanics. (3-3) I-II.

Lecture—3 hours. Prerequisite: course 110C. Tensor notation, algebra, and analysis. Theory of elasticity, stress-strain relation, strain energy, reciprocity laws, elastic waves. Hydrodynamics of incompressible and compressible flows in two and three dimensions.

251. Geophysical and Stellar Hydrodynamics. (3) III.

Lecture—3 hours. Prerequisite: course 250B. Hydrodynamics and thermodynamics of fluids in gravitational fields with applications to the atmosphere, the ocean, and stellar models. The role of convection and radiation transport. The use of numerical models. Offered in even-numbered years.

252. Turbulence. (3) III.

Lecture—3 hours. Prerequisite: course 250B. Definition, kinematics, and dynamics of turbulent flows. Hydrodynamic instability. Equilibrium theory for isotropic turbulence. Convection, diffusion, and Reynolds stress, magneto-hydro-

dynamic turbulence of plasmas. Two-dimensional turbulence with geophysical applications. Offered in odd-numbered years.

260A-260B. Statistical Theory of Equilibrium and Transport Phenomena. (3-3) III-I.

Lecture—3 hours. Prerequisite: courses 110A and 120B. Statistical mechanical formulation of thermodynamics with application to the various states of matter. Statistical foundation of irreversible phenomena; evaluation of the transport coefficients in fluids and metals. Mr. Hoover

261A. Advanced Statistical Mechanics. (1) I.

Lecture—1½ hours. Prerequisite: course 260B. The application of high speed computers to the study of equilibrium and non-equilibrium systems by the Monte Carlo and molecular dynamic techniques.

Mr. Sahlin

261B. Advanced Statistical Mechanics. (1) II.

Lecture—1½ hours. Prerequisite: course 260B. A discussion of the experimental study of the properties of matter at high temperatures and pressures with high explosive techniques.

Mr. Sahlin

261C. Advanced Statistical Mechanics. (1) III.

Lecture—1½ hours. Prerequisite: course 260B. A theoretical approach to the properties of matter with emphasis on astrophysical and geophysical application.

Mr. Sahlin

262. Advanced Statistical Thermodynamics. (3) II.

Lecture—3 hours. Prerequisite: course 260B. Formulation of thermodynamics of many-component systems through the grand partition function. Distribution functions. Cluster expansion and condensation. Monte Carlo. Molecular dynamics.

Mr. Hoover

263. Material Properties at High Pressures and Temperatures. (3) III.

Lecture—3 hours. Prerequisite: course 262. Theory of the properties of matter at extremely high pressure and temperatures. Terrestrial and astrophysical applications.

Mr. Keeler

266. Quantum Optics. (4) III.

Lecture—4 hours. Prerequisite: course 230C. Quantum theory of radiation; quantum theory of optical coherence, conditions for laser action; laser types; rate equations, density matrices; laser noise theory; parametric amplifiers, nonlinear optics, stimulated Raman and Brillouin scattering.

Mr. Fleck

270A-270B-270C. Electromagnetic Theory. (3-3) II-III-I.

Lecture—3 hours. Prerequisite: Electrical Engineering 131B; ordinary differential equations. Electromagnetic field theory; physical properties of dielectrics and conductors; magnetic properties of materials, steady and quasi-steady currents; propagation of electromagnetic waves in vacuum and through matter.

275A-275B-275C. Plasma Physics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 270C. The basic equations governing the behavior of a fully ionized plasma in a magnetic field; simple plasma configurations in controlled fusion research and space applications. Theory of plasma waves and instabilities. Transport coefficients and radiation phenomena. Mr. Moses

277. Plasma Kinetic Theory. (3) I.

Lecture—3 hours. Prerequisite: course 275B. The derivation of plasma kinetic equations; turbulence; fluctuations; advanced radiation and transport phenomena. Mr. Bodner

278. Waves and Radiation in Plasmas. (3) III.

Lecture—3 hours. Prerequisite: course 275B. Theory of propagation of waves in hot and cold magneto-plasmas; relation of wave theory to plasma instabilities; radiation processes, in-

cluding collective effects, bremsstrahlung, synchrotron radiation and radiation from partially ionized atoms.

279. High-Temperature Plasmas. (3) I.

Lecture—3 hours. Prerequisite: course 275B. Confinement and stability of high temperature plasmas in open and closed magnetic-field structures. Application to controlled-fusion research and space plasmas.

290. Seminar. (1-2) I, II, III.

Seminar—2 hours. The Staff

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

299. Research. (1-12) I, II, III

The Staff

ENGINEERING: CHEMICAL

J. M. Smith, Sc.D., *Chairman of the Department*
Department Office, 3094 Engineering I

Professor:

J. M. Smith, Sc.D.

Associate Professor:

Stephen Whitaker, Ph.D.

Assistant Professors:

Richard L. Bell, Ph.D.

Neil A. Dougherty, Ph.D.

Benjamin J. McCoy, Ph.D.

Lower Division Courses**38. Directed Group Study. (1-5) I, II, III.**

Prerequisite: consent of instructor. Group study of selected topics. Students may enroll in more than one section. The Staff

39. Special Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. The Staff

49. Freshman Chemical Engineers' Seminar: The Scope of Chemical Engineering. (1) II.

Seminar—1 hour. Demonstrations and discussions of the opportunities in chemical engineering for service to society and contributions to basic knowledge, as well as professional development. The Staff (Mr. Bell in charge)

Upper Division Courses**151. Material and Energy Balances. (3) I.**

Lecture—3 hours. Prerequisite: Chemistry 110A (may be taken concurrently). Use of principles of conservation of mass and energy in chemical process calculations. Mr. Dougherty

152A. Chemical Engineering Thermodynamics. (3) II.

Lecture—3 hours. Prerequisite: course 151; Chemistry 110A. Application of principles of thermodynamics to chemical processes. Mr. Bell

152B. Chemical Engineering Thermodynamics. (3) III.

Lecture—3 hours. Prerequisite: course 152A. Continuation of course 152A. Mr. Smith

154A. Mass Transfer. (3) I.

Lecture—3 hours. Prerequisite: Engineering 186 (may be taken concurrently); Chemistry 110A. Fundamental concepts of mass transfer in fluids. Problems in pure diffusion and convective mass transfer. Mr. Bell

154B. Applications of Mass Transfer. (3) II.

Lecture—3 hours. Prerequisite: course 154A. Application of the principles of mass transfer and thermodynamic equilibrium to absorption, extraction, distillation and other separation processes. Mr. Bell

155A. Chemical Engineering Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 154A; course 154B (may be taken concurrently). Laboratory experiments in heat, mass, and momentum transfer and in chemical kinetics. The Staff

155B. Chemical Engineering Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 155A. Continuation of course 155A. The Staff

156A. Chemical Engineering Kinetics. (3) II.

Lecture—3 hours. Prerequisite: course 152B, 154A; and Chemistry 110C (may be taken concurrently). Chemical kinetics and introduction to homogeneous and heterogeneous reactor design. Mr. Smith

156B. Chemical Engineering Kinetics. (3) III.

Lecture—3 hours. Prerequisite: course 156A. Continuation of course 156A. Mr. Dougherty

157. Chemical Engineering Process Dynamics. (3) III.

Lecture—3 hours. Prerequisite: courses 154B, 156A. A study of the transient state, the stability and control of chemical process systems. Mr. Bell

158. Chemical Engineering Process Design. (3) III.

Lecture—3 hours. Prerequisite: courses 154B and 156A. Chemical Engineering process design; optimization and economics. Mr. Bell

159. Chemical Engineering Analysis. (3) I.

Lecture—3 hours. Chemical engineering applications of partial differential equations, tensors, systems of linear equations, and operational calculus. Mr. Whitaker

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

Prerequisite: senior standing in engineering with at least a B average. Student groups may be organized in instrumentation and design problems. Students may enroll in one or more separate subjects. The Staff

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

Prerequisite: consent of instructor. The Staff

Graduate Courses**252A. Advanced Thermodynamics. (3) I.**

Lecture—3 hours. Prerequisite: course 152B or Engineering 105B. A general treatment of the first and second laws; applications of thermodynamic relationships to phase and chemical reaction equilibria; introduction to statistical thermodynamics. Mr. Smith

252B. Advanced Thermodynamics. (3) II.

Lecture—3 hours. Prerequisite: course 252A. Continuation of 252A with an emphasis on statistical thermodynamics. Mr. Dougherty

253A. Advanced Transport Phenomena. (4) I.

Lecture—4 hours. Prerequisite: Engineering 186. Tensor and vector methods in the formulation of equations of mass, momentum, energy, and entropy in continuous media with particular emphasis on fluids. Applications to the formulation of rheological equations of state for viscoelastic fluids and fluid interfaces. Mr. McCoy

253B. Advanced Transport Phenomena. (4) II.

Lecture—4 hours. Prerequisite: course 253A. Continuation of 253A, with application to both differential and integral mass, momentum, and energy balances. Radiant energy transport and heat transfer in reacting systems. Mr. McCoy

253C. Advanced Transport Phenomena. (3) III.

Lecture—3 hours. Prerequisite: course 253B. Continuation of 253B with special emphasis on multicomponent systems. The laws of molecular diffusion and energy transport, including the effects of concentration, temperature, electric and pressure fields. Convective mass transfer and chemically reacting flows. Mr. Bell

254. Molecular Theory of Transport Phenomena. (3) II.

Lecture—3 hours. The transport of mass, momentum, and energy is considered from the molecular point of view. Derivations of the Boltzmann equation are considered, and solutions for special cases are discussed. Methods for calculating transport coefficients are presented. Mr. McCoy

255A. Equilibrium Stage Processing. (3) I.

Lecture—3 hours. Prerequisite: course 154B; course 252B (may be taken concurrently). The concept of equilibrium stage processing; applications to the design of distillation, absorption, and extraction processes. Mr. Dougherty

255B. Equilibrium Stage Processing. (3) II.

Lecture—3 hours. Prerequisite: course 255A. Continuation of course 255A. Mr. Bell

256A. Applied Kinetics and Reactor Design. (3) II.

Lecture—3 hours. Prerequisite: courses 156B and 252B. Application of kinetics and molecular transport rates to the design of chemical reactors, with emphasis on homogeneous systems. Mr. Dougherty

256B. Applied Kinetics and Reactor Design. (3) III.

Lecture—3 hours. Prerequisite: course 256A. Continuation of 256A, with emphasis on convective transport and heterogeneous catalytic systems. Mr. Smith

257. Rheology of Fluids. (3) III.

Lecture—3 hours. Prerequisite: course 253A. Non-Newtonian and viscoelastic behavior of polymer materials, suspensions and emulsions. Continuum theories of stress equations for materials with and without memory. Solution of simple boundary value problems and the evaluation of rheological experiments. Mr. Whitaker

258. Chemical Process Dynamics. (3) I.

Lecture—3 hours. Prerequisite: courses 154B, 156B. Unsteady-state process analysis,

examples of first and second order process systems, coupling of mixed order processes including chemical reaction kinetics, mass and heat transfer and fluid mechanics, simulation of chemical processes.

Mr. Bell

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff

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

The Staff

299. Research. (1-12) I, II, III.

The Staff

ENGINEERING: CIVIL

Ray B. Krone, Ph.D., *Chairman of the Department*

Department Office, 2092 Engineering I

Professors:

²Jamie Amorocho, Ph.D. (*Civil Engineering and Water Science and Engineering*)

Don O. Brush, Ph.D.

Robert H. Burgy, M.S. (*Civil Engineering and Water Science and Engineering*)

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*)

Associate Professors:

James A. Cheney, Ph.D.

Leonard R. Herrmann, Ph.D.

James R. Hutchinson, Ph.D.

Ray B. Krone, Ph.D.

Theodor S. Strelkoff, Ph.D.

Assistant Professors:

Kandiah Arulanandan, 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.

Lower Division Course

10. Introduction to Surveying. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: lower division standing in the College. Theory and practice of measurements for distance, elevations, and angles; the analyses and adjustments for systematic and random measurement errors; line directions, traverse computations, horizontal and vertical curves; astronomical observations and calculations for latitude, longitude, azimuth, and time. Mr. Goss

Upper Division Courses

131A. Structural Analysis. (3) I, III.

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Structural

analysis of determinate and indeterminate beams, trusses and frames; influence lines, moving loads, deflection analysis. Mr. Romstad

131B. Structural Analysis. (2) I, II.

Lecture—2 hours. Prerequisite: course 131A. General force and displacement methods of analysis of structures; matrix notation, limit analysis. Mr. Romstad

132A. Structural Design: Metallic Elements. (3) II, III.

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Metallic beams, columns, other members; analysis and design of riveted, bolted, and welded joints; design of simple beam connections, moment resistant connections, and column base plates. Mr. Ramey

132B. Structural Design: Concrete Elements. (3) I, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 132A (may be taken concurrently). Reinforced concrete beams, columns, slabs, and footings; elastic theory and ultimate design. Introduction to prestressed concrete and plastics. Mr. Ramey

132C. Structural Design: Timber Elements. (2) III.

Lecture—2 hours. Prerequisite: course 132A. Elements of timber structures and laminated structures, including connection design. Mr. Cheney

134. Analysis and Design of Buildings. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 131A, 132B. Vertical dead and live loading; earthquake and wind forces. Building code and structural requirements for the use of timber, steel frame, reinforced concrete, and brick. Supervised classroom design. Mr. Romstad

135. Advanced Structural Analysis. (4) III.

Lecture—4 hours. Prerequisite: course 131B. Analysis of stiffened and unstiffened shell structures; limit analysis of frame structures; analysis of statically indeterminate box beams, rings, and arches. Buckling of flat plates and shells. Introduction to matrix analysis of space frames. Mr. Cheney

²Absent on leave, fall quarter 1969.

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.

Mr. Cheney

138. Dynamic Loads on Stationary Structures. (3) II.

Lecture—3 hours. Prerequisite: course 131B; Engineering 102B, 103B. Determination of loads on structures due to base movements (earthquakes), steady and non-steady aerodynamic forces (wind and blast), and impact and vibration forces; comparison of dynamic loads with stationary loads and determination of equivalent load factors.

Mr. Hutchinson

141. Engineering Hydromechanics. (3) I.

Lecture—3 hours. Prerequisite: Engineering 103B. Application of principles of mechanics to flows of heavy, incompressible fluids. Flow visualization, configuration of free surfaces, streamlines, flow nets, separation, cavitation; pressure distribution in non-uniform, unsteady flow; turbulence; surface and form drag; conduit flow. Engineering approximations.

Mr. Strelkoff

142. Water Supply. (3) I, II.

Lecture—3 hours. Prerequisite: Engineering 103B (may be taken concurrently), or consent of instructor. Study of surface and ground water supplies; analysis for prediction of surface and ground water yields; water requirements; water supply and distribution systems including dams, reservoirs, wells, pumping plants, open channels, and pipe lines; water treatment methods and processes.

Mr. Burgy

143. Water Resources Engineering. (3) II.

Lecture—3 hours. Prerequisite: course 142. Basic concepts of water resources planning; water inventories, use, and control; water conservation measures and legislation; multiple-purpose project planning; domestic and foreign water development projects; simulation, optimization, and dynamic programming studies.

Mr. Scott

144. Drainage Engineering. (3) III.

Lecture—3 hours. Prerequisite: Engineering 103B. Elements of seepage through porous media; theory of drainage; depth and spacing of drains; methods of drainage investigation; project planning for drainage; engineering analysis of surface drainage.

Mr. Luthin

145. Hydraulic System Design. (3) III.

Lecture—3 hours. Prerequisite: Engineering 103B. Principles of project planning; methods

of analysis and hydraulic design of storage systems, diversion structures, conveyance and regulation systems, and structures for irrigation, power, and flood control projects.

Mr. Amorocho

146. Hydraulic Engineering Design Laboratory. (3) III.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 145 (may be taken concurrently). Design and experimental analysis of hydraulic systems including storage, conveyance and energy dissipation structures; hydrologic considerations; irrigation and drainage systems; measurements and instrumentation.

Mr. Larock

147. Solid and Radioactive Waste Management. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 103B. Characteristics and amounts of solid wastes; collection systems; introduction to waste treatment processes and return of treated wastes to the environment. Origin, nature, and management of radioactive wastes.

Mr. Hart

148. Waterborne Waste Management. (3) II.

Lecture—3 hours. Prerequisite: course 142 (may be taken concurrently). Introduction to industrial and domestic waterborne waste collection and treatment systems; methods of treated waste release.

Mr. Schroeder

149. Air Pollution Control. (3) III.

Lecture—3 hours. Prerequisite: Engineering 103B. Origins, characteristics, and amounts of air pollutants; atmospheric reactions and behavior of airborne wastes; methods of control.

Mr. Krone

160. Highway Engineering. (3) III.

Lecture—3 hours. Prerequisite: course 171; senior standing in engineering. Highway planning, economy, surveys and plans; highway design to include highway capacity, cross section, vertical and horizontal alignment, intersections and drainage. Highway construction, grading and pavements.

Mr. Arulanandan

171. Soil Mechanics. (3) I, III.

Lecture—3 hours. Prerequisite: Engineering 104A (may be taken concurrently). Soil formations, mass-volume relationships, principle of effective stress, soil characteristics (classification and identification) compaction, capillarity and permeability, compressibility and consolidation, strength—state of stress and failure criteria.

Mr. 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.

Mr. Shen

173. Soil Mechanics and Foundation Design. (4) II.

Lecture—4 hours. Prerequisite: courses 132B and 171. Site exploration, bearing capacity, footing design, lateral earth pressures, retaining walls, slope stability, theory of consolidation and application of foundation design, methods of minimizing settlements and effect of settlement on structures.

Mr. Shen

174. Nuclear Civil Engineering Laboratory. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing in engineering. Phenomenology and potentials of nuclear explosives as a construction tool. Hazards associated with underground detonation. Laboratory experiments on radioisotope transport in groundwater, cratering with explosives, and slope stability. Offered in odd-numbered years.

Mr. Cheney, Mr. Talley

181. Plastic Analysis of Structures. (3) III.

Lecture—3 hours. Prerequisite: courses 131B, 132A. Structural behavior in the plastic range; methods of predicting strength and deformation in the inelastic range; analysis and design of continuous beams and frames; rules of practice for plastic design of structures.

Mr. Romstad

182. Prestressed Concrete. (3) II.

Lecture—3 hours. Prerequisite: course 132B. Analysis and design of prestressed concrete structures; statically determinate and indeterminate structures; principles and applications of ultimate strength; applications to buildings, bridges and tanks.

Mr. Ramey

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

Lecture—1–5 hours. Prerequisite: consent of instructor. Selected topics. Students may enroll in one or more separate sections.

The Staff (Mr. Krone in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

Lecture—1–5 hours. Prerequisite: senior standing in engineering and at least a B average.

The Staff

Graduate Courses

225. Theory of Elasticity. (3) II.

Lecture—3 hours. Prerequisite: Engineering 187. Tensor formulation of the elastic field equations. Variational principles. Introduction to nonlinear elasticity. Approximate and exact solutions for plane stress and plane strain problems. Introduction to three-dimensional problems. Offered in even-numbered years.

Mr. Herrmann

226A. Theory of Elastic Stability. (3) II.

Lecture—3 hours. Prerequisite: Engineering 187. Basic concepts of the stability of elastic systems. Adjacent-equilibrium and minimum potential energy theories of stability. Application to bars, frames, and rings.

Mr. Brush

226B. Theory of Elastic Stability. (3) III.

Lecture—3 hours. Prerequisite: courses 226A, 227. Continuation of course 226A. Application to plates and shells. Offered in even-numbered years.

Mr. Brush

227. Theory of Plates. (3) II.

Lecture—3 hours. Prerequisite: Engineering 187. Stress and deformation analysis of plates bent by transverse loads; applications to circular, rectangular, and other shapes.

Mr. Herrmann

228. Theory of Shells. (3) III.

Lecture—3 hours. Prerequisite: Engineering 187. Direct stresses in shells with axial symmetry. Applications to shell roofs, tanks, cylindrical shells, pipelines; bending stresses in shells.

Mr. Brush

229. Theory of Plasticity. (3) I.

Lecture—3 hours. Prerequisite: Engineering 187. Fundamentals of plasticity, the concept of yield and the associated constitutive equations in the theory of elastic-plastic solids. Variational theorems, the piecewise linear loading functions and related minimum principles. Application to earth structures, torsion and plane problems of plasticity. Offered in even-numbered years.

Mr. Hutchinson

230. Theory of Viscoelasticity. (3) I.

Lecture—3 hours. Prerequisite: Engineering 187. Fundamentals of viscoelasticity, representation of linear viscoelastic material behavior in integral and differential operator forms. Application to earth structure, buckling, plane and axisymmetric problems. Introduction to nonlinear viscoelasticity. Offered in odd-numbered years.

Mr. Herrmann

231. Advanced Analysis Procedures in Solid

Mechanics. (4) I.

Lecture—4 hours. Prerequisite: course 131B; Engineering 187 (may be taken concurrently). Fundamentals of the finite element and related procedures. Application to torsion, plane stress, plane strain, axisymmetric, plate and shell bending, thermal stress and soil mechanics problems. Consideration of inelastic and nonlinear problems.

Mr. Herrmann

240. Water Quality. (3) I.

Lecture—3 hours. Prerequisite: Bacteriology 2 and Mechanical Engineering 185B or equivalent; Chemistry 110A (may be taken concurrently). Water quality requirements for domestic, industrial, agricultural, and recreational and

wildlife water uses; properties of natural surface and ground waters; transport and fates of water-borne pollutants; methods of analysis; and transfer of pollutants in the aquatic food chain.

Mr. Orlob

241. Land Quality. (2) II.

Lecture—2 hours. Prerequisite: Bacteriology 2; Chemistry 110B (may be taken concurrently) and consent of instructor. Factors determining land quality for use in man's activities; origins of soil pollutants; uptake of pollutants by plants; interrelations of land and vegetation and qualities of air and water.

Mr. Krone

242. Air Quality. (3) III.

Lecture—3 hours. Prerequisite: Engineering 105A, 186; Chemistry 110B. Properties of the air and the atmosphere; atmospheric phenomena; factors determining air quality; origins, transport and degradation of atmospheric pollutants; effects of pollutants on men, plants, soil, and water.

Mr. Krone

243A. Water and Waste Treatment. (3) I.

Lecture—3 hours. Prerequisite: courses 148, 149; Mechanical Engineering 185B. Characteristics of water- and airborne-wastes; treatment processes and process kinetics; treatment system design.

Mr. Schroeder

243B. Water and Waste Treatment. (3) II.

Lecture—3 hours. Prerequisite: course 243A. Continuation of course 243A.

Mr. Schroeder

243C. Water and Waste Treatment Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 243B. Operation of model treatment units; measurements of waste and process effluent characteristics; evaluation of process parameters.

Mr. Schroeder

244. Environment Quality Management. (2) III.

Lecture—2 hours. Prerequisite: course 240, 241, 242 (may be taken concurrently). Fates of pollutants in the overall environment; requirements for environment quality; monitoring methods; environment quality control methods.

The Staff

247. Nuclear Civil Engineering. (3) III.

Lecture—3 hours. Prerequisite: Applied Science 246. The engineering uses of nuclear explosives; earthmoving for canals, harbors, highways and water resource development; mining; petroleum; desalinization. Offered in odd-numbered years.

Mr. Cheney

251. Advanced Topics in Structural Engineering. (3) I.

Lecture—3 hours. Prerequisite: course 131B; course 138 or Engineering 122. Analysis of indeterminate structures by force (flexibility) methods and by displacement (stiffness) meth-

ods; application to multistory buildings and aerospace structures; consideration of dynamic and inelastic effects; emphasis on methods suited for digital computer solution. Offered in odd-numbered years.

Mr. Romstad

252. Advanced Topics in Metal Structures. (3) II.

Lecture—3 hours. Prerequisite: consent of instructor. Residual stresses, recent developments in welded structures and high-strength bolt connections, light gage and alloy steels, aluminum and other metals; aerospace structures, three dimensional space frames. Offered in odd-numbered years.

Mr. Ramey

253. Advanced Topics in Concrete Structures. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. Advanced analysis and design of concrete folded plates, thin shells and gravity dams; yield line theory; lift slabs; effects of shrinkage and creep upon stress and deflection.

Mr. Ramey

257. Analysis of Structures under Dynamic Loading. (3) I.

Lecture—3 hours. Prerequisite: course 138. Analysis of earthquake and blast resistant structures; method of lateral forces; current research about earthquake and blast loading and structural effects. Offered in even-numbered years.

Mr. Hutchinson

271. Advanced Topics in Surface Water Hydrology. (2) III.

Lecture—2 hours. Prerequisite: course 142; Water Science 141; consent of instructor. Analysis of hydrologic processes and procedures in water supply investigations including topics in atmospheric relationships, research methods, water balances, and water yield prediction methods. Offered in odd-numbered years.

Mr. Burgy

272. Groundwater Flow and Seepage. (3) II.

Lecture—3 hours. Prerequisite: Engineering 103B. Flow of fluids through porous media. Anisotropy. Solution of steady state problems by: mathematical analysis, models, analogs, graphical methods. Dupuit-Forchheimer assumptions. Method of images. Boussinesq's equation for transient problems, solution by Laplace transform. Seepage under dams.

Mr. Luthin

273. Groundwater Hydrology. (3) III.

Lecture—3 hours. Prerequisite: course 272. Analyses and methods of groundwater development; geophysical exploration and analysis; artificial recharge concepts; hydraulics of wells, including analytical treatment of transient flow problems; and problems of well design. Numerical and experimental methods of groundwater flow.

Mr. Scott

274. Hydraulics of Pipe Lines. (3) I.

Lecture—3 hours. Prerequisite: course 141 (may be taken concurrently); Engineering 5A or equivalent, or consent of instructor. Mechanics of liquid flow in pipes and pipe network systems. Steady flow, unsteady flow, surge and water-hammer problems. Introduction to stability and resonance phenomena. Offered in even-numbered years.
Mr. Larock

276. Hydrologic Systems Analysis. (3) II.

Lecture—3 hours. Prerequisite: course 142 or Water Science 141 or equivalent; Mathematics 22A, 22B, 22C, 24. Theory and application of the methods of modern systems analysis and mathematical statistics to problems of hydrological prediction. Emphasis on current developments in parametric and stochastic hydrologies.
Mr. Amorocho

277. Mechanics of Open Channel Flow. (3) II.

Lecture—3 hours. Prerequisite: course 141; Mathematics 22B, 22C. Recommended: a short course in FORTRAN programming (may be taken concurrently). Free surface flow; resistance in uniform flows; gradually and rapidly varied flows; critical depth; unsteady flows; supercritical flows; shock waves. Graphical and digital-computer solutions. Offered in odd-numbered years.
Mr. Strelkoff

278. Hydrodynamics. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 24, 185A; Mechanical Engineering 185B. Recommended: a short course in FORTRAN programming (may be taken concurrently). General equations of continuity, momentum, and energy. Stream functions; velocity potential; conformal mapping. Direct solutions for irrotational flow around bodies and in conduits; gravitational effects. Offered in even-numbered years.
Mr. Larock

279. Advanced Mechanics of Fluids. (4) I.

Lecture—4 hours. Prerequisite: Mathematics 22B, 22C, 24; Mechanical Engineering 185B. Rotational flows. Navier-Stokes equations and solutions for laminar, viscous flows; turbulent flow and Reynolds equations, isotropy simplification, diffusion, phenomenological theories; the boundary layer approximation. Offered in odd-numbered years.
Mr. Larock

ENGINEERING: ELECTRICAL

Ronald F. Soohoo, Ph.D., *Chairman of the Department*

Department Office, 3004 Engineering I

Professors:

John B. Powers, Ph.D.
Ronald F. Soohoo, Ph.D.

¹ Absent on leave, 1969-70.

281A. Advanced Soil Mechanics. (3) I.

Lecture—3 hours. Prerequisite: course 173. Theories of consolidation, secondary compression, stress distribution, bearing capacity, lateral earth pressures, shear strength, yielding of soils, creep, effect of type of compaction on the behavior of compacted clays. Mr. Arulanandan

281B. Advanced Soil Mechanics. (3) II.

Lecture—3 hours. Prerequisite: course 281A. Theories of slope stability. Analysis of slope stability problems for static and dynamic loading conditions. Anisotropic stress conditions in soils. Lateral earth pressure theories. Design of anchored bulkheads.
Mr. Arulanandan

282. Advanced Soil Laboratory. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 281A. Subsurface exploration, advanced laboratory techniques including consolidation, shear strength, pore water pressure measurement, electrical properties measurement, pavement design tests, field strength and load bearing tests.
Mr. Shen

283. Physicochemical Properties of Soils and Soil Behavior. (3) I.

Lecture—3 hours. Prerequisite: course 171. Analysis of the mechanical behavior of soils from consideration of clay mineralogy, colloidal phenomena, ion-exchange and soil-water characteristics. Conduction phenomena, deformation mechanisms, strength, swelling, compaction. Microscopic theories to explain yielding of soils.
Mr. Arulanandan

285. Principles of Placement and Improvement of Soils. (3) II.

Lecture—3 hours. Prerequisite: course 283. Theories and principles of densification of soils; properties of compacted clay; theories relating to thermal, electro-osmotic and chemical methods for the improvement of soils.
Mr. Shen

290. Seminar. (1) III.

Seminar—1 hour. Discussion of current graduate research, and guest lectures on recent advances. Oral presentation of individual study.
Mr. Larock

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

Lecture—1-5 hours.
The Staff (Mr. Krone in charge)

299. Research. (1-12) I, II, III.

The Staff

Associate Professors:

¹Jack W. LaPatra, Ph.D.
Herschel H. Loomis, Jr., Ph.D.
Sanjit K. Mitra, Ph.D.

Assistant Professors:

Vidal R. Algazi, Ph.D.
 John N. Churchill, Ph. D.
 Lawrence W. Davis, Ph.D.
 Robert B. Green, Ph.D.
 Tien C. Hsia, Ph.D.
 Edward W. Kozdrowicki, Ph.D.
 Earle W. Owen, D.Sc.
 Myron F. Uman, Ph.D.

**Assistant Professor:**

Hartley J. Jensen, M.S. (Acting)

Upper Division Courses**110A. Electronic Circuits. (3) III.**

Lecture—3 hours. Prerequisite: Engineering 100. Analysis of linear amplifiers; single stage and multistage amplifiers, tuned amplifiers, oscillators. Mr. Jensen

110B. Electronic Circuits. (3) I.

Lecture—3 hours. Prerequisite: course 110A. Nonlinear electronic circuits; large signal amplifiers, oscillators, and switching circuits. Mr. Jensen

111A. Electronics Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 110A (may be taken concurrently); Engineering 101. Properties of transistors and vacuum tubes. Small-signal analysis of single-stage and multi-stage resistance-coupled and transformer-coupled class A amplifiers. Mr. Jensen

111B. Electronics Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: courses 110B (may be taken concurrently), 111A. Tuned amplifiers and oscillators. Switching circuits and large signal amplifiers. Mr. Jensen

112A. Linear Systems Analysis I. (3) II.

Lecture—3 hours. Prerequisite: Engineering 17. Properties and classification of linear systems. Signal representation by discrete, continuous, and generalized exponentials: Fourier series, Fourier and Laplace transform methods. Convolution integral. State space techniques. Mr. Mitra, Mr. Hsia

112B. Linear Systems Analysis, II. (3) III.

Lecture—3 hours. Prerequisite: course 112A or equivalent. Frequency analysis of linear, electrical, mechanical, and electromechanical systems. System function. Natural response and stability concepts. Introduction to feedback systems and to communication systems. Mr. Kozdrowicki, Mr. Mitra

116. Network Analysis. (3) I.

Lecture—3 hours. Prerequisite: course 112A. Topics in modern network analysis, including two-port networks, matrix methods, graph theory, nonlinear circuits, and computer solutions. Mr. LaPatra

117. Network Synthesis. (3) III.

Lecture—3 hours. Prerequisite: course 112A. An introduction to modern network synthesis techniques. Topics include one- and two-port networks, approximation problems, realization procedures, and filter theory. Mr. LaPatra

130A. Introductory Electromagnetics. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 22B, 22C. Static electric and magnetic fields, properties of materials, time-varying electromagnetic phenomena, Maxwell's equations. Mr. Uman

130B. Introductory Electromagnetics. (3) II.

Lecture—3 hours. Prerequisite: course 130A. Propagation of plane electromagnetic waves, guided waves, transmission lines, antennas. Mr. Uman

131A. Electromagnetic Fields and Waves. (3) I.

Lecture—3 hours. Prerequisite: course 130B. Maxwell's equations and the derivation of high-frequency circuit concepts from these field equations; the skin effect. Mr. Green, Mr. Uman

131B. Electromagnetic Fields and Waves. (3) II.

Lecture—3 hours. Prerequisite: course 131A. Propagation and reflection of electromagnetic waves and their application to transmission lines and wave guides. Mr. Green, Mr. Uman

131C. Electromagnetic Fields and Waves. (3) III.

Lecture—3 hours. Prerequisite: course 131B. The behavior of resonant cavities, microwave networks, radiation, and antennas. Mr. Green, Mr. Uman

133. High-Frequency Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 130B. Steady-state and transient transmission line behavior; wave propagation in linear and nonlinear artificial lines; rudimentary experiments with reflex klystrons and wave guides. Mr. Green, Mr. Uman

145A. Solid-State Electronics. (3) I.

Lecture—3 hours. Prerequisite: Physics 121. Electric and magnetic properties of solids. Topics discussed include electrical conductivity, dielectric constant, and various types of magnetism in solids. Mr. Churchill, Mr. Soohoo

145B. Solid-State Electronics. (3) II.

Lecture—3 hours. Prerequisite: course 145A. Electrical characteristics of dielectric and semiconducting materials, with application to such solid-state electronics devices as transistors, tunnel diodes, parametric amplifiers, and their associated circuits. Mr. Churchill, Mr. Soohoo

145C. Solid-State Electronics. (3) III.

Lecture—3 hours. Prerequisite: course 145A. Characteristics of magnetic materials, with application to such magnetic devices as ferrite

cores, thin films, and their associated computer memory and logic circuits.

Mr. Churchill, Mr. Soohoo

146. Physical Electronics. (3) II.

Lecture—3 hours. Prerequisite: Physics 121. Motion of charges through vacuum, gases and solids. Topics include discussion of vacuum tubes, gaseous electronic and semiconductor devices, and magnetic materials. Mr. Soohoo

150. Instrumentation Systems. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 100, 101. Analytical and design methods common to all instrumentation systems; dynamic response; transducers; signal conditioning.

Mr. Owen

155A. Electronic Instrumentation for Biology Majors. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 16A, 16B and a freshman physics course. Mathematical description of instruments, static errors, dynamic errors, the external characteristics of amplifiers. Laboratory projects illustrate the use of electronic instruments and the properties of sensors. Not open to engineering majors.

Mr. Owen

155B. Electronic Instrumentation for Biology Majors. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 155A. Amplifiers, the use of feedback, digital instrumentation. Laboratory projects illustrate the properties of amplifiers and the use of analog and digital computers as a component of an instrumentation system. Not open to engineering majors.

Mr. Owen

157A. Control Systems. (3) II.

Lecture—3 hours. Prerequisite: course 112B. Design and analysis of closed loop automatic control systems. Examples are drawn from all engineering fields. The mathematical representation of systems; frequency, s-plane and state space methods; stability criteria.

Mr. Hsia, Mr. Owen

157B. Control Systems. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157A. Introduction to nonlinear and sampled data systems. Applications of digital and analog computers.

Mr. Hsia, Mr. Owen

172. Switching Circuit Theory. (3) I.

Lecture—3 hours. Prerequisite: Engineering 100. The analysis and design of switching circuits, considering relay, electronic and magnetic realizations. Introduction to sequential machines.

Mr. Mitra

173. Digital Computer Design. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 172; Engineering 5A. A study of the architecture and logic design of digital computers; laboratory applications of this study.

Mr. Loomis

184A. Principles of Communications. (3) I.

Lecture—3 hours. Prerequisite: course 112A. Mathematical representation of deterministic and random signals; elements of probability and random processes; power spectral density and correlation; application to communications.

Mr. Algazi

184B. Principles of Communications. (3) II.

Lecture—3 hours. Prerequisite: course 184A. Probabilistic analysis of digital and analog communication systems; elements of information theory.

Mr. Algazi

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

Prerequisite: senior standing in engineering with at least a B average. Group study of selected topics. Students may enroll in one or more separate subjects.

The Staff

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

The Staff

Graduate Courses

212A-212B. Systems Analysis. (3-3) I-II.

Lecture—3 hours. Prerequisite: course 112A. Properties of systems and their mathematical characteristics; state space concepts, matrix methods; multivariable systems, time-invariant systems; real time analysis, frequency methods, the identification problem, adaptive systems.

Mr. Hsia, Mr. Owen

216. Network Theory. (3) II.

Lecture—3 hours. Prerequisite: course 112B or equivalent. Foundations of network theory. Generalized network analysis, state-variable approach, energy functions, equivalent networks and normal co-ordinates, scattering matrices, integral theorems and network limitations.

Mr. Mitra

217. Passive Network Synthesis. (3) III.

Lecture—3 hours. Prerequisite: course 117 or equivalent. Advanced topics in synthesis of passive networks. Driving-point and transfer function realizations, matching networks, n-port realizations, approximation techniques.

Mr. Mitra

218. Advanced Network Theory. (3) I.

Lecture—3 hours. Prerequisite: course 216 or equivalent. Advanced topics in network theory such as linear active networks, theory of network graphs, nonlinear and time-varying networks. Topics change from year to year.

Mr. Mitra

226A. Microwave and Quantum Electronics. (3) I.

Lecture—3 hours. Prerequisite: courses 131C, 133. Interaction between electromagnetic fields and the electron charge and spin. Topics include Lorentz force law, energy levels in matter, Zeeman splitting, magnetic resonance and relaxation, and the absorption and radiation of electromagnetic energy.

Mr. Davis

226B. Microwave and Quantum Electronics. (3) II.

Lecture—3 hours. Prerequisite: course 226A. Theory of interaction between electromagnetic fields and the electronic charge, with applications to microwave tubes and plasmas. Beam formation, velocity, and density modulation, plasma oscillation, space charge wave propagation in klystrons.

Mr. Davis

226C. Microwave and Quantum Electronics. (3) III.

Lecture—3 hours. Prerequisite: course 226A. Theory of interaction between electromagnetic fields and the electron-spin, with applications to quantum oscillators and amplifiers such as masers and lasers.

Mr. Davis

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.

Mr. Green

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.

Mr. Green

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.

Mr. Green

240. Engineering Problems in Plasma Physics. (3) III.

Lecture—3 hours. Prerequisite: courses 130B and 146. Plasma oscillations and sheaths, measurement of plasma parameters, magnetized plasmas, kinetic and fluid descriptions, waves; applications to problems in communications, devices, power generation, propulsion and controlled thermonuclear fusion research. Mr. Uman

245A. Applied Solid State Physics. (3) I.

Lecture—3 hours. Prerequisite: course 145C or equivalent. The physics of solids relevant to solid state applications. Topics include classical statistics, band theory of solids, electric polarization, conductivity, and magnetism in solids.

Mr. Soohoo, Mr. Churchill

245B. Applied Solid State Physics. (3) II.

Lecture—3 hours. Prerequisite: course 245A. The theory of semiconductors with application to transistors. Topics include electrons, holes, mobility, and transistor circuitry. Brief discussion of superconductivity and superconducting solenoids.

Mr. Soohoo, Mr. Churchill

245C. Applied Solid State Physics. (3) III.

Lecture—3 hours. Prerequisite: course 245A. The 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.

Mr. Soohoo, Mr. Churchill

251. Nonlinear Control Systems. (3) III.

Lecture—3 hours. Prerequisite: course 157B and 212B. Techniques for solving nonlinear control problems; state space methods, stability theorems; Lyapunov's methods; sinusoidal describing function and on-off systems.

Mr. Owen

252. Control System Optimization. (3) III.

Lecture—3 hours. Prerequisite: course 157B and 212B. Optimization of systems by the adjustment of parameters; deterministic inputs, stochastic inputs. Optimization of systems by the calculus of variations: Pontryagin's maximum principle, Bellman's principle of optimality.

Mr. Hsia

270. Sequential Machines. (3) II.

Lecture—3 hours. Prerequisite: course 172. A study of the algebraic structure theory of sequential machines and the development of sequential machine synthesis techniques.

Mr. Loomis

271. Advanced Digital System Design. (3) III.

Lecture—3 hours. Prerequisite: course 173. Advanced topics in the design of digital systems; high speed and high rate arithmetic; the state assignment problem.

Mr. Loomis

276. Symbol Manipulation Languages. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5A; Mathematics 129. Use of computers for non-numerical processing or manipulation of symbolic expressions; a comparison of the symbol manipulating capability of SNOBOL, LISP, FORMAC, PL/I, MAP, ALGOL 68; application of these languages for compiler writing and theorem proving; descriptive languages.

Mr. Kozdrowicki

279A-279B. Artificial Intelligence. (3) II-III.

Lecture—3 hours. Prerequisite: course 276. The achievement of artificial intelligence through attempted realization of macroscopic descriptions of intelligent behavior; heuristic programming; game playing; mechanical theorem proving; concept formation by machine;

perception of geometrical figures; analogical reasoning; natural language processors; the brain-modeling problem. Mr. Kozdrowicki

signals described by finite parameter sets. Linear and nonlinear modulation and efficient demodulators. Mr. Algazi

284A. Noise, Communication and Information Theory. (3) II.

Lecture—3 hours. Prerequisite: course 184A or equivalent. Fundamentals of the theory of random processes pertinent to communications, control and other physical applications. Review of probability theory. Characterization of random processes. Correlation functions and power spectra. Linear and nonlinear operations on random processes. Mr. Algazi

284B. Noise, Communication and Information Theory. (3) III.

Lecture—3 hours. Prerequisite: course 284A. Application of statistical techniques to the areas of detection, estimation, and modulation theory. Detection problem and application to radar and digital communication. Estimation theory for

284C. Noise, Communication and Information Theory. (3) I.

Lecture—3 hours. Prerequisite: course 284A. Information theory and coding. Definition of a measure of information and study of its properties. Introduction to channel capacity and error free communications over noisy channels. Encoding and decoding of data for transmission over noisy channels. Mr. Algazi

290. Seminar. (1) I, II, III.

Seminar—1 hour. Discussion of current research. Written and oral reports will be given. The Staff

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

The Staff

299. Research. (1-12) I, II, III.

The Staff

ENGINEERING: MECHANICAL

Warren H. Giedt, Ph.D., *Chairman of the Department*
Department Office, 2020 Engineering I

Professors:

Harry Brandt, Ph.D.
Clyne F. Garland, M.S.
¹Warren H. Giedt, Ph.D
Myron A. Hoffman, Sc.D.
John D. Kemper, M.S.

Associate Professors:

Arthur L. Austin, Ph.D.
Charles W. Beadle, Ph.D.
Allan A. McKillop, Ph.D.
¹Paul S. Moller, Ph. D.
Amiya K. Mukherjee, Ph.D.
An Tzu Yang, D.E.Sc.

Assistant Professors:

John W. Brewer, Ph. D.
Harry A. Dwyer, Ph.D.
Jerald M. Henderson, D.Eng.
Walter V. Loscutoff, Ph.D.
Donald W. Moon, Ph.D.
◇ ◇ ◇

Associate Professor:

Roger T. Griffiths, B.Sc. (*Visiting*)

Upper Division Courses

111. Engineering Principles Laboratory. (4) III.

Discussion—2 hours; laboratory—4 hours. Prerequisite: Engineering 103A, 104A, 105B. Experimental investigation of the steady-state

and transient behavior of thermal, mechanical, structural, and fluid systems. Mr. Brandt

114. Kinematics of Mechanisms. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 102B. Classification of kinematic elements and mechanisms; graphical and analytical determination of displacements, velocities, and accelerations within planar mechanisms involving turning, sliding, and higher pairs. Kinematic design of cams, gears, and gear trains; intermittent-motion mechanisms. Mr. Yang

115. Dynamics of Machinery. (3) II.

Lecture—3 hours. Prerequisite: course 114. Analysis of dynamic response of machine elements such as cams, springs, gears, and links, with emphasis on high speed operation; gyroscopic forces in machines; balancing of machinery; introduction to dynamics of feedback control systems. Mr. Yang

118. Mechanical Design. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 4, 104A; course 121 recommended. Application of the principles of engineering mechanics in the design of mechanical components, with special emphasis on stress concentration, theories of failure, fatigue, and fluctuating stresses. Mr. Kemper

120. Advanced Mechanical Design. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 118. Continuation of course 118, with special emphasis on advanced design

¹ Absent on leave, 1969-70.

analysis; application of two-dimensional theory of elasticity to stress analysis; contact stresses; thermal stresses; elastic impact; creep; hydrodynamic lubrication and bearing design.

Mr. Yang

121. Manufacturing Methods. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104A. Introduction to the methods employed in modern manufacturing, with particular emphasis on the interrelationships between engineering design and manufacturing methods. Introduction to the theoretical basis of metal forming.

Mr. Kemper

123A-123B. Experimental Engineering.

(2-2) I-II; II-III.

Laboratory—6 hours. Prerequisite: senior standing in engineering. Performance of a two-quarter long project which includes the design, construction, and evaluation of a mechanical engineering system or related experiment intended to give the student experience in theoretical modelling and experimental evaluation.

Mr. Henderson

124. Engineering Systems Design. (3) III.

Lecture—3 hours. Prerequisite: senior standing in engineering. Synthesis of the several fields of engineering, with applications in the design of systems.

Mr. McKillop

125. Mechanics of Compressible Fluids. (3) III.

Lecture—3 hours. Prerequisite: Engineering 103B. Introductory concepts of compressible flow. Isentropic flow; normal shock waves; frictional and diabatic flow; generalized one-dimensional continuous flow.

Mr. Moller

127. Aerodynamics. (3) I.

Lecture—3 hours. Prerequisite: Engineering 103B. Lift and drag; aerodynamic load distributions; thin aerofoil and slender body theory; boundary layer control; compressibility effects; mutual interference; static and elementary dynamic stability; propulsion.

Mr. Moller

128. Aerospace Design. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 127; Engineering 104B. Design of aircraft and missile systems; influence of aerodynamic and inertial loading on structural integrity; guidance and control.

Mr. Moller

129A. Analysis, Simulation, and Design of Dynamic Systems. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: senior standing in engineering. Structural models for dynamic systems. The design of control systems to improve linearity, accuracy, and speed of response of dynamic systems. Design of feedback systems which maintain quality of performance in spite of parameter variation. Analog and digital computer simulation.

Mr. Brewer

129B. Analysis, Simulation, and Design of Dynamic Systems. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 129A. Phenomenological models for dynamic systems. Control system design using frequency domain methods. Stability of nonlinear control systems. Introduction to the theory of state space methods for multi-variable control systems. Laboratory demonstrations in automatic control practice. Mr. Brewer

129L. Laboratory for Analysis, Simulation and Design of Dynamic Systems. (1) III.

Laboratory—3 hours. Prerequisite: course 129B (to be taken concurrently). Analog and digital computer experiments in feedback control theory. Topics are based on content of course 129B.

Mr. Loscutoff

130. Solid-State Thermodynamics. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 105B or consent of instructor. The thermodynamics of the Solid State, relation between thermodynamic and physical properties, free energy of heterogeneous reactions, quasichemical approach to solutions, free energy of binary systems and thermodynamics of interfaces.

Mr. Mukherjee

135. Aircraft and Rocket Propulsion. (4) II.

Lecture—4 hours. Prerequisite: Engineering 103B, 105B. Principles of fluid propulsion and propulsive efficiency of air-breathing systems. Principles of rocket propulsion. Dynamics of launch in gravitational field and with air drag; thrust programming; and multistaging. Satellite orbital mechanics and interplanetary flight.

Mr. Hoffman

140. Materials in Engineering Design. (4) II.

Lecture—3 hours. 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 their applications in engineering will be emphasized.

Mr. Moon

142. Crystal Structure and X-Ray Diffraction. (3) I.

Lecture—3 hours. Prerequisite: Engineering 45. Crystallography, including crystal structure and symmetry operations. Stereographic projection. Reciprocal lattice. Physics of X-rays. Theory of diffraction for X-rays, electrons and neutrons.

Mr. Moon

185A. Intermediate Fluid Mechanics. (3) II.

Lecture—3 hours. Prerequisite: Engineering 103B. Formulation of continuity, momentum, and energy equations; applications to control volumes; two-dimensional and axially symmetric potential flows.

Mr. Brandt

185B. Intermediate Fluid Mechanics. (3) III.

Lecture—3 hours. Prerequisite: course 185A. Incompressible flows of real fluids; Navier-Stokes equations; unsteady flows in conduits and open channels; flow around immersed bodies; one-dimensional compressible flow.

Mr. Brandt

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

Lecture—1-5 hours. Prerequisite: senior standing in engineering with at least a B average. Group study of selected topics.

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff

Graduate Courses**203A-203B. Convective Heat Transfer. (3-3) II-III.**

Lecture—3 hours. Prerequisite: course 210A and Engineering 186; or Chemical Engineering 253A. Analysis of heat and momentum transfer by forced and natural convection during laminar and turbulent flow; discussion of allied topics such as boiling and condensation; current topics in heat transfer.

Mr. McKillop

204. Heat Conduction. (3) I.

Lecture—3 hours. Prerequisite: Engineering 180, 186. Steady-state and transient problems in heat conduction, using both mathematical and numerical methods of solution. Mr. Giedt

205. Thermal Radiation. (3) I.

Lecture—3 hours. Prerequisite: Engineering 186, or consent of instructor. The transfer of radiant energy. Geometrical and spectral characteristics of systems involving thermal radiation. Gaseous radiation.

Mr. Brandt

210A. Boundary Layer Theory. (3) I.

Lecture—3 hours. Prerequisite: course 185B or consent of instructor; Mathematics 24. Introduction to boundary layer theory. Boundary layers for two-dimensional flow. Similarity solutions of boundary layer equations. Axially symmetrical and three-dimensional boundary layers.

Mr. Dwyer

210B. Boundary Layer Theory. (3) II.

Lecture—3 hours. Prerequisite: course 210A, or consent of instructor. Nonsteady-state boundary layers. Approximate methods for solution of boundary layer equations. Boundary layers in compressible flow. Turbulent boundary layers along a flat plate. Turbulent boundary layers with positive and negative pressure gradients.

Mr. Dwyer

211. Transitional and Turbulent Flows. (3) III.

Lecture—3 hours. Prerequisite: course 210B. Wave motion in fluids; stability of Couette flow, plane Poiseuille flow and boundary layers; description of turbulent flow. Structure of the turbulent energy spectrum; turbulent transport phenomena. Turbulent shear flows and their measurement; new theories in turbulence.

Mr. Dwyer

212A. Gas Dynamics. (3) I.

Lecture—3 hours. Prerequisite: course 125 or equivalent. 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.

Mr. Dwyer

212B. Gas Dynamics. (3) II.

Lecture—3 hours. Prerequisite: course 212A. Advanced numerical techniques for solving the differential equations of gas dynamics. Introduction to the gas dynamics of non-equilibrium flow. Shock structure. Free molecular and rarefied gas dynamics.

Mr. Dwyer

213. Theory of Jets. (3) III.

Lecture—3 hours. Prerequisite: course 210A or consent of instructor. Turbulent jets of incompressible and compressible fluids; free jets and jets confined to finite spaces; wakes behind bluff bodies; practical applications of turbulent jets. Offered in odd-numbered years. Mr. Brandt

214. Aerodynamics. (3) III.

Lecture—3 hours. Prerequisite: courses 125, 127, 185B. Development and examination of the potential and viscous flow concepts useful in evaluating the aerodynamic loads and performance of flight vehicles. Applications of these concepts will be made through complete system analysis and optimization with particular emphasis on V.T.O.L. aircraft.

Mr. Moller

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. Oscillations in systems having nonlinear characteristics. Self-excited oscillations. Response curves and stability considerations.

Mr. Kemper

221. Introduction to Random Vibration. (3) II.

Lecture—3 hours. Prerequisite: Engineering 122. Nature and statistical analysis of random vibrations. Response of physical systems to random excitation. Data processing. Mr. Beadle

222. Advanced Dynamics. (3) I.

Lecture—3 hours. Prerequisite: Engineering 102B. Dynamics of particles and of rigid bodies with advanced engineering applications; generalized coordinates; Hamilton's Principles; Lagrange's Equations; Hamilton-Jacobi theory.

Mr. Beadle

223. Advanced Kinematic Analysis. (3) I.

Lecture—3 hours. Prerequisite: course 115. Advanced kinematic analysis of planar mechanism, poles and centrodes, Euler-Savary equation, inflection circle, curvature theory, Bobillier's construction, Hartmann's construction. Four-bar coupler-point curves.

Mr. Yang

224. Kinematic Synthesis of Mechanisms. (3) II.

Lecture—3 hours. Prerequisite: course 115. Introduction to curve and function synthesis. Chebychev's theorem. Structure errors. Complex number methods. Geometrical synthesis using poles, pole paths, and center point curves. Burmester's theorem.

Mr. Yang

225. Spatial Mechanisms. (3) III.

Lecture—3 hours. Prerequisite: courses 115 and 223. Constraints and pairing in spatial mechanisms. Analysis of spatial mechanisms; application of vector, dual number, dual vector, matrix, quaternions, and associated computer methods. Synthesis of spatial mechanisms for path and function generation.

Mr. Yang

229A. Analysis, Simulation, and Identification of Dynamic Systems. (3) II.

Lecture—3 hours. Prerequisite: course 129B or equivalent; Electrical Engineering 212B (may be taken concurrently). Analysis of distributed parameter systems. Analog and digital simulation of distributed and lumped parameter dynamic systems. Introduction to concepts of transfer state and dynamic state. Experimental determination of transfer function and state space models for dynamic systems. Mr. Brewer

229B. Analysis and Design of Dynamic Systems. (3) III.

Lecture—3 hours. Prerequisite: course 229A; Electrical Engineering 252 recommended (may be taken concurrently). Emphasis on the application of computer technology and numerical analysis theory to the design of control systems. Numerical control systems. Sampled data control systems. Optimal and sub-optimal control.

Mr. Brewer

240. Theory of Crystal Dislocations. (3) I.

Lecture—3 hours. Prerequisite: course 142 or Engineering 187, or consent of instructor. Edge, screw and mixed dislocation concepts. The stress field and energy of dislocations. Force on a dislocation. Motion of dislocations and its relation to plastic deformation. Dislocation multiplication and interaction with point, line, and surface defects.

Mr. Moon

241. Applications of Dislocation Theory. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240; Engineering 188. Concepts of dislocation theory are applied to explain plasticity of crystalline solids. Guide and climb of dislocations, imperfect dislocations, strain hardening, recrystallization, theories of creep processes and interaction of dislocation with solute atoms, precipitates and impurity clouds are discussed. Offered in even-numbered years.

Mr. Mukherjee

242. Advanced Mechanical Properties of Materials. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 188, 104B. 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.

Mr. Mukherjee

243. Solid-State Phase Transformation. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 188, 105B. The theory of alloying, kinetics of phase changes, homogeneous and heterogeneous transformation, transformation by shear, order-disorder reactions and the phase changes during the heat treatment of Iron-Carbon alloys are discussed. Offered in odd-numbered years.

Mr. Mukherjee

290. Seminar. (1) II, III.

Seminar—1 hour. Discussion of current graduate research with particular attention to validity of experimental procedures, and including oral and written presentation of a term paper.

Mr. Giedt

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

The Staff

299. Research. (1-12) I, II, III.

The Staff

ENGLISHRobert A. Wiggins, Ph.D., *Chairman of the Department*Brom Weber, Ph.D., *Vice-Chairman of the Department*

Department Office, 100 Sproul Hall

Professors:

- Everett Carter, Ph.D.
 Thomas A. Hanzo, Ph.D.
 Gwendolyn B. Needham, Ph.D.
 Karl J. Shapiro
 Linda Van Norden, Ph.D.
 Brom Weber, Ph.D.
 Robert A. Wiggins, Ph.D.
 James L. Woodress, Ph.D.
 Celeste T. Wright, Ph.D.

Associate Professors:

- Wayne C. Harsh, Ph.D., (*English and Linguistics*)
 Robert Hogan, Ph.D.
 Elizabeth R. Homann, Ph.D.
 Robert H. Hopkins, Ph.D.

Assistant Professors:

- Allen Bergson, Ph.D.
 Elliot L. Gilbert, Ph.D.
 John O. Hayden, Ph.D.
 Peter L. Hays, Ph.D.
 Michael J. Hoffman, Ph.D.
 James R. Hurford, Ph.D.
 Lindsay A. Mann, Ph.D.
 Arthur E. McGuinness, Ph.D.
 Leonard Michaels, Ph.D.
 Daniel S. Silvia, Jr., Ph.D.
 David S. Wilson, Ph.D.

◊ ◊ ◊

Assistant Professor:

- Diane J. Murray, M.A. (*Acting*)

Lecturers:

- Mary A. O'Connor, M.A.
 W. Georg Isaak, M.A.

Departmental Major Advisers.—Mr. Bergson, Mr. Gilbert, Mr. Hanzo, Mr. Hayden, Mr. Hays, Mr. Hoffman, Mr. Hogan, Mr. Hopkins, Mr. Hurford, Mr. Mann, Mr. McGuinness, Mr. Murray, Mr. Silvia, Miss Van Norden, Mr. Wilson, Mrs. Wright.

The Major Program

All English majors are required to attend a general meeting for majors at the beginning of each year; all new and transfer English majors are required to attend a general meeting for majors at the beginning of their first quarter in residence; all English majors must see their advisers, individually, in the spring quarters of their sophomore and junior years.

Lower Division Courses.—Required: one course from 1, 2, 3, 4A, or 4B; course 45; 46A–46B–46C (these courses should be taken in order). Recommended: courses in the Freshman offering other than the one chosen to meet the requirements; courses 30A, 30B, 30C; a course in philosophy; and a course in classics.

Upper Division Courses.—Required: Thirty-six units of upper-division courses which must include at least one in each of the following groups: Period courses, Genre courses, Author courses, Special Subjects.

In addition, the student must choose one of four areas of emphasis: General English and American Literature; Writing; Language and Linguistics; Preparation for Teaching. The student must consult with his adviser for details of each area of emphasis.

Teaching Major.—The English teaching major in the teacher-training curriculum requires not only the departmental major but also courses 103, 105A, 105B, and 300 (which counts as 3 units of credit in education). Although these courses may be postponed to the fifth year, course 105A should be taken before course 300.

Teaching Minor.—The teaching minor consists of 32 units, including courses 45, 46A, 46B, 46C, either 30B or 30C, and at least 12 units of upper-division work including English 103, 117A or 117B, and 155B or 155C. Course 300 (which counts as 3 units of credit in education) must be taken in the senior or postgraduate year. Recommended in addition to the required 32 units, especially in preparation for course 300: course 105A.

Teaching Adviser: Mr. Harsh.

Foreign Languages.—Students who contemplate advanced study in English at Davis should keep in mind the foreign-language requirements for higher degrees. Consultation with the graduate adviser is suggested.

Honors and Honors Program.—See page 133.

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 Chairman of the Department or from the Graduate Adviser.

Subject A.—Students must have passed Subject A before taking any course in English.

Prerequisite: one course from courses 1, 2, 3, 4A, 4B is required for admission to courses 20, 30A, 30B, 30C, 45, 46A, 46B, 46C, 47 and all upper-division courses.

Lower Division Courses**1. Expository Writing. (4) I, II, III.**

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. Composition, the essay, paragraph structure, diction, and related topics. Frequent writing assignments will be made.

The Staff (Mr. Harsh in charge)

2. Language and Stylistics. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. An introduction to modern inquiries into the nature and forms of the English language. Frequent writing assignments will be made.

Mr. Harsh

3. Introduction to Literature. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. Introductory study of several genres of English literature, emphasizing both analysis of particular works and the range of forms and styles in English prose and poetry. Frequent writing assignments will be made.

Mr. Mann

4A, 4B. Backgrounds for English Literature.**(4) A: I, II, III; B: I, II, III.**

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement; course 4A is not prerequisite to 4B. This course, designed to introduce English majors to essential background material, will concentrate on such major literary works as *The Iliad*, *The Bible*, *The Aeneid*, and *The Divine Comedy*. Frequent writing assignments will be made.

Mr. McGuinness, Mr. Hayden

5. Introduction to Creative Writing. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement and consent of instructor. A course in the elementary principles of writing fiction and poetry. Students will be expected to experiment with a variety of forms, and will be encouraged to do free and independent work in addition to the restricted assignments of the course.

Mr. Michaels

20. Intermediate Composition. (4) I, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Designed primarily for non-majors who wish to improve their skills in expository writing; the content of the course includes basic principles of rhetoric and rules of usage in present-day English. Mr. Hays, Mr. Hopkins

25. English for Foreign Students. (5) I, II.

Lecture, 2 hours; discussion—2 hours; laboratory—1 hour. For foreign students only. Required of those who do not pass the examination in English.

Mr. Harsh in charge

26. English for Foreign Students. (5) I, II, III.

Lecture—2 hours; discussion—2 hours; laboratory—2 hours. Continuation of course 25; required of those who have taken course 25.

Mr. Harsh in charge

30A. Survey of American Literature. (4) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature from its seventeenth-century beginnings to 1830.

Mr. Wiggins

30B. Survey of American Literature. (4) II.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Nineteenth-century American literature from 1830 to 1900.

Mr. Wiggins

30C. Survey of American Literature. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature in the twentieth century.

Mr. Wiggins

45. Critical Reading of Poetry. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Close reading of selections from English and American Poetry. Frequent written exercises.

The Staff

46A. Masterpieces of English Literature. (4) I, II.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected works of principal writers to 1640. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

Mr. Hopkins

46B. Masterpieces of English Literature. (4) II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected works of principal writers from 1640 to 1800. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

Mr. Hopkins

46C. Masterpieces of English Literature. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected works of principal writers from 1800 to the present. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

Mr. Gilbert

47. Introduction to Modern Literature. (4) II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Chief twentieth-century writers of England and America.

Mr. Shapiro

Upper Division Courses

Period courses: studies of the major writers, the literary traditions and forms they worked in, and the influencing events of an age.

111. Old English and Early Medieval Literature. (4) I.

Lecture—3 hours. 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. Mr. Silvia

112. The Age of Chaucer. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The literary, religious, and social movements of the later fourteenth century in England as they are reflected in the writings of Chaucer, Langland, the *Gawain* poet, and their contemporaries; the fifteenth-century Chaucerians. Mr. Silvia

115. The English Renaissance. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected poetry and prose: More, Spenser, Hooker, Bacon and others. The New Learning; the Reformation; psychological and moral concepts of the age.

116. The Age of Elizabeth. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Poetry of Marlowe, Shakespeare, Sidney and others; fiction of Gascoigne, Lyly, Lodge; representative plays.

120. Earlier Seventeenth-Century Poetry and Prose.

(4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major authors, forms, and styles. Donne, Jonson, Marvell, Bacon, Browne, Hobbes. Tradition and revolution. A term paper, or its equivalent in essay composition, will be required. Mr. Mann

123. Dryden and His Contemporaries. (4) III.

Lecture—3 hours. 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) II.

Lecture—3 hours. 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. A term paper, or its equivalent in essay composition, will be required.

Mr. Hopkins, Mr. McGuinness

127. Johnson and His Contemporaries. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sense and Sensibility in poetry, biography, journals, fiction, comedy, and criticism. Readings in Johnson, Boswell, Goldsmith, Fielding, and others.

Mr. McGuinness

128. Prose and Poetry of the Later Eighteenth Century. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sense and Sensibility in criticism, history, philosophy and the novel. Readings in Hume, Burke, Gibbon, Sterne, Cowper, and others. The mysticism of Blake.

Mr. McGuinness

130. Early Romantic Literature. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Blake, Burns, Wordsworth, Coleridge, Scott; the eighteenth-century background and the development of Romantic concepts of the imagination.

Mr. Hayden

132. Later Romantic Literature. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Byron, Shelley, Keats. Individualism and revolt. Mr. Michaels

133. Early Victorian Literature. (4) I.

Lecture—3 hours. 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. Mr. Gilbert

134. Later Victorian Literature. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Ruskin, Hardy, Hopkins, and others. The Oxford movement; the Pre-Raphaelites; art and sociology; aestheticism and decadence; pessimism. Tendencies continuing into the Edwardian period.

Mr. Gilbert

136. British Literature from 1880 to 1918. (4) I.

Lecture—3 hours. 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.

Mr. Gilbert

137. British Literature from 1918 to 1940. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Lawrence, Eliot, Forster, and others. Post-war attitudes. Modern psychology and the awareness of myth.

Mr. Hoffman

138. British Literature from 1940 to the Present. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Literature of En-

gland and Ireland from World War II to the present. Major themes in the novel, poetry, and short story.

140. Origins of American Literature. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Seventeenth-century American literature; special attention to European literary-intellectual traditions, dominant American forms (poems, sermon, history), and major writers (Ann Bradstreet, Edward Taylor, and others).

Mr. Wilson

141. The American Enlightenment and Its Reaction. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Eighteenth-century American literature; rise of neoclassicism, liberal religion, popular literature, scientific thought, satiric temper; decline of Puritan traditions; major writers, including Franklin, Edwards, Freneau, and Brackenridge.

Mr. Woodress, Mr. Wilson

142. Early Nineteenth-Century American Literature. (4) III.

Lecture—3 hours. 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.

143. Transcendentalism and Its Reaction. (4) I.

Lecture—3 hours. 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.

144. American Literature from 1865 to 1914. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Religion, local color, social criticism, naturalism, *fin de siècle* aestheticism; Twain, James, Crane, Dreiser, Howells.

Mr. Carter

146. Modern American Literature: 1914 to 1940. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The Modernist movement, disillusionment, artistic experimentation, classical revival, New Criticism, proletarian literature, romantic nationalism, European currents, Pound, Fitzgerald, Eliot, Frost, Hemingway, Crane, Faulkner, and Stevens.

Mr. Hays

147. Modern American Literature: 1940 to the Present. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Contemporary fiction, poetry, and drama. The impact of World War II on the younger writers; experimentation and formalism in poetry and the drama.

Mr. Weber

Genre courses: studies of major literary forms.

150A. English Drama to Marlowe. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The development of the drama from its beginnings to the Renaissance. Miracle and mystery plays; the morality tradition. Early comedy, tragedy, and chronicle plays.

Mrs. Homann

150B. English Drama from Marlowe to 1642. (4) II.

Lecture—3 hours. 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.

Mrs. Wright

150C. English Drama from 1642 to 1890. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Restoration comedy, eighteenth-century sentimental comedy, and nineteenth-century melodrama, with particular attention to plays of Congreve, Sheridan, and Boucicault.

Mr. Hays

150D. British Drama from 1890 to the Present. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The rise of dramatic realism; the chief reactions against it; emphasis on Shaw, O'Casey, and Osborne.

Mr. Hogan

152. American Drama from its Beginnings to the Present. (4) II.

Lecture—3 hours. 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 Boucicault, Rice, O'Neill, Williams, and Miller.

Mr. Hogan

155A. The English Novel: 1700-1770. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Realism and the rise of the modern novel. Defoe, Richardson, Fielding, Sterne, and Smollett.

Mr. Hopkins

155B. The English Novel: 1770-1850. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sense and Sensibility in the novel. Walpole, Radcliffe, Austen, Scott, Dickens, Bronte sisters. Mrs. Needham

155C. The English Novel: 1850-1900. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major Victorian novelists: their theory and practice. Dickens, Thackeray, Trollope, Eliot, Meredith, and Hardy.

Mr. Gilbert

155D. The English Novel: 1900 to the Present. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major figures including Conrad, Joyce, and Lawrence. Impressionism, the revolt against naturalism; the experimental novel; the anti-modernist reaction.

Mr. Hoffman

158A. The American Novel to 1900. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The rise and development of the American novel from its eighteenth-century beginnings. Cooper, Hawthorne, Melville, Howells, Twain, James, Crane.

Mr. Hoffman

158B. The American Novel from 1900 to Present. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major American novelists of the twentieth century. Wharton, Dreiser, Faulkner, Hemingway, Fitzgerald, Bellow.

Mr. Hays

160. The English Lyric. (4) III.

Lecture—3 hours. 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.

Mr. Hanzo

170A. The Epic. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Studies in the development of the epic.

Miss Van Norden

Author courses: studies of the works and development of an author or authors.

113. Chaucer. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. *Troilus and Criseyde*, selected *Canterbury Tales*; central ideas in the fourteenth century.

Mr. Silvia

117A. Shakespeare. (4) II, III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works.

The Staff

117B. Shakespeare. (4) II, III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works not included in 117A.

The Staff

122. Milton. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works, including *Paradise Lost*.

Mr. Mann

189. Study of a Major Writer. (4) I, III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The artistic development of one major writer. May be repeated for credit when a different writer is studied.

The Staff

Special subjects: studies in a special problem in literature.

110A. Introduction to Principles of Criticism. (4) I.

Lecture—3 hours. Prerequisite: course 45 or equivalent. Methods and assumptions of critical theory from Aristotle to the present. Emphasis on major contributions to the history of literary criticism.

Mr. Hayden

110B. Introduction to Principles of Criticism. (4) II.

Lecture—3 hours. Prerequisite: course 45. Continuation of 110A.

Mr. Hayden

170B. European Influences on the English and American Novel. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Studies in the English and American novel, with special reference to continental influences.

Mr. Carter

171. English Bible as Literature. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Old Testament poetry and prophecy; the Gospels and certain Epistles.

Miss Van Norden

175. American Literary Humor. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The American humorous vision as expressed in such modes as comedy, satire, irony, and their combinations from the seventeenth century to the present, with attention given to such matters as the nature of humor and the cultural influences affecting its development.

Mr. Weber

Writing courses:

100A. Creative Writing. (4) I.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B; sophomores may enroll with consent of instructor.

Mr. Michaels, Mr. Shapiro

100B. Creative Writing. (4) II.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B; course 100A recommended. Sophomores may enroll with consent of instructor. Mr. Michaels, Mr. Shapiro

100C. Creative Writing. (4) III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B; sophomores may enroll with consent of instructor.

Mr. Michaels, Mr. Shapiro

103. Advanced Composition. (4) I, II, III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B; required of prospective high school English teachers. 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.

The Staff

Language and linguistics:**105A. Language. (4) I, II.**

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Present-day English grammar and pronunciation according to the perspectives of traditional grammar and contemporary linguistics. Preparation for stylistic analysis and historical study of English language and literature. Required of prospective English teachers.

Mr. Harsh, Mr. Hurford

105B. Language. (4) II, III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. History of the English language. Examination of the language as recorded in literary texts from Old English to present-day English. Relationship of English to other languages; development of vocabulary, phonology, and grammatical patterns. Required of prospective English teachers.

Mr. Harsh, Mr. Hurford

Senior Seminars:**189. Study of a Major Writer. (4) I, III.**

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The artistic development of one major writer and his intellectual and literary milieu. May be repeated for credit when a different writer is studied.

The Staff

194H. Special Study for Honors Students.

(2) I, II, III.

Prerequisite: honors status. Individual directed study leading to preparation of a long paper. May be repeated once for credit.

The Staff

198. Directed Group Study. (4) I, II, III.

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**200. Techniques of Literary Scholarship. (4) II.**

Lecture—3 hours. The elements of bibliography with special attention to literature and discussion of the principal modes of literary investigation—critical, historical, textual, and others.

Mr. Hopkins

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.

Mr. Hayden

205. Introduction to Old English. (4) I.

Lecture—3 hours. The language of Anglo-Saxon England; readings in Old English prose and poetry.

206. Beowulf. (4) II.

Lecture—3 hours. A study of the poem and the Heroic Age of Germanic literature.

Mr. Silvia

***207. Middle and Early Modern English. (4) III.**

Lecture—3 hours. Earlier dialects; the new vocabulary; the later sound shifts and changes to the seventeenth century. Readings in illustrative documents.

210. Readings in English and American Literature.

(4) I, II, III.

Discussion—3 hours. 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

***215. Arthurian Romance. (4) I.**

Lecture—3 hours. The sources of Arthurian Romantic literature; Continental and English literary treatment; Malory's synthesis; significant changes of attitudes in post-Malory literature.

Mrs. Homann

***225. Modern Anglo-Irish Writers. (4) I.**

Lecture—3 hours.

Mr. Hogan

230A. Studies in Major Writers: Chaucer. (4) III.

Seminar—3 hours.

Mrs. Homann

230B. Studies in Major Writers: Milton. (4) II.

Seminar—3 hours.

***231. American-European Literary Relations. (4) I.**

Lecture—3 hours. The interchange of ideas and forms between America and Europe.

Mr. Carter

***232A. Problems of English Romantic Literature.**

(4) III.

Seminar—3 hours. Selected issues in the current study and critical assessment of Romantic literature.

Mr. Hayden

^o Not to be given, 1969-70.

***232B. Problems of English Victorian Literature.**

(4) II.

Seminar—3 hours. Selected issues in the current study and critical assessment of Victorian literature.
Mr. Gilbert

***233. Problems in American Literature. (4) II.**

Seminar—3 hours. Selected topics for intensive investigation.
Mr. Carter

234. Drama Literature. (4) III.

Seminar—3 hours. An historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy.
Mr. Hogan

***235. Fiction. (4) I.**

Seminar—3 hours. Theories of fiction as reflected in the practice of writers from the eighteenth century to the present.
Mrs. Needham

***236. Poetics. (4) II.**

Seminar—3 hours. Metaphor, style, and structure in English poetry from the sixteenth century to the present.
Mr. Weber

237. Modern Critical Theory. (4) III.

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.

240A-240B-240C. Medieval Literature.

(4-4-4) I-II-III.

Seminar—3 hours. Mrs. Homann

***242A-242B-242C. Sixteenth-Century Literature.**

(4-4-4) I-II-III.

Seminar—3 hours.

244A-244B-244C. Shakespeare. (4-4-4) I-II-III.

Seminar—3 hours.

246A-246B-246C. Seventeenth-Century Literature.

(4-4-4) I-II-III.

Seminar—3 hours. Miss Van Norden

248A-248B-248C. Eighteenth-Century Literature.

(4-4-4) I-II-III.

Seminar—3 hours. Mrs. Needham

***250A-250B-250C. Romantic Literature.**

(4-4-4) I-II-III.

Seminar—3 hours.

ENTOMOLOGYOscar G. Bacon, Ph.D., *Chairman of the Department*

Department Office, 124 Robbins Hall

Professors:

Oscar G. Bacon, Ph.D.

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

Richard M. Bohart, Ph.D.

252A-252B-252C. Victorian Literature.

(4-4-4) I-II-III.

Seminar—3 hours.

***254A-254B-254C. Twentieth-Century British Literature. (4-4-4) I-II-III.**

Seminar—3 hours.

***256A-256B-256C. Early American Literature. (4-4-4) I-II-III.**

Seminar—3 hours.

Mr. Weber

***258A-258B-258C. American Literature: 1800 to the Civil War. (4-4-4) I-II-III.**

Seminar—3 hours.

260A-260B-260C. American Literature: Civil War to 1914. (4-4-4) I-II-III.

Seminar—3 hours.

Mr. Woodress

262A-262B-262C. American Literature after 1914. (4-4-4) I-II-III.

Seminar—3 hours.

Mr. Weber

***264A-264B-264C. Studies in Modern British and American Literature. (4-4-4) I-II-III.**

Seminar—3 hours.

Mr. Hanzo

298. Directed Group Study (1-5) I, II, III. The Staff**299. Individual Study. (1-4) I, II, III. The Staff****299D. Special Study for the Doctoral Dissertation. (1-8) I, II, III. The Staff****Professional Courses****300. Problems in Teaching English Language Literature and Composition in Secondary Schools. (3) I, II.**

Lecture—2 hours. Prerequisite: senior or graduate standing; an English teaching major or minor. This course should be completed before practice teaching. The course is accepted in partial satisfaction of the requirement in education for the general secondary credential.

Mr. Harsh

301. The Teaching of English as a Foreign Language. (4) III.

Lecture—3 hours. Methods for the use of applied linguistics in the teaching of English to nonnative speakers.

Mr. Hurford

* Not to be given, 1969-70.

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

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

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

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

Eugene M. Stafford, Ph.D.

Francis M. Summers, Ph.D.

Associate Professors:

^{2,3}Norman E. Gary, Ph.D.
Albert A. Grigarick, Jr., Ph.D.
Charles L. Judson, Ph.D.
Donald L. McLean, Ph.D.
Frank E. Strong, Ph.D.

Assistant Professors:

G. A. H. McClelland, Ph.D.
Warren R. Cothran, Ph.D.

Professors:

Merlin W. Allen, Ph.D. (*Nematology*)
James R. Douglas, Ph.D. (*Veterinary Microbiology*)
Paul D. Hurd, Jr., Ph.D. (*Berkeley Campus*)
Michel, M. J. Lavoipierre, M.B., Ch.B. (*Veterinary Microbiology*)

Assistant Professor:

Allen W. Knight, Ph.D. (*Water Science and Engineering*)

Lecturers:

Everett W. Jameson, Ph.D. (*Zoology*)
Wendell W. Kilgore, Ph.D., (*Environmental Toxicology*)
Jerry A. Powell, Ph.D. (*Berkeley Campus*)
Robbin W. Thorp, Ph.D.
Robert K. Washino, Ph.D.

Departmental Major Advisers.—See Schedule and Directory Listing.

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

Lower Division Courses**1. An Introduction to Entomology. (5) III.**

Lecture—3 hours; laboratory—6 hours. A basic study of insects: their biology, anatomy, classification, and relation to human welfare.

Mr. Strong

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 course 10 may take course 1 for credit. Biology, taxonomy and behavior of insects. A cultural and technical course providing an introduction to the insects.

Mr. Bacon

Upper Division Courses**101. Introduction to Structure and Function in Insects. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1. General principles of insect morphology with emphasis on the functional approach. Comparative anatomy of selected insect types.

Mr. Summers

¹Absent on leave, 1969-70.

²Absent on leave, fall quarter 1969.

³Absent on leave, winter quarter 1970.

102. Insect Physiology. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1 or equivalent; Chemistry 8B; course 101 recommended. Vital functions of insects and related organisms. Mr. Judson

103. Systematic Entomology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in zoology or entomology. The principles of taxonomy in animals; speciation; introduction to classification and nomenclature. Mr. Bohart

104. Insect Ecology. (4) III.

Lecture—4 hours. Prerequisite: upper division standing in one of the biological sciences. Principles of ecology with examples from the insects; analysis of the insect environment; population dynamics. Mr. Cothran

109. Field Taxonomy and Ecology. (5) (Summer).

Lecture—2 hours; laboratory—24 hours. Prerequisite: an introductory course in Entomology or consent of instructor. The study of insects in their natural habitats; their identification and ecology. Mr. Bohart, Mr. Hurd, Mr. Powell

110. Economic Entomology. (4) III.

Lecture—2 hours; laboratory—6 hours. An introductory course dealing with the identification, biology, and control of economic insects, with emphasis on those attacking agricultural crops. Mr. Grigarick

112. Principles of Agricultural Entomology. (4) II.

Lecture—4 hours. Prerequisite: an introductory course in entomology or consent of instructor. Principles and problems in the control of insects and mites; integrated control, residues, considerations of application equipment, philosophy of sampling. Mr. Lange

116. Biology of Aquatic Insects. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: an introductory course in entomology or consent of instructor. A study of the life histories, ecology, and identification of insects associated with streams, ponds, and lakes. Offered in even-numbered years. Mr. Grigarick

117. Chemistry of Insecticides. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B, or consent of instructor. Chemical composition and reactions of insecticides; their physiological effects on plant and animal tissues. Mr. Stafford

119. Apiculture. (3) II.

Lecture—3 hours. Biology and behavior of honeybees; communication, orientation, social organization, foraging activities, honey production, pollination activities.

Mr. Laidlaw, —————

119L. Apiculture Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 119. Biology and behavior of honeybees (especially communicative behavior); fundamentals of colony management necessary for efficient agricultural use; utilization of bees in research and teaching. Mr. Gary, Mr. Laidlaw

***121. Insect Behavior. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences or consent of instructor. Evolution of behavior, sense organs, specific types and patterns of behavior, comparative behavior, learning, and applied aspects of behavioral phenomena. Analysis of movies on behavior. Mr. Gary

123. Classification of Immature Insects. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in entomology. Criteria used to identify the immature forms of the principal orders and families of insects; primary emphasis on economic groups. Offered in even-numbered years. Mr. Lange

125. Insect Vectors of Plant Pathogens. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in entomology or plant pathology, or consent of instructor. The role of insects and mites in the transmission of plant pathogens with emphasis on the biological relationships between insect vectors and plant viruses they transmit. Virus transmission techniques and approaches to control. Mr. McLean

127. Acarology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 103 or 110. The morphology, taxonomy, and ecology of mites, with emphasis on plant and animal parasites. Offered in odd-numbered years. Mr. Summers

130. Biological Control of Insect and Weed Pests. (4) II.

Lecture—4 hours. Prerequisite: introductory course in entomology or consent of instructor. Theories and practices of biological control; population phenomena, and the biology of entomophagous insects. Offered in even-numbered years. Mr. Bacon

153. Medical Entomology. (3) III.

Lecture—3 hours. Prerequisite: one course in entomology or consent of instructor. The worldwide relationships of insects and other arthropods to human health. The biology and basic classification of medically important arthropods with special emphasis on the ecology of arthropod-borne diseases of man and principles of their control.

* Not to be given, 1969-70.

194H. Special Study for Honors Students. (1-5) I, II, III.

Prerequisite: open only to majors who are honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. The Staff

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

Prerequisite: consent of instructor. The Staff (Mr. Bacon in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III. (Summer).

The Staff (Mr. Grigarick in charge)

Graduate Courses**202. Advanced Insect Physiology. (4) III.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 102 or Zoology 112, or consent of instructor; Biochemistry 101A or 101B recommended. Selected topics of insect physiology. Intensive study of topics of current interest, which will vary from year to year. The course may be repeated for credit. Offered in odd-numbered years. Mr. Judson

203. Principles of Systematic Entomology. (3) II.

Lecture—3 hours. Prerequisite: course 103. Theory and philosophy of taxonomy with emphasis on phylogeny, zoogeography, and nomenclature of insects. Offered in even-numbered years. Mr. Bohart

219. Advanced Apiculture. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 119, or consent of instructor. Advanced topics in bee biology with special consideration of morphology, genetics, caste differentiation, and artificial insemination. Offered in even-numbered years. Mr. Laidlaw

253. Advanced Medical Entomology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: one upper division course in entomology other than 153 and one course in microbiology; course 153 is recommended. A study in depth of one or more selected arthropod-borne diseases of man with emphasis on the relationship of the physiology, behavior and population dynamics of the vector to the ecology of the disease. Emphasis in the laboratory on epidemiologic techniques relating to vectors and taxonomy of a selected group.

_____, Mr. Lavoipierre

275. Principles and Methods of Entomological Research. (4) II.

Lecture—2 hours; laboratory—6 hours. Techniques and purposes of the scientific

method as related to the field of entomological research with emphasis on problem selection, methods of attack, and the accompanying collection, evaluation, and presentation of data. Offered in odd-numbered years. Mr. Strong

290. Seminar. (2) I, II, III.

Seminar—2 hours.

The Staff (Mr. Strong in charge)

ENVIRONMENTAL HORTICULTURE—See Plant Science

ENVIRONMENTAL TOXICOLOGY

George F. Stewart, Ph.D., *Chairman of the Department*

Department Office, 109 Environmental Toxicology Building

Professors:

Donald G. Crosby, Ph.D.

George F. Stewart, Ph.D. (*Environmental Toxicology and Food Science and Technology*) ◊ ◊ ◊

Assistant Professor:

Dorothy E. Wooley, Ph.D. (*Animal Physiology*)

Lecturers:

Wendell W. Kilgore, Ph.D. (*Environmental Toxicology, Entomology*)

Norman E. Walker, Ph.D.

Lower Division Course

10. Protecting the Quality of the Environment.

(3) III.

Lecture—3 hours. Prerequisite: open to science and nonscience majors. A discussion of man-made hazards in the world around us, including how they might be minimized. Topics to be covered: air, water and soil pollution; food safety, waste disposal. Included are household, domestic and agricultural chemicals and industrial toxicants. Mr. Kilgore, Mr. Walker

Upper Division Courses

180. Agricultural Toxicology. (3) I.

Lecture—3 hours. Prerequisite: Chemistry 8B or 112B; Biochemistry 101A recommended. A unified introduction to the principles of agricultural toxicology. Pesticides, food additives, natural toxicants; their legal, commercial, and health significance. Mr. Crosby, Mr. Kilgore

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

Prerequisite: consent of instructor. The Staff

EPIDEMIOLOGY AND PREVENTIVE MEDICINE

Calvin W. Schwabe, D.V.M., M.P.H., Sc.D., *Chairman of the Department*

Department Office, 2079 Haring Hall

Professors:

Henry E. Adler, D.V.M., Ph.D.

Raymond A. Bankowski, D.V.M., Ph.D.

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. The Staff

298. Group Study. (1-5) I-II-III.

The Staff

299. Research. (1-12) I, II, III. (Summer).

The Staff (Mr. Summers in charge)

ENVIRONMENTAL HORTICULTURE—See Plant Science

ENVIRONMENTAL TOXICOLOGY

George F. Stewart, Ph.D., *Chairman of the Department*

Department Office, 109 Environmental Toxicology Building

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses

203. Chemistry of Toxicants. (3) II.

Lecture—3 hours. Prerequisite: Chemistry 112B (or equivalent), or Chemistry 8B and consent of instructor. Toxic substances: selected topics illustrating their occurrence, structure, and reactions indicative of metabolism and environmental transformations. Mr. Crosby

214. Mechanisms of Toxic Action. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B and consent of instructor. Biochemical and physiological mechanisms underlying toxicity and detoxification. Mr. Kilgore

220. Analysis of Toxicants. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Chemistry 5 or 7B, Chemistry 9 or 112B; course 180 recommended. Principles of the chemistry of toxicants as applied to microanalytical techniques, theoretical considerations regarding sampling, sample processing, cleanup and isolation techniques and detection systems.

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff

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

Prerequisite: consent of instructor. Topics such as trace analysis of toxicants, natural toxicants, and new pesticides.

The Staff (Mr. Crosby in charge)

299. Research. (1-12) I, II, III.

The Staff

Calvin W. Schwabe, D.V.M., M.P.H.,
Sc.D.

Associate Professors:

Hans P. Riemann, D.V.M., Ph.D.
Richard Yamamoto, Ph.D.

Assistant Professors:

Charles E. Franti, Ph.D.
Joyce E. Goggin, D.V.M., M.P.H.
Dan R. Harlow, Ph.D.



Professors:

Ralph J. Audy, M.B., Ph.D. (*San Francisco Campus*)
Stewart H. Madin, D.V.M., Ph.D. (*Berkeley Campus*)
Nicholas L. Petrakis, M.D. (*San Francisco Campus*)

Senior Lecturer:

Dale R. Lindsay, Ph.D.

Lecturers:

Robert B. Bushnell, D.V.M.
Robert D. Conrad, D.V.M.
Fred N. Cooper, B.S., P.H.
George L. Crenshaw, D.V.M.
Benjamin H. Dean, D.V.M., M.P.H.
Murray B. Gardner, M.D.
Constantin Genigeorgis, D.V.M., Ph.D.
Wei Hwa Lee, Ph.D.
Ming-Yu Li, Ph.D.
Bryan Mayeda, D.V.M.
Marjan Merala, M.S., Ldo. Vet.
Arnold S. Rosenwald, D.V.M., Ph.D.
Charles R. Schroeder, D.V.M.
Herald G. Wixom, D.V.M.
James H. Wommack, D.V.M.
George K. York, Ph.D.

Upper Division Courses

101. Perspectives in Veterinary Medicine. (2) I.

Lecture—2 hours. Consideration of the present-day scope of veterinary medicine and of the role of the veterinary profession in modern society. Mr. Schwabe

102. Biomedical Information Retrieval. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: enrollment in the School of Veterinary Medicine or consent of instructor. The use of bibliographic tools in the biomedical sciences; the use and availability of demographic data; the application of manual and machine systems for storage and retrieval of data; and considera-

tion of computerized systems in literature retrieval and clinical data processing.

Miss Goggin, Mr. Li, Mr. Merala, Mr. Franti

103A. Medical Statistics. (1) I.

Laboratory—3 hours. Prerequisite: upper division or graduate student status in School of Veterinary Medicine; previous or current enrollment in Mathematics 13 or consent of instructor. Use of statistics in clinical, laboratory and population medicine; graphical and tabular presentation; biomedical statistical laboratory to accompany introductory course in statistics.

Mr. Franti

103B. Medical Statistics. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103A or consent of instructor. Regression, correlation, analysis of variance in biomedical sciences; time-dependent variation and trends; bioassay; introduction to mathematical epidemiology; non-parametric methods.

Mr. Franti

103C. Medical Statistics. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103B, or consent of instructor. Continuation of course 103B; additional topics in bioassay; life tables and cohort studies; clinical trials; problems in sampling and surveys.

Mr. Franti

111. Animal Hygiene. (3) III.

Lecture—3 hours. Prerequisite: Biology 1 or consent of instructor. The causes, prevention, and control of animal diseases important in economic agriculture and in public health, with emphasis upon animal management factors in disease.

Mr. Adler

140. Principles of Epidemiology. (2) II.

Lecture—1 hour; case study—2 hours. Prerequisite: sophomore standing in the School of Veterinary Medicine or consent of instructor. Introduction to medical ecology with special consideration given to modes of disease transmission and to interrelationships between those host, agent, and environmental factors which are responsible for the distributional patterns of diseases in space and time. Mr. Schwabe

150. Food-borne Infections and Intoxications. (4) II.

Lecture—4 hours. Prerequisite: Bacteriology 2. Prevalence and characteristics of those diseases of man which are derived from food or food sources; access of disease agents to and distribution in food and food sources; exposure of man to those agents; prevention of food-borne diseases.

Messrs. Genigeorgis, Lee, Riemann, York

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**201. Diseases of Laboratory Animals. (3) II.**

Lecture—3 hours. Prerequisite: senior standing in veterinary medicine or consent of instructor. A study of infectious and noninfectious diseases of laboratory animals, including diagnostic procedures and treatment.

Messrs. Adler, Bustad, Conrad, Edward, Sadler, Theilen, Yamamoto

205. Physiological and Ecological Bases of Parasitism. (3) III.

Lecture—2 lectures of 1½ hours per week. Prerequisite: general parasitology and introductory biochemistry or consent of instructor. The physiological adaptations of protozoa and helminths for parasitism with consideration given to those host factors which influence the establishment of host-parasite associations.

Mr. Harlow

207. Diseases of Pet Birds. (1) II.

Lecture—1 hour. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. The diagnosis and treatment of diseases of small avian species. Mr. Brownell

208. Avian Medicine. (3) II.

Lecture—3 hours. Prerequisite: junior standing in the School of Veterinary Medicine or consent of instructor. Etiology, diagnosis, epidemiology, prevention and control of diseases of poultry, including those important to the public health.

Mr. Raggi (in charge), Mr. Adler,
Mr. Bankowski

209. Avian Medicine Laboratory. (2) I.

Lecture—1 hour; laboratory—2 hours. Prerequisite: senior standing in the School of Veterinary Medicine. Diagnosis of avian diseases by necropsy and laboratory procedures. Selected diseases, including some of bacterial, viral, and chemical etiology, are experimentally induced for study.

Mr. Yamamoto (in charge), Mr. Adler,
Mr. Raggi, Mr. Bankowski

210. Advanced Epidemiology. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: A doctoral degree (or equivalent) in veterinary medicine, human medicine, or dental medicine, or consent of instructor. Methods for the study of diseases in populations both of lower animals and of man, with critical discussions of illustrative case examples of "classical" and contemporary epidemiological research.

Miss Goggin, Mr. Riemann, Mr. Schwabe

212. Epidemiology of the Zoonoses. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 210 or consent of instructor. The epidemiological features of infections and infestations shared by man and other animals,

with particular attention to those perpetuated in nature by wildlife and those which are of greater public health and economic significance.

Mr. Enright, Mr. Cooper

214. Comparative Epidemiology of Noninfectious Diseases. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 210 or consent of instructor. Study of the environmental and host factors which are associated with the occurrence of diseases of noninfectious or unknown etiology. Emphasis will be placed on the comparison of the epidemiologic features of these diseases in man and lower animals.

Miss Goggin

216. Mass Screening for Diseases in Populations. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 210 or consent of instructor; Veterinary Microbiology 270 recommended. Consideration of immunodiagnostic, biochemical, and other techniques for mass screening of human and animal populations for abnormalities and disease; evaluation of their usefulness to study incidence and/or prevalence of such conditions and for application in programs of prevention and control. Mr. Yamamoto, Mr. Adler

218. Disease Control and Eradication. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 216 or consent of instructor. Studies of various approaches used to control diseases in lower animals and man. Discussions will be concerned with past successes and failures and emphasis placed on future prospects and limitations of these methods. Mr. Bankowski

240. Public Health. (3) III.

Lecture—3 hours. Prerequisite: junior standing in the School of Veterinary Medicine or consent of instructor. Introduction to public health and to the responsibilities of the veterinarian; consideration of the roles of lower animals in the causation and perpetuation of human diseases; consideration of occupational health hazards associated with the practice of veterinary medicine.

Mr. Schwabe

250. Sanitary Control of Meat and Milk. (2) III.

Lecture—2 hours. Prerequisite: junior standing in the School of Veterinary Medicine or consent of instructor. Principles and practice of inspection and sanitary control of meat of mammalian and avian origin and of milk.

Mr. Sadler, Mr. Riemann

290. Seminar in Epidemiology and Preventive Medicine. (1) I, II, III.

Seminar—2 hours.

The Staff

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

The Staff

299. Research. (1-9) I, II, III.

The Staff

FAMILY AND CONSUMER SCIENCES

Participating Departments:

AGRICULTURAL ECONOMICS

J. Herbert Snyder, Ph.D., *Chairman of the Department*

Department Office, 117 Voorhies Hall

Professors:

Daniel B. De Loach, Ph.D., D.Lit.
J. Herbert Snyder, Ph.D.

APPLIED BEHAVIORAL SCIENCES

Orville E. Thompson, Ph.D., *Chairman of the Department*

Department Office, 206 Walker

Professors:

Frederick L. Griffin, M.S. (*Emeritus*)
Glenn R. Hawkes, Ph.D.
Milton Hildebrand, Ph.D. (*Applied Behavioral Sciences and Zoology*)
Elwood M. Juergenson, Ph.D. (*also Coordinator of Vocational Teacher Education*)
David B. Lynn, Ph.D.
Sidney S. Sutherland, M.S. (*Emeritus*)
Orville E. Thompson, Ph.D.

Associate Professors:

Katherine W. Rossbach, M.A.
Emmy E. Werner, Ph.D.

Assistant Professor:

Mary C. Regan, Ph.D.
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Assistant Professor:

Isao Fujimoto, M.A. (*Acting, Applied Behavioral Sciences and Sociology*)

Lecturers:

Louise M. Bachtold, Ed.D.
Glen Burch, Ed.D.
Helen E. Giambruni, M.A.
Arline Johnson, M.S.
Helge B. Olsen
JoAnn Stabb, M.A.
Jane N. Welker, M.A.
Thomas J. Witt, M.A.

CONSUMER SCIENCES

Mary Ann Morris, Ph.D., *Chairman of the Department*

Department Office, 148 Home Economics Building

Professor:

Mary Ann Morris, Ph.D.

Associate Professor:

Rose Marie Pangborn, M.S. (*Consumer Sciences and Food Science and Technology*)

Assistant Professors:

Duane E. Heinz, Ph.D.
Howard L. Needles, Ph.D.
Gerald F. Russell, Ph.D.

S. Haig Zeronian, Ph.D.

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Professor:

Walter G. Jennings, Ph.D., (*Food Science and Technology*)

Lecturers:

Rosalie H. Haines, M.S.
Harold P. Lundgren, Ph.D.
JoAnn Stabb, M.A.

NUTRITION

Fredric W. Hill, Ph.D., *Chairman of the Department*
Department Office, 231 Home Economics Building

Professors:

Myron Brin, Ph.D.
Fredric W. Hill, Ph.D.
Lucille S. Hurley, Ph.D.

Associate Professor:

Frances J. Zeman, Ph.D.

Assistant Professor:

Susan M. Oace, Ph.D.

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Professors:

Robert E. Hungate, Ph.D. (*Bacteriology*)
Magnar Ronning, Ph.D. (*Animal Science*)
Aloys L. Tappel, Ph.D. (*Food Science and Technology*)

Associate Professor:

Richard A. Freedland, Ph.D. (*Physiological Sciences*)

Assistant Professor:

Quinton R. Rogers, Ph.D. (*Physiological Sciences*)

Lecturers:

Rocco J. Della Rosa, Ph.D. (*Physiological Sciences*)

Marvin Goldman, Ph.D. (*Physiological Sciences*)

Curriculum Major Advisers.—See *Schedule and Directory Listing*.

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

Applied Behavioral Sciences

Lower Division Courses

18. Scientific Bias and Social Myths. (2) II, III.

Lecture—2 hours. Assumptions and biases in different fields of knowledge, taboo topics, and the nature of evidence in the public and academic communities; fit between University education and issues of society.

II. Mr. Fujimoto, III. Miss Regan

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

The Staff

39. Special Study for Undergraduates. (1-5) I, II, III.
The Staff

47. Orientation to Community Resources. (1) II, III.

Field trip—3 days; Seminar—two 2 hour sessions. 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.

Mr. Hawkes

Upper Division Courses

150. Housing. (4) III.

Lecture—4 hours. Exploration of the shelter aspects of the family environment. Study of technological, social, economic and aesthetic factors affecting the nature and organization of family and community housing.

Mr. Witt

151. Community Development. (4) II, III.

Lecture—4 hours. Prerequisite: consent of instructor. Principles of community development for change agents involved in community action, extension, and rural development; theories and processes of social change pertinent to community analysis; the changing community in both domestic and cross-cultural settings, particularly small towns and urban neighborhoods with rural migrants.

Mr. Fujimoto

160. The Disadvantaged: Issues and Innovations. (3) I, II.

Seminar—3 hours. Prerequisite: 10 units of psychology, sociology, and/or anthropology. Identification and characteristics of the "invisible" segments of society with emphasis on the socially and culturally disadvantaged. Barriers encountered by these individuals and avenues for change are explored.

Mr. Lynn

161. The Continuing Learner. (3) II.

Lecture—3 hours. Prerequisite: Education 110 (may be taken concurrently). Principles of adult education emphasizing barriers to learning, the role of non-verbal communication, the importance of self-concept in teaching adults, and the educator's role in working with non-school populations.

190. Research Methods in Applied Behavioral Sciences. (3) I.

Lecture—3 hours. Prerequisite: Psychology 1A. Application of social sciences research methodology to multidisciplinary problems.

Miss Regan, Mr. Thompson

191. Research Design and Analysis. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 13, course 190 or consent of instructor. Survey of major types of research design in the Behavioral Sciences. Tests of statistical significance, analysis of variance, and related topics. Use of computer in data processing.

Miss Regan

- 198. Directed Group Study. (1-5) I, II, III.** The Staff
199. Special Study for Advanced Undergraduates. (1-5) I, II, III. The Staff

Consumer Economics

Upper Division Courses

- 141. Consumers and the Market. (4) II.**

Lecture—4 hours. Prerequisite: Economics 1A; Mathematics 13. Social and economic factors affecting consumer expenditures. The structure of the retail market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers.

- 142. Social and Economic Problems of Families. (4) III.**

Lecture—4 hours. Prerequisite: Economics 1A; Mathematics 13. The management of income and expenditures by the family. The use of consumer credit, savings, investments, and insurance by families.

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

- 199. Special Study for Advanced Undergraduates. (1-5) I, II, III.** The Staff

Graduate Courses

- 247. Consumption and Standards of Living. (4) III.**

Lecture—4 hours. Prerequisite: course 141. An analytical treatment of household consumption behavior. The effects of income, prices, and household characteristics on expenditures. Standards of income and consumption adequacy.

Mr. DeLoach

- 290. Seminar. (1) I, II, III.**

Seminar—1 hour.

- 299. Research. (1-12) I, II, III.**

The Staff

Design

Lower Division Courses

- 6. Introduction to Design. (4) I, II.**

Lecture—4 hours. Introduction to various fields of design. Consideration of the social, cultural, and physical needs of man influencing the design of objects. I. Mr. Witt, II. Mr. Olsen

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

Prerequisite: consent of instructor. The Staff

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

Prerequisite: consent of instructor. The Staff

Upper Division Courses

- 120A. Principles of Design. (3) I.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: Art 2, Psychology 1A. Principles of organization and composition in design. An exploration of the subjective process of awareness.

Mr. Olsen, Mr. Witt

- 120B. Principles of Design. (3) II.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 120A. Exploration of the principles of structure; development of approaches to the solution of problems involving multi-dimensional space and movement. Mr. Olsen

- 120C. Principles of Design. (3) III.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 120A. Visual perception and organization in the interaction of color phenomena; design problems dealing with the effects and functions of color as sensation, as light and as form.

Mr. Witt

- 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.

Mrs. Giambruni

- 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.

Mrs. Giambruni

- 143. History of Costume Design. (3) II.**

Lecture—3 hours. Prerequisite: Art 1A. The history of costume design from the earliest times to the present with emphasis on both aesthetic and functional aspects.

Mrs. Stabb

- 144. History of Interior Design. (3) I.**

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.

Mrs. Giambruni

- 160A-160B-160C. Textile Design. (3-3-3) I-II-III.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 120A, or consent of instructor. An exploration of the design and appreciation of hand printed textiles; emphasizes the unique qualities of the individual as producer.

Mrs. Rossbach

170A-170B-170C. Costume Design. (3-3-3) II-III-I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 120A, or consent of instructor. Studio projects in costume design; consideration of functional and aesthetic factors influencing the historic, contemporary and projected image of man as expressed through costume.

Mrs. Stabb

180A-180B-180C. Interior Design. (3-3-3) I-II-III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 120A, or consent of instructor. Analysis, organization and solution of interior design problems involving the social, cultural, economic and aesthetic needs of man. Consideration of the interrelationship of interior design, architectural and landscape design.

I-III. Mr. Olsen, II. Mr. Witt

197. Individual Problems in Design. (3) III.

Seminar—1 hour; laboratory—6 hours. Prerequisite: design major of senior standing. A proseminar in relationship to a senior thesis, a comprehensive design problem pursued under the direction of a member of the faculty.

The Staff (Mrs. Rossbach in charge)

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

Prerequisite: upper division standing and consent of instructor. The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. The Staff

Foods**Upper Division Courses****100A. Principles of Food Composition and Preparation. (3) I.**

Lecture—3 hours. Prerequisite: Chemistry 8B; one course in physics; Bacteriology 2 (may be taken concurrently). Science, sensory aspects and aesthetics of food preparation with emphasis on the chemical and physical properties of food products. Characteristics and functions of colloids, carbohydrates, lipids, and proteins in food combinations. Mr. Russell, Mr. Heinz

100B. Principles of Food Composition and Preparation. (3) II.

Lecture—3 hours. Prerequisite: course 100A. Chemical, physical, microbiological, and sensory aspects relating to food. Edible plant tissues, protein foods, pigments, food preservation, packaging and marketing, food regulatory agencies, science and aesthetics of food combinations, food habits, world food problems.

Mrs. Pangborn, Mr. Russell

101A. Principles of Food Composition and Preparation Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: course 100A, should be taken concurrently. Studies of the chemical, physical and sensory properties of foods. Characteristics and functions of basic constituents and of food systems—solutions, colloidal dispersions, gel structures, emulsions and foams.

Mr. Russell

101B. Principles of Food Composition and Preparation Laboratory. (2) II.

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 100B, should be taken concurrently. Studies of the chemical, physical, microbiological and sensory aspects relating to foods. Plant, meat and flour systems, science and aesthetics of food combinations.

Mr. Russell

134A-134B. Advanced Food Studies. (2-2) I, II.

Lecture—2 hours. Prerequisite: course 100B or an upper division course in food science and technology. Chemical and physical properties of food materials influencing consumption.

Mr. Heinz, Mr. Russell

135A-135B. Advanced Food Studies Laboratory.

(2-2) I, II.

Laboratory—6 hours. Prerequisite: course 134A, 134B (may be taken concurrently) or consent of instructor. Laboratory methods and theories employed to study changes occurring in foods during consumer usage.

Mr. Heinz

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: open only to honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis.

The Staff (Mr. Heinz in charge)

197. Introduction to Research in Foods. (4) III.

Lecture—1 hour; laboratory—9 hours. Prerequisite: food majors of senior standing. Senior thesis on independent problems.

The Staff (Mr. Heinz in charge)

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

The Staff (Mr. Heinz in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Heinz in charge)

Graduate Courses**290. Seminar. (1) I, II, III.**

Seminar—1 hour.

The Staff

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

The Staff

299. Research. (1-12) I, II, III.

The Staff

Home Economics Education**Professional Course****300. Teaching Home Economics in Secondary Schools. (3) I, II, III.**

Lecture—3 hours. Prerequisite: senior or graduate standing; a teaching major or minor in home economics. Instructional procedures and materials used in teaching home economics in secondary schools. This course should be completed before student teaching and is accepted as a part of the professional education requirements for the teaching credential.

Miss Johnson

Home Management**Upper Division Courses****140. Home Management. (4) I.**

Lecture—4 hours. Prerequisite: Psychology 1A. Management principles in relation to family resources, goals, and values.

140L. Laboratory in Home Management. (3) II, III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 140 and senior or graduate standing. Integrated experiences in the various phases of home management.

Human Development**Lower Division Courses****12. Human Sexuality and Sexual Behavior. (2) I.**

Lecture—2 hours. Structure, physiology, fertility, birth control, pregnancy, childbirth, historical and cross-cultural survey, homosexuality and other deviation, legal and social considerations, psychological and emotional considerations, courtship, communication, sex education, sexual response, lovemaking, attitudes, responsibility and values.

Mr. Hildebrand

***33. Laboratory Study of Young Children. (2) I, II, III.**

Discussion—1 hour; laboratory—3 hours. Observation of individual and cultural differences among 3- to 5-year-old children in the University Laboratory Nursery School.

Mrs. Welker

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

The Staff

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

The Staff

Upper Division Courses**131. Infancy and Early Childhood. (4) I, II, III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: Psychology 1A. Psychological and cultural factors in the development of infants and preschool children.

Mr. Lynn

133. Case Study of a Preschool Child. (2) I, II, III.

Lecture—1 hour; observation—3 hours. Prerequisite: course 131 or consent of instructor. Intensive case study of an individual child, age 3 to 5; use of observational techniques, cumulative records, test results.

Mrs. Welker

136. Middle Childhood and Adolescence. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Psychology 1C. Psychological and cultural factors in the development of school-age children and adolescents.

Miss Werner

136L. Laboratory in Child Development. (2) I, II, III.

Discussion—1 hour; laboratory—3 hours. Prerequisite: Human Development 133 or 136 or Psychology 112. Laboratory work with school-age children and adolescents including supervised tutorial work with children with special needs. May be repeated for credit.

Mrs. Bachtold

137. Contemporary American Family. (4) I, III.

Lecture—4 hours. Sociological and psychological factors influencing marriage and the family in present-day society.

Mr. Hawkes

139. Diagnostic Techniques with Children. (4) I, II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 131 and 136, or Psychology 112. Evaluation of intelligence, personality, and special abilities of children. Class demonstration of individual tests for infants, preschool, and school-age children. Concepts of environment. Relevant research findings.

140. Emotionally Disturbed Children. (3) II, III.

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 131 and 136, or Psychology 112. Discussion of psychosis, neurosis, behavior disorders, and learning difficulties in children.

Mrs. Bachtold

141. Physically Handicapped and Mentally Retarded Children. (3) I, II.

Lecture—3 hours. Prerequisite: courses 131 and 136 or Psychology 112. Etiology and diagnosis of sensory handicaps, brain damage, and mental retardation in children; education of these children.

Miss Werner

142. Gifted Children. (3) I, II.

Lecture—3 hours. Prerequisite: course 136 or Psychology 112 or consent of instructor. Review of research on intellectually gifted; planning appropriate classroom experiences; role of parents and teachers in encouraging creative thinking.

Mrs. Bachtold

* Not to be given, 1969-70.

- 198. Directed Group Study. (1-5) I, II, III.** The Staff
199. Special Study for Advanced Undergraduates. (1-5) I, II, III. The Staff

Graduate Courses

- 210. Child Development and Behavior. (3) I.**
 Lecture—2 hours; discussion—2 hours. An analysis of the historical, theoretical and empirical issues in child development.
- 290. Seminar. (2) I, II, III.**
 Discussion—2 hours. Discussion and analysis of research in human development. The Staff
- 299. Research. (1-12) I, II, III.** The Staff

Institution Management**Upper Division Courses**

- 121. Institution Food Study. (5) I.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: Foods 100B. The principles and problems involved in the preparation and service of food in institutions.

Miss Zeman

- 122A. Organization and Management of Institutions. (3) II.**

Lecture—3 hours. Prerequisite: Foods 100B; course 121 recommended. Organization and administration of institutional food services; management and training of personnel; work simplification, sanitation.

Miss Zeman

- 122B. Food Service Planning and Control. (4) III.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 122A. Design of food service facilities; selection of equipment and furnishings. Procedures employed in financial control.

Miss Zeman

Nutrition**Lower Division Course**

- 10. Discoveries and Concepts in Nutrition. (3) II.**

Lecture—3 hours; not open for credit to students who have taken an upper division course in nutrition. Nutrition as a science; historical development of nutrition concepts; properties of nutrients and foods.

Mr. Hill

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 Nutrition 110 and 111. Introduction to the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism; nutrient requirements of man.

Miss Oace

- 102L. General Nutrition Laboratory. (1) II.**

Laboratory—3 hours. Prerequisite: course 102A; course 102B (should be taken concurrently); not open for credit to students who have taken 111L. Laboratory study of the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism.

Miss Oace

- 110. Principles of Nutrition. (5) II.**

Lecture—4 hours; discussion—1 hour. Prerequisite: Biochemistry 101B (may be taken concurrently); a course in physiology or zoology. The fundamental principles of the nutrition of man and other animals. The nutrients in relation to physiological processes of growth, maintenance, and reproduction. Nutritional disorders.

Mr. Robinson, Mr. 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.

Mrs. Hurley

- 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.

Mrs. Hurley, Mr. Vohra

- *114. Nutrition and Development. (4) I.**

Lecture—4 hours. Prerequisite: course 110 or 102B. The role of nutritional factors in embryonic and postnatal development. Mrs. Hurley

- 116. Diet Therapy. (5) I.**

Lecture—5 hours. Prerequisite: course 111 or 102B; Biochemistry 101B or Physiological Sciences 101B. Biochemical and physiological bases for therapeutic diets. Problems in planning diets for normal and pathological conditions.

- 117. Experimental Nutrition. (5) III.**

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.

- 194H. Special Study for Honors Students. (1-5) I, II, III.**

Prerequisite: open only to honors students of senior standing. Independent study of selected topics under the direction of a staff member or the writing of a senior thesis.

The Staff (Mr. Hill in charge)

* Not to be given, 1969-70.

- 198. Directed Group Study. (1-5) I, II, III.** The Staff
199. Special Study for Advanced Undergraduates. (1-5) I, II, III. The Staff

Graduate Courses

- 201A. Advanced General Nutrition. (4) I.**

Lecture—4 hours. Prerequisite: Bacteriology 2; Biochemistry 101B; Physiology 110B; a course in nutrition. Advanced studies of protein and amino acid metabolism; animal energetics and energy metabolism. Comparative aspects.

The Staff

- 201B. Advanced General Nutrition. (3) II.**

Lecture—3 hours. Prerequisite: Bacteriology 2; Biochemistry 101B; Physiology 110B; a course in nutrition. Advanced studies of problems in nutrition with emphasis on minerals; water balance. Comparative aspects.

The Staff

- 201C. Advanced General Nutrition. (3) III.**

Lecture—3 hours. Prerequisite: Bacteriology 2; Biochemistry 101B; Physiology 110B; a course in nutrition. Advanced studies of metabolic function and nutritional importance of vitamins; essential fatty acids; deficiency and degenerative diseases. Comparative aspects.

The Staff

- *250. Concepts of Animal Nutrition. (3) II.**

Lecture—3 hours. Prerequisite: courses 201A, 201B, 201C. Dynamic interrelationships between food, animal, and environment, including concepts in food intake, digestion, absorption, and utilization of nutrients.

- 290. Seminar. (1) I, II, III.**

Seminar—1 hour.

The Staff (Mr. Grau in charge)

- 298. Group Study. (1-5) I, II, III.**

The Staff (Mr. Weir in charge)

- 299. Research. (1-12) I, II, III.**

The Staff (Mr. Weir in charge)

Textiles and Clothing**Lower Division Courses**

- 7. Clothing Study. (2) I, III.**

Lecture—2 hours. Prerequisite: Art 2, Psychology 1A. Social, psychological, and artistic aspects of clothing as related to the selection and design for individuals.

Mrs. Stabb

- 47. Field Study. (1) II.**

Seminar—three 2-hour sessions; field trip—2 days. To observe commercial aspects of the designing, production, development, distribution and maintenance of textiles and clothing.

Miss Morris

Upper Division Courses

- 160. Introduction to Textiles. (3) I.**

Lecture—3 hours. Prerequisite: Chemistry 8B. Study of plant, animal, and synthetic fibers used in textiles and of the finished textile fabrics.

Miss Morris

- 160L. Introduction to Textiles Laboratory. (2) I.**

Laboratory—6 hours. Prerequisite: course 160 (may be taken concurrently). Study of plant, animal, and synthetic fibers used in textiles and of the finished textile fabrics.

Miss Morris

- 161. Textile Fibers. (3) III.**

Lecture—3 hours. Prerequisite: course 160. The chemical and physical structure of textile fibers, and its relation to fiber and fabric properties.

Mr. Zeronian

- 161L. Textile Fibers Laboratory. (2) III.**

Laboratory—6 hours. Prerequisite: course 161 (may be taken concurrently). Laboratory methods and procedures employed in studying chemical and physical properties of textile fibers.

Mr. Zeronian

- 162. Textile Fabrics. (3) II.**

Lecture—3 hours. Prerequisite: course 160. The properties of fabrics as related to serviceability, comfort, and appearance.

Miss Morris

- 162L. Textile Fabrics Laboratory. (1) II.**

Laboratory—3 hours. Prerequisite: course 162 (may be taken concurrently). Laboratory methods and procedures employed in studying properties of textile fabrics as related to serviceability, comfort, and appearance.

Miss Morris

- 172. Socio-Economic Factors of Clothing and Textiles. (3) II.**

Lecture—3 hours. Prerequisite: Economics 1A, sociology or cultural anthropology; Psychology 1A. Clothing and textiles as related to social, economic, and psychological aspects of families and cultures.

Mrs. Stabb

- 194H. Special Study for Honors Students. (1-5) I, II, III.**

Prerequisite: open only to honors students of senior standing. Independent study of selected topics under the direction of a member, or members of the staff. Completion will involve the writing of a senior thesis.

The Staff

- 197. Introduction to Research in Textiles and Clothing. (4) III.**

Lecture—1 hour; laboratory—9 hours. Prerequisite: Textile Science major of senior standing. Senior thesis on independent problems.

Mr. Zeronian

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

* Not to be given, 1969-70.

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses

292. Seminar in Textiles. (2) I, II, III.

Seminar—2 hours. Selected topics related to the chemical and physical properties of fibers and fabrics.

The Staff

Prerequisite: course 7 (may be taken concurrently).

Application of selection, design, and construction principles in different textile fabrics.

Mrs. Haines

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

The Staff

299. Research. (1-12) I, II, III.

The Staff

Professional Courses

370. Clothing Study Laboratory. (2) I, II, III.

Discussion—1 hour; laboratory—3 hours.

375. Clothing Design Laboratory. (2) I, II, III.

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 370. A knowledge of the principles of fitting and basic dress design through the medium of flat pattern designing, drafting and draping.

Mrs. Haines

376. Advanced Clothing Laboratory. (3) I, III.

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 370. Advanced problems and tailoring techniques in clothing construction.

Mrs. Haines

FOOD SCIENCE

Participating Departments:

FOOD SCIENCE AND TECHNOLOGY

Clinton O. Chichester, Ph.D., *Chairman of the Department*

Department Office, 126A Cruess Hall

Professors:

Clinton O. Chichester, Ph.D.

Edwin B. Collins, Ph.D.

Walter L. Dunkley, Ph.D.

Robert E. Feeney, Ph.D.

Eugene L. Jack, Ph.D. (*Emeritus*)

Walter G. Jennings, Ph.D.

George L. Marsh, M.S. (*Emeritus*)

Emil M. Mrak, Ph.D.

Thomas A. Nickerson, Ph.D.

Herman J. Phaff, Ph.D. (*Food Science and Technology and Bacteriology*)

Chester L. Roadhouse, D.V.M. (*Emeritus*)

Lloyd M. Smith, Ph.D.

Clarence Sterling, Ph.D.

George F. Stewart, Ph.D.

Aloys L. Tappel, Ph.D.

Nikita P. Tarassuk, Ph.D. (*Emeritus*)

Reese H. Vaughn, Ph.D.

John R. Whitaker, Ph.D.

Associate Professors:

Richard A. Bernhard, Ph.D.

Mendel Mazelis, Ph.D.

Martin W. Miller, Ph.D.

Rose Marie Pangborn, M.S. (*Food Science and Technology and Consumer Sciences*)

Assistant Professors:

Eli V. Crisan, Ph.D.

Jerald M. Henderson, D.Eng. (*Food Science and Technology and Mechanical Engineering*)

Michael J. Lewis, Ph.D.

Morris H. Woskow, Ph.D. (*Food Science and Technology and Psychology*)

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Professors:

^{2, 3} Maynard A. Amerine, Ph.D. (*Viticulture and Enology*)

James F. Guymon, Ph.D. (*Viticulture and Enology*)

Samuel B. Lepkovsky, Ph.D. (*Poultry Husbandry, Berkeley Campus, Emeritus*)

Edward B. Roessler, Ph.D. (*Mathematics*)

J. M. Smith, Sc.D. (*Chemical Engineering*)

Associate Professors:

John C. Harper, D.Sc. (*Agricultural Engineering*)

Daniel W. Peterson, Ph.D. (*Poultry Husbandry*)

Assistant Professor:

Ralph E. Kunkee, Ph.D. (*Viticulture and Enology*)

Lecturers:

A. Wade Brant, Ph.D.

Donald G. Crosby, Ph.D. (*Environmental Toxicology*)

Dieter W. Grunwedel, Ph.D.

Wendell W. Kilgore, Ph.D. (*Environmental Toxicology*)

Sherman J. Leonard, B.S.

Bor S. Luh, Ph.D.

² Absent on leave, fall quarter 1969.

³ Absent on leave, winter quarter 1970.

VITICULTURE AND ENOLOGY

Harold W. Berg, M.S., *Chairman of the Department*
Department Office, 1023 Wickson Hall

Professors:

Maynard A. Amerine, Ph.D.
Harold W. Berg, M.S.
James A. Cook, Ph.D.
James F. Guymon, Ph.D.
Klayton E. Nelson, Ph.D.
Harold P. Olmo, Ph.D.
Robert J. Weaver, Ph.D.
A. Dinsmoor Webb, Ph.D.
Albert J. Winkler, Ph.D., LL.D. (*Emeritus*)

Associate Professor:

Lloyd A. Lider, Ph.D.

Assistant Professor:

Ralph E. Kunkee, Ph.D.

◇ ◇ ◇

Professor:

Frederick T. Addicott, Ph.D. (*Agronomy and Range Science*)

Lecturers:

W. Mark Kliewer, Ph.D.
Cornelius S. Ough, B.S.
Vernon L. Singleton, Ph.D.

Departmental Major Advisers.—See *Schedule and Directory Listing*.

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

Food Science and Technology

Lower Division Courses

1. Introduction to Food Science. (3) I.

Lecture—3 hours. Open to nonmajors. Development and maintenance of an adequate food supply; food quality and its measurement; scientific and technological aspects of converting raw animal and plant products into a large variety of processed and preserved foods; maintenance and improvement of the acceptability and nutritional value of foods.

Mr. Stewart, Mr. Mrak

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

Prerequisite: consent of instructor.
The Staff (Mr. Chichester in charge)

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

The Staff (Mr. Chichester in charge)

49. Processing Plant Studies. (1) II.

Prerequisite: course 1. Field trips during spring recess to observe processing, distribution, quality control and regulatory control of foods and related materials.

The Staff

Upper Division Courses

***100. Processing Agricultural Products. (5) I.**

Lecture—4 hours; laboratory—3 hours. Prerequisite: Biology 1; Chemistry 8B. Processing of foods, feeds, and fibres to provide desirable qualities, such as convenience, economy and utility. Principles used in raw product selection, conversion, preservation, and quality control.

Mr. Miller, Mr. Dunkley

101. Biochemistry and Food Science. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101B. Topics on enzymes, proteins, lipids and vitamins. Biochemical principles related to food composition, preservation and processing.

Mr. Tappel

102. Biochemistry and Technology of Malting and Brewing. (2) III.

Lecture—2 hours. Prerequisite: Biochemistry 101B. Special attention is paid to the complex biochemistry of raw materials, malting, brewing, and fermentation as it affects industrial practice. Field trips and pilot brewing by arrangement.

Mr. Lewis

103. Physical and Chemical Methods for Food Analysis. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biochemistry 101B; Chemistry 5; Chemistry 8B (may be taken concurrently). Theory and application of physical and chemical methods for analyzing foods.

Mr. Whitaker, Mr. Bernhard

104A. Food and Industrial Microbiology. (2) II.

Lecture—2 hours. Prerequisite: Bacteriology 2; Chemistry 8B. Taxonomy, physiology, ecology, and control of microorganisms important in manufacturing and ripening foods, producing defects, and spoilage; disposing of wastes and protecting public health; bacteriophage action and control.

Mr. Collins

104B. Food and Industrial Microbiology. (2) III.

Lecture—2 hours. Prerequisite: course 104A. Continuation of course 104A with emphasis on destruction of microorganisms, and food-borne infections and intoxications.

Mr. Collins

105A-105B. Food and Industrial Microbiology Laboratory. (2-2) II-III.

Laboratory—6 hours. Prerequisite: courses 104A-104B (should be taken concurrently); Bacteriology 2; Chemistry 8B. Laboratory pro-

* Not to be given, 1969-70.

cedures selected to follow subject matter sequence of course 104A-104B.

Mr. Crisan and Mr. Vaughn

106. Industrial Fermentations. (3) I.

Lecture—3 hours. Prerequisite: Bacteriology 2. Microorganisms and their activity in relation to industrial processes such as baking, brewing, and the production of industrial solvents, vitamins, enzymes, drugs, and other chemicals. For laboratory experience in this field, students may register in course 106L.

Messrs. Lewis, Phaff, Kunkee

106L Food and Industrial Microbiology Laboratory.

(3) (Summer).

Laboratory—90 hours total. Prerequisite: A course in industrial fermentation. 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.

Mr. Lewis

107A. Analysis of Variance as Applied to Sensory Evaluation Problems. (1) II.

Lecture, Discussion and Laboratory—2 hours a week. Prerequisite: Mathematics 13 or its equivalent. Intensive review of hypothesis testing and the analysis of variance.

Mr. Roessler, Mr. Woskow, Mrs. Pangborn

107B. Principles of Sensory Evaluation of Foods. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 107A or the ability to use analysis of variance. Nature of sensory response with emphasis on taste and smell as related to foods; design and methodology of small panel and consumer panel testing; and application of appropriate mathematical procedures.

Mr. Amerine, Mr. Woskow, Mrs. Pangborn

108A. Food Plant Sanitation. (2) I.

Lecture—2 hours. Prerequisite: Chemistry 1A. Principles of water conditioning and water treatment, chemical sanitizing agents, metallic corrosion, fundamental concepts in the disposal of wastes, and discussion of other factors relating to food plant sanitation. Mr. Jennings

108B. Food Plant Sanitation. (2) II.

Lecture—2 hours. Prerequisite: Chemistry 8B. Principles of hard-surface detergency; detergent classification and formulations, soil and substrate considerations, energy relationships in detergency, and theories and mechanisms of detergency. Mr. Jennings

109. Quality Control for Food Processing Operations. (3) III.

Lecture—3 hours. Prerequisite: course 103, and Mathematics 13. Objectives of quality control; measurement of quality attributes; develop-

ment of grades and standards of quality; sampling and inspection techniques; statistical procedures; application of analyzed data to control of quality. Mr. Bernhard, Mr. L. M. Smith

110A. Engineering Principles of Food Processing. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 16C; Physics 2B, 3B. Application of the conservation of mass and energy to food processing. Elements of engineering thermodynamics, fluid mechanics, and heat transfer. Mr. Merson

110B. Engineering Principles of Food Processing. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110A. Introduction to process principles, including counter-current operation and equilibrium stage processing. Treatment of heat exchanger, evaporation, and refrigeration unit operations. Field trips to processing plants.

Messrs. Harper, Merson, Guymon

110C. Engineering Principles of Food Processing. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110B. Principles of psychrometry and the unit operations of dehydration and distillation; process control and economic considerations. Field trips to selected processing plants.

Messrs. Harper, Merson, Guymon

111A. Preservation Technology. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Bacteriology 2; Chemistry 8B. Technology of the preservation of foods by pasteurization, sterilization, and radiation. Laboratories and field trips. Mr. Dunkley, Mr. Leonard

111B. Preservation Technology. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 111A. Technology of the preservation of foods by concentration, drying, refrigeration, freezing, fermentation and chemical additives. Laboratories and field trips.

Mr. Miller

113. Structure of Food Materials. (3) I.

Lecture—2 hours; laboratory—3 hours. Anatomical features and structural properties of foods; histochemical tests of food tissues; rheological characteristics; food texture.

Mr. Sterling

119. Principles of Dairy Processing. (3) III.

Lecture—3 hours. Prerequisite: Bacteriology 2; Chemistry 8B. Technical principles related to the commercial processing of milk and its products including ice cream, butter and cheese; theory and practical applications. Mr. Dunkley

122. An Introduction to Enzymology. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Biochemistry 101B. Principles of purification, physicochemical and enzymatic properties, and utilization with emphasis on enzymes which are used, or have potential use, in the food and beverage industries. Mr. Whitaker

125. Metals and Metal Complexes in Foods. (4) II.

Lecture—4 hours. Prerequisite: Biochemistry 101B; Chemistry 109B. Structure, reactions, and physical properties of metal complexes, particularly those of importance to food science. The biochemistry of metal ions in foods. Mr. Gruenwedel

130. Chemistry of Milk and Dairy Products. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101A. The chemistry of milk constituents; physical and chemical properties of milk; and the changes that occur during the processing and storage of dairy products, with emphasis on quality. Offered in even-numbered years. Mr. Smith

131. Packaging Processed Foods. (3) II.

Lecture—3 hours. Prerequisite: course 1; open to nonmajors. Technical aspects of packaging processed foods. Definitions and functions of packages for food. Packaging materials and properties. Public health problems associated with packaging. Food-packaging interactions for major commodities and their control. Design criteria, construction technology and performance testing of food packages. Mr. Stewart

190. Recent Advances in Food Technology. (1) I.

Lecture—1 hour. Prerequisite: two courses in Food Science and Technology. Assigned topics, reports, and discussions concerning recent advances in food technology. Mr. Chichester

194H. Special Study for Honors Students.

(1–5) I, II, III.

Prerequisite: open only to majors who are honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. The Staff

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

Prerequisite: consent of instructor.

The Staff (Mr. Chichester in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff (Mr. Chichester in charge)

Graduate Courses**210A. Proteins: Functional Activities and Interactions. (3) II.**

Lecture—3 hours. Prerequisite: Biochemistry 101B. The relationships of structure of proteins

to their biological functions. Structural proteins, complexing proteins, and catalytic proteins in plant and animal materials and products.

Mr. Feeney

210B. Proteins: Functional Activities and Interactions. (2) III.

Lecture—2 hours. Prerequisite: course 210A or Biochemistry 201A. The relationships of structure of proteins to their biological functions. Structural proteins, complexing proteins, and catalytic proteins in plant and animal materials and products.

Mr. Feeney

211. Chemistry of the Food Lipids. (3) 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.

Mr. Smith

213. Macromolecular Gels. (2) II.

Lecture—2 hours. Prerequisite: Biochemistry 101A. Structural interrelationship of water with typical biological polymers in gels; xerogels; gel properties and methods of study. Mr. Sterling

220. The Natural Coloring Matters. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: 3 units of biochemistry or plant biochemistry; 3 units of upper division organic chemistry. Chemistry of natural pigments and related compounds; spectrophotometric and chromatographic techniques; special emphasis on pigments in relation to foods.

Mr. Chichester

250A–250B. Isolation and Characterization of Trace Volatiles. (2) I, II.

Lecture—2 hours. Prerequisite: consent of instructor. Preparation of volatile concentrates suitable for gas chromatographic separations; influence of the design and type of chromatograph on the efficiency of separation; techniques of trapping and reinjecting chromatographic fractions; and spectrometric characterization of the separated compounds.

Mr. Jennings

290. Seminar. (1) I, II, III.

Seminar—1 hour.

Mr. Mazelis

291. Current Research Literature. (1) I, II, III.

Seminar—1 hour. Prerequisite: graduate student standing. Critical reading, evaluation, and presentation of papers from the literature as well as results of own research with emphasis on those dealing with all aspects of proteins, enzymes and nucleic acids.

The Staff

298. Group Study. (1–5) I, II, III.

Directed study on food chemistry, food microbiology, food processing or sensory evaluation.

The Staff (Mr. Chichester in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing.

The Staff (Mr. Chichester in charge)

Viticulture and Enology†

Lower Division Course

3. Introduction to Wine Making. (3) II, III.

Lecture—3 hours. An introduction to wine technology, including history, fermentation, production practices, wine types, and the wine industry of California and other wine producing areas.

Mr. Singleton, Mr. Amerine

Upper Division Courses

124. Enology: Wine Production. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: Chemistry 9, 109B; Food Science and Technology 107; Plant Science 2; and course 3. The principles and practice of making the various standard types of wines, with special reference to the grape varieties used and the methods of vinification required for each.

Mr. Berg

125. Principles of Sensory and Chemical Analysis of Wines; Wine Types. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: Chemistry 9, 109B; Food Science and Technology 107; Plant Science 2; and courses 3, 124. Principles of sensory and chemical examination of wines; wine regions of the world; principles of production of sparkling wines and vermouth.

Mr. Amerine

126. Enology: Wine Processing. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: Chemistry 9, 109B; Food Science and Technology 107A—107B; Plant Science 2; and courses 3, 124, 125. Principles and theory of nonbacterial disorders: metal, tartrate, protein, color, oxidative and their control by clarification, refrigeration, filtration and ion-exchange.

Mr. Berg

140. Distillation Principles and Brandy Technology. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 5, 8B. Recommended:

FOODS—See Family and Consumer Sciences

FOREIGN LITERATURE IN TRANSLATION

The following courses are open to students throughout the campus. The readings are in English. Refer to departmental listing for descriptions of courses.

Classics

139A and 139B. Greek Literature in Translation.

† Additional Viticulture and Enology courses listed under Plant Science, page 339.

Chemistry 109B; Food Science and Technology 110A. Principles of distillation including engineering aspects and problems with emphasis upon the alcohol-water system and distillation of wines; brandy types, sensory and chemical analysis and production factors. Offered in odd-numbered years.

Mr. Guymon

191. Proseminar in Enology. (1) I, II, III.

Lecture—1 hour. Prerequisite: consent of instructor. Reports and discussion of recent advances in enology.

Mr. Amerine, Mr. Berg

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

Prerequisite: consent of instructor.

The Staff (Mr. Berg in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Mr. Berg in charge)

Graduate Courses

217. Microbiology of Wine Production. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: Bacteriology 2; Biochemistry 101A; Chemistry 5, 8B. Recommended: course 3 or 124, 125, 126, and an upper division course in Bacteriology. Nature, development, physiology, biochemistry, and control of yeasts and bacteria involved in the making, aging, and spoilage of wines.

Mr. Kunkee

219. Plant Phenolics. (3) 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.

Mr. Singleton

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor.

Mr. Kunkee

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

The Staff (Mr. Berg in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Berg in charge)

Dramatic Art

20. Introduction to Dramatic Art.

158A, 158B. World Drama.

159. Contemporary Drama.

English

170A. The Epic.

170B. European Influences on the English and American Novel.

171. English Bible as Literature.

French

*39A. French Literature in English Translation: to the End of the Eighteenth Century.

39B. French Literature in English Translation: to the Nineteenth Century.

*39C. French Literature in English Translation: the Contemporary Period.

141. Gide and Proust.

142. French Novel from Malraux to the Nouveau Roman.

150. Masterpieces of French Literature.

151. The French Novel.

German

10. The Development of German Literature.

110. Masterpieces of German Prose from Goethe to Kafka.

111. Masterpieces of German Drama from Lessing to Brecht.

112. Masterpieces of German Poetry from Walther von der Vogelweide to Rilke.

FRENCHMax Bach, Ph.D., *Chairman of the Department*
Department Office, 515 Sproul Hall*Professor:*

Max Bach, Ph.D.

Associate Professor:

Marshall Lindsay, Ph.D.

Assistant Professors:

Edward M. Bloomberg, Ph.D.

Gerald Herman, Ph.D.

George H. Keith, Ph.D.

Ruth B. York, Ph.D.

114. Goethe's Faust.

115. German Literature of the Twentieth Century up to the Second World War.

116. German Literature of the Twentieth Century since the Second World War.

117. Kafka and Dada.

118. Brecht.

Oriental Languages

112. Chinese Literature in Translation.

132. History of Japanese Literature.

150A. Ancient Israel.

150B. Ancient Israel.

*151A. Ancient Jewish Civilization.

*151B. Ancient Jewish Civilization.

Russian

30. Great Russian Writers.

40. Survey of Russian Literature to 1800.

41. Survey of Russian Literature: Nineteenth Century.

42. Survey of Russian Literature: Twentieth Century.

121. The Nineteenth-Century Russian Novel.

123. The Twentieth-Century Russian Novel.

128. Modern Russian Poets.

140. Dostoevsky.

141. Tolstoy.

Spanish

150. Masterpieces of Spanish Literature.

Emily Zants, Ph.D.

*Professor:*Jean P. Hytier, D.ès L. (*Visiting*)*Assistant Professors:*David S. Wilson, M.A. (*Acting*)
Jurate Izokaitis, M.A. (*Acting*)*Lecturer:*

William P. Galvin, M.A.

* Not to be given, 1969-70.

Departmental Major Advisers.—Mr. Herman, Miss York.

Graduate Advisers.—Mr. Bach, Mr. Bloomberg, Miss York.

The Major Program

Lower Division Courses.—Required: French 1, 2, 3, 4, 5, and 6 or their equivalents; French 30A, 30B. Recommended: French 46A, 46B, and 46C; one year of college Latin or the equivalent.

Upper Division Courses.—Required: at least 36 units including one quarter of course 110, one of the following: 130, 131, 132, and a separate course in each of the following periods: sixteenth century, seventeenth century, eighteenth century, nineteenth century. Recommended: Classics 139A, 139B, 140.

Courses 107A, 107B, 160 and either course 104 or 105 are required for the General Secondary Teaching Credential in French.

Honors and Honors Program (see page 133). The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination.

Graduate Study.—The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in French. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of French and Italian.

Teaching Minor.—A minimum of 30 units in French including courses 30A, 30B, 104, 105, and 107A–107B. Recommended: courses 46A, 46B, 46C.

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.

Duplication of Credit.—A student will not receive unit credit for French 1, 1R, 2, 2R, 3, 3R, 4, 4R, 4X, 5 or 5R when these duplicate courses previously completed in secondary school (see page 130), or at another university or college.

1. Elementary French. (4) I, II, III.

Discussion—5 hours. The Staff

*1G. French for Graduate Students. No Credit. III.

Recitation—3 hours. A course designed to prepare students for the graduate reading examination.
Mr. Herman

*1R. Elementary French—Reading. (4) I.

Lecture—3 hours; laboratory—1 hour. Elementary French with emphasis on reading. The Staff

2. Elementary French. (4) I, II, III.

Discussion—5 hours. Prerequisite: course 1 or equivalent. A continuation of course 1. The Staff

*2R. Elementary French—Reading. (4) II.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 1R or equivalent. Elementary French with emphasis on reading. The Staff

3. Elementary French. (4) I, II, III.

Discussion—5 hours. Prerequisite: course 2 or equivalent. A continuation of course 2. The Staff

*3R. Elementary French—Reading. (4) III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 2R or equivalent. Elementary French with emphasis on reading. The Staff

4. Intermediate French. (3) I, II, III.

Recitation—3 hours. Prerequisite: course 3 or equivalent. The Staff

*4R. Intermediate French—Reading. (4) I.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 3R or equivalent. This variant of course 4 places greater emphasis on reading than the regular course. The Staff

4X. Intermediate French-Intensive. (6) I.

Lecture—5 hours. Prerequisite: course 3. Intensive course combining present courses 4 and 5. The Staff

5. Intermediate French. (3) I, II, III.

Recitation—3 hours. Prerequisite: course 4 or equivalent. Continuation of course 4. The Staff

*5R. Intermediate French—Reading. (4) II.

Laboratory—2 hours; recitation—4 hours. Prerequisite: course 4R or equivalent. This variant of course 5 places greater emphasis on reading than the regular course. The Staff

6. Reading and Conversation. (4) I, II, III.

Recitation—3 hours. Prerequisite: course 5 or equivalent. Class discussion; reading of selected works; oral reports; analysis of texts. The Staff

30A. Grammar, Composition, and Conversation.

(4) I, II, III.

Lecture—3 hours. Prerequisite: course 6. The Staff

30B. Grammar, Composition, and Conversation.

(4) I, II, III.

Lecture—3 hours. Prerequisite: course 30A. The Staff

* Not to be given, 1969–70.

***39A. French Literature in English Translation: to the End of the Eighteenth Century. (4) II.**

Lecture—3 hours. An introduction to French literature for non-French majors. Knowledge of French not required.
Miss Zants

39B. French Literature in English Translation: the Nineteenth Century. (4) I.

Lecture—3 hours. An introduction to French literature for non-French majors. Knowledge of French not required.
Miss Zants

***39C. French Literature in English Translation: the Contemporary Period. (4) III.**

Lecture—3 hours. An introduction to French literature for non-French majors. Knowledge of French not required.
Miss Zants

46A. Survey of French Literature: Middle Ages and Renaissance. (3) III.

Lecture—3 hours. Prerequisite: course 6. Readings from major works; discussion of literary history and theory.
Mr. Keith

46B. Survey of French Literature from 1600 to 1800. (3) II.

Lecture—3 hours. Prerequisite: course 6. Readings from major works; discussion of literary history and theory.
Mr. Bloomberg

46C. Survey of French Literature from 1800 to the Present. (3) I.

Lecture—3 hours. Prerequisite: course 6. Readings from major works; discussion of literary history and criticism.
Miss York

Upper Division Courses**104. Advanced Grammar and Composition. (3) I.**

Lecture—3 hours. Prerequisite: course 30B.
Mr. Bach

105. Advanced Grammar and Composition. (3) II.

Lecture—3 hours. Prerequisite: course 104.
Mr. Bach

107A-107B. Survey of French Culture and Institutions. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 6. 107A—from the origins of French civilization through the Renaissance. 107B—from the seventeenth century to the present.
The Staff

110. Advanced Composition and Translation. (2) III.

Lecture—2 hours. Prerequisite: course 30B. This course may be repeated for credit.
The Staff

***115A. Medieval Literature: Epic and Romance. (4) II.**

Lecture—3 hours. Prerequisite: course 6. *La Chanson de Roland*, *Tristan et Iseut*, and selected works of Chrétien de Troyes. Mr. Herman

115B. Medieval Literature: Poetry, Drama and Satire. (4) II.

Lecture—3 hours. Prerequisite: course 6. "Chansonniers" *Roman de la Rose*, *Fabliaux*, *Renart*, *Villon*.
Mr. Herman

116A. Literature of the Sixteenth Century. (4) III.

Lecture—3 hours. Prerequisite: course 6. A study of the lyric poetry of the sixteenth century, from Marot to d'Aubigné, with emphasis on the Pléiade.
Mr. Wilson

***116B. Literature of the Sixteenth Century. (4) II.**

Lecture—3 hours. Prerequisite: course 6. Rabelais and Montaigne. A critical study of the works in relationship to the period. Mr. Wilson

***117A. Theater of the Seventeenth Century. (4) I.**

Lecture—3 hours. Prerequisite: course 6. Offered in even-numbered years. Mr. Bloomberg

117B. Novelists and Moralists of the Seventeenth Century. (4) I.

Lecture—3 hours. Prerequisite: course 6.
Mr. Bloomberg

117C. Classicism and Baroque. (4) II.

Lecture—3 hours. Prerequisite: course 6.
Mr. Wilson

118A. The Enlightenment. (4) III.

Lecture—3 hours. Prerequisite: course 6. Readings from Bayle, Fontenelle, Montesquieu, Voltaire, Diderot, Rousseau, and others.
Miss Izokaitis

***118B. Drama and Novel in the Eighteenth Century. (4) I.**

Lecture—3 hours. Prerequisite: course 6. Plays of Marivaux and Beaumarchais; novels of Lesage, Prevost, Diderot, Voltaire, Rousseau.
The Staff

118C. Diderot and the Encyclopédie. (4) I.

Lecture—3 hours. Prerequisite: course 6.
Miss Zants

***119A. The Nineteenth Century. (4) III.**

Lecture—3 hours. Prerequisite: course 6. Romanticism in the drama and novel: Hugo, Stendhal, Vigny, Musset, etc.
Mr. Bach

119B. The Nineteenth Century. (4) II.

Lecture—3 hours. Prerequisite: course 6. Realism: Balzac and Flaubert.
Miss Zants

***119C. The Nineteenth Century. (4) III.**

Lecture—3 hours. Prerequisite: course 6. Naturalism and Symbolism: Zola, Maupassant, Mallarmé.
The Staff

* Not to be given, 1969-70.

***120A. Twentieth Century Drama. (4) II.**

Lecture—3 hours. Prerequisite: course 6. Representative plays from Jarry to Giraudoux. Miss York

***120B. Twentieth Century Drama. (4) III.**

Lecture—3 hours. Prerequisite: course 6. Representative plays from Anouilh to Ionesco. Miss York

130. Critical Reading of Poetry. (4) I.

Lecture—3 hours. Prerequisite: course 6 or its equivalent. Analysis and evaluation of works representing main types of French poetry. Study of poetic conventions and versification.

Mr. Lindsay

***131. Critical Reading of Fiction. (4) III.**

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.

Miss Zants

132. Critical Reading of Drama. (4) III.

Lecture—3 hours. Prerequisite: course 6 or its equivalent. Analysis and evaluation of plays representing main types of French drama, with emphasis on dramatic structure and techniques.

Miss York

***138A. French Poetry from the Pre-Romantics to Baudelaire. (4) II.**

Lecture—3 hours. Prerequisite: course 6 or equivalent. Offered in even-numbered years.

Mr. Hytier

***138B. French Poetry from Baudelaire to the Surrealists. (4) III.**

Lecture—3 hours. Prerequisite: course 6 or equivalent. Offered in even-numbered years.

Mr. Hytier

***140. Study of a Major Writer. (4) I.**

Lecture—3 hours. Prerequisite: course 6. May be repeated for credit with consent of instructor.

Mr. Hytier, Miss Zants

***141. Gide and Proust. (4) I.**

Lecture—3 hours. Prerequisite: course 6 for those reading in French. Lectures and discussion in English; reading in French or English.

Mr. Lindsay

142. French Novel from Malraux to the Nouveau Roman. (4) I.

Lecture—3 hours. Reading in French and English.

Mr. Lindsay

***145. Reading of Philosophical Texts. (4) III.**

Lecture—3 hours. Prerequisite: course 6. Style and content of representative texts from the Renaissance to the present.

Mr. Lindsay

***150. Masterpieces of French Literature. (4) I.**

Lecture—3 hours. Prerequisite: English 1. Reading, lectures, and discussion in English. May not be counted as part of the major in French. Offered in even-numbered years.

Mr. Lindsay

151. The French Novel. (4) III.

Lecture—3 hours. Reading, lectures, and discussion in English. May not be counted as part of major in French.

Mr. Lindsay

***155. Criticism. (4) III.**

Lecture—3 hours. Prerequisite: course 6. The study of various critical approaches to literature (thematic, structural, linguistic, psychoanalytic, etc.) together with their application to selected French works.

Mr. Wilson

160. Structure of the French Language. (4) II.

Lecture—3 hours. Prerequisite: course 6 or consent of instructor. Linguistic analysis of modern French.

Mr. Keith

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

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses***200. Seminar in French Linguistics. (4) III.**

Seminar—3 hours. Prerequisite: graduate standing and consent of instructor. Study of substrata influences, dialect geography, homonymic conflict, jargons and argots, French contributions to linguistic theory.

Mr. Keith

201A. History of the French Language. (4) I.

Seminar—3 hours.

Mr. Keith

201B. History of the French Language. (4) II.

Seminar—3 hours. Prerequisite: course 201A.

Mr. Keith

202. Medieval French Literature. (4) III.

Seminar—3 hours. May be repeated for credit with consent of instructor.

Mr. Herman

203. Reading of Old French Texts. (4) III.

Seminar—3 hours. Prerequisite: course 201A-201B or equivalent.

Mr. Keith

***204. Sixteenth-Century French Literature. (4) I.**

Seminar—3 hours. May be repeated for credit with consent of instructor.

Mr. Wilson

206. Seventeenth-Century French Literature.

(4) I, II.

Seminar—3 hours. May be repeated for credit with consent of instructor.

Mr. Hytier

* Not to be given, 1969-70.

***208. Eighteenth-Century French Literature. (4) II.**

Seminar—3 hours. May be repeated for credit with consent of instructor. Mr. Hytier

215. Nineteenth-Century French Literature.

(4) I, II, III.

Seminar—3 hours. May be repeated for credit with consent of instructor. Miss Zants

220. Twentieth-Century French Literature.

(4) I, II, III.

Seminar—3 hours. May be repeated for credit with consent of instructor.

Mr. Hytier, Miss York, Mr. Lindsay

***225. Problems in French Criticism. (4) II.**

Seminar—3 hours. May be repeated for credit with consent of instructor. Selected topics in criticism for intensive investigation.

Mr. Lindsay

230. Old Provençal. (4) III.

Seminar—3 hours. Prerequisite: course 201A, 201B or equivalent. An introduction to Old

GENETICS—See also Agricultural Genetics, page 66, and Animal Science**GENETICS**

Robert W. Allard, Ph.D., *Chairman of the Department*

Department Office, 201 Hutchison Hall

Professors:

Robert W. Allard, Ph.D. (*Genetics and Agronomy and Range Science*)

Melvin M. Green, Ph.D.

G. Ledyard Stebbins, Ph.D.

Associate Professors:

Cordon J. Edlin, Ph.D.

Sidney R. Snow, Ph.D.

Assistant Professor:

James B. Boyd, Ph.D.

◇ ◇ ◇

Professors:

Charles M. Rick, Ph.D. (*Vegetable Crops*)

Herman T. Spieth, Ph.D. (*Zoology*)

Associate Professor:

¹Stephen L. Wolfe, Ph.D. (*Zoology*)

Assistant Professors:

Leslie D. Gottlieb, M.S. (*Acting*)

Paul E. Hansche, Ph.D. (*Pomology*)

Robert M. Murphey, Ph.D., (*Psychology*)

Departmental Major Adviser.—Mr. Snow.

The department offers two undergraduate majors in Genetics: Bachelor of Science, College of Letters and Science; and Bachelor of Science, (Agricultural Genetics) College of Ag-

ricultural and Environmental Sciences. These majors are designed to provide a broad background in the biological, mathematical and physical sciences basic to the study of heredity and evolution. The Agricultural Genetics major provides opportunity for greater emphasis in applied genetics. Either major is suitable for students who plan graduate work in biology.

235. Explication de Textes. (4) III.

Seminar — 3 hours. Prerequisite: graduate standing in French. Theory of the *explication de textes* method and exercises according to this method.

Mr. Bloomberg

298. Group Study. (1-4) I, II, III.

Seminar—1-3 hours. May be repeated for credit with consent of instructor. The Staff

299. Research. (2-5) I, II, III.

The Staff

Professional Course***300. The 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.

The Staff

The Major Program (College of Agricultural and Environmental Sciences)

See page 66.

The Major Program (Letters and Science)

Lower Division Courses.—Required: Bacteriology 2; Biology 1; Botany 2; Chemistry 1A-1B-1C, 8A-8B; Mathematics 13; and Mathematics 15, 16A-16B or 16A-16B-16C or 21A-21B-21C; Physics 2A-2B-2C; Zoology 2.

Upper Division Courses.—Required: Biochemistry 101A-101B or Mathematics 105A-105B (both sequences recommended); Genetics 100A-100B, 100L; one course in animal, microbial or plant physiology; three courses from the following group: Genetics 101, 102, 103, 104, 105; Bacteriology 170; 28 additional upper division units in biological sciences.

In addition to the courses listed above, the student must also complete those courses satisfying the College and University requirements summarized on page 102.

^o Not to be given, 1969-70.

¹ Absent on leave, 1969-70.

Graduate Study.—The Graduate Group in Genetics offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding graduate study in genetics, write the Chairman of the Genetics Graduate Group, Department of Genetics. (Also see page 133).

Lower Division Course

10. Heredity and Evolution. (4) II.

Lecture—3 hours; discussion—1 hour. The general principles of the laws of heredity and evolution for students not specializing in biology. No credit to students who have had or are taking upper division genetics courses.

Mr. Stebbins

Upper Division Courses

100A. Principles of Genetics. (3) I, II.

Lecture—3 hours; discussion—optional. Prerequisite: introductory course in zoology, botany, or biology; Mathematics 13 or equivalent recommended; not open for credit to students who have received credit for course 115. Introduction to genetics with some consideration of its applications in agriculture and biology.

I. Mr. Boyd, II. Mr. Snow

100B. Principles of Genetics. (3) II, III.

Lecture—3 hours; discussion—optional. Prerequisite: course 100A. Continuation of course 100A. II. Mr. Green, III. Mr. Hansche

100L. Principles of Genetics Laboratory. (1) II, III.

Laboratory—3 hours. Prerequisite: course 100A. Laboratory work in basic genetics to supplement course 100A, 100B, and 115.

Mr. Green

101. Cytogenetics. (3) III.

Lecture—3 hours. Prerequisite: course 100B or 115. Gross and fine structure of chromosomes and associated cell organelles; chromosome reproduction; behavior of chromosomes as related to genetics and evolution in polyploids, aneuploids, and structural heterozygotes.

Mr. Snow, Mr. Wolfe

101L. Cytogenetics Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 101 (may be taken concurrently). Laboratory study of chromosome structure and behavior.

Mr. Snow, Mr. Wolfe

102. Molecular and Biochemical Genetics. (3) I.

Lecture—3 hours. Prerequisite: course 100B, Biochemistry 101B. Study of gene structure, mutation and the biochemical basis of gene function.

Mr. Edlin

103. Organic Evolution. (3) III.

Lecture—3 hours. Prerequisite: course 100B or 115. Evolutionary processes in higher organisms.

Mr. Stebbins

104. Developmental Genetics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B or 115; Biochemistry 101B. The action of genes in development at the levels of the enzyme molecule, cellular organelle, tissue and organ, with examples from microorganisms, plants, and animals. Mr. Boyd

105. Population Genetics. (3) I.

Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: course 100B or 115; Mathematics 13, 16B recommended. An introductory course in the analysis and interpretation of quantitative genetic systems. Mr. Allard

115. Human Genetics. (5) III.

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. This course will fulfill the needs of preprofessional students and those in other areas of human biology. Mr. Green

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

Prerequisite: Consent of instructor based on adequate preparation of the student in allied fields.

The Staff

Graduate Courses

203. Advanced Organic Evolution. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 103 and 105, or consent of instructor. Analysis of evolutionary processes.

205. Advanced Population Genetics. (3) II.

Lecture—3 hours. Prerequisite: course 105, Mathematics 131A. Analysis of the genetic structure and evolution of populations. Offered in odd-numbered years. Mr. Hansche

206. Current Topics in Genetics. (3) I, II, III.

Lecture—2 hours; laboratory or discussion—2 hours. Prerequisite: course 100B or 115, consent of instructor. Selected topics of current interest in advanced genetics. May be repeated for credit.

291. Seminar in History of Genetics. (2) II.

Seminar—2 hours. Prerequisite: course 100B or 115. The development of modern genetic theories beginning with Mendel. Mr. Stebbins

292. Seminar in Gene Structure and Action. (1–3) I.

Seminar—1 hour. Prerequisite: course 102 or 206; Bacteriology 170. Topics of current interest related to the structure of genes, mutation, and the mechanism of gene action. Offered in even-numbered years. Mr. Edlin

293. Seminar in Cytogenetics and Evolution.

(1-3) II.

Seminar—1-3 hours. Prerequisite: course 291 (may be taken concurrently). 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.

Mr. Rick

GEOGRAPHYKenneth Thompson, Ph.D., *Chairman of the Department*

Department Office, 328 Voorhies Hall

Associate Professors:

Howard F. Gregor, Ph.D.

*Kenneth Thompson, Ph.D.

Assistant Professors:

Stephen C. Jett, Ph.D.

David R. Lee, Ph.D.

Paul D. Marr, Ph.D.

Roy J. Shlemon, Ph.D.

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Lecturers:

Karl M. Kriesel, M.A.

Herbert B. Schultz, Ph.D. (*Agricultural Engineering*)**Departmental Major Advisers.**—Mr. Marr, Mr. Lee.**The Major Program****Lower Division Courses.**—Required: Geography 1, 2, 3, 5; Anthropology 2.**Upper Division Courses.**—Required: 36 upper division units in geography. Each program should normally include Geography 102 or 103, 105 and 151.

Students who wish to prepare for further training or employment in the field of Urban and Regional Planning may do so by completing certain additional courses, while fulfilling the requirements for the major, in consultation with the departmental adviser.

Teaching Major.—Requirements for the teaching major are the same as for the undergraduate major for degree, with the addition of Geography 300.**Teaching Minor.**—A minimum of 30 quarter units in Geography, including course 300.**Subject Representative:** Mr. Lee.**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.^a Absent on leave, fall quarter 1969.**294. Seminar in Breeding Systems. (1-3) III.**

Seminar—1-3 hours. Prerequisite: course 291. Topics of current interest relating genetics to problems of animal and plant breeding.

Mr. Spieth, Mr. Murphey

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

Prerequisite: consent of instructor. Directed group study of special topics in genetics.

The Staff

299. Research. (1-12) I, II, III.

The Staff

Lower Division Courses**1. Physical Geography. (4) I, III.**

Lecture—4 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

Mr. Jett, Mr. Shlemon

2. Cultural Geography. (4) I, III.

Lecture—4 hours. Distribution and cultural differentiation of human groups. Population, technology, economy, and relation to habitat.

_____, Mr. Jett

3. Climate and Weather. (3) II.

Lecture—3 hours. Composition and structure of atmosphere, weather elements, pressure, wind, temperature, moisture, fog, and clouds; weather maps; regional climates and world climate classification; instruments for obtaining climatological data; installation and maintenance of weather stations; evaluation of recordings.

Mr. Schultz

4. Introduction to Maps. (3) I.

Lecture—3 hours. History and principles of cartography; great map-makers; national surveys; modern trends in mapping.

Mr. Lee

5. Economic Geography. (4) II.

Lecture—3 hours; discussion—1 hour. Geographic aspects of the production, exchange, and consumption of goods.

Mr. Marr

11. Cultural Geography of Black America. (4) II.

Lecture—4 hours. Geographic origins, dispersals, and adaptations of Blacks in the New World.

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

The Staff

39. Independent Study. (1-5) I, II, III.

The Staff

Upper Division Courses**102. Field Course in Physical Geography. (4) III.**

Lecture and Field trip—one day per week. Prerequisite: courses 1 and 2 and consent of instructor. Research methodology and field study. Systematic mapping and analysis of elements of the natural landscape.

Mr. Shlemon

103. Field Course in Human Geography. (4) I.

Lecture and Field trip—one day per week. Prerequisite: courses 1 and 2 and consent of instructor. Research methodology and field study. Systematic mapping and analysis of elements of the cultural landscape. Mr. Lee

104. Field Course in Urban Geography. (4) I.

Lecture—1 hour; four 2-day field trips. Field analysis of selected urban problems in northern California. Special attention to regional interrelationships, functional structure, and land use changes as specifically related to the core of the city, changing residential and retail patterns, and urban encroachment on agricultural lands. Mr. Marr

105. Cartography. (4) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 4; or consent of instructor. Theory and construction of map projections; interpretation of maps; compilation and generalization of base-map data; symbolization and processing of map data; cartographic designing and lettering techniques; map reproduction. Mr. Lee

106. Interpretation of Aerial Photographs. (4) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 1; or consent of instructor. Analysis of landscape from aerial photographs: land forms; vegetation; land use; settlement; transport and communications. Preparation of contour and planimetric maps, and construction of aerial photo mosaics. Mr. Marr

107. Advanced Cartography. (4) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 105 and 106. Advanced cartographic representation of field and aerial photographic data. Mr. Lee

108. Analysis of Landforms. (4) II.

Lecture—3 hours. Prerequisite: course 1; or consent of instructor. Origin of land forms. Review of varied interpretations of processes involved, with emphasis on recent views. Mr. Shlemon

119. Arid Lands. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; or consent of instructor. Physical characteristics and human utilization of rainfall deficiency regions. Mr. Jett

121. North America. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Natural and economic regions of the United States and Canada. Mr. Gregor

122A. Middle America. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2; or consent of instructor. Environment, culture, and economy from Mexico to Panama and in the Caribbean.

122B. South America. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2; or consent of instructor. Environment, culture, and economy in the South American countries.

***123A. Western Europe. (4) II.**

Lecture—3 hours; 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 Western Europe. Mr. Thompson

***123B. Eastern Europe. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2; or consent of instructor. Geographic conditions and their relation to the economic, social and political problems of the countries of Eastern Europe.

124. The Soviet Union. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2; or consent of instructor. Physical landscapes and cultural regions of the U.S.S.R. Mr. Kriesel

125A. North Africa and the Near East. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2; or consent of instructor. Physical, cultural, and historical geography of the Arab World and its neighbors. Mr. Lee

125B. Sub-Saharan Africa. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2; or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara. Mr. Lee

131. California. (4) I, III.

Lecture—3 hours; discussion—1 hour. Regions of California: landforms, climate, and other physical characteristics; agricultural, mineral, and other resources; and patterns of settlement, population, transportation, and economy. Mr. Shlemon, Mr. Gregor

141A. Economic Geography. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5; or consent of instructor. Factors in economic regionalism. Analysis of major agricultural regions of the earth. Mr. Gregor

141B. Economic Geography. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5; or consent of instructor. Factors in economic regionalism. Analysis of major industrial regions of the earth. Mr. Gregor

143. Political Geography. (4) III.

Lecture—3 hours; discussion—1 hour. Areal differentiation of major natural and cultural phenomena affecting the world's political organization. Mr. Thompson

* Not to be given, 1969-70.

151. History of Geographic Thought. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: three upper division courses in geography. The literature of geography: objectives, subdivisions, and development of the subject.

Mr. Kriesel

152. Geographical Discovery and Exploration. (4) I.

Lecture—3 hours; discussion—1 hour. Expansion of western world's geographical horizons from ancient through modern times.

Mr. Thompson

155. Urban Geography. (4) I.

Lecture—3 hours; discussion—1 hour. Origin, development, distribution, and regional variation of the world's cities, with emphasis on an analysis of the functions and patterns of American cities.

Mr. Kriesel

156. Regional Structure. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2. Concepts of regional structure and their application to geographic problems; nodes, linkages, circulation, and regions. Quantitative and cartographic methods of regional research.

Mr. Marr

161. Conservation of Natural Resources. (4) III.

Lecture—3 hours; discussion—1 hour. Principles of the conservation of renewable and non-renewable resources: the conservation movement. Land-use conflicts between forestry, agricultural, mining, and recreational interests, especially in the United States.

Mr. Jett

162. Geography of Water Resources. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; or consent of instructor. Geographical survey of water on the land; needs and opportunities for water-resource development and conservation. Historical solutions to water needs of specific areas, and geographical problems associated with current and future water requirements.

Mr. Marr

170. Cultural Ecology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; or Anthropology 2. Theories of environment-man relations. Ecologic relations of gatherers, fishermen, hunters, swidden cultivators, peasants; their impact on environment; their domestic plants and animals.

GEOLOGY

Daniel I. Axelrod, Ph.D., *Acting Chairman of the Department*
Charles G. Higgins, Ph.D., *Vice Chairman of the Department*

Department Office, 306A Young Hall

Professors:

Daniel I. Axelrod, Ph.D.

Cordell Durrell, Ph.D.

Charles G. Higgins, Ph.D.

198. Directed Group Study. (1-5) I, II, III. The Staff**199. Special Study for Advanced Undergraduates.**

(1-5) I, II, III.

The Staff

Graduate Courses**250. Theory and Method in Geography. (4) III.**

Lecture—2 hours; discussion—1 hour.

Mr. Kriesel

***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.

Mr. Marr

290. Seminar: Selected Regions. (4) III.

Seminar—3 hours. Region to be announced annually.

Mr. Thompson

291. Seminar in Cultural Geography. (4) II.

Seminar—3 hours.

Mr. Jett

292. Seminar in Landform Analysis. (4) I.

Seminar—3 hours.

Mr. Shlemon

294. Seminar in Climatology. (4) II.

Seminar—3 hours.

Mr. Schultz

295. Seminar in Urban Geography. (4) II.

Seminar—3 hours.

Mr. Kriesel

296. Seminar in Agricultural Geography. (4) I.

Seminar—3 hours.

Mr. Gregor

297. Seminar in Industrial Geography. (4) II.

Seminar—3 hours.

Mr. Gregor

299. Research. (2-9) I, II, III.

The Staff

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.

The Staff

Ian D. MacGregor, Ph.D.

James W. Valentine, Ph.D.

* Not to be given, 1969-70.

Associate Professor:

Donald O. Emerson, Ph.D.

Assistant Professors:

Richard Cowen, Ph.D.

Jere H. Lipps, Ph.D.

Eldridge M. Moores, Ph.D.

**Assistant Professor:**

David H. Chipping, M.S. (Acting)

Departmental Major Advisers.—B.S. Degree: Mr. Cowen, Mr. Durrell, Mr. Emerson. A.B. Degree: Mr. Higgins.

The Major Programs

Students interested in becoming professional geologists and continuing their geological studies at the graduate level should elect the program leading to the Bachelor of Science degree. Students desiring a less intensive program in geology as part of their general education or as preparation for nonprofessional careers in geology should elect the program leading to the Bachelor of Arts degree. High school students should note that the preparation for either degree is simplified if their high school programs include chemistry and four years of mathematics.

Bachelor of Science Major Program

Lower Division Courses.—Biology 1; Chemistry 1A–1B–1C or preferably 1A–7A–7B, Geology 1, 1L, 2, 2L, 3, 3L, 51; Mathematics 11, 21A–21B–21C; Physics 4A–4B. In addition, for emphasis in physical geology, Mathematics 22A or 22B or 22C and Physics 4C; for emphasis in paleobiology, Mathematics 15 and Zoology 2.

Upper Division Courses.—Geology 101A–101B–101C, 102A–102B, 105, 106, 107, 118, and 190 repeated at least once. Additional courses in cognate sciences, mathematics, and geology, required for specialization within physical geology or paleobiology, must be selected on recommendation of the major adviser.

Bachelor of Arts Major Program

Lower Division Courses.—Biology 1; Chemistry 1A–1B or 1A–7A; Geology 1, 1L, 2, 2L, 3, 3L, 51; Physics 2A, 3A, 2B, 3B. Recommended: Chemistry 1C or 7B; Mathematics 13, 15, 16A; Physics 2C, 3C; Zoology 2.

Upper Division Courses.—Geology 101A–101B–101C, 102A, 105, 106, 107, and other upper division courses in geology and related fields to total not less than 36 units selected in accordance with a plan approved by the major adviser.

Graduate Study.—The Department of Geology offers a program of study and research leading to the M.S. and Ph.D. degrees. For

information regarding graduate study in geology, address the Graduate Adviser, Department of Geology.

Teaching Major.—Requirements for the teaching major are the same as for undergraduate major for degree (B.A. or B.S.).

Teaching Minor.—Thirty units (quarter units) to be selected with the advice of the subject representative. Eighteen of the 30 units must be at the upper division or graduate level.

Subject Representative: Mr. Higgins

Lower Division Courses**1. General Geology. (3) I.**

Lecture—3 hours. Recommended: high school chemistry, course 1L (may be taken concurrently). Physical geology: rocks, minerals, geologic structures, and internal constitution and processes of the Earth.

1L. General Geology Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: course 1 (preferably taken concurrently). Study of important minerals and rocks; introduction to geologic maps.

2. General Geology. (3) II.

Lecture—3 hours. Prerequisite: course 1. Recommended: course 2L taken concurrently. Physical geology and geomorphology: the Earth as a planet; processes which affect its erosional and depositional landforms.

Mr. Higgins

2L. General Geology Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: courses 1, 2 (preferably taken concurrently); stereoscopic vision recommended. Introduction to landforms and geologic features as depicted on topographic and geologic maps, structure sections, and aerial photographs.

Mr. Higgins

3. General Geology. (3) III.

Lecture—3 hours. Prerequisite: course 1. Recommended: course 3L taken concurrently. Historical geology: paleobiology, the fossil record, and stratigraphy; an introduction to Earth history.

Mr. Cowen

3L. General Geology Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: courses 1, 3 (preferably taken concurrently). Study of important fossils; problems in paleobiology and stratigraphy.

Mr. Cowen

51. Map Interpretation. (2) III.

Laboratory—6 hours. Prerequisite: course 2L. Study of topographic and geologic maps and geologic structure sections.

Mr. Durrell

Upper Division Courses**101A-101B-101C. Mineralogy-Petrology.**
(5-5-5) I-II-III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 1, 1L; Chemistry 1A (may be taken concurrently). Integrated sequence comprising fundamentals of physical and optical mineralogy, crystallography, crystal chemistry, petrography, and petrology. **The Staff**

102A. Field Geology. (3) I.

Field—eight 9-hour days; orientation-discussion—eight 1-hour sessions; 10-hours report preparation. Prerequisite: courses 51, 101C, 106 (may be taken concurrently). Introduction to geologic field study. **The Staff**

102B. Field Geology. (3) III.

Field—eight 9-hour days; discussion—eight 1-hour sessions; 10-hours report preparation. Prerequisite: courses 102A, 105; course 152A recommended. Continuation of course 102A. **The Staff**

105. Structural Geology. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 1, 1L, 101A; Physics 4A (may be taken concurrently); courses 51 and 102A recommended. Behavior of deformed rocks in the laboratory and in the field; tectonic features and processes of the Earth. Graphic solutions to structural problems; analysis of deformed areas. **Mr. Moores**

106. Stratigraphy. (4) I.

Lecture—4 hours. Prerequisite: courses 2, 2L, 3, 3L. Lithologic and biologic aspects of stratified rocks and their interrelationships. Introduction to synthesis of Earth history. (Formerly Geology 112.) **Mr. Chipping**

107. Paleobiology. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 1, 1L, 3, 3L; Biology 1. The origin, history, and morphology of the major phyla; principles and methods of interpreting ancient biotic systems. (Formerly Geology 113 and 115.) **Mr. Lipps, Mr. Valentine**

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. **Mr. 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. **Mr. Lipps**

118. Summer Field Geology. (8) (Summer).

Six weeks in field. Prerequisite: course 102B. Preparation of a geologic map and report on a selected field area. **Mr. Moores**

***124. Advanced Mineralogy. (4) III.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 101C. Consideration of special topics in mineralogy by means of optical and x-ray diffraction studies. Offered in odd-numbered years.

125. Advanced Petrology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 101C. Paragenesis of mineral assemblages as controlled by pressure, temperature, and composition. Laboratory study of selected petrologic problems. Offered in even-numbered years. **Mr. MacGregor**

126. Sedimentation. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 101C. Characteristics of sedimentary materials; principles of sediment transport and deposition. Laboratory analyses of sediment texture and composition. (Formerly Geology 109C.) **Mr. Chipping**

140. Paleobotany. (4) I.

Lecture—2 hours; laboratory—6 hours; one mandatory field trip. Prerequisite: senior standing. Development of modern vegetation, with emphasis on centers of origin and radiation, rates of evolution, and community evolution. Guiding principles underlying analyses of succeeding floral assemblages recorded in Cretaceous and Cenozoic fossil floras. (Same course as Botany 140.) **Mr. Axelrod**

152A. Aerial Photographs and Photogrammetry.**(1) II.**

Lecture—1 hour. Prerequisite: stereoscopic vision; course 2L recommended. Types and availability of aerial photographs; stereoscopic viewing; geometry of the single vertical photograph and of the stereoscopic model; planimetric plotting, data-transfer, and quantitative measurements from photographs. **Mr. Higgins**

152B. Photogeology. (3) III.

Lecture—1 hour; laboratory-workshop—6 hours. Prerequisite: stereoscopic vision; courses 1 and 2 (or Geography 1) and course 152A (or Geography 106); courses 2L, 102A, 105 recommended. Group-learning experience in interpretation of geologic structures, rock types, and regional geologic history by analysis of landforms, drainage, vegetation and outcrop patterns, tone, texture, and other elements visible on aerial photographs. Workshop sections limited to 12 students. **Mr. Higgins**

***153. Studies in Geomorphology. (3) I.**

Lecture—3 hours. Prerequisite: course 2. Recommended: course 2L; Geography 108. Methods of analysis of geomorphic problems. Offered in even-numbered years. **Mr. Higgins**

* Not to be given, 1969-70.

190. Seminar in Geology. (1) I, II, III.

Seminar—1 hour; discussion 1 hour. Prerequisite: senior standing in geology. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. May be repeated for credit. (Passed/Not Passed grading only.)

The Staff

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

Prerequisite: senior standing in geology or consent of instructor.

The Staff

199. Special Study for Advanced Undergraduates.

(1-4) I, II, III.

The Staff

Graduate Courses**201A. Ecological Theory. (3) I.**

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology. The 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.)

Ecology Group Staff

201B. Analysis of A Selected Ecosystem. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: 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.)

Ecology Group Staff

201C. The Changing Biosphere. (3) III.

Lecture—2 hours. Prerequisite: courses 201A, 201B, or consent of instructor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical and physical changes on living systems, changes in species diversity, effects of human population increase, and related topics. (Same course as Botany, Ecology and Zoology 201C.)

Ecology Group Staff

213. Geomorphology. (3) I.

Seminar—two 1½ hour sessions per week. Prerequisite: course 153 or Geography 108. Selected geomorphic studies of surficial processes and the evolution of landforms. Offered in odd-numbered years.

Mr. Higgins

***216. Tectonics. (3) II.**

Seminar—3 hours. Prerequisite: course 105. Tectonic features of the Earth; structural histories of selected deformed belts in relation to

theories of orogenesis. Offered in odd-numbered years.

Mr. Moores

218. Advanced Structural Analysis. (3) II.

Lecture—2 hours; seminar—1 hour. Prerequisite: course 105. Analysis of stress and strain. Theoretical and experimental investigations of rock deformation. Principles of fracture, folding, and flow of rocks and their application to field occurrences. Offered in even-numbered years.

Mr. Moores

236. Physical Geology of California. (2) I, II, III.

Seminar—2 hours.

Mr. Durrell

***254. Phase Equilibria. (3) II.**

Seminar—3 hours. Prerequisite: Chemistry 1C; 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. Offered in odd-numbered years.

***255. Genesis of Metamorphic Rocks. (3) II.**

Seminar—3 hours. Prerequisite: course 101C; courses 125, 254 recommended. Physiochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks. Offered in even-numbered years.

***257. Sedimentary Petrology: Terrigenous Rocks.**

(4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 126. Origin of land-derived non-carbonate clastic rocks. Textural and compositional analyses in thin section. (Formerly course 257A.) Offered in odd-numbered years.

Mr. Chipping

258. Sedimentary Petrology: Carbonate Rocks.

(4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 126. Origin of biological, biochemical, and chemical sedimentary carbonate rocks. Textural and compositional analyses in thin section. (Formerly course 257B.) Offered in even-numbered years. Mr. Chipping

260. Paleontology. (3) III.

Seminar—3 hours. Prerequisite: courses 111A or 111B, or graduate standing in a biological science. Selected problems in paleontology. Subject to be studied will be decided at an organizational meeting.

Messrs. Axelrod, Cowen, Lipps, Valentine

261. Paleocoenology. (3) I.

Lecture—2 hours; seminar—1 hour. Prerequisite: course 107; Mathematics 15; Mathematics 13 recommended. Theoretical and operational analyses of the structure and evolution of ancient and modern biotic associations, chiefly marine. Offered in odd-numbered years.

Mr. Valentine

* Not to be given, 1969-70.

***262. Paleosystematics. (3) I.**

Lecture—1 hour; seminar—2 hours. Prerequisite: course 107; Mathematics 15; Genetics 100B, Mathematics 13 recommended. Principles and methods of taxonomy of fossil organisms. Offered in even-numbered years.

Mr. Valentine

263. Functional Morphology of Fossil**Invertebrates. (4) II.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 111A. Principles and methods of functional analysis of fossils, with special reference to selected problems in invertebrate phyla.

Mr. Cowen

GERMAN

Clifford A. Bernd, Ph.D., *Chairman of the Department*

Department Office, 416 Sprout Hall

Professor:

Clifford A. Bernd, Ph.D.

Associate Professors:

Roland W. Hoermann, Ph.D.

Wolfgang W. Moelleken, Ph.D.

¹H. Guenther Nerjes, Ph.D.

Assistant Professors:

Wolfgang Bender, Ph.D.

^{2,3}John F. Fetzer, Ph.D.

A. Cornelius Sommer, Ph.D.

◇ ◇ ◇

Professors:

Fritz O. Martini, Ph.D. (*Visiting*)

Ernest L. Stahl, Ph.D. (*Visiting*)

Lecturer:

William M. Estabrook, Ph.D.

Departmental Major Adviser.—Mr. Estabrook.

Graduate Advisers.—Mr. Fetzer, Mr. Sommer.

The Major Program

Lower Division Courses.—German 1, 2, 3, 4, 5, 6A–6B or 7. Recommended: German 15.

Upper Division Courses.—36 units in upper division courses, including German 101, 102, 103; 119A and 119B. Majors can take not more than two courses in translation for credit.

Honors and Honors Program (see page 131).—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

280. Igneous Petrology. (3) I.

Seminar—2 hours; laboratory—3 hours. Prerequisite: course 101C. Integrated laboratory, field study, and seminar on igneous processes and products.

Mr. Emerson

290. Seminar in Geology. (1) I, II, III.

Seminar—1 hour; discussion—1 hour. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. (Satisfactory/Unsatisfactory grading only.)

The Staff

298. Group Study. (1–5) I, II, III.

The Staff

299. Research. (1–6) I, II, III.

The Staff

M.A. will be expected to acquire a reading knowledge of French. Further information may be obtained by writing to the Graduate Adviser.

The Degree of Doctor of Philosophy

The Department offers programs of study and research leading to the Ph.D. degree. Detailed information may be obtained by writing to the Graduate Adviser.

Teaching Major.—Requirements are the same as for the departmental major.

Teaching Minor.—A minimum of 30 units in German, including 101, 102, 103.

Subject Representative: Mr. Estabrook.

Lower Division Courses

Duplication of Credit.—A student will not receive unit credit for German 1, 2, 3, 4, 4R, 5 or 5R when these duplicate courses previously completed in secondary school (see page 130), or at another university or college.

1. Elementary German. (4) I, II, III.

Lecture—1 hour; discussion—3 hours; supplementary laboratory practice. Mr. Estabrook

16. German for Graduate Students. (3) I.

Lecture—3 hours. A course designed to prepare students for the graduate reading examination. (Satisfactory/Unsatisfactory grading only.)

The Staff

2. Elementary German. (4) I, II, III.

Lecture—1 hour; discussion—3 hours; supplementary laboratory practice. Prerequisite: course 1 or equivalent. Continuation of course 1.

Mr. Estabrook

¹ Not to be given, 1969–70.

¹ Absent on leave, 1969–70.

² Absent on leave, fall quarter 1969.

³ Absent on leave, winter quarter 1970.

26. German for Graduate Students. (3) II.

Lecture—3 hours. Continuation of course 1G.
(Satisfactory/Unsatisfactory grading only.)

The Staff

3. Elementary German. (4) I, II, III.

Lecture—1 hour; discussion—3 hours; supplementary laboratory practice. Prerequisite: course 2 or equivalent. Continuation of course 2.

Mr. Estabrook

4. Intermediate German. (3) I, II, III.

Recitation—3 hours. Prerequisite: course 3. Spoken German stressed; class discussion of modern short stories, with inductive review of grammar.

Mr. Estabrook

4R. Intermediate German Reading. (3) I.

Lecture—3 hours. Prerequisite: course 3. Intensive emphasis on reading and translation of materials taken primarily from the natural and social sciences. A continuation of course 3.

The Staff

5. Intermediate German. (3) I, II, III.

Recitation—3 hours. Prerequisite: course 4. Spoken German stressed through class discussion of a variety of selected readings. A continuation of course 4.

Mr. Estabrook

5R. Intermediate German—Reading. (3) II.

Lecture—3 hours. Prerequisite: course 4R. A continuation of course 4R.

The Staff

6A. Spoken German. (2) I, II, III.

Discussion—2 hours. Prerequisite: course 5. (Course 6A may be taken concurrently with 6B and/or 7.) Intensive conversational practice based on the everyday vocabulary of reading assignments in German newspapers and contemporary literature.

The Staff

6B. Spoken German. (2) I, II, III.

Discussion—2 hours. Prerequisite: course 5. (Course 6B may be taken concurrently with 6A and/or 7.) Intensive conversational practice and discussions based on selected literary texts; oral interpretation of dramatic roles in representative dramas and one-act plays.

The Staff

7. Advanced German. (4) I, II, III.

Recitation—3 hours. Prerequisite: course 5. (Course 7 may be taken concurrently with 6A and/or 6B.) Review of grammatical and stylistic principles by means of written exercises; expanding of comprehension vocabulary through rapid and extensive readings of modern prose, dramatic and verse texts.

The Staff

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

Upper Division Courses**101. Composition and Conversation. (4) I, II, III.**

Lecture—3 hours. Prerequisite: course 7 or courses 6A–6B, or their equivalents. The Staff

102. Composition and Conversation. (4) I, II, III.

Lecture—3 hours. Prerequisite: course 101 or consent of instructor. Intermediate essay-writing; analysis of literary and journalistic styles; extension of active writing and speaking vocabulary.

The Staff

103. Advanced Composition. (4) I, II, III.

Lecture—3 hours. Prerequisite: course 102 or consent of instructor. Advanced prose style and original composition.

Mr. Sommer

104. German Grammar and Stylistics. (4) I.

Lecture—3 hours. Prerequisite: course 103 or consent of instructor. The grammar and stylistics of modern written usage.

Mr. Bender

105. History of the German Language. (4) I.

Lecture—3 hours. Prerequisite: course 102. Survey of the linguistic development from the Germanic and Old High German sound shifts; Middle High diphthongization and monophthongization, Ablaut and Umlaut phenomena; "Kanzleisprache" and Luther; origins of modern comparative philology with the Grimms; elementary phonetics.

Mr. Moelleken

106. Linguistic Structure of German. (4) I.

Lecture—3 hours. A linguistic analysis of modern standard German including phonetics, phonemics, morphology and Syntax.

Mr. Moelleken

108. Contrastive Structures of English and German. (4) II.

Lecture—3 hours; other—1 hour. Prerequisite: course 106. A contrastive study of the linguistic structures of English and German.

Mr. Estabrook

109. Development of German Culture. (4) III.

Lecture—3 hours. Prerequisite: course 7 or courses 6A and 6B, or their equivalents. The evolution of ideas, science, and the arts as dimensions of German society and national thought.

Mr. Fetzer

110. Masterpieces of German Prose from Goethe to Kafka. (4) I.

Lecture—3 hours. Study in translation of works which have helped shape the European tradition in the novel and short story or were crucial in the development of German literature. Knowledge of German not required; may not be counted as part of the major in German.

Mr. Sommer

111. Masterpieces of German Drama from Lessing to Brecht. (4) III.

Lecture—3 hours. Study in translation of works which have helped shape the European drama or were crucial in the development of German literature. Knowledge of German not required; may not be counted as part of the major in German. Mr. Nierjes

112. Masterpieces of German Poetry from Walther von der Vogelweide to Rilke. (4) III.

Lecture—3 hours. Study in translation of the German Lyric genius from medieval love poetry through the classicism of Goethe and Hölderlin to the mysticism of Rilke. Knowledge of German not required; may not be counted as part of the major in German. Mr. Sommer

114. Goethe's Faust. (4) II.

Lecture—3 hours. A detailed analysis and aesthetic critique in English of both "Parts," together with the first-draft *Urfraust*. Knowledge of German not required; German majors fulfill readings in German. Mr. Nierjes

115. German Literature of the Twentieth Century Up to the Second World War. (4) I.

Lecture—3 hours. Knowledge of German not required. The sublimation of tradition and the exploration of new forms from Nietzsche's death until the Second World War, including readings in translation from Hofmannsthal, Hesse, Rilke, Kafka and Thomas Mann. Mr. Hoermann

116. German Literature of the Twentieth Century Since the Second World War. (4) II.

Lecture—3 hours. Knowledge of German not required. The period of reawakening since 1945, the search for identity and meaning within the European community East and West, and the German political-moral dilemma as reflected in translated works by Brecht, Frisch, Dürrenmatt, Grass, and other "Gruppe 47" writers. Mr. Hoermann

117. Kafka and Dada. (4) II.

Lecture—3 hours. Knowledge of German not required. Two contemporaneous confrontations with Nietzsche's legacy of cultural nihilism: Kafka's paradoxical dissection, and Dada's paradoxical sublimation of the twentieth-century's continuing encounter with the absurd in literature and art. Mr. Hoermann

118. Brecht. (4) II.

Lecture—3 hours. Knowledge of German not required. A study of Brecht's Epic Theater and his doctrine of aesthetic alienation. Mr. Hoermann

119A. Survey of Literary Periods Through Classicism. (4) I.

Prerequisite: course 7 or courses 6A and 6B,

or their equivalents. An integrated view of the philosophical, historical, and stylistic components in the development of the German literary tradition up to German Romanticism.

Mr. Sommer

119B. Survey of Literary Periods from Romanticism to the Present. (4) II.

Lecture—3 hours. Prerequisite: course 119A. Romanticism to the present. Continuation of course 119A. Mr. Sommer

120. The Medieval Period in German Literature. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent. The literary-philosophical profile of the "Mittelhochdeutsche Blütezeit" in terms of the significant courtly and folk epics and the "Minnesang." Readings in modern German translation. Mr. Moelleken

121. The Renaissance and Reformation Period in German Literature. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent. The distinctive thought and literary values of the period from Der-Ackermann-aus-Böhmen through the "Meistersingersang" and "Fastnachtspiel" of Hans Sachs. Mr. Bender

122. The Baroque Period. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent. The stylistic and philosophical predicament of the Thirty-Years War era as documented in the works of Opitz and the Silesian Schools to Grimmelshausen and Gryphius. Mr. Bender

123. Enlightenment, Sentimentality and Rococo in German Literature. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent (may be taken concurrently), or consent of instructor. From the rationalism of Gottsched to the humanism of Lessing, from the hymodic verse of Klopstock, the anacreontic of Gellert, the rococo of Wieland to the beginnings of "Sturm und Drang" with Herder. Mr. Sommer

125A. Goethe. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent (may be taken concurrently), or consent of instructor. Goethe's development from his anacreontic period to the Italian Journey, with particular emphasis on *Werther*, *Götz* and his early lyrics. Mr. Sommer

125B. Goethe. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent (may be taken concurrently), or consent of instructor. From the Italian Journey to his death. Study and discussion of the master works of his later period. Mr. Nierjes

126A. Young Schiller. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent (may be taken concurrently), or consent of instructor. A study of the poetry and dramas of his "Sturm und Drang" period to the beginning of the classical era: from *Die Räuber* to *Don Carlos*. Mr. Stahl

126B. Classical Schiller. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent (may be taken concurrently), or consent of instructor. Schiller's historical dramas in conjunction with his critical essays and "Ideeindichtung." Mr. Nerjes

127. Romanticism. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 119B or equivalent (may be taken concurrently), or consent of instructor. The Napoleonic era from the Jena school of the Schlegels and Novalis, through the Arnim-Brentano group in Heidelberg, to the Berlin circle including Tieck, Eichendorff, and Hoffmann. Mr. Fetzer

128. Early Nineteenth-Century German Realism. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119B or equivalent (may be taken concurrently), or consent of instructor. An examination of the work of such important literary figures as Kleist, Hebbel, Büchner and Grillparzer. Mr. Bernd

129. Naturalism to Neo-Classicism in German Literature. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119B or equivalent (may be taken concurrently), or consent of instructor. From Hauptmann and the social protest of north-German naturalism, through the Viennese psychological impressionism of Schnitzler and the neo-romanticism of Hofmannsthal and Hesse, to Rilke and the collective mysticism of the "George-Kreis." Mr. Fetzer

130. The Modern Period from Expressionism to the Present. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 119B or equivalent (may be taken concurrently), or consent of instructor. The moral and existential quandary from Nietzsche, Wedekind, and the wartime generation of dramatists, through the poetry of Trakl, Loerke, and Benn; novelistic mastery in Thomas Mann and Kafka, and the new theater of Brecht, Frisch, and Dürrenmatt. Mr. Fetzer

132. The German Novelle. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119B or equivalent (may be taken concurrently), or consent of instructor. An inquiry into the art of the "Novelle" through

analysis of the materials and formal devices of representative authors from Goethe to Kafka.

Mr. Bernd

134. German Poetry. (4) III.

Lecture—3 hours; language laboratory. Prerequisite: courses 101, 102; or consent of instructor. Analysis and study of representative lyric modes as deduced from the master specimens of verse throughout German literature. Offered in odd-numbered years. Mr. Hoermann

190. Proseminar in a Major Writer. (4) I, II, III.

Lecture—3 hours; term paper. Prerequisite: courses 119A and 119B or their equivalent, and consent of instructor. Introduction to techniques of independent research and seminar reporting and rebuttal. May be repeated for credit with consent of instructor.

The Staff

194H. Special Study for Honors Students.

(5) I, II, III.

Prerequisite: open only to honors students. Guided research leading to an honors paper.

The Staff

198. Directed Group Study. (1-5) I, II, III. The Staff**199. Special Study for Advanced Undergraduates.**

(1-5) I, II, III.

The Staff

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.

Mr. Estabrook

201. Old High German. (4) II.

Seminar—3 hours. A 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 even-numbered years.

Mr. Moelleken

202. Middle High German. (4) III.

Seminar—3 hours. Outline of grammar; selections from Middle High German epic and lyric poetry. Offered in odd-numbered years.

Mr. Estabrook

203. Old Saxon. (4) III.

Seminar—3 hours. A 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.

Mr. Estabrook

210. Techniques of Literary Scholarship. (4) I.

Seminar—3 hours. The bibliographic, organizational, and methodological tools and resources for advanced, independent research. Mr. Bernd

211. The Rise of German Literary Criticism. (4) I.

Seminar—3 hours. The history of criticism in Germany, with some attention to classical sources. The course proceeds chronologically until the modern period, then by a study of special topics broadens to a consideration of recent approaches to German literature.

Mr. Bernd

240. Forms of German Verse. (4) II.

Seminar—3 hours. The development of German verse from the Middle Ages to Gottfried Benn, with special emphasis on different techniques of text analysis and interpretation. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Sommer

241. The German Drama. (4) III.

Seminar—3 hours. The major forms of German drama from the origins to the middle of the twentieth century. May be repeated for credit with consent of instructor.

Mr. Nerjes

242. The German "Novelle." (4) III.

Seminar—3 hours. The major German *Novellisten*, with particular emphasis on the flowering of this genre in the nineteenth century. May be repeated for credit with consent of instructor.

Mr. Bernd

250. Walther von der Vogelweide and the "Minnesang." (4) II.

Seminar—3 hours. A critical study of the greatest lyric poet of medieval Germany. Offered in even-numbered years.

Mr. Moelleken

251. Studies in the Works of Andreas Gryphius. (4) II.

Seminar—3 hours. A study of Gryphius' literary legacy, his lyrics, his tragedies and his comedies, with the purpose of showing his place in the world of seventeenth-century thought, artistic, religious and humanistic. Offered in even-numbered years.

Mr. Bender

252. The Writings of Lessing. (4) I.

Seminar—3 hours. A study of Lessing's theory of literature with particular emphasis upon his critical attacks on French drama. Offered in odd-numbered years.

Mr. Bender

253. Goethe. (4) II.

Seminar—3 hours. A study of the origins of Goethe's thought in German pietism, and his principal artistic, autobiographical, scientific and philosophical works. Offered in even-numbered years.

Mr. Stahl

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. Offered in odd-numbered years.

Mr. Stahl

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. Offered in even-numbered years.

Mr. Stahl

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. Offered in odd-numbered years.

Mr. Fetzer

259. Studies in Kafka. (4) I.

Seminar—3 hours. Study of Kafka's nuclear fables. Offered in odd-numbered years.

Mr. Sommer

260. The Poetry of Rilke. (4) I.

Seminar—3 hours. A study of the principal motifs, myths, images and problems in the poetry of Rainer Maria Rilke. Offered in even-numbered years.

Mr. Hoermann

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. Offered in odd-numbered years.

Mr. Hoermann

285. Middle High German Literature. (4) I.

Seminar—3 hours. An extensive reading of Middle High German texts with emphasis upon belletristic and cultural values; also examines linguistic problems. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Moelleken

288. The Renaissance and Reformation in German Literature. (4) I.

Seminar—3 hours. The parabolic and didactic style in Germany's literature during the sixteenth century. Offered in odd-numbered years. May be repeated for credit with consent of instructor.

Mr. Bender

289. German Literature of the Baroque. (4) III.

Seminar—3 hours. The "Elegantiaideal" and the varying methods used to portray it in seventeenth-century German literature. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Bender

290. The Enlightenment in German Literature. (4) II.

Seminar—3 hours. The revolt against the excesses of the "Elegantiaideal," and the evolution of a new literature based on reason and wit. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Sommer

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. Offered in odd-numbered years. May be repeated for credit with consent of instructor.

Mr. Sommer

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. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Sommer

293. The Classical Age of German Literature. (4) I.

Seminar—3 hours. An inquiry into the aesthetic and humanistic qualities of Germany's greatest literary epoch. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Nerjes

294. The Romantic Period in German Literature. (4) III.

(4) III.

Seminar—3 hours. Survey of the works of early nineteenth-century authors in reaction

against the age of classicism. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Fetzer

295. Poetic Realism in German Literature. (4) I.

Seminar—3 hours. Outstanding figures in German literature between 1840 and 1890. Important phases in their developments will be treated. Offered in odd-numbered years. May be repeated for credit with consent of instructor.

Mr. Martini

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. Offered in even-numbered years. May be repeated for credit with consent of instructor.

Mr. Martini

298. Group Study. (1-9) I, II, III.

The Staff

299. Research. (1-12) I, II, III.

The Staff

Professional Course**300. The Teaching of German. (3) I.**

Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language.

Mr. Estabrook

GREEK—See Classics**HEBREW—See Oriental Languages****HISTORY**

Walter L. Woodfill, Ph.D., *Chairman of the Department*

Department Office, 167 Voorhies Hall

Professors:

- William M. Bowsky, Ph.D.
- David Brody, Ph.D.
- W. Turrentine Jackson, Ph.D.
- Kwang-Ching Liu, Ph.D.
- C. Bickford O'Brien, Ph.D.
- Rollie E. Poppino, Ph.D.
- James H. Shideler, Ph.D.
- Wilson Smith, Ph.D.
- F. Roy Willis, Ph.D.
- Walter L. Woodfill, Ph.D.

Associate Professors:

- Daniel Calhoun, Ph.D.
- Paul Goodman, Ph.D.
- *David L. Jacobson, Ph.D.

^{2, 3}Jung-Pang Lo, Ph.D.

- Richard N. Schwab, Ph.D.
- Morgan B. Sherwood, Ph.D.
- Donald C. Swain, Ph.D.

Assistant Professors:

- Daniel Brower, Ph.D.
- Peter K. Cline Ph.D.
- Arthur F. Corwin, Ph.D.
- Manfred P. Fleischer, Ph.D.
- C. Roland Marchand, Ph.D.
- ¹Gordon R. Mork, Ph.D.
- Stylianos Spyridakis, Ph.D.



¹Absent on leave, 1969-70.

²Absent on leave, fall quarter 1969.

³Absent on leave, winter quarter 1970.

⁴Absent on leave, spring quarter 1970.

Assistant Professor:

Ted W. Margadant, B.A. (Acting)

Departmental Advisers.—Mr. Brower, Mr. Cline, Mr. Corwin, Mr. Fleischer, Mr. Goodwin, Mr. Jacobson, Mr. Lo, Mr. Marchand, Mr. Mork, Mr. O'Brien, Mr. Schwab, Mr. Sherwood, Mr. Spyridakis, Mr. Swain.

Graduate Advisers.—Mr. Bowsky, Mr. Brody, Mr. Calhoun, Mr. Liu, Mr. Poppino, Mr. Shideler, Mr. Smith, Mr. Willis.

Introductory Courses.—Courses 4A, 4B, 4C, 17A, and 17B are open to all students.

The American History and Institutions requirement may be satisfied by any two of the following courses: History 17A, 17B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 176A, 176B, 178A, 178B, 179A, 179B, 180, 183A, 183B. See also page 32.

The Major Program

Lower Division Courses.—Required: Courses 4A, 4B, 4C, 17A, 17B. It is recommended that students, in consultation with their advisers, also take at least 6 or 8 units (normally a two-quarter sequence of courses) in one of the following fields: cultural anthropology, cultural geography, principles of economics, English literature, literature of the United States, philosophy, political science, psychology, or sociology.

Upper Division Courses.—Required: Students majoring in history must complete at least 36 upper division units in history, including:

(a) A minimum of 12 units (including a two-quarter sequence of courses) in a field of concentration (for "field" see below).

(b) A minimum of 8 units each in two other fields of history. (The fields referred to are Great Britain, Europe, Russia, East Asia, Latin America, and the United States.)

Honors and Honors Program (see page 133).—A student may become eligible for graduation with high honors or highest honors in history by completing the department's honors program. The program consists of the following work (along with normal major requirements): History 101A, usually taken during the junior year; at least one undergraduate proseminar (History 102 or equivalent); an honors essay, to be written in 6 to 8 units of History 199, and completed during the two quarters before the beginning of the student's last quarter as an undergraduate. Any history major who has a departmental grade-point average of 3.2 in a total of at least 20 units of history may enter the program by registering in the departmental office. Those with special interests or qualifications may apply through their advisers.

Graduate Study.—The Department of History offers programs of study and research leading to the M.A. and Ph.D. degrees in history. Detailed

information may be obtained by writing to the Graduate Adviser, Department of History.

Teaching Major.—Requirements are the same as for the departmental major plus course 300.

Teaching Minor.—Thirty-two units of history, including 4A–4B–4C, 17A–17B, and 12 units of upper division course work. The 12 units of upper division work should include a two-quarter sequence.

Subject Representative: Mr. Jacobson

Lower Division Courses**4A. History of Western Civilization. (4) I.**

Lecture—3 hours; discussion—1 hour. The growth of western civilization from ancient times through the middle ages. The Staff

4B. History of Western Civilization. (4) I, II.

Lecture—3 hours; discussion—1 hour. The 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

17A. History of the United States. (4) I, II.

Lecture—3 hours; discussion—1 hour. The growth of the American people from colonial times through the Civil War. The Staff

17B. History of the United States. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. The American people from Reconstruction to the present. The Staff

38. Directed Group Study. (1–5) I, II, III. The Staff**39. Special Study for Undergraduates. (1–5) I, II, III.**

The Staff

49. Freshman Seminar. (2) I, II, III.

Seminar—2 hours. Prerequisite: consent of instructor. Reports, discussion and elementary research in the several fields of history designed for the beginning student. The Staff

Upper Division Courses**101A. Introduction to Historical Thought and Writing. (4) III.**

Lecture—3 hours; discussion—1 hour. 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. Mr. Marchand

***101B. Introduction to Historical Methods. (4) I, II.**

Discussion—4 hours. Prerequisite: consent of instructor. The development of skills in historical research and composition through individual, guided research. An extensive paper is required. The Staff

* Not to be given, 1969–70.

102. Proseminar in History. (4) I, II, III.

Seminar—3 hours. Prerequisite: consent of instructor. Designed primarily for history majors. Intensive reading, discussion, and writing in selected topics in the various fields of history, in classes with limited enrollment. May be repeated for credit. A. Ancient; B. Medieval; C. Renaissance and Reformation; D. Modern Europe to 1815; E. Europe since 1815; F. Russia; G. China to 1600; H. China since 1600; I. Britain; J. Latin America since 1810; K. American History to 1787; L. United States, 1787–1896; M. United States, since 1896; N. Japan.

The Staff

111A. Ancient History. (4) I.

Lecture—3 hours. History of the ancient empires of the Near East and of the Greek city-states to the fifth century B.C. Mr. Spyridakis

111B. Ancient History. (4) II.

Lecture—3 hours. History of Greece, the Hellenistic kingdoms, and Rome from the fifth century B.C. to the Punic Wars. Mr. Spyridakis

111C. Ancient History. (4) III.

Lecture—3 hours. History of Rome and its empire from the Punic Wars to Constantine. Mr. Spyridakis

121A. Medieval History. (4) II.

Lecture—3 hours. Western European history from the “fall of the Roman Empire” to the crusades. Mr. Bowsky

121B. Medieval History. (4) III.

Lecture—3 hours. Western European history from the crusades to the Renaissance.

Mr. Bowsky

131A. Early Modern European History. (4) I.

Lecture—3 hours. Recommended: courses 4A, 4B. Western European history from about 1350 to about 1500. Mr. Fleischer

131B. Early Modern European History. (4) II.

Lecture—3 hours. Recommended: courses 4A, 4B, 131A. Western European history from about 1500 to about 1650. Mr. Fleischer

131C. Early Modern European History. (4) III.

Lecture—3 hours. Recommended: courses 4A, 4B, 131B. Western European history from about 1650 to about 1789. Mr. Fleischer

133. The Age of Ideas. (4) II.

Lecture—3 hours. The Enlightenment and its background in the seventeenth century.

Mr. Schwab

134A. The Age of Revolution. (4) III.

Lecture—3 hours. Ideas and institutions during the French Revolution and the Napoleonic era.

Mr. Schwab

* Not to be given, 1969–70.

***134B. The Age of Revolution. (4) III.**

Lecture—3 hours. Ideas and revolution after 1815. Mr. Schwab

137A. Russian History: Kievan and Muscovite Russia. (4) I.

Lecture—3 hours. Russian civilization from earliest times to the reign of Peter the Great. Mr. O'Brien

137B. Russian History: The Empire to 1856. (4) II.

Lecture—3 hours. Russian civilization from the Age of Peter the Great through the Crimean War. Mr. O'Brien

137C. Russian History: The Empire, 1856–1914. (4) II.

Lecture—3 hours. Russian civilization from the Crimean War to the outbreak of the First World War. Mr. Brower

137D. Russian History: Soviet Russia. (4) III.

Lecture—3 hours. Russia from the Revolution of 1917 to the Age of Stalin. Mr. Brower

***141. France since 1815. (4) I.**

Lecture—3 hours. Mr. Willis

***142. History of Italy since the French Revolution. (4) III.**

Lecture—3 hours. Prerequisite: courses 4A, 4B, 4C.

***144A. History of Germany to 1815. (4) I.**

Lecture—3 hours. Prerequisite: courses 4A and 4B. A history of the Germanies through the Congress of Vienna. Mr. Mork,

***144B. History of Germany since 1815. (4) II.**

Lecture—3 hours. Prerequisite: courses 4C and 144A. The German national unification, the age of Bismarck and William II, and the wars and revolutions of the twentieth century.

Mr. Mork

145A. Europe in the Nineteenth Century. (4) II.

Lecture—3 hours. A survey of the history of Europe from 1815 to 1870.

145B. Europe in the Nineteenth Century. (4) III.

Lecture—3 hours. A survey of the history of Europe from 1870 to 1918.

146A. Europe in the Twentieth Century. (4) I.

Lecture—3 hours. A survey of the history of Europe from 1919 to 1939. Mr. Willis

146B. Europe in the Twentieth Century. (4) II.

Lecture—3 hours. A survey of the history of Europe since 1939. Mr. Willis

***147. Ideas and Politics in Twentieth-Century Europe. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 4A, 4B, and 4C; or consent of instructor. Political, military, and intellectual history of Europe from the turn of the century to the present. Extensive source readings.

***148A. Diplomatic History of Modern Europe. (4) I.**

Lecture—3 hours. A survey of the diplomatic relations of the European powers from the eighteenth century to the middle of the nineteenth century.

***148B. Diplomatic History of Modern Europe. (4) II.**

Lecture—3 hours. A survey of the diplomatic relations of the European powers from the Crimean War to 1890.

***148C. Diplomatic History of Modern Europe. (4) III.**

Lecture—3 hours. A survey of the diplomatic relations of the European powers from 1890 to the 1930's.

***149. History of Military Thought and Policy from Machiavelli to the Present. (4) I.**

Lecture—3 hours. Prerequisite: courses 4A, 4B, 4C. Recommended: additional background in history, political theory, or sociology. An analysis of military affairs and of their interaction with intellectual, social, economic, and political history since the Renaissance.

151A. History of England. (4) I.

Lecture—3 hours. Recommended: course 4A. A survey of English history to the latter part of the fifteenth century. Mr. Woodfill

151B. History of England. (4) II.

Lecture—3 hours. Recommended: courses 4A, 4B, and 151A. A survey of English history from the latter part of the fifteenth century to the latter part of the eighteenth century. Mr. Woodfill

151C. History of England. (4) III.

Lecture—3 hours. Recommended: courses 4B, 4C, 151A, and 151B. A survey of English history from the latter part of the eighteenth century to the present. Mr. Cline

***152A. English Constitutional History. (4) II.**

Lecture—2 hours; discussion—2 hours. Recommended: course 151A. From Anglo-Saxon times to the reign of Edward IV. Mr. Woodfill

***152B. English Constitutional History. (4) III.**

Lecture—2 hours; discussion—2 hours. Recommended: courses 151B or 154, 151C, and 152A. From the reign of Edward IV to the present. Mr. Woodfill

* Not to be given, 1969-70.

154. Tudor and Stuart England. (4) III.

Lecture and discussion—3 hours. Prerequisite: consent of instructor. Recommended: courses 151A and 151B. Mr. Woodfill

156. Social and Economic History of Britain since 1760. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 151C (or concurrent enrollment) or consent of instructor. Integration of the history of industrial, commercial and agricultural development with the nature and course of change in demography, social organization and urbanization and urbanization from pre-industrial to postindustrial Britain. Mr. Cline

***158A. The British Empire in the Nineteenth Century. (4) II.**

Lecture—3 hours. Prerequisite: course 4C; courses 151B, 151C recommended. The development of Britain's overseas empire, and the evolution of colonial policies, to the Boer War.

***158B. The British Empire in the Twentieth Century. (4) III.**

Lecture—3 hours. Prerequisite: course 4C. Recommended: courses 151B, 151C. The evolution and decline of the British Empire from the Boer War to the 1950's.

***160. History of the West Indies, 1492-1800. (4) II.**

Seminar—3 hours. Prerequisite: consent of instructor. Study of selected topics on European expansion in the West Indies to 1800, with special emphasis on social and economic developments. Limited enrollment. Mr. Jacobson

161A. Latin American History. (4) I.

Lecture—3 hours. Colonial history of Latin America. Mr. Corwin

161B. Latin American History. (4) II.

Lecture—3 hours. The national period of Latin American history. Mr. Corwin

***162. History of Cuba and the Spanish Caribbean. (4) III.**

Lecture—3 hours. Prerequisite: courses 161A and 161B or consent of instructor. The history of Cuba and the Spanish Caribbean since 1492, including discovery and settlement, slavery and the plantation economy, independence movements, and United States relations with the island republics. Emphasis on the period since 1898. Offered in odd-numbered years. Mr. Corwin

163A. History of Brazil. (4) I.

Lecture—3 hours. The history of colonial and imperial Brazil from 1500 to 1889. Mr. Poppino

163B. History of Brazil. (4) II.

Lecture—3 hours. Prerequisite: course 163A

or consent of instructor. The history of the Brazilian republic from 1889 to the present.

Mr. Poppino

164. History of Argentina. (4) III.

Lecture—3 hours. Prerequisite: courses 161A and 161B or consent of instructor. The history of Argentina from about 1800 to the present, stressing the contributions of the colonial heritage and nineteenth-century political, economic, and social developments to the rise of Argentine nationalism. Offered in even-numbered years.

Mr. Corwin

***165. Latin American Social Revolutions. (4) III.**

Lecture—3 hours. Prerequisite: a reading knowledge of Spanish is recommended. Major social upheavals since 1900 in Mexico, Argentina, Brazil, Bolivia, Guatemala, and Cuba, examined as to similarities and differences in causes, course, and consequences. Offered in odd-numbered years.

Mr. Poppino

***166. History of Mexico. (4) III.**

Lecture—3 hours. The colonial origin and development of the Mexican nation; its political, economic, and social institutions. Emphasis on the period since 1910.

Mr. Corwin

168. History of Inter-American Relations. (4) III.

Lecture—3 hours. Prerequisite: a reading knowledge of Spanish or Portuguese is recommended. 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. Offered in even-numbered years.

Mr. Poppino

170A. Colonial America. (4) I.

Lecture—3 hours; discussion—1 hour. Colonial society from 1607 to the American Revolution, with emphasis on European expansion, political, social, and economic foundations, colonial thought and culture, and imperial rivalry.

Mr. Jacobson

170B. The American Revolution. (4) II.

Lecture—3 hours. An analysis of the Revolutionary epoch with emphasis on the structure of British colonial policy, the rise of revolutionary movements, the War for Independence and its consequences, and the Confederation period.

Mr. Jacobson, Mr. Goodman

170C. The Early National Period. 1789–1815.

(4) III.

Lecture—3 hours. The political and social history of the American republic from the adoption of the Constitution through the War of 1812 and its consequences.

Mr. Goodman

171A. The Jacksonian Era. (4) I.

Lecture—3 hours. The political and social history of the American Republic from the end of the War of 1812 to the Compromise of 1850.

Mr. Calhoun

171B. American Civil War. (4) III.

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.

171C. The Emergence of Modern America. (4) I.

Lecture—3 hours. From Reconstruction to the twentieth century, including political and intellectual change, the advent of big business, the rise of organized labor, ethnic adjustments, urbanization, and movements of social unrest.

Mr. Brody

174A. Recent History of the United States. (4) II.

Lecture—3 hours; discussion—1 hour. Study of political, economic, and cultural aspects of American democracy from 1900 to 1930's.

Mr. Shideler, Mr. Swain

174B. Recent History of the United States. (4) II.

Lecture—3 hours; discussion—1 hour. Study of political, economic, and cultural aspects of American democracy from the 1930's to the present.

Mr. Brody, Mr. Swain

***175A. Intellectual History of the United States. (4) I.**

Lecture—3 hours. Prerequisite: course 17A or its equivalent; or a course in philosophy since the Renaissance, political theory, American literature, or sociological theory. American social thought from colonial times to the 1860's. Emphasis upon Puritanism, the American Enlightenment, Transcendentalism, Jacksonian democracy, in the context of ideas about the nature of man and his freedom and the idea of progress.

Mr. Smith

***175B. Intellectual History of the United States. (4) II.**

Lecture—3 hours. Prerequisite: courses 17A and 17B; or a course in philosophy since the Renaissance, political theory, American literature, or sociological theory. American social thought from the 1860's to the present. Emphasis upon the social relevance of philosophical and religious idealism, naturalism, and pragmatism.

Mr. Smith

***176A. Social and Cultural History of the United States. (4) III.**

Lecture—3 hours. A study of social and cultural forces in American society from colonial times through reconstruction and the post-Civil War industrial expansion, with emphasis on class structure, religious movements, labor systems, racial and national groups, social reform movements, changes in social values. Offered in odd-numbered years.

Mr. Marchand

* Not to be given, 1969–70.

176B. Social and Cultural History of the United States. (4) III.

Lecture—3 hours. A study of social and cultural forces in American society from 1880 to the present with emphasis on class structure, religious movements, labor systems, racial and national groups, social reform movements, and changes in social values. Offered in even-numbered years.

Mr. Marchand

***178A. Great Issues in United States History: Ideas and Interpretations. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: junior standing; or consent of instructor. Selected topics in the political, economic, social and intellectual history of the United States. A study in historical thought and interpretation concerning the main currents of national development to 1865.

Mr. Jackson

178B. Great Issues in United States History: Ideas and Interpretations. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: junior standing; or consent of instructor. Selected topics in the political, economic, social and intellectual history of the United States. A study in historical thought and interpretation concerning the main currents of national development since 1865.

Mr. Jackson

***179A. Economic Growth of the United States. (4) II.**

Lecture—3 hours. Development of the American economy from colonial agriculture and mercantilism to the emergence of industrial capitalism.

***179B. Economic Growth of the United States. (4) III.**

Lecture—3 hours. The changing nature of industrial capitalism and its effects on agriculture, labor, business, and government in the late nineteenth and twentieth centuries.

Mr. Brody

180. The Westward Movement to 1850. (4) I.

Lecture—3 hours. The political, economic, and social significance of the westward movement from colonial times to 1850.

Mr. Sherwood

183A. The Frontier Experience: Trans-Mississippi West. (4) I.

Lecture—3 hours; discussion—1 hour. The fur trade, western exploration and transportation, the Oregon Country, the Greater Southwest and the Mexican War, the Mormons, mining discovery, and the West during the Civil War.

Mr. Jackson

* Not to be given, 1969-70.

183B. The Frontier Experience: Trans-Mississippi West. (4) II.

Lecture—3 hours; discussion—1 hour. Spread of the mining kingdom, the range cattle industry, Indian-military affairs, settlement of the Great Plains and Rocky Mountain Regions and political organization of the West.

Mr. Jackson

***185A. History of Science and Technology in America. (4) II.**

Lecture—3 hours. A study of science and technology in America, emphasizing the development of scientific ideas and institutions, to 1890.

Mr. Sherwood, Mr. Swain

***185B. History of Science and Technology in America. (4) III.**

Lecture—3 hours. A study of science and technology in America, emphasizing the development of scientific ideas and institutions, since 1890.

Mr. Sherwood, Mr. Swain

187. Issues in American Educational History. (4) III.

Lecture—3 hours; discussion—1 hour. An exploration of the patterns by which educational institutions have developed, with emphasis, on the ways in which Americans have used the transmission of culture between generations as a focus for general social criticism. Offered in odd-numbered years.

Mr. Calhoun

***188A. History of Agriculture in the United States. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: junior or senior standing. History of agricultural development to 1900 with emphasis on social and economic institutions.

Mr. Shideler

188B. History of Agriculture in the United States. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: junior or senior standing. History of agricultural changes from 1900 to the present with emphasis on the background and evolution of government policy.

Mr. Shideler

***189A. History of California. (4) III.**

Lecture—3 hours; discussion—1 hour. History of California to 1865. Offered in odd-numbered years.

Mr. Jackson

189B. History of California. (4) III.

Lecture—3 hours; discussion—1 hour. History of California since 1865. Offered in even-numbered years.

Mr. Jackson

***190A. East Asian Civilization. (4) I.**

Lecture—3 hours. The culture and history of East Asia to 1600. Emphasis on China and Japan; attention also to Southeast Asia. Offered in odd-numbered years.

Mr. Liu

190B. East Asian Civilization. (4) II.

Lecture—3 hours. The culture, history, and problems of East Asia since 1600. Emphasis on China and Japan; attention also to Southeast Asia. Offered in even-numbered years. Mr. Liu

***191A. Early Imperial China. (4) I.**

Lecture—3 hours; discussion—1 hour. Chinese history to 960 with emphasis on the basic ideas and institutions which have molded the culture and society of China. Offered in odd-numbered years.

Mr. Lo

***191B. Late Imperial China. (4) II.**

Lecture—3 hours; discussion—1 hour. China, 960 to 1800, with attention to the growth of autocracy, economic and intellectual development, and problems of foreign relations. Offered in even-numbered years.

Mr. Lo

191C. Modern China. (4) III.

Lecture—3 hours; discussion—1 hour. The revolutionary transformation of China from the nineteenth century to the present.

Mr. Lo

192A. Modern China and the West. (4) I.

Lecture—3 hours. A survey of China's relations with the West since 1800, with emphasis on the impact on imperialism, the profound effects of Western technology and ideas, and the changes in the Chinese Worldview and foreign policy.

Mr. Liu

192B. Modern China and the West. (4) II.

Lecture—1 hour; discussion—2 hours. Prerequisite: course 192A or consent of instructor. Intensive study of topics in the history of China's relations with the West.

Mr. Liu

***193. China's Relations with Southeast Asia. (4) I.**

Lecture—3 hours; discussion—1 hour. China's historical relations with Southeast Asia—military, political, cultural, and economic. Offered in odd-numbered years.

Mr. Lo

***194A. History of Japan, I. (4) I.**

Lecture—3 hours. A survey of Japanese history to the end of the Tokugawa period.

***194B. History of Japan, II. (4) II.**

Lecture—3 hours. Prerequisite: course 194A or consent of instructor. A survey of Japanese history from the late Tokugawa period to the present.

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

Prerequisite: consent of instructor; upper division standing.

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. The Staff

Graduate Courses**201. Sources and General Literature of History.**

(4) I, II, III.

Seminar—3 hours. Designed primarily for students preparing for higher degrees in history. A. Ancient; B. Medieval; C. Renaissance and Reformation; D. Modern Europe to 1815; E. Europe since 1815; F. Russia; G. China to 1600; H. China since 1600; I. Britain, J. Latin America since 1810; L. United States, 1787-1896; M. United States since 1896; N. Japan.

The Staff

***211. Ancient History. (4) II.**

Seminar—3 hours. Prerequisite: course 111A, 111B, 111C. A seminar dealing with the various aspects of Near Eastern and Greco-Roman civilization.

Mr. Spyridakis

221. Medieval History. (4) II, III.

Seminar—3 hours. Recommended: courses 121A, 121B. Topics in the history of medieval Europe.

Mr. Bowsky

***237. Russian History. (4) I.**

Seminar—3 hours. Prerequisite: a reading knowledge of Russian. Topics relating to the history of Muscovite and Imperial Russia before 1856.

Mr. O'Brien

242. History of the Enlightenment. (4) II, III.

Seminar—3 hours. Prerequisite: a reading knowledge of French. Intellectual and social history of Europe during the Enlightenment. May be repeated for credit.

Mr. Schwab

***245. History of the Napoleonic Era. (4) I, II.**

Seminar—3 hours. Prerequisite: reading knowledge of French or German and consent of instructor. Political, intellectual, social, and military history of Europe from the Consulate to the Congress of Vienna.

***246. Europe in the Twentieth Century. (4) III.**

Seminar—3 hours. Political history of Europe since 1919, with particular emphasis on the post-1939 period.

Mr. Willis

***248A-248B. Modern European Diplomatic History.**

(4-4) II-III.

Seminar—3 hours. Prerequisite: reading knowledge of French or German; courses 148B and 148C; or consent of instructor. Bibliography and topics in the diplomatic history of Europe from the French Revolution to the 1930's, with emphasis on the nineteenth century.

***249. Military Theory, Institutions, and Policy since the Renaissance. (4) II, III.**

Seminar—3 hours.

• Not to be given, 1969-70.

251. English History. (4) I, II.

Seminar—3 hours. Recommended: courses 151A, 151B, and 151C; 152A and 152B; 154. Mr. Woodfill

261. Latin American History. (4) I.

Seminar—3 hours. Prerequisite: two courses in Latin American history; reading knowledge of Spanish or Portuguese.

Mr. Corwin, Mr. Poppino

***270. Early American History. (4) III.**

Seminar—3 hours. Mr. Jacobson

271. History of the United States, 1760–1815.

(4) II.

Seminar—3 hours. Mr. Goodman

272. History of the United States, 1815–1848.

(4) III.

Seminar—3 hours. Mr. Calhoun

***273. History of the United States, 1848–1900.**

(4) I, II.

Seminar—3 hours. —

274. Recent History of the United States. (4) II.

Seminar—3 hours. Topics in twentieth century American history. Mr. Swain

275. American Social and Intellectual History.

(4) I.

Seminar—3 hours. Prerequisite: courses 175A, 175B or their equivalent; or consent of instructor. Studies in the recent historiography of, or research in, American social and intellectual history. May be repeated for credit. Mr. Smith

***277. Nineteenth Century American Institutions.**

(4) II.

Seminar—3 hours. Churches, schools, professions, urban growth, and social mobility in nineteenth century America. Mr. Smith

279. History of the United States: the Twentieth Century. (4) III.

Seminar—3 hours. Emphasis on social and economic developments. Mr. Brody

***283. History of the United States: The Frontier. (4) I.**

Seminar—3 hours. Mr. Jackson

***288. History of the United States. (4) II, III.**

Seminar—3 hours. Prerequisite: graduate standing. Emphasis on agricultural history and closely related topics such as exports, transportation and politics. Mr. Shideler

291A–291B. Chinese History. (4–4) I–II.

Seminar—3 hours. Prerequisite: consent of instructor. Research on topics to be chosen by the student, aiming at the writing of papers of article length. Mr. Liu, Mr. Lo

291C. Chinese History. (4) III.

Seminar—3 hours. Prerequisite: reading knowledge of Chinese. Readings in Chinese historical materials. Training in the techniques of using Chinese reference works will be provided. Mr. Lo

299. Research. (1–6) I, II, III.

The Staff

299D. Individual Study. (1–6) I, II, III.

The Staff

Professional Course

300. The Teaching of History in the Secondary School and the Junior College. (3) III.

Lecture—3 hours. Prerequisite: junior or senior standing with a teaching major or minor in social studies. Methods for the presentation of history at the secondary and junior college level. —

* Not to be given, 1969–70.

HOME ECONOMICS EDUCATION—See Family and Consumer Sciences

HOME MANAGEMENT—See Family and Consumer Sciences

HUMAN ANATOMY—See Medicine

HUMAN DEVELOPMENT—See Family and Consumer Sciences

INSTITUTION MANAGEMENT—See Family and Consumer Sciences

INTERNATIONAL AGRICULTURAL DEVELOPMENT

Participating Departments:

AGRICULTURAL ECONOMICS

Professor:

Trimble R. Hedges, Ph.D.

AGRICULTURAL ENGINEERING

Professor:

Norman B. Akesson, M.S.

AGRONOMY AND RANGE SCIENCE

Professor:

William A. Williams, Ph.D.

ANIMAL SCIENCE

Professor:

Floyd D. Carroll, Ph.D.



Associate Professor:

Pran N. Vohra, Ph.D. (*Acting; Poultry Husbandry*)

Departmental Major Adviser.—See *Schedule and Directory Listing*.

Bachelor of Science major program and Graduate Study. See pages 56 and 153.

Upper Division Courses

101. Crop Production under Tropical Conditions. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Science 2 or Botany 2. Climatic and soil adaptation; varieties and varietal improvement in annual and perennial crops; pests, diseases, and their control; fertilization and other management practices.

Mr. W. A. Williams

102. Livestock and Poultry Production in Developing Areas. (4) I.

Lecture—4 hours. Prerequisite: Animal Science 10, Nutrition 103. Kinds of livestock and poultry suited to developing areas; feed-stuff resources and their utilization; ecological problems including pests, diseases and their control; management practices. Mr. Carroll, Mr. Vohra

190. Proseminar in International Agricultural Development. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Problems of coordinating principles and information from technical agriculture and the social sciences in the context of economic development.

Mr. Hedges

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

Prerequisite: consent of instructor.
The Staff (Mr. Akesson in charge)

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

The Staff (Mr. Hedges in charge)

INTERNATIONAL AGRICULTURAL DEVELOPMENT (A Graduate Group)

Lynn D. Whittig, Ph.D., *Chairman of the Group*

Group Office, 167 Hoagland Hall

Graduate Courses

280. Social, Technological, and Other Factors in Agricultural Development. (3) II.

Seminar—3 hours. Problem identification and analysis in agricultural development; cultural forces; political, social, and economic organiza-

tion; human factors in relation to resource use and technology, function and use of the change agent; program development, planning and execution.

Mr. Hedges

299. Research. (1-9) I, II, III.

The Staff (Mr. Whittig in charge)

INTERNATIONAL RELATIONS

Paul E. Zinner, Ph.D., *Chairman of the Committee*
Committee Office, 267 Voorhies Hall

Committee in Charge:

Professors:

Bennett M. Berger, Ph.D. (*Sociology*)
Homero Castillo, Ph.D. (*Spanish*)
F. Roy Willis, Ph.D. (*History*)
Paul E. Zinner, Ph.D. (*Political Science*)

Associate Professor:

Elias H. Tuma, Ph.D. (*Economics*)

Major Adviser: See *Schedule and Directory*.

International relations embraces the social relationships which transcend the boundaries of national states. The major in international relations is devised to meet the needs of students interested in acquiring an understanding of the forces and influences conditioning present-day world politics and economics, as well as the main problems and policies of organized states in their relations with one another. Because these problems and policies must be dealt with and determined by governments, the major is built around courses dealing with intergovernmental diplomatic and economic relations. However, it cuts across departmental lines, for foreign policies are made in relation to political, geographic, economic, and social conditions, and in the light of historical precedents.

The Major Program

Language requirement: approximately 28 quarter units in one modern foreign language.

Lower Division Courses.—Required: Economics 1A-1B or 2A-2B-2C; History 4B, 4C,

or 17A, 17B; Political Science 2, 3; one course in sociology; one course from: anthropology, geography, art or philosophy.

Upper Division Courses.—Economics, 12 quarter units (115A, 116, 161); political science, 12 quarter units (select from 123, 124, 128A, 128B, 131, 132, 134, 137, 139, 149); history, 12 quarter units (from 137D, 146A, 146B, 147, 148A, 148B, 148C, 149, 158B, 165, 168, 174A, 174B, 192A, 192B, 193); sociology, 12 quarter units (from 118, 125, 130, 141); 2 quarter courses to be selected from the following: anthropology, geography, literature, art, philosophy, interdisciplinary seminar (required of all students, junior or senior year) 2 quarters of 4 units each.

Additional recommended courses: Economics 115B, 117, 160, 110B; History 102, 141, 144B, 151C, 161B, 162, 190B, 191C, 194B; Political Science 141, 142, 143, 146A, 146B, 147A, 147B, 148A, 148B, 172, 174; Sociology 145, 175; German 115, 116; Russian 40, 41, 42, 125; French 107A, 107B, 141, 142, 150; Italian 120A, 120B; Oriental Languages 112, 132, 142; Portuguese 104, 105, 106; Spanish 104C, 111, 120A, 122, 134, 135.

Teaching Major—For the secondary credential: In addition to the departmental major, one (three or four unit) course in history, economics, political science, or sociology is required. This course is to be selected from the recommended courses listed above.

For the elementary credential: The teaching major is the same as the departmental major.

Subject Representative: Mr. Zinner

ITALIAN

Department Office, 515 Sprout Hall

Assistant Professors:

Jonathan L. Butler, Ph.D.
Alfonso De Petris, *Dottore in Lettere*.
Enrico Marelli, *Dottore in Lettere*.



Associate:

Julijana Janich.

Departmental Major Adviser.—Mr. Butler.

The Major Program

Lower Division Courses.—Required: Italian 1, 2, 3, 4, 5, and 6 or their equivalents. Recommended: one year of college Latin or a Romance Language.

Upper Division Courses.—Required: at least 36 units of upper division courses of which two may be chosen from department-approved courses in related fields.

Honors and Honors Program (see page 133). The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—A minimum of at least 30 units in Italian of which 12 are upper division units including Italian 101 and 102.

Lower Division Courses

A course may not ordinarily be taken for credit if it is a prerequisite to a course already completed. Students offering high school language preparation as a prerequisite must take a placement test.

Duplication of Credit.—A student will not receive unit credit for Italian 1, 2, 3, 4, or 5 when these duplicate courses previously completed in secondary school (see page 130), or at another university or college.

1. Elementary Italian. (4) I, II.

Laboratory—2 hours; recitation—3 hours.
The Staff

2. Elementary Italian. (4) II, III.

Laboratory—2 hours; recitation—3 hours.
Prerequisite: course 1. Continuation of course 1.
The Staff

3. Elementary Italian. (4) I, III.

Laboratory—2 hours; recitation—3 hours.
Prerequisite: course 2 or equivalent. Continuation
of course 2.
The Staff

4. Intermediate Italian. (3) I

Laboratory—1 hour; recitation—3 hours. Pre-
requisite: course 3 or equivalent. The Staff

5. Intermediate Italian. (3) II.

Laboratory—1 hour; recitation—3 hours. Pre-
requisite: course 4 or equivalent. Continuation
of course 4.
The Staff

6. Reading and Conversation. (4) III.

Recitation—4 hours. Prerequisite: course 5 or
equivalent. Class discussion; reading of selected
works; oral reports; analysis of texts. The Staff

Upper Division Courses**101. Advanced Conversation, Composition, and
Grammar. (4) I.**

Lecture—3 hours. Prerequisite: course 6 or
consent of instructor. Mr. Butler

**102. Advanced Conversation, Composition, and
Grammar. (4) II.**

Lecture—3 hours. Prerequisite: course 101
or consent of instructor. Offered in odd-num-
bered years. Mr. Butler

**113A. Italian Literature before the Renaissance:
from St. Francis to Petrarch. (4) III.**

Lecture—3 hours. Prerequisite: course 6 or
consent of instructor. A study of the origins
of lyrical forms of Italian literature of the thir-
teenth and fourteenth centuries. The develop-
ment of an Italian standard of poetry, with em-
phasis on the Sicilian school of Poetry, The
“Sweet New Style,” and Petrarch. Mr. Butler

***113B. Italian Literature before the Renaissance:**

Dante's Divine Comedy and Boccaccio. (4) III.

Lecture—3 hours. Prerequisite: course 6 or
consent of instructor. A study of the origins
of non-lyrical forms of Italian literature of the
thirteenth and fourteenth centuries. The *Divine
Comedy* and the development of a prose style
with emphasis on Boccaccio's *Decameron*.
Mr. Butler

**115A. Italian Literature of the Renaissance and
the Baroque: from Humanism to Machiavelli.**

(4) II.

Lecture—3 hours. Prerequisite: course 6 or
consent of instructor. A detailed examination of
the development of the renaissance ideal of man
and the subsequent loss of faith in this ideal as
evidenced in the work of Lorenzo de' Medici,
Poliziano, Ariosto and Machiavelli.

Mr. De Petris

**115B. Italian Literature of the Renaissance and
the Baroque: from Cellini to Marino. (4) III.**

Lecture—3 hours. Prerequisite: course 115A.
A continued examination into the loss of an
ideal. Emphasis on the conflicts in Michel-
angelo and Tasso leading to Marino, with an
excursus on Galileo's role in the formation of a
modern literary standard.

Mr. De Petris

**118. Italian Literature of the Eighteenth
Century. (4) I.**

Lecture—3 hours. Prerequisite: course 6 or
consent of instructor. An examination of the
struggle for the establishment of a modern
Italian literature. Emphasis on the work of
Goldoni, Bettinelli, Baretti, Parini, Alfieri and
Vico. Offered in odd-numbered years.

Mr. Marelli

**119. Italian Literature of the Nineteenth
Century. (4) II.**

Lecture—3 hours. Prerequisite: course 6 or
consent of instructor. The various aspects of
romanticism in Italy; Manzoni, Verga and
Verismo. Offered in even-numbered years.

Mr. Marelli

***120A. Italian Literature of the Twentieth Century:
The Novel. (4) III.**

Lecture—3 hours. Prerequisite: course 6 or
consent of instructor. A study into the de-
velopment of the novel from Svevo to the
present. Emphasis on the work of Svevo, Levi,
Moravia, Pavese and Vittorini. Offered in odd-
numbered years.

Mr. Marelli

120B. Italian Literature of the Twentieth Century:

Poetry and Drama. (4) III.

Lecture—3 hours. Prerequisite: course 6 or

* Not to be given, 1969-70.

consent of instructor. The main trends in Italian poetry with emphasis on hermeticism; the theater of Luigi Pirandello and its role in the development of contemporary Italian drama. Offered in even-numbered years. Mr. Marelli

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

199. Special Study for Advanced Undergraduates.

(1-4) I, II, III.

Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students.

The Staff

Professional Course

300. The 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.

The Staff

JAPANESE—See Oriental Languages

LANDSCAPE HORTICULTURE—See Plant Science

LATIN—See Classics

LAW

Edward L. Barrett, Jr., J.D., *Dean of the School and Chairman of the Department*

Department Office, 1011 Law Building

Professors:

Homer G. Angelo, J.D., LL.M.

Edward L. Barrett, Jr., J.D.

Edgar Bodenheimer, J.D., LL.B.

Daniel J. Dykstra, LL.B., S.J.D.

James E. Hogan, LL.B.

Edward H. Rabin, LL.B.

Mortimer D. Schwartz, LL.B., LL.M., M.S.
(*Law Librarian*)

John W. Whelan, LL.B.

Donald H. Wollett, LL.B.

Assistant Professors:

Gerald J. Adler, L.L.B., L.L.M., D.Sc.

John D. Ayer, J.D.

Dov M. Grunschlag, LL.B.



Professors:

Floyd F. Feeney, LL.B. (*Acting*)

Paul N. Savoy, LL.B. (*Acting*)

Associate Professors:

Raymond I. Parnas, J.D., LL.M. (*Acting*)

John W. Poulos, J.D. (*Acting*)

Admission Requirements and Curriculum:
for details consult the *Announcement of the School of Law*.

Professional Curriculum

First Year

200A–200B–200C. Introduction to Law and Equity.

(2-2-2) I-II-III.

Lecture—2-2-2 hours. Basic concepts of the law, the precedent system, reasoning in law, the historical roots of common law and equity, the

forms of action, equitable remedies, fundamentals of statutory interpretation.

Mr. Bodenheimer

201A–201B–201C. Property. (3-3-2) I-II-III.

Lecture—3-3-2 hours. The development of the law of property, including estates and other interests in land, real property marketing and conveying, land-use control, and landlord-tenant problems.

202A–202B. Contracts. (4-4) I-II.

Lecture—4-4 hours. The law of contracts, including problems of formation, interpretation, performance, enforcement, and termination.

Mr. Whelan

203A–203B–203C. Pleading and Procedure in Civil Cases. (2-2-4) I-II-III.

Lecture—2-2-4 hours. The principles of pleading under the code system and the federal rules; jurisdiction of state and federal courts; modern pretrial, trial and appellate procedure.

Mr. Hogan

204A–204B. Torts. (4-4) I-II.

Lecture—4-4 hours. Intentional and unintentional invasions of interests of personality and property.

Mr. Dykstra

207. Legal Research and Writing. (2) III.

Lecture—2 hours. Small group instruction in the techniques of legal research and writing.

Mr. Schwartz

208. Criminal Law and Procedure. (5) III.

Lecture—5 hours. The elements and policies of selected criminal offenses; principles of evidence and procedure in criminal cases.

Mr. Savoy

Second and Third Year Courses**214. Constitutional Law I. (3) II.**

Lecture—3 hours. An introductory analysis of the judicial process in constitutional cases; division of powers between the national government and the states. Mr. Barrett

***215A-215B-215C. Business Associations.**

(3-2-2) I-II-III.

Lecture—3-2-2 hours. Principles of agency and partnership, the process of incorporation, corporate control and management, and problems related to corporate finance and regulation. ———, Mr. Dykstra

***216. Commercial Law I. (3) I.**

Lecture—3 hours. Legal problems stemming from the distribution of goods. ———

***217. Constitutional Law II. (3) III.**

Lecture—3 hours. Constitutional limitations on governmental power. Mr. Barrett

***219A-219B. Evidence. (3-2) II-III.**

Lecture—3-2 hours. An examination and evaluation of the basic rules governing the presentation of material in court by means of documents and the examination of witnesses. Mr. Hogan

***220A-220B. Federal Taxation I. (3-2) I-II.**

Lecture—3-2 hours. A study of the statutory, judicial, and administrative material concerning federal income taxes. Mr. Rabin

***221A-221B-221C. Introduction to Estate Planning.
(3-2-2) I-II-III.**

Lecture—3-2-2 hours. The basic estate planning devices, including wills, trusts, and future interests. Mr. Rabin

***222A-222B. Writing Seminar. (2-2) II-III.**

Seminar—2-2 hours. Limited enrollment. Subject matter emphasis of the sections will vary from professor to professor and from year to year. The Staff

230. Family Law. (3) I.

Lecture—3 hours. Legal aspects of the problems of family organization and disorganization, and the domestic relations of husband and wife, parent and child. Mr. Savoy

231. Legislation. (3) III.

Lecture—3 hours. Organization and operation of the Legislature, statutory interpretation and drafting, governmental relationships between the Legislature and Executive. Mr. Whelan

232. Land Financing. (3) II.

Lecture—3 hours. A study of the history and principles of real estate mortgages and deeds of trust as security devices for financing land and other transactions. Mr. Schwartz

233. Philosophy of Responsibility and Punishment.

(3) III.

Lecture—3 hours. Prerequisite: consent of instructor. Freedom of will and responsibility in the light of recent developments in philosophy and psychology; the significance of the concept of responsibility in the administration of criminal justice; modern approaches to the problems of punishment and rehabilitation.

Mr. Bodenheimer

234. Agricultural Law Seminar. (No credit) I.

A series of discussions on problems of agricultural industries which have legal significance. Discussions will be led by invited faculty members from the College of Agricultural and Environmental Sciences and other related departments.

The Staff

235. Administrative Law. (3) I.

Lecture—3 hours. Theory and practice of administrative agencies. Mr. Grunschlag

236. Securities Regulation. (3) III.

Lecture—3 hours. Prerequisite: course 215C. Legal problems of financing business enterprise under federal and state securities acts.

Mr. Dykstra

237. Commercial Law II. (3) II.

Lecture—3 hours. ———

238. Selected Problems in Comparative Law. (2) II.

Seminar—2 hours. A comparison of the handling of selected legal problems in various legal systems.

Mr. Angelo

242A-242B. Conflict of Laws. (3-2) I-II.

Lecture—3-2 hours. A study of the decisions in cases in which some of the operative facts are connected with some other state or country than the one in which suit is brought, and of the jurisdiction of courts and the recognition and enforcement of judgments of sister states and foreign countries. Mr. Bodenheimer

243A-243B. Creditors' Remedies. (2-3) II, III.

Lecture—2-3 hours. Bankruptcy and other matter affecting debtor-credit relations. ———

244. Criminal Procedure. (3) I.

Lecture—3 hours. Selected problems in procedure in criminal cases. Mr. Savoy

245A-245B. Estate Planning and Taxation.

(2-3) II-III.

Lecture—2-3 hours. Prerequisite: course 221C. Federal estate and gift taxes; federal income taxation as it affects trusts, estates and their beneficiaries. Mr. Rabin

⁹ Recommended for second-year students.

¹⁰ Required for second-year students.

246. Federal Jurisdiction. (3) I.

Lecture—3 hours. Legal problems peculiar to the federal courts. Mr. Grunschlag

247. Federal Taxation II. (4) I.

Lecture—4 hours. Prerequisite: course 220B. Emphasis on income tax problems of corporations and their shareholders. —

248A-248B. International Business Transactions.

(2-2) I-II.

Lecture—2-2 hours. The legal aspects of doing business in other countries. Mr. Angelo

249A-249B. International Organizations. (2-2) I-II.

Lecture—2 hours. The legal problems relating to international organizations. Mr. Angelo

250. Jurisprudence. (3) III.

Lecture—3 hours. A study of the philosophical and sociological foundations of the legal order. Among the subjects treated are the relations between law and morality, the role of basic values (such as freedom, equality, security) in legal ordering, the functions and techniques of adjudication. Mr. Bodenheimer

251. Labor Law. (4) II.

Lecture—4 hours. The law governing employer-employee relations. Mr. Wollett

252. Selected Problems in Labor Law. (2) III.

Seminar—2 hours. Prerequisite: course 251. A seminar on selected problems in labor law. Mr. Wollett

256. Land Use Planning. (3) I.

Lecture—3 hours. Zoning, subdivision control, and other methods for the regulation of land use. Mr. Rabin

257. Law and Social Science. (2) II.

Seminar—2 hours. A study of the methodology of social science and its application to law. Mr. Feeney

258. Legal Profession. (2) II.

Lecture—2 hours. Legal ethics; the responsibility of the organized bar. Mr. Barrett

259. Modern Social Legislation. (3) III.

Lecture—3 hours. An examination of legislation designed to secure adequate minimum standards of living. Mr. Feeney

260. Remedies. (4) II.

Lecture—4 hours. Alternate remedies available for the redress of substantive wrongs. Mr. Adler

261. State and Local Government. (4) III.

Lecture—4 hours. Legal problems of state and local governmental agencies. Mr. Adler

262A-262B. Trade Regulation. (2-3) II, III.

Lecture—2-3 hours. Government regulation of trade practices with emphasis upon the anti-trust laws. Mr. Grunschlag

263. Trial Practice. (3) I.

Lecture—3 hours. Intensive study of practice problems in litigation. Mr. Hogan

***264. Natural Resources. (3) III.**

The law governing natural resources, with emphasis upon the law relating to water. —

265. Government Contracts. (3) III.

Lecture—3 hours. Selected problems in government contracts. Mr. Whelan

266. Law and Medicine. (3) III.

Lecture—3 hours. Selected problems in law and medicine. —

267A-267B. Law and Contemporary Social Problems. (1) I-II.

Seminar—1 hour to be arranged. A course in which the emphasis will be on relationships of the law to the solution of particular social problems. Students will play a major role in the design and conduct of the course. Emphasis will be placed on independent research. The Staff

268. Community Property. (2) III.

Lecture—2 hours. The law of community property. —

299. Research. (1-6) I, II, III.

The Staff

LINGUISTICS

Benjamin E. Wallacker, Ph.D., *Chairman of the Committee*
Committee Office, 331 Voorhies Hall

Committee in Charge:**Professors:**

Martin A. Baumhoff, Ph.D. (*Anthropology*)
David L. Olmsted, Ph.D. (*Anthropology*)

Associate Professors:

Jarvis R. Bastian, Ph.D. (*Psychology*)

* Not to be given, 1969-70.

Wayne C. Harsh, Ph.D. (*English and Linguistics*)

Edward J. Tully, Jr., Ph.D. (*Mathematics*)
Benjamin E. Wallacker, Ph.D. (*Oriental Languages*)

Assistant Professors:

Ronald A. Arbini, Ph.D. (*Philosophy*)
Edwin A. Cook, Ph.D. (*Anthropology*)

William M. Estabrook, Ph.D. (*German*)
 James R. Hurford, Ph.D. (*English*)
 George H. Keith, Ph.D. (*French and Italian*)
 J. Rolf Kjolseth, Ph.D. (*Sociology*)
 Eric S. Liu, Ph.D. (*Oriental Languages*)

Lecturers: ◇ ◇ ◇

Jonathan L. Butler, M.A. (*French and Italian*)
 H. Phelps Gates, Jr., M.A. (*Spanish and Classics*)

Major Adviser.—Mr. Wallacker

Graduate Adviser.—Mr. Wallacker

The Major Program

The required courses include the one-year introductory sequence (Anthropology 110A, 110B, 110C) Elementary Linguistic Analysis, Intermediate Linguistic Analysis, and Comparative Linguistics; Grammatical Analysis (Linguistics 140); Elementary Sanskrit (Classics 191, 192, 193); and two more upper division courses in linguistics.

The student is required also to complete one year's study, or the equivalent, of a non-Indo-European language.

Graduate Study.—Requirements for the M.A. degree are 30 units in addition to a thesis. 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 equivalent, are specifically required: Linguistics 140, Grammatical Analysis; Linguistics 225, Modern Linguistic Theory; Linguistics 202, Principles of Historical Linguistics.

35. Introduction to Linguistics. (4) III.

Lecture—3 hours; laboratory—2 hours. Introduction to the study of language: its nature, diversity, and structure. Mr. Butler

MATHEMATICS

Edward B. Roessler, *Chairman of the Department*
 Department Office, 824 Sproul Hall

Professors:

Henry L. Alder, Ph.D.
 George A. Baker, Ph.D.
 Donald C. Benson, Ph.D.
 Curtis M. Fulton, Ph.D.
 Charles A. Hayes, Jr., Ph.D.
 Kurt Kreith, Ph.D.

¹ Absent on leave, 1969-70.

Upper Division Courses

139. Phonological Analysis. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 110B. Introduction to and application of phonological theory.

Mr. Hurford

140. Grammatical Analysis. (3) II.

Lecture—3 hours. Prerequisite: Anthropology 110B. Introduction to the theory of grammatical analysis; practice in solving exercise problems.

Mr. Liu

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses

202. Principles of Historical Linguistics. (3) I.

Lecture—3 hours. Prerequisite: Anthropology 110C. Advanced treatment of the theory and method of historical linguistics.

210. Historical Germanic Linguistics. (4) II.

Seminar—3 hours. The principles and techniques of historical linguistics will be used to study the development of the Germanic languages from Proto-Indo-European through Proto-Germanic and into early Germanic dialects such as Old Norse, Gothic, Old Saxon, and Old English.

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.

Mr. Liu

220. Romance Linguistics. (4) II.

Seminar—3 hours. Prerequisite: consent of instructor. Phonology, morphology, and lexicography of the major Romance languages.

Mr. Keith

225. Modern Linguistic Theory. (3) III.

Lecture—3 hours. Prerequisite: course 140 and Anthropology 110B. Survey of leading contributions to linguistic theory from de Saussure to the present.

299. Research. (1-12) I, II, III.

The Staff

Edward B. Roessler, Ph.D.

Sherman K. Stein, Ph.D.

Takayuki Tamura, D.Sc.

Associate Professors:

Hubert A. Arnold, Ph.D.

Dallas O. Banks, Ph.D.

Carlos Borges, Ph.D.

Albert C. Burdette, Ph.D.

Gulbank D. Chakerian, Ph.D.
 Melven R. Krom, Ph.D.
 Gary J. Kurowski, Ph.D.
 David G. Mead, Ph.D.
 Donald A. Norton, Ph.D.
 Washek F. Pfeffer, Ph.D.
¹Edward J. Tully, Jr., Ph.D.
 Howard J. Weiner, Ph.D.

Assistant Professors:

David W. Barnette, Ph.D.
 Robert J. Buck, Ph.D.
 Doyle O. Cutler, Ph.D.
 Lawrence S. Kroll, Ph.D.
 Maxwell W. J. Layard, Ph.D.
 Milton P. Olson, Ph.D.
 George T. Sallee, Ph.D.
 Robert W. Stringall, Ph.D.



Professor:

Robert D. Glauz, Ph.D. (*Acting*)

Assistant Professor:

Charles E. Franti, Ph.D. (*Biostatistics*)

Lecturers:

Steven A. Douglass, Ph.D.
 Shirley A. Goldman, M.S.
 Raymond N. Sproule, M.S.

Major Subject Advisers.—Mr. Alder, Mr. Baker, Mr. Barnette, Mr. Benson, Mr. Borges, Mr. Buck, Mr. Chakerian, Mr. Krom, Mr. Mead, Mr. Norton, Mr. Sallee, Mr. Stein, Mr. Stringall, and Mr. Tully.

The Major Program

There are three programs: Bachelor of Arts, Plan I; Bachelor of Arts, Plan II (for prospective teachers); and Bachelor of Science (for students who expect to continue the study of mathematics at the graduate level). Common to all three is the following:

First Two Years

	Freshman Year	Fall	Winter	Spring
Mathematics 21A, 21B, 21C	3	3	3	
Mathematics 11 (or its equivalent in high school)	2	—	—	
Mathematics 23	—	—	2	

Sophomore Year

Mathematics 22A, 22B, 22C	3	3	3
Mathematics 108A	3	—	—
Mathematics 24	—	—	2

Under Bachelor of Arts, Plan II described below, 108B should be taken immediately after 108A.

Bachelor of Arts, Plan I

First Two Years: described above and Physics 4A.

Upper Division Courses. Required: 40 units, including courses 108A, 127A, 127B, 151A, one course in each of three areas listed below, at least 9 units in one area:

- a) Analysis—courses 127C, 118A, 118B, 119, 147, 185A, 185B, 187.
- b) Foundations—courses 115A, 115B, 115C, 125, 126, 151B, 151C, 136A, 136B.
- c) Geometry—courses 112, 113, 114, 116, 141.
- d) Computer Sciences and Applications—courses 128A, 128B, 128C, 129, 140, 168.
- e) Statistics—courses 105A, 105B, 131A, 131B, 131C, 132A, 132B.

Those interested in applied mathematics (including computers), are advised to take 30, 128A, 128B, 128C, as well as 127C, 151B, 151C; those interested in statistics, 105A, 105B, 131A, 131B, 131C, 132A, 132B.

Bachelor of Arts, Plan II

First two years: as described above, plus Physics 4A and Mathematics 30. Recommended: Physics 4B and courses in other departments that use mathematics.

Upper Division Courses. Required: 36 units, including 108A, 108B, 136A, 136B, 139A, 139B, 139C, 140, 141.

Bachelor of Science

First two years: as described above.

In addition to the courses specified below, the student is required to take a course in another department which applies mathematics, such as Physics 105A; Engineering 102A; Agricultural Economics 106A. (A list of other acceptable courses may be obtained from the mathematics department.) It is recommended that the student fulfill the language requirement for the B.S. degree by taking French, German, or Russian.

Upper Division Courses. Required: 42 units including:

- a) 108A.
- b) 127A, 127B, 127C, and 151A, 151B, 151C. (It is recommended that the student initiate, and if possible complete, these two sequences in the junior year.)
- c) at least one of the following sequences: 185A, 185B; 128A, 128B, 128C; 118A, 118B, 119; 115A, either 115B or 115C; 126, 147, 187; 112 or 113, 116, 147; 131A, 131B, 131C; 132A, 132B; 125, 225A, 225B; 201A, 201B, 201C; 205A, 205B, 205C; 220A, 220B, 220C; 250A, 250B, 250C.

Those interested in applied mathematics (including computers) are advised to take courses 30, 128A, 128B, 128C; those interested in statistics, courses 105A, 105B, 131A, 131B, 131C, 132A, 132B.

¹ Absent on leave, 1969-70.

Graduate Study.—The Department of Mathematics offers programs of study and research leading to the M.A. and Ph.D. degrees in mathematics. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Mathematics.

Qualifying Examinations.—A student entering from high school who believes that he has had the equivalent of a course offered by the Department of Mathematics (e.g., analytic geometry and calculus) may demonstrate his proficiency in this course by examination. If, in the opinion of the department, his level of achievement is sufficiently high, he will be permitted to enter the next course in the sequence. No University credit is earned by passing such an examination. Arrangements for an examination must be made with the department secretary in 822 Sproul Hall on or before the Monday of registration week.

Teaching Major.—Requirements for the teaching major are described for the B.A., Plan II.

Teaching Minor.—Thirty units of mathematics which must include: 4 units of fundamentals of mathematics (course 36A); 8 units of calculus (courses 11, 21A, 21B or 16A–16B–16C); 3 units of probability and/or statistics (courses 13, 15, or 131A); 3 units of geometry (course 37 especially recommended, 112, 113, 114, or 116).

The remainder of the 30 units are elective, except that students with a non-academic major must include 18 units in mathematics at the upper division or graduate level.

Subject Representative: Mr. Burdette.

Lower Division Courses

7. Topics in Algebra. (4) II.

Lecture—4 hours. Prerequisite: two years of high school algebra, plane trigonometry. Natural numbers; integers; rational, real, and complex numbers; permutations; combinations; theory of equations; matrices; determinants. 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 and three 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. (Junior standing mathematics majors or students having had courses

130A or 131A may not take course 13 for credit.) The Staff

15. Discrete Mathematics. (3) I, II.

Lecture—3 hours. Courses 15, 16A, and 16B constitute a year sequence recommended for students in the biological, management, and social sciences. Introduction to probability, vectors, and matrices. Applications to elementary Markov chains. Mr. Arnold, Mr. Mead

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. Courses 15, 16A, and 16B constitute a year sequence recommended for students in the biological, management, and social sciences.

The Staff

16B. Analytic Geometry and Calculus. (3) I, II, II.

Lecture—3 hours. Prerequisite: course 16A or 21A. Not open for credit to students who have received credit in course 21B. Continuation of course 16A. The Staff

16C. Analytic Geometry and Calculus. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 16B or 21B. Only 1 unit of credit will be allowed to students who have received credit for course 21B. Continuation of course 16B with special emphasis on the calculus of three dimensions including partial differentiation and total differentials; designed for students desiring to take physical chemistry. The Staff

21A. Calculus. (3) I, II, III.

Lecture—3 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 may be taken concurrently. Only 2 units of credit will be allowed in course 21A for students who have received credit for 16A. The Staff

21B. Calculus. (3) I, II, III.

Lecture—3 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

21C. Calculus. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 21B or 16C. Continuation of course 21B. Infinite

series, calculus of vector functions, Green's Theorem in the plane. The Staff

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.) The Staff

22B. Differential Equations. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 21C. Solutions of elementary differential equations. The Staff

22C. Vector Analysis. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 21C. Green's theorem, Stoke's theorem, divergence theorem. The Staff

23. Applications of the Calculus. (2) III.

Lecture—2 hours. Prerequisite: course 21C (may be taken concurrently). Significant applications of the calculus in various sciences. The Staff

24. Infinite Series. (2) III.

Lecture—2 hours. Prerequisite: course 21C. Elements of infinite series including Fourier series and series with complex terms. The Staff

30. Introduction to Computer Science. (3) I, II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: two years of high school algebra. Introduction to the digital computer and its organization, coding and programming, use of compilers, flow charts, solutions of typical problems, code checking. (Course 30 may not be taken for credit by students who have completed Engineering 5A.) Mr. Norton

31. Algorithms for Computer Mathematics. (3) II.

Lecture—3 hours. Prerequisite: course 30, 21B (may be taken concurrently). Introduction to assembly languages. The development and description of mathematical algorithms in computer dependent languages. Mr. Norton

36A. Fundamentals of Mathematics. (4) I, II, III.

Lecture—4 hours. Introduction to fundamental mathematical ideas selected from the principal areas of modern mathematics. Properties of the primes, the fundamental theorem of arithmetic, properties of the rationals and irrationals, binary and other number systems. The Staff

36B. Fundamentals of Mathematics. (2) III.

Lecture—2 hours. Prerequisite: course 36A. The content will be selected from the following topics: number systems, set theory, number theory, the axiomatic method, topology, and combinatorics. The Staff

37. Topics in Geometry. (4) III.

Lecture—4 hours. Topics in Euclidian geom-

etry selected from the theory of geometric transformations, the area and dissection of plane figures, convex polyhedra, foundations of geometry. Mr. Barnette

Upper Division Courses

105A. Applied Statistical Methods: Analysis of Variance. (4) II, III.

Lecture—4 hours. Prerequisite: course 13. Design of experiments including randomized complete block designs, Latin squares, split-plot designs, factorial designs, and incomplete block designs. Mr. Baker

105B. Applied Statistical Methods: Multiple Regression. (3) III.

Lecture—3 hours. Prerequisite: course 105A. Continuation of course 105A. Multiple regression and analysis of covariance. Mr. Baker

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. Mr. Buck, Mr. Mead

108B. Introduction to Abstract Algebra and Analysis. (3) I, II.

Lecture—3 hours. Prerequisite: course 108A. Unique factorization, Gaussian integers and applications. Introduction to integration theory. Course 108B may not be taken for credit after students have completed courses 127A or 151A, and may not be taken concurrently with 127A or 151A. Mr. Buck

***112. Higher Geometry. (3) I.**

Lecture—3 hours. Prerequisite: course 108A; or consent of instructor. Homogeneous point and line coordinates, cross ratio, one- and two-dimensional projective geometry, point and line conics. Offered in even-numbered years. Mr. Fulton

113. Synthetic Projective Geometry. (4) II.

Lecture—4 hours. Prerequisite: course 108A; or consent of instructor. Duality, perspectivity, harmonic sets, projectivity, definition of conics, theorems on conics, pole and polar. Offered in even-numbered years. Mr. Fulton

114. The Theory of Convex Sets. (3) I.

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 odd-numbered years. Mr. Sallee

* Not to be given, 1969-70.

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. Offered in odd-numbered years.

Mr. Alder

115B. The Theory of Numbers. (3) II.

Lecture—3 hours. Prerequisite: course 108A. Euler-function, Moebius function, congruences, primitive roots, quadratic reciprocity law. Offered in even-numbered years.

Mr. Alder

115C. The Theory of Numbers. (3) III.

Lecture—3 hours. Prerequisite: course 108A. Continued fractions, partitions. Offered in even-numbered years.

Mr. Adler

***116. Metric Differential Geometry. (4) III.**

Lecture—4 hours. Prerequisite: courses 22A, 22C, or consent of instructor. Vector analysis, curves and surfaces in three dimensions. Offered in odd-numbered years.

Mr. Chakerian

118A-118B. Introduction to Partial Differential**Equation. (3-3) II-III.**

Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Solutions of partial differential equations of mathematical physics by separation of variables, series of orthogonal functions. Applications to boundary value problems.

Mr. Kroll

119. Theory of Ordinary Differential Equations.**(3) I.**

Lecture—3 hours. Prerequisite: courses 22A, 22B. Existence and uniqueness theorems, theory of linear equations of the second and higher orders, regular singular points, Sturm-Liouville systems, Laplace transforms.

Mr. Kroll

***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 even-numbered years.

Mr. Krom

***126. Introduction to the Theory of Sets. (3) I.**

Lecture—3 hours. Prerequisite: course 21C, or consent of instructor. Fundamental concepts including cardinal numbers, order types, ordinal numbers. Offered in even-numbered years.

Mr. Stringall

127A. Advanced Calculus. (4) I, II.

Lecture—4 hours. Prerequisite: courses 22A, 22C. The real number system, continuity, differentiation and integration on the real line, vector calculus and functions of several variables, theory of convergence.

Mr. Buck

127B. Advanced Calculus. (4) II, III.

Lecture—4 hours. Prerequisite: course 127A. Continuation of course 127A.

Mr. Buck

127C. Advanced Calculus. (4) I, III.

Lecture—4 hours. Prerequisite: course 127B. Continuation of course 127B.

Mr. Arnold, Mr. Buck

128A-128B-128C. Numerical Analysis.**(4-4-4) I-II-III.**

Lecture—3 hours; laboratory—1 hour. Prerequisite: courses 22A, 22B, and 30 or a knowledge of Fortran. Finite differences, interpolation, polynomial approximation, numerical integration and differentiation, non-linear equations, systems of linear equations, matrices and eigenvalue problems, solution of ordinary and partial differential equations.

Mr. Glauz

129. Theory of Compilers. (4) III.

Lecture—4 hours. Prerequisite: course 31. Theory of compilers; structure of computer languages, their limitations and ambiguities; study of a particular language.

Mr. Norton

130A-130B. Mathematical Statistics, Brief**Course. (4-4) I-II.**

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 16B. A course in mathematical statistics for non-majors. Concepts of probability and sampling, principles of estimation, properties of estimators, sampling distributions, bivariate normal and principles of testing.

Mr. Layard

131A-131B-131C. Introduction to Mathematical**Statistics. (4-4-4) I-II-III.**

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 21C or 16C. An introduction to the mathematical theory of probability and statistics.

Mr. Layard

132A-132B. Introduction to Stochastic Processes.**(3-3) II-III.**

Lecture—3 hours. Prerequisite: course 131A. Random walks, recurrent events, Markov chains, birth-and-death processes.

Mr. Olson

136A-136B. Development of Mathematical Ideas.*(3-3) I-II.**

Lecture—3 hours. Prerequisite: course 21C. Topics and mathematicians studied with an emphasis on the origin of modern mathematics. Offered in even-numbered years.

Mr. Chakerian, Mr. Krom

139A-139B-139C. Introduction to Algebra.**(3-3-3) I-II-III.**

Lecture—3 hours. Prerequisite: courses 22A, 108A; or consent of instructor. Not open for credit to students who have received credit in course 151A without consent of Department, and may not be taken concurrently with 151A.

* Not to be given, 1969-70.

Theory of equations, symmetric functions, vector space aspects of Galois theory, Euclidean rings, integers in quadratic fields. Mr. Hayes

***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. Offered in odd-numbered years. Mr. 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. Offered in odd-numbered years. Mr. Barnette

147. Topology. (3) II.

Lecture—3 hours. Prerequisite: course 127C. The basic notions of point-set and combinatorial topology. Mr. Borges

151A–151B–151C. Algebra. (4–4–4) A: I, II;

B: II, III; C: I, III.

Lecture—4 hours. Prerequisite: course 108A. Introduction to groups, rings, fields and linear transformations. Mr. Stein, Mr. Stringall

***168. Linear Programming and Game Theory. (3) I.**

Lecture—3 hours. Prerequisite: course 21C, 7 or 15. Introduction to zero-sum, two-person games; the fundamental theory for matrix games; basic concepts of linear inequalities; the duality theorem; the simplex method. Offered in even-numbered years. Mr. Sallee

185A. Geometry of Functions of a Complex Variable.

(3) I, III.

Lecture—3 hours. Prerequisite: course 22C. Complex number system, Cauchy-Riemann equations, elementary functions, conformal mapping. Mr. Chakerian

185B. Analysis of Functions of a Complex Variable.

(3) I, II.

Lecture—3 hours. Prerequisite: course 185A. Cauchy's integral theorem, power series, Laurent series, residue theorem, special topics. Mr. Burdette

187. Lebesgue Measure and Integration. (3) III.

Lecture—3 hours. Prerequisite: course 127C. Theory of Lebesgue measure and integration on the real line. Mr. Hayes

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

Prerequisite: consent of instructor.

The Staff (Mr. Roessler in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff (Mr. Roessler in charge)

Graduate Courses

201A–201B–201C. Real Analysis. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 127C. Point set topology; Lebesgue measure and integration on the real line; abstract spaces; general measure and integration. Mr. Pfeffer

202A–202B–202C. Functional Analysis.

(3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: courses 127C, 151C, 201C. Hilbert spaces, spectral theorem, Banach spaces, commutative Banach algebras. Mr. Banks

205A–205B–205C. Functions of a Complex Variable.

(3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 127C. Theory of analytic functions, Cauchy integral theorem, power series, analytic continuation, conformal mapping, special functions. Mr. Arnold

215A–215B–215C. Topology. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Topics selected from point-set topology and homotopy theory. Mr. Borges

***216. Integral Equations. (3) I.**

Lecture—3 hours. Prerequisite: courses 22A, 127C. Volterra equations, Fredholm equations, symmetric kernels. Offered in even-numbered years. The Staff

***218A–218B. Partial Differential Equations.**

(3–3) II–III.

Lecture—3 hours. Prerequisite: courses 22A, 127C; 216 recommended. Topics from the theory of first order, hyperbolic and elliptic partial differential equations. Offered in odd-numbered years. Mr. Chakerian

219. Ordinary Differential Equations. (3) I.

Lecture—3 hours. Prerequisite: courses 22A, 127C. Ordinary differential equations in the real and complex domains; existence and uniqueness theorems; linear systems; analysis of singular points; Sturm-Liouville theory; asymptotic expansions. Offered in odd-numbered years. Mr. Benson

220A–220B–220C. Mathematics for the Physical Sciences. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 185A, 185B (may be taken concurrently). Topics in ordinary and partial differential equations, boundary value problems, functions of a complex variable, matrices and calculus of variations. Mr. Kreith

***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,

* Not to be given, 1969–70.

and completeness of the formalized mathematical theories; definability in formal languages; topics from the theory of models. Offered in odd-numbered years.

Mr. Krom

***228A–228B. Advanced Numerical Analysis of Ordinary Differential Equations. (3–3) I–II.**

Lecture—3 hours. Prerequisite: course 128C. Numerical solutions of initial and boundary value problems for systems of ordinary differential equations; error analysis and stability. Offered in even-numbered years. Mr. Kurowski

229A–229B–229C. Numerical Methods in Linear Algebra and Selected Topics. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 128C. Computational methods and theoretical aspects in the solution of simultaneous algebraic equations and matrix eigenvalue problems. Numerical analysis in optimization, data analysis, Monte Carlo, etc. Offered in odd-numbered years.

Mr. Glauz

***231A–231B–231C. Mathematical Statistics. (3–3–3) I–II–III.**

Lecture—3 hours. Prerequisite: courses 22C and 131C; or consent of instructor. A first year graduate course in theoretical statistics. Offered in even-numbered years.

Mr. Baker

232. Analysis of Variance. (3) I.

Lecture—3 hours. Prerequisite: course 131C. Estimation and testing for the general linear hypothesis, components of variance, multiple comparisons. Offered in odd-numbered years.

Mr. Sproule

233A–233B. Design of Experiments. (3–3) II–III.

Lecture—3 hours. Prerequisite: course 232. Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces.

Mr. Sproule

235A–235B–235C. Analytic Probability Theory. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 187 or equivalent. Measure-theoretic foundations of probability, distribution functions and characteristic functions, law of large numbers and central limit theorems, conditional probabilities, martingales.

Mr. Olson

236A–236B–236C. Advanced Mathematical Statistics. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: courses 127C and 131C. Distribution theory, parametric and nonparametric estimation, principles of statistical tests, sequential analysis, statistical decision functions.

Mr. Weiner

***237A–237B. Nonparametric Inference. (3–3) II–III.**

Lecture—3 hours. Prerequisite: course 131C. A survey of nonparametric methods in estima-

tion and hypothesis testing. Offered in even-numbered years.

Mr. Sproule

***238A–238B–238C. Analysis of Stochastic Processes. (3–3–3) I–II–III.**

Lecture—3 hours. Prerequisite: course 132B. The analytical theory of second-order stochastic processes, Poisson processes, birth-and-death processes, and Markov processes, including a study of statistical inference for these processes. Offered in even-numbered years. Mr. Weiner

240A–240B–240C. Differential Geometry.

(3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 116. Transformation of coordinates, tensor analysis, intrinsic geometry of surfaces, parallel displacement, Riemannian manifolds, the geometry of subspaces, subspaces of a flat space, application of tensor analysis to the theory of relativity. Offered in odd-numbered years. Mr. Fulton

***245A–245B–245C. Algebraic Topology. (3–3–3)**

I–II–III.

Discussion—3 hours. Prerequisite: course 215C. Algebraic invariants of spaces and their behavior with respect to continuous functions. Offered in even-numbered years. Mr. Pfeffer

250A–250B–250C. Algebra. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: graduate standing in mathematics; or consent of instructor. The theory of groups, rings, and fields.

Mr. 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, ordered groups.

Mr. Mead

***252. Linear Algebra. (3) I.**

Lecture—3 hours. Prerequisite: graduate standing in mathematics; or consent of instructor. Vector spaces. Offered in even-numbered years.

Mr. Tully

253. Theory of Binary Systems. (3) III.

Lecture—3 hours. Prerequisite: graduate standing in mathematics; or consent of instructor. Elements of semigroups, quasigroups, and groupoids.

Mr. Tamura

290. Seminar. (1–6) I, II, III.

Advanced study in various fields of mathematics as follows: (a) algebra; (b) analysis; (c) geometry; (d) mathematical logic; (e) number theory; (f) topology; (g) theoretical statis-

* Not to be given, 1969–70.

tics; (h) applied statistics; (i) applied mathematics.
The Staff

299. Research. (2-6) I, II, III. The Staff

Professional Courses

300A. The Teaching of Mathematics. (3) I, II.

Lecture—3 hours. Prerequisite: senior or

graduate standing. Methods of teaching mathematics in grades K-6. Mrs. Goldman

300B. The Teaching of Mathematics. (3) II.

Lecture—3 hours. Prerequisite: senior or graduate standing. Methods of teaching mathematics in grades 7-12. Mrs. Goldman

MEDICAL MICROBIOLOGY—See Medicine

MEDICAL SCIENCES—See Medicine

MEDICINE

C. John Tupper, M.D., *Dean of the School*
 Alexander Barry, Ph.D., *Associate Dean*
 Loren D. Carlson, Ph.D., *Associate Dean*
 Earl F. Wolfman, Jr., M.D., *Associate Dean*
 Robert E. Stowell, M.D., Ph.D., *Assistant Dean*

Office of the Dean, Medical School

Professors:

Charles F. Abildgaard, M.D. (*Pediatrics*)
 Alexander Barry, Ph.D. (*Human Anatomy*)
 Robert J. Bolt, M.D. (*Internal Medicine*)
 Nemat O. Borhani, M.D. (*Internal Medicine, Community Health*)
 Myron Brin, Ph.D. (*Nutrition*)
 Robert H. Brownson, Ph.D. (*Human Anatomy*)
 Loren D. Carlson, Ph.D. (*Human Physiology*)
 Robert S. Chang, M.D., D.Sc. (*Medical Microbiology*)
 Loring F. Chapman, Ph.D. (*Behavioral Biology*)
 Hamilton S. Davis, M.D. (*Anesthesiology*)
 Pierre Dreyfus, M.D. (*Neurology*)
 Paul D. Hoeprich, M.D. (*Internal Medicine, Pathology*)
 Robert L. Hunter, Ph.D. (*Human Anatomy*)
 Gordon D. Jensen, M.D. (*Pediatrics and Psychiatry*)
 Keith F. Killam, Jr., Ph.D. (*Pharmacology*)
 Edwin G. Krebs, M.D. (*Biological Chemistry*)
 Donald G. Langsley, M.D. (*Psychiatry*)
 Paul R. Lipscomb, M.D. (*Orthopedic Surgery*)
 Dean T. Mason, M.D. (*Internal Medicine, Human Physiology*)
 Arnold Meadow, Ph.D. (*Psychiatry*)
 Kenneth R. Niswander, M.D. (*Obstetrics and Gynecology*)
 Demosthenes Pappagianis, M.D., Ph.D. (*Medical Microbiology*)

Boris H. Ruebner, M.D. (*Pathology*)

Calvin W. Schwabe, D.V.M., D.Sc. (*Community Health*)

Robert Stempfel, Jr., M.D. (*Pediatrics*)
 Robert E. Stowell, M.D., Ph.D. (*Pathology*)

C. John Tupper, M.D. (*Internal Medicine*)
 Irving H. Wagman, Ph.D. (*Human Physiology*)

Sefton R. Wellings, M.D. (*Pathology*)
 Theodore C. West, Ph.D. (*Medical Education, Pharmacology*)
 Earl F. Wolfman, Jr., M.D. (*Surgery*)
 Julian R. Youmans, M.D., Ph.D. (*Neurosurgery*)

Associate Professors:

E. Jack Benner, M.D. (*Internal Medicine*)
 William M. Fowler, Jr., M.D. (*Physical Medicine & Rehabilitation*)
 Anthony J. Hance, Ph.D. (*Pharmacology*)
 Arnold C. L. Hsieh, M.D., D.Sc. (*Human Physiology*)
 Edward J. Hurley, M.D. (*Surgery*)
 Jerry P. Lewis, M.D. (*Internal Medicine*)
 Robert T. Patrick, M.D. (*Anesthesiology*)
 V. J. Polidora, Ph.D. (*Behavioral Biology*)
 James F. Spann, Jr., M.D. (*Internal Medicine, Human Physiology*)
 Antonio Zappala, M.D. (*Human Anatomy*)

Assistant Professors:

Ezra A. Amsterdam, M.D. (*Internal Medicine*)
 Richard P. Anderson, M.D. (*Surgery*)
 John R. Beljan, M.D. (*Surgery*)
 William F. Benisek, Ph.D. (*Biological Chemistry*)
 Louis Conway, M.D. (*Neurosurgery*)

Carroll E. Cross, M.D. (*Internal Medicine*)
 Myron K. Denney, M.D. (*Surgery*)
 James G. Garrick, M.D. (*Orthopedic Surgery*)
 Nanine S. Henderson, Ph.D. (*Human Anatomy*)
 Mannfred A. Hollinger, Ph.D. (*Pharmacology*)
 Julian J. A. Irias, M.D. (*Pediatrics*)
 Thomas C. Lee, Ph.D. (*Human Physiology*)
 Larry W. McDonald, M.D. (*Pathology*)
 Stanley Meizel, Ph.D. (*Human Anatomy*)
 Edwin S. Munson, M.D. (*Anesthesiology*)
 Lois F. O'Grady, M.D. (*Internal Medicine*)
 Lawrence Rabinowitz, Ph.D. (*Human Physiology*)
 G. Henry Schmitt, M.D. (*Pharmacology*)
 Robert P. Scobey, Ph.D. (*Behavioral Biology*)
 Bagher Sheikholislam, M.D. (*Pediatrics*)
 Robert El. Smith, Ph.D. (*Human Physiology*)
 Frederick A. Troy, II, Ph.D. (*Biological Chemistry*)
 Thomas L. Volk, M.D. (*Pathology*)
 Donal A. Walsh, Ph.D. (*Biological Chemistry*)
 Lowell D. Wilson, M.D., Ph.D. (*Internal Medicine*)
 Phillip R. Yarnell, M.D. (*Neurology*)
 Robert F. Zelis, M.D. (*Internal Medicine, Human Physiology*)

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Professors in Residence:

Eva K. Killam, Ph.D. (*Human Physiology*)
 Makepeace U. Tsao, Ph.D. (*Biochemist in Surgery*)

Assistant Professor in Residence:

Richard F. Walters, Ph.D. (*Medical Education and Human Physiology*)

Lecturers:

Arthur L. Barry, Ph.D. (*Internal Medicine*)
 Bernard J. Bryant, Ph.D. (*Medical Microbiology*)
 Felix L. Hunkeler, Ph.D. (*Biological Chemistry*)
 Reed M. Nesbit, M.D. (*Surgery, Regional Medical Program*)
 Ethelda N. Sassenrath, Ph.D. (*Behavioral Biology*)
 Jean A. Zelle, M.A. (*Physical Medicine and Rehabilitation*)

Instructor:

Thomas R. Hakala, M.D. (*Surgery*)

Admission Requirements and Curriculum.—For details consult the *Announcement of the School of Medicine*.

Professional Curriculum

(Open to registered Medical students only.)

Medical Sciences

First Year

101. Molecular and Cell Biology. (11) I.

Lecture—6 hours; discussion—2 hours; laboratory—8 hours. Correlated presentation of the normal and abnormal structural and functional aspects of mammalian and microbial cells as an important foundation of the medical sciences.

The Staff

102A–102B. Organ and System Biology (11–8) II–III.

Lecture—6–4 hours; discussion—2–2 hours; laboratory—7–4 hours. Normal and abnormal structure and function of human organ systems.

The Staff

103A–103B–103C. Clinical Medicine. (3–3–3)

I–II–III.

Lecture—1–1–1 hour; discussion—1–1–1 hour; laboratory—2–3–2 hours. Introduction to physical diagnosis and medical history taking. Discussion of patient problems correlated with courses 101, 102, and 104.

The Staff

104. Behavioral and Environmental Biology. (4) III.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Basic medical aspects of interaction of man and his environment; patient-physician relationship; sociological, behavioral, legal, and economic problems of medical care and practice.

The Staff

Second Year

202A–202B–202C–202D. Organ-System Medicine. (11–11–11–11) IV, I, II, III.

Lecture—5 hours; discussion—5 hours; laboratory—10 hours. Prerequisite: courses 101, 102B, 103C, 104, or consent of instructor. Problems in clinical medicine will be introduced through actual case presentations representative of the pathophysiology of each organ-system. All techniques and methods necessary to gathering and interpreting the information needed for patient care will be marshalled in the way the physician goes about solving clinical problems.

The Staff

203A–203B–203C–203D. Patient Evaluation.

(No Credit) IV, I, II, III.

Discussion—1 hour. Prerequisite: courses 103C, 104, or consent of instructor. Twice during each quarter, each student will obtain a complete history, do a complete physical examination, and turn in a complete, written patient

workup, i.e., 8 complete patient workups. At least once each quarter, each student will participate in one complete autopsy. The Staff

Departmental Courses

Anesthesiology

Graduate Course

201. Principles of Anesthesiology. (1) II.

Lecture—1 hour. Prerequisite: senior standing in the Schools of Medicine or Veterinary Medicine or consent of instructor. Application of physiologic and pharmacologic principles for the proper management of the anesthetized subject, with consideration of comparative aspects where appropriate. Resuscitation and monitoring are included. The Staff

Behavioral Biology

Upper Division Courses

198. Directed Group Study. (1-3) I, II, III.

Discussion—1-3 hours. Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research. The Staff

199. Special Study for Advanced Undergraduates.

(1-3) I, II, III.

Discussion—1 hour; laboratory—2-4 hours. Prerequisite: consent of instructor. Laboratory research on selected topics relating to the biological bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problem. The Staff

Graduate Courses

235. Mood, Motivation, Arousal and Sleep. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor. A critical examination of the current concepts and research on the physiological and biochemical correlates of these behavior processes. Mr. Polidora

290. Seminar. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. Group discussion and critique of current topics of importance and relevance to Behavioral Biology. The Staff

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

Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research. The Staff

299. Research. (1-12) I, II, III.

Prerequisite: consent of instructor. Laboratory research on selected topics relating to the physiological and biochemical bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problem. The Staff

Biological Chemistry

Upper Division Course

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III, IV.

Prerequisite: consent of instructor. The Staff

Graduate Courses

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

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. The Staff

Human Anatomy

Upper Division Courses

102. General Human Anatomy. (5) II.

Lecture—3 hours; laboratory—6 hours. The development and structure of the human body. The Staff (Mr. Hunter in charge)

198. Directed Group Study. (2-4) I, II, III, IV.

Discussion—2 hours; laboratory—0-6 hours. Prerequisite: consent of instructor. Directed reading and group discussion and/or laboratory experience on selected topics. The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III, IV.

Prerequisite: consent of instructor. The Staff

Graduate Courses

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. Regional and radiological anatomy as applied to the clinical sciences. Offered in even-numbered years. Mr. Zappala

290. Seminar. (2) I, II, III, IV.

Seminar—2 hours. Prerequisite: consent of instructor. The Staff (Mr. Hunter, in charge)

298. Advanced Group Study. (1-5) I, II, III.

The Staff

299. Research. (2-12) I, II, III, IV.

Laboratory 6-36 hours.

The Staff

Human Physiology

Upper Division Course

151. Information Systems: Design and Analysis of Computerized Information Systems. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: programming desirable; consent of instructor. Basic storage devices; organization of information; design of information systems, on-line, off-line and multilevel; relation of systems design to retrieval requirements and storage elements. Laboratory in preparation of modest information system.

Mr. Walters

Graduate Courses

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

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. The Staff

Medical Microbiology

Graduate Courses

298. Group Study in Medical Microbiology and Immunology. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics.

The Staff

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. Laboratory investigation contributing to the dissertation for a graduate degree.

The Staff

Pathology

Graduate Courses

210. Introduction to Human Pathology. (6) IV.

Lecture—2 hours; discussion—2 hours; laboratory—4 hours. Prerequisite: Open to graduate students and advanced undergraduates with an adequate background in gross anatomy,

MICROBIOLOGY—See Also Veterinary Microbiology

MICROBIOLOGY

(A Graduate Group)

Herman J. Phaff, Ph.D., *Chairman of the Group*
Group Office, 134 Cruess Hall

Graduate Courses

290. Seminar. (1) I, II.

Seminar—1 hour. One seminar is offered during the fall and winter quarters. One weekly meeting is held.

The Staff

MICRONESIAN LANGUAGES—See Oriental Languages

histology, physiology and biochemistry. Study of the processes, causes and effects of disease, including inflammation, neoplasia, immunology, parasitism, degeneration, abnormalities of growth, injuries due to environmental and toxic agents.

The Staff

220. Ultrastructure of Disease. (3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor. The contribution of ultrastructure to the understanding of disease processes.

The Staff

230. Autopsy Case Studies. (1-12) I, II, III, IV.

Discussion—1-4 hours; laboratory 3-24 hours. Prerequisite: consent of instructor. Participation and performance under supervision of complete autopsies with correlative studies of clinical material, gross, microscopic and laboratory findings.

The Staff

290. Seminar in Pathology. (2) I, II, III.

Seminar—2 hours. Prerequisite: consent of instructor. Student participation course in the mechanisms of disease.

The Staff

298. Advanced Group Study. (1-5) I, II, III, IV.

Lecture—1-2 hours; discussion—1-2 hours; laboratory—2 hours. Prerequisite: consent of instructor. Group study in a variety of advanced topics in general and special pathology.

The Staff

299. Research. (2-12) I, II, III, IV.

Research in the mechanisms of disease, the effects and causes of injury, neoplasia, neuropathology and comparative pathology.

The Staff

Pharmacology

Graduate Courses

298. Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. Directed reading and discussion of topics in modern pharmacology.

The Staff

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor. The Staff

MILITARY SCIENCE

Max V. Kirkbride, Colonel, *Chairman of the Department*

Department Office, 125 Gymnasium

Professor:

Max V. Kirkbride, Colonel

Associate Professor:

Edward B. Hempstead, Major

Assistant Professors:

Gary R. Prisk, Captain

Robert Koningsor, Captain

The Military Science Department offers instruction and training which, combined with a baccalaureate degree, qualifies a student for a commission in the Army Reserves. The objective of the ROTC program is to produce junior officers who by their education, training and inherent qualities are suitable for continued development. The program assists qualified men in all academic fields to prepare for positions of leadership in a military or civilian career. A continuing effort is made to assign graduates to military career fields aligned with their major field of study, individual capabilities and preferences. Active duty obligation for upper division ROTC is 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 \$50 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 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. Academic credit of five units for the six weeks of field training is granted by the University.

Two-Year Program.—This program is pri-

marily 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.

Scholarship Program.—Four-year scholarship students are selected by nationwide competitive examination. Successful candidates receive all tuition, fees, books, uniforms and \$50 subsistence per month. Two-year scholarships with similar benefits applicable to upper division are awarded by the department to outstanding students who have been accepted for upper division.

Academic Credit

College of Letters and Science.—The Bachelor of Arts degree requires the completion of 180 units, of which 150 units must be in courses chosen from the Letters and Science List of Courses. Military science courses are considered off the Letters and Science List of Courses. They must be counted in the 30-unit allowance as indicated above.

College of Agricultural and Environmental Sciences.—The Bachelor of Science degree in agriculture requires the completion of 180 units. All units of upper and lower division military science courses combined may be accredited toward this requirement. The dual-credit units in general areas may be selected from upper division courses required by the College of Agricultural and Environmental Sciences.

College of Engineering.—Six units of military science may be accredited toward the requirement of the College of Engineering for the Bachelor of Science degree. The dual-credit units in general areas may be selected from upper division courses required by the College of Engineering.

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. Students in upper division military science may select the dual-credit units in general areas from upper division courses required by the School of Veterinary Medicine. Graduates with the D.V.M. degree may apply for direct commission in the United States Army Veterinary Corps.

Lower Division Courses

1A. Basic General Military Science (First Year). (1) I.

Lecture—1 hour; laboratory—1 hour. Prerequisite: meet enrollment criteria in General Regulations of the General Catalog. Individual weapons and marksmanship; assembly, disassembly, and functioning of the standard United States Army rifle; preliminary training in marksmanship and good shooting habits: Leadership laboratory. The Staff

1B. Basic General Military Science (First Year). (1) II.

Lecture—1 hour; laboratory—1 hour. Prerequisite: course 1A or the equivalent. The theory of organization of the Army; history and organization of the ROTC. United States Army and national security; organization for national defense. Leadership laboratory. The Staff

1C. Basic General Military Science (First Year). (1) III.

Lecture—1 hour; laboratory—1 hour. Prerequisite, course 1B or the equivalent. United States Army and national security (continued): missions and responsibilities of the Army as a part of the National Defense Team. Leadership laboratory. The Staff

20A. Basic General Military Science (Second Year). (2) I.

Lecture—2 hours; laboratory—1 hour. Prerequisite: course 1C American military history: survey from origins of American Army to World War II; emphasis on factors which led to organizational, logistical, operational, and other patterns in our present Army; analysis based on the principles of war. Leadership laboratory.

Mr. Koningsor

20B. Basic General Military Science (Second Year). (2) II.

Lecture—2 hours; laboratory—1 hour. Prerequisite: course 20A. American military history (continued): World War II until the present. Counterinsurgency operations: orientation. Map and aerial photograph reading: basic principles to include terrain evaluation, marginal information, map symbols, methods of orientation, and grid references. Leadership laboratory. The Staff

20C. Basic General Military Science (Second Year). (2) III.

Lecture—2 hours; laboratory—1 hour. Prerequisite: course 20B, or the equivalent. Map and aerial photograph reading (continued): review of military maps; elementary aerial photograph reading. Introduction to operations and basic tactics: basic military team; combat formations and patrolling; field fortifications; concealment

and cover; techniques of fire; principles of combat. Leadership laboratory. The Staff

Upper Division Courses

130A. Advanced General Military Science (First Year). (2) I.

Lecture—2 hours; laboratory—1 hour. Prerequisite: acceptance into upper division ROTC program; completion of lower division courses, or the equivalent. Leadership: responsibilities and basic qualities of a leader; leadership objectives, traits, technique, principles; special problems of military leadership. Counterinsurgency operations: analysis of nature of the insurgency problem; role of the United States Government agencies. Leadership laboratory. Mr. Kirkbride

130B. Advanced General Military Science (First Year). (3) II.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 130A. Military teaching principles: techniques used in planning and presenting instruction; use of training aids; methods of instruction; student presentations. Branches of the Army: familiarization with their missions, functions, and career patterns. Leadership laboratory. The Staff

130C. Advanced General Military Science (First Year). (3) III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 130B. Communications: means and principles of signal communications; characteristics, operation, and maintenance of communications equipment. Small unit tactics; infantry organization; fundamentals of offensive and defensive combat and their application. Summer camp orientation. Leadership laboratory. The Staff

140A. Advanced General Military Science (Second Year). (3) I.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 130C. Analysis of leadership, military administrative procedures, and personnel management, including the military occupational structure. Military law and the fundamental concepts of military judicial procedures. Customs of the service. Comparative survey of United States and other world powers. Leadership laboratory. Mr. Hempstead

140B. Advanced General Military Science (Second Year). (3) II.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 140A. Fundamentals and dynamics of the military team, to include command and staff structures, functions and operations at division and lower levels. Analysis of intelligence collection and correlation procedures. Leadership laboratory. Mr. Hempstead

**140C. Advanced General Military Science
(Second Year). (2) III.**

Lecture—2 hours; laboratory—1 hour Prerequisite: course 140B. Logistical procedures encompassing unit supply operations, tactical

troop movements, medical evacuation, maintenance operations, accountability for property, and supply forms and records. Principles of internal defense development. Leadership laboratory.

Mr. Hempstead

MUSIC

Richard G. Swift, M.A., *Chairman of the Department*
Department Office, Music Building

Professors:

Jerome W. Rosen, M.A.
Richard G. Swift, M.A.

Associate Professors:

Larry D. Austin, M.M.
Theodore C. Karp, Ph.D.

Assistant Professors:

Sydney R. Charles, Ph.D.
Sven H. Hansell, Ph.D.



Lecturers:

John Cage
Arthur N. Woodbury, M.M.

Major Subject Advisers. Mrs. Charles, Mr. Swift.

The Major Program

Preparation for the major—required: first year, Music 1A-1B, Music 4A-4B-4C; second year, 5A-5B-5C and 21A-21B-21C. 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 and at least twenty units selected from the following courses: 105A-105B, 106, 108, 111, 112, 114, 115, 116, 117, 118, 119, 198, and 199. In addition, a total of at least 18 units in performance courses is required of all music majors. These courses include Music 30, 41, 42, 43, 44, 46, 130, 141, 142, 143, 144, 146.

Attention is called to the requirements in foreign languages for higher degrees in music: a reading knowledge of French or German for the M.A. degree in both composition and musicology. Undergraduates contemplating advanced study in music should prepare to satisfy these

requirements as they proceed to the bachelor's degree.

Individual Group Major.—Individual group majors may be established by combining the work offered in this department with courses in allied fields. The major subject adviser should be consulted for details.

Graduate Study.—The Department of Music offers programs of study and research leading to the M.A. degree in composition or musicology. Detailed information regarding graduate study may be obtained from the Graduate Adviser for Music, Mr. Karp.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major. In addition, teaching methods courses (Music 321, 322, 323) are required.

Teaching Minor.—Required: courses 4A-4B-4C, 5A-5B, 108, 405A-405B-405C or equivalent, and either 111 or 112. In addition, students are advised to enroll in at least two quarters of performance courses. Students must consult with the subject representative.

Subject Representative: Mrs. Charles.

Lower Division Courses

4A-4B-4C. Elementary Theory. (5-5-5) I-II-III.

Lecture—5 hours. The development of writing and listening techniques through the study of music fundamentals; ear training; beginning tonal counterpoint and harmony; keyboard harmony, score reading; analysis of repertory.

Mr. Swift,

5A-5B-5C. Intermediate Theory. (4-4-4) I-II-III.

Lecture—4 hours. Prerequisite: course 4C. Intermediate tonal counterpoint and harmony.

Mr. Rosen

10. Basic Musicianship. (2) I, II, III.

Lecture—3 hours. Fundamentals of music, singing, ear-training, and conducting for the general student with emphasis upon classroom procedures for the elementary grades.

The Staff (Mr. Woodbury in charge)

21A-21B-21C. History and Literature of Music.

(4-4-4) I-II-III.

Lecture—3 hours; listening section—1 hour. Prerequisite: course 4C.

Mr. Hansell

27A. Introduction to Musical Literature. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Lectures, guided listening and readings designed to furnish the student with an understanding of basic music concepts. Intended primarily for non-majors. Messrs. ———, Austin, Woodbury

27B. Introduction to Musical Literature. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 27A, or consent of instructor. A survey of the history of musical styles from antiquity to the present. Lectures, guided listening and readings. Intended primarily for non-majors. ———, Mr. Austin

30A-30B-30C. Applied Study of Music Literature:**Intermediate. (1-1-2) I-II-III.**

Class instruction in performance—2 hours. Prerequisite: consent of instructor; student must demonstrate ability to perform scales and small compositions. Non-majors and auditors not accepted. Class instruction in individual wind, brass, string or keyboard instruments. May be repeated once for credit.

The Staff (Mr. Swift 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.

42. Repertory Band. (2) I, III.

Rehearsal: 4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for wind ensembles.

Mr. Austin, Mr. Woodbury

43. University Concert Band. (2) II.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band.

Mr. Austin, Mr. Woodbury

44. University Chorus. (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music.

Mr. Rosen

46. Chamber Music Ensemble. (2) I, II, III.

Rehearsal—3 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, piano, harpsichord, and organ.

Mr. Hansell

Upper Division Courses**104A-104B-104C. Advanced Theory.****(4-4-4) I-II-III.**

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 5C. Continuation of Music 5. Mr. Karp

***105A-105B. Principles of Composition. (3-3) I-II.**

Lecture—3 hours. Prerequisite: course 104C. Elementary assignments in free composition.

Mr. Swift

***106. Fugue. (3) III.**

Lecture—3 hours. Prerequisite: course 104C.

Mr. Karp

107. Elements of Electronic Composition. (3) III.

Lecture—1 hour; laboratory—4 hours. Prerequisite: course 105B, or consent of instructor. Introduction to composition utilizing Buchla and Moog synthesizers.

Mr. Rosen

108. Instrumentation. (2) II.

Lecture—2 hours. Prerequisite: course 5C or consent of instructor. A study of instruments of the orchestra, analysis of scores, and scoring for various instrumental combinations.

Mr. Woodbury

***111. Choral Conducting. (2) III.**

Lecture—2 hours. Prerequisite: course 5C. A study of the principles and techniques of conducting choral ensembles.

Mr. Rosen

112. Instrumental Conducting. (2) III.

Lecture—2 hours. Prerequisite: course 108. A study of the principles and techniques of conducting instrumental ensembles.

Mr. Woodbury

***114. Music of the Middle Ages. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the middle ages.

Mr. Karp

115. Music of the Renaissance. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the period from 1430-1600.

Mrs. Charles

116. Music of the Baroque Period. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the period from Monteverdi to Handel and J. S. Bach.

Mr. Karp

117. Music of the Classic Period. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the eighteenth century.

Mr. Swift

***118. Music of the Romantic Period. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the nineteenth century.

* Not to be given, 1969-70.

***119. Music of the Twentieth Century. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the twentieth century. Mr. Austin

***127A. Musical Literature: The Opera. (3) I.**

Lecture—3 hours. Prerequisite: course 27B, or consent of instructor. A study of selected operas such as Monteverdi's *Orfeo*, Mozart's *Don Giovanni*, Wagner's *Tristan und Isolde*, Verdi's *Otello*, Debussy's *Pélleas et Mélisande*, and Berg's *Wozzeck*. Intended primarily for non-majors.

127B. Musical Literature: The Symphony. (3) III.

Lecture—3 hours. Prerequisite: course 27B or consent of instructor. A study of selected symphonies by composers such as Haydn, Mozart, Beethoven, Schubert, Brahms, and Stravinsky, emphasizing form and style. Intended primarily for non-majors.

130A–130B–130C. Applied Study of Music*Literature: Advanced. (1–1–2) I–II–III.**

Class instruction in performance—2 hours. Prerequisite: course 30C, consent of instructor. Advanced class instruction in individual wind, brass, string or keyboard instruments. To complete the course students must perform in public concert or before faculty examination board. Non-majors and auditors not accepted. May be repeated once for credit.

The Staff (Mr. Swift 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.

142. Repertory Band. (2) I, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for wind ensembles.

Mr. Austin, Mr. Woodbury

143. University Concert Band. (2) II.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band. Mr. Austin, Mr. Woodbury

144. University Chorus. (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting.

* Not to be given, 1969–70.

Open to any student in the University. Rehearsal and performance of choral music. Mr. Rosen

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. Mr. Hansell

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

Prerequisite: consent of instructor.

The Staff (Mr. Cage in charge)

199. Special Study for Advanced Undergraduates.

(2–4) I, II, III.

The Staff (Mr. Swift in charge)

Graduate Courses**200A–200B–200C. Introduction to Musicology.**

(4–4–4) I–II–III.

Seminar—3 hours. Bibliography, individual research problems, and a class problem.

Mrs. Charles

203A–203B–203C. Composition. (4–4–4) I–II–III.

Seminar—3 hours. Prerequisite: course 105B. Technical projects and free composition.

Mr. Austin

***210A–210B–210C. History of Notation.**

(4–4–4) I–II–III.

Seminar—3 hours.

Mr. Karp

***240A–240B–240C. Techniques of Analysis.**

(4–4–4) I–II–III.

Seminar—3 hours. Analysis and analytical techniques as applied to music of all historical style periods.

Mr. Karp, Mr. Swift

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.

Mr. Karp, Mrs. Charles, Mr. Hansell

299. Individual Study. (2–5) I, II, III.

Special studies and projects in musical composition or music history.

The Staff (Mr. Swift 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.

***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.
Mr. Austin

323A-323B. Woodwind Instruments. (1-1) I-II.

Discussion—2 hours. Prerequisite: course 4C.
Mr. Woodbury

Professional Course**405A-405B-405C. Elementary Piano.**
(1-1-1) I-II-III.

Laboratory—2 hours. Prerequisite: open to music majors and candidates for the general secondary credential with a minor in music.

NEMATOLOGY

Dewey J. Raski, Ph.D., *Chairman of the Department*

Department Office, 223 Hoagland Hall

Professors:

Merlin W. Allen, Ph.D.
Bert Lear, Ph.D.
Dewey J. Raski, Ph.D.

**Professor:**

Richard W. Timm, Ph.D. (*Visiting*)

Lecturers:

Benjamin F. Lownsbery, Ph.D.
Armand R. Maggenti, Ph.D.
David R. Viglierchio, Ph.D.

Upper Division Courses**100. General Plant Nematology. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biology 1 or 10. An introduction to the classification, morphology, biology, and control of the nematodes attacking cultivated crops.
Mr. Lownsbery

110. Introduction to Nematology. (2) II.

Lecture—2 hours. The relationship of nematodes to man's environment. Classification, morphology, ecology, distribution, and importance of nematodes occurring in water and soil and as parasites of plants and invertebrate animals.
Mr. Allen

130. Principles of Nematode Control. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100. Recommended: Chemistry 8B; Mathematics 13. Principles and techniques used for derivation of data and their interpre-

tation as the basis for control of plant parasitic nematodes. The biological, physical, and chemical factors influencing nematodes and their control are studied in laboratory and greenhouse. Some field trips required.

Mr. Lear

Graduate Courses**220. Principles and Techniques of Nematode Taxonomy and Morphology. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100. Analysis and evaluation of the techniques used in the collection, extraction, and preparation of specimens, free-hand and histologic sections; presentation of illustrative material.

Mr. Maggenti

***222. Nematode Pathogenicity to Plants. (3) II.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 100. Investigations of problems in proving nematode pathogenicity; the role of nematodes in plant disease.

Mr. Lownsbery

225. Nematode Taxonomy and Comparative Morphology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 220. The taxonomy, morphology, and comparative morphology of soil, freshwater, and marine nematodes.

Mr. Allen

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff

299. Research. (1-9) I, II, III.

The Staff

* Not to be given, 1969-70.

NUTRITION—See Animal Sciences and Family and Consumer Sciences; for major requirements, see pages 76 and 83

ORIENTAL LANGUAGES

(Department of Anthropology)

Department Office, 331 Voorhies Hall

Associate Professors:

- ¹Bezalel Porten, Ph.D.
Benjamin E. Wallacker, Ph.D.

Assistant Professors:

- Olof G. Lidin, Ph.D.
Eric S. Liu, Ph.D.

The Major Program

Emphasis in Chinese.

Lower Division Courses.—Required: Oriental Languages 1C-2C-3C, 4C-5C-6C. Recommended: elementary Japanese; Art 1D.

Upper Division Courses.—Required: at least 12 units of Oriental Languages 100, 101, 102, 112, 123A, 123B, 123C; courses from the following list to bring the total upper division units to 45: Anthropology 190; History 190A, 190B, 191A, 191B, 191C, 192A, 192B, 193; Political Science 148A, 148B.

Lower Division Courses

1C-2C-3C. Elementary Modern Chinese.

(4-4-4) I-II-III.

Lecture—3 hours; laboratory—2 hours. Introduction to the standard or “National Language” (Kuo Yü) of China. Mr. Liu

4C-5C-6C. Intermediate Modern Chinese.

(4-4-4) I-II-III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 3C. A continuation of 3C. Mr. Liu

1H-2H-3H. Elementary Hebrew. (4-4-4) I-II-III.

Lecture—3 hours; laboratory—2 hours. Grammar, translation, composition, and conversation; introduction to Biblical Hebrew. Student may concentrate on any aspect or phase of the language.

1HL-2HL-3HL. Elementary Hebrew. (1) I-II-III.

Laboratory—2 hours. Prerequisite: course 1H-2H-3H (may be taken concurrently); and consent of instructor. Composition and grammatical drill.

4H-5H-6H. Intermediate Hebrew. (4-4-4) I-II-III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 3H. Selected study of texts from different periods of the Hebrew language;

grammar review; composition; conversation. Student may concentrate on any aspect or phase of the language.

Mr. Porten

4HL-5HL-6HL. Intermediate Hebrew. (1) I-II-III.

Laboratory—2 hours. Prerequisite: course 4H-5H-6H concurrently and consent of instructor. Composition and grammatical drill.

1J-2J-3J. Elementary Modern Japanese.

(4-4-4) I-II-III.

Lecture—3 hours; laboratory—2 hours. Mr. Lidin

4J-5J-6J. Intermediate Modern Japanese.

(4-4-4) I-II-III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 3J. A continuation of 3J. Mr. Lidin

*1T. Elementary Telugu. (4) I.

Lecture—3 hours; laboratory—2 hours. Offered in odd-numbered years.

*20. Elementary Tamil. (4) I, II, III.

Lecture—3 hours; laboratory—2 hours.

Upper Division Courses

100. Languages of Eastern Asia. (4) II.

Lecture—3 hours; discussion—1 hour. A survey course on the nature and distribution of the main languages of Eastern Asia.

Mr. Wallacker

101. Classical Chinese. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6C. Readings in selected texts. May be repeated twice for credit. Mr. Wallacker

102. Chinese Fiction. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6C. Readings in selected texts. May be repeated twice for credit. Offered in quarters when course 101 is not being given. Mr. Wallacker

112. Chinese Literature in Translation. (4) I.

Lecture—3 hours; discussion—1 hour. No knowledge of Chinese is required. Representative works—including classics, histories, belles lettres, and fiction—in English translation.

Mr. Wallacker

123A. Chinese Phonology. (4) I.

Lecture—3 hours. Prerequisite: consent of instructor. Offered if sufficient number of students enroll.

Mr. Liu

^{*} Not to be given, 1969-70.

¹ Absent on leave, 1969-70.

123B. Chinese Morphology. (4) II.

Lecture—3 hours. Prerequisite: consent of instructor. Offered if sufficient number of students enroll.
Mr. Liu

123C. Chinese Syntax. (4) III.

Lecture—3 hours. Prerequisite: consent of instructor. Offered if sufficient number of students enroll.
Mr. Liu

132. History of Japanese Literature. (4) II.

Lecture—3 hours; discussion—1 hour. From the beginning to modern times, with emphasis on Chinese, Buddhist, and Western influences.
Mr. Lidin

142. Civilization of Eastern Asia: Japan. (4) I.

Lecture—3 hours; discussion—1 hour. A broad survey of Japanese civilization dealing with cultural, literary, religious, and social developments.
Mr. Lidin

***146. The Dravidian Languages. (4) I.**

Lecture—3 hours; discussion—1 hour. Analysis of the structures and distribution of Dravidian languages. Offered in even-numbered years.

***147. The Micronesian Languages. (4) II.**

Lecture—3 hours; discussion—1 hour. Analysis of the structure, distribution and external relationships of the Micronesian languages.

PARK AND RECREATION ADMINISTRATION—See Resource Sciences**PATHOLOGY—Veterinary Medicine, this page; Medicine, see page 309****PATHOLOGY**

Donald R. Cordy, D.V.M., Ph.D., *Chairman of the Department*

Department Office, 1221 Haring Hall

Professors:

Donald R. Cordy, D.V.M., Ph.D.
Peter C. Kennedy, D.V.M., Ph.D.
Jack E. Moulton, D.V.M., Ph.D.

Associate Professor:

Donald L. Dungworth, B.V.Sc., Ph.D.

◇ ◇ ◇

Associate Professor:

Gordon H. Theilen, D.V.M. (*Clinical Sciences*)

Assistant Professor:

Leslie J. Faulkin, Jr., Ph.D. (*Anatomy*)

Lecturers:

David H. Gribble, D.V.M.

***150A. Ancient Israel. (4) I.**

Lecture—3 hours; discussion—1 hour. The culture of Israel as reflected in the Bible and archaeological discoveries. Patriarchal period to the Judges.
Mr. Porten

***150B. Ancient Israel. (4) II.**

Lecture—3 hours; discussion—1 hour. The culture of Israel as reflected in the Bible and archaeological discoveries. Monarchy to Restoration.
Mr. Porten

***151A. Ancient Jewish Civilization. (4) II.**

Lecture—3 hours; discussion—1 hour. The culture of the Jews in Palestine and the Diaspora as reflected in the Apocrypha and Pseudepigrapha; Josephus; Dead Sea Scrolls; Philo; Tannaitic and classical sources; archaeological discoveries. Alexander to Herod.
Mr. Porten

***151B. Ancient Jewish Civilization. (4) III.**

Lecture—3 hours; discussion—1 hour. The culture of the Jews in Palestine and the Diaspora as reflected in the Apocrypha and Pseudepigrapha; Josephus; Dead Sea Scrolls; Philo; Tannaitic and classical sources; archaeological discoveries. Procurators to demise of Patriarchate.
Mr. Porten

199. Special Study for Advanced Undergraduates.

(1-3) I, II, III.

The Staff

299. Research. (1-12) I, II, III.

Mr. Wallacker

Lynn A. Griner, Ph.D.

Anthony A. Stannard, D.V.M.

Upper Division Courses**122A. Veterinary Pathology. (5) I.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: second-year standing in the School of Veterinary Medicine or consent of instructor. The fundamental degenerative, vascular, and inflammatory processes, disturbances of cell growth, including oncology.

Mr. Cordy, Mr. Moulton, Mr. Stannard

122B. Veterinary Pathology. (5) II.

Lecture—4 hours; laboratory—3 hours. Prerequisite: course 122A. Special pathology of organ systems and related communicable diseases.
Messrs. Gribble, Kennedy, Moulton

* Not to be given, 1969-70.

122C. Veterinary Pathology. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 122A. Special pathology of organ systems and related communicable diseases. —, Mr. Richards

Graduate Courses**250A-250B-250C. Necropsy Laboratory. (1) I-II-III.**

Laboratory—33 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Supervised experience in necropsy diagnosis, including techniques and interpretation. The Staff

280. Advanced Pathology. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 122A-122B-122C. Selected topics in the pathology of non-neoplastic diseases. Mechanisms of disease and patterns of reaction are stressed. Offered in odd-numbered years. Mr. Cordy, Mr. Kennedy

282. Tumor Pathology. (3) II.

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 122A-122B-122C. The histogenesis, incidence, geographical distribution, etiology, transmission, immunity, host response, gross and microscopic structure, and metastasis of the neoplasms of domestic animals. Offered in even-numbered years.

Mr. Moulton, Mr. Dungworth

283. Tumor Biology. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Growth, invasion and metastasis of tumors; mechanisms of carcinogenesis; intrinsic and extrinsic etiologic factors. Offered in odd-numbered years.

Mr. Dungworth, Mr. Faulkin, Mr. Theilen

284. Pathology of Reproductive Failure. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 122A-122B-122C. Selected

PHARMACOLOGY—See Medicine**PHILOSOPHY**

Marjorie Grene, Ph.D., *Chairman of the Department*

Department Office, 922 Sproul Hall

Professors:

Arthur Child, Ph.D.

Neal W. Gilbert, Ph.D.

Marjorie Grene, Ph.D.

Associate Professors:

¹William H. Bossart, Ph.D.

John F. Malcolm, Ph.D.

Assistant Professors:

Ronald A. Arbini, Ph.D.

Joel I. Friedman, Ph.D.

**Assistant Professor:**

Melvin W. Beal, M.A. (*Acting*)

Lecturer:

Fred R. Berger, M.A.

The Major Program

Lower Division Courses.—Required: courses 12A and 20A-20B-20C.

¹ Absent on leave, 1969-70.

² Absent on leave, fall quarter 1969.

⁴ Absent on leave, spring quarter 1970.

Upper Division Courses.—Required: 36 units of upper division courses in philosophy, selected with the approval of the departmental major adviser, Mr. Arbini.

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, Mr. Child.

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. An intensive introduction to philosophical inquiry. Open only to freshmen with strong interest or background in philosophy.

Mr. Child

12A. Introduction to Logic. (4) I.

Lecture—3 hours; discussion—1 hour. Theorems and principles of inference of formal deductive systems; propositional calculus and predicate calculus; translation of English into symbolic formulas.

Mr. Arbini

12B. Introduction to Logic. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 12A or consent of instructor. Development of the full predicate calculus; identity and description calculus; decision procedures; more advanced translation of English; elementary theory of classes and relations.

Mr. Friedman

20A. History of Philosophy, I. (4) I.

Lecture—3 hours; discussion—1 hour. A survey of Greek philosophy with special attention to the Pre-Socratics, Plato and Aristotle.

Mr. Malcolm

20B. History of Philosophy, II. (4) I, II.

Lecture—3 hours; discussion—1 hour. The seventeenth century and its background.

Mr. Beal, Mr. Arbini

20C. History of Philosophy, III. (4) II, III.

Lecture—3 hours; discussion—1 hour. Eighteenth-century Philosophy.

Mr. Beal

Upper Division Courses

101. Metaphysics. (4) I.

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, 114, 117, 123. Theories of being. Such topics as reality, substance, universals, space, time, causality, becoming, body, experience, persons, freedom and

determinism. Views of the nature and method of metaphysics. Anti-metaphysical arguments.

Mr. Arbini

102. Theory of Knowledge. (4) III.

Lecture and 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, 114, 117, 123. Philosophical problems of perception and thought, memory and preognition, imagination, truth and error, belief and knowledge. Types of epistemology. Mr. Beal

103. Philosophy of Mind. (4) II.

Lecture and discussion—3 hours. The relation between mind and body, our knowledge of other minds, and the explanation of mental acts. Discussion of such concepts as action, intention, and causation. Offered in even-numbered years.

Mr. Arbini

105. Philosophy of Religion. (4) I.

Lecture—3 hours. Prerequisite: two courses in philosophy. Logical, metaphysical, epistemological and existential aspects of selected religious concepts and problems.

Mr. Child

107A. Philosophy of the Physical Sciences. (4) I.

Lecture-discussion—3 hours. Prerequisite: one philosophy course or a major in science. Introduction to the nature of scientific laws, theories, explanations, and models. Problems of causality, determinism and indeterminism, induction and probability.

Mr. Arbini

107B. Philosophy of the Biological Sciences. (4) III.

Lecture-discussion—3 hours. Prerequisite: one philosophy course or a major in science. The relation of the biological to the physical sciences; the nature of theories, explanations, and models in biology and psychology. Problems of taxonomy, ethology, and evolutionary theory.

Mrs. Grene

107C. Philosophy of the Social Sciences. (4) III.

Lecture-discussion—3 hours. Prerequisite: one philosophy course or a major in a social science. The nature of laws and explanations in the social sciences; their relation to mathematics and the physical sciences; the role of value judgments in the social sciences; theories of historical knowledge; theoretical problems of data-processing.

Mr. Berger

114. Ethics. (4) II.

Lecture-discussion—3 hours. Prerequisite: one course in philosophy. Major attempts of philosophers to deal with central problems of moral conduct; principles of obligation, right and wrong, responsibility, the meaning of the basic terms of ethical language, criteria of moral behavior.

Mr. Berger

117. Political Philosophy. (4) II.

Lecture and discussion—3 hours. Recommended: course 6 or 6F. Intensive examination of some central concepts of political thought such as the state, sovereignty, rights, obligation, freedom, law, authority, and responsibility. Offered in even-numbered years. Mr. Berger

123. Aesthetics. (4) III.

Lecture—3 hours. Prerequisite: one course in philosophy; one course in music, the plastic arts, or literature. Nature of art, of artistic creation, of the work of art, and of aesthetic experience; nature and validity of criticism; relations of art to its environment. Mr. Child

131. Philosophy of Logic. (4) II.

Lecture and discussion—4 hours. Prerequisite: course 12A; or Mathematics 125. Discussion of such topics as identity, descriptions, meaning, and denotation. The nature and development of axiomatic systems; philosophical discussion of certain results in mathematical logic such as the Lowenheim-Skolem Theorem; and consideration of non-standard logics, such as modal logic. Mr. Friedman

***132. History of Logic. (4) III.**

Lecture and discussion—3 hours. Prerequisite: course 12A; or Mathematics 125. Recommended: course 131. Aristotle's *Organon*; Stoic logic; medieval Terminist logic; Leibniz' universal calculus; the logical contributions of Boole, De Morgan, and Peirce; and Frege's general logic. The initiation of contemporary logic by Peano, and by Whitehead and Russell. Offered in odd-numbered years. Mr. Gilbert

133. Philosophy of Mathematics. (4) III.

Lecture-discussion—3 hours. Prerequisite: course 12A or a major in mathematics. The nature of mathematical theories; set theory and type theory as foundations for mathematics; logicism, intuitionism, and formalism; philosophical discussion of Gödel's theorems; and relations between pure and applied mathematics. Offered in even-numbered years. Mr. Friedman

134. Metalogic. (4) II.

Lecture and 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 odd-numbered years. Mr. Friedman

137. Philosophy of Language. (4) III.

Lecture and discussion—3 hours. Recommended: course 20C, 156, or Linguistics 35. Discussion of problems arising from consideration of the syntax and semantics of natural and

formalized languages. Nature of linguistic rules and universals; theories of universal grammar; linguistic implications for theories of cognition. Mr. Arbini

145. Medieval Philosophy. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 20A. A study of major philosophers in the medieval period. Mr. Gilbert

***146. Renaissance Philosophy. (4) I.**

Lecture and discussion—3 hours. Renaissance conceptions of man, as found in the writings of Valla, Ficino, Pico, Pomponazzi, Erasmus, Vives, and Montaigne. Some reference to current religious and social developments. Offered in even-numbered years. Mr. Gilbert

151. Philosophy of the Nineteenth Century. (4) II.

Lecture and discussion—3 hours. Recommended: courses 20A, 20B, or 20C. The idealism of Hegel, his contemporaries and his successors; Marxism; the positivism of Comte and Mill; the irrationalism of Kierkegaard and Nietzsche. Offered in even-numbered years. Mr. Beal

155. American Philosophy. (4) II.

Lecture-discussion—3 hours. Recommended: course 6 or 6F. Study of such American thinkers as Peirce, James, Royce, Dewey, Santayana, Whitehead, and C. I. Lewis. Offered in odd-numbered years. Mr. Berger

156. Contemporary British Philosophy. (4) I.

Lecture and discussion—3 hours. Recommended: course 20C or 151. Interpretation and analysis of the most influential work of Bertrand Russell, G. E. Moore, Wittgenstein, J. L. Austin, and G. Ryle. Offered in even-numbered years. Mr. Arbini

157A. Contemporary European Philosophy. (4) I.

Lecture and discussion—3 hours. Recommended: course 20C, 151, or 175A, 175B. A study of contemporary directions in European philosophy, with particular attention to the development of phenomenology and *Existenzphilosophie* in Germany. Readings in Husserl, Heidegger, Jaspers, and related philosophers. Offered in odd-numbered years. Mrs. Grene

157B. Contemporary European Philosophy. (4) II.

Lecture and discussion—3 hours. A study of contemporary directions in European philosophy, paying particular attention to the development of phenomenology and existentialism in France. Readings in Sartre, Marcel, Merleau-Ponty, and related philosophers. Offered in even-numbered years. Mrs. Grene

161. Plato. (4) I.

Lecture and discussion—3 hours. Prerequisite: course 20A. Offered in odd-numbered years. Mr. Malcom

* Not to be given, 1969-70.

162. Aristotle. (4) I.

Lecture and discussion—3 hours. Prerequisite: course 20A; or consent of instructor. Offered in even-numbered years. Mr. Malcolm

163. Hellenistic Philosophy. (4) III.

Lecture-discussion—3 hours. Prerequisite: course 20A. Offered in even-numbered years. Term paper will be required. Mr. Malcolm

168. Descartes. (4) I.

Lecture-discussion—3 hours. Prerequisite: course 20C. Offered in even-numbered years. Term paper will be required. Mr. Arbini

169. Spinoza. (4) III.

Lecture and discussion—3 hours. Recommended: course 20C. Offered in odd-numbered years. Mrs. Grene

170. Leibniz. (4) I.

Lecture and discussion—3 hours. Recommended: course 20C. Offered in odd-numbered years. Mr. Gilbert

172. Locke. (4) II.

Lecture and discussion—3 hours. Offered in odd-numbered years. Mr. Arbini

174. Hume. (4) III.

Lecture and discussion—3 hours. Offered in even-numbered years. Mr. Friedman

175A. Kant. (4) I.

Lecture-discussion—3 hours. Prerequisite: course 20C. Offered in even-numbered years. Mr. Bossart

175B. Kant. (4) II.

Lecture and discussion—3 hours. Prerequisite: course 20C. Offered in odd-numbered years. Mr. Bossart

***176. Hegel. (4) I.**

Lecture and discussion—3 hours. Recommended: courses 20C, 175A, 175B. Offered in odd-numbered years. Mr. Bossart

178. Kierkegaard. (4) III.

Lecture—3 hours. Prerequisite: course 20A; course 20C or 185. Offered in even-numbered years. Mr. Child

183. Russell. (4) III.

Lecture and discussion—3 hours. Recommended: course 12A or Mathematics 125. Offered in odd-numbered years. Mr. Friedman

***185. Founders of Modern Thought. (4) I.**

Lecture and discussion—3 hours. Not open to philosophy majors or students who have had course 20C. A survey of modern philosophy from Descartes to Kant. Major emphasis upon problems still current today. Mr. Beal

198. Directed Group Study. (1-5) I, II, III. The Staff**199. Special Study for Advanced Undergraduates. (1-5) I, II, III.**

Prerequisite: consent of instructor. The Staff

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) II.

Seminar—3 hours. Mr. Child

202. Theory of Knowledge. (4) II.

Seminar—3 hours. Mrs. Grene

207. Philosophy of Science. (4) III.

Seminar—3 hours. The Staff

***209. Theory of History. (4) II.**

Seminar—3 hours. Offered in odd-numbered years.

214. Ethics. (4) I.

Seminar—3 hours. Mr. Berger

223. Aesthetics. (4) II.

Seminar—3 hours. Offered in even-numbered years. Mr. Child

261A. Plato. (4) I.

Lecture-discussion—3 hours. Offered in odd-numbered years. Mr. Malcolm

261B. Plato. (4) II.

Seminar—3 hours. Prerequisite: course 261A. Offered in odd-numbered years. Mr. Malcolm

262A. Aristotle. (4) I.

Lecture-discussion—3 hours. Offered in even-numbered years. Mr. Malcolm

262B. Aristotle. (4) II.

Seminar—3 hours. Prerequisite: course 262A. Offered in even-numbered years. Mr. Malcolm

274. Hume. (4) III.

Lecture and discussion—3 hours. Offered in even-numbered years. Mr. Child

275A. Kant. (4) I.

Lecture-discussion—3 hours. Offered in even-numbered years. Mr. Bossart

275B. Kant. (4) II.

Lecture-discussion—3 hours. Prerequisite: course 275A. Offered in odd-numbered years.

Mr. Bossart

* Not to be given, 1969-70.

290. History of Philosophy. (4) I, III.

Seminar—3 hours. Special topics in the history of philosophy. Mr. Beal, Mr. Gilbert

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

The Staff

299. Research. (1-12) I, II, III.

The Staff

PHYSICAL EDUCATION

Charles R. Kovacic, Ed.D., *Chairman of the Department*

Department Office, 264 Gymnasium

Professors:

Charles R. Kovacic, Ed.D.
Everett D. Ryan, Ed.D.

Associate Professors:

Edmund M. Bernauer, Ph.D.
William L. Lakie, Ed.D.
Willard S. Lotter, Ed. D.
Marya Welch, Ed.D.

Assistant Professor:

William C. Adams, Ph.D.
◇ ◇ ◇

Lecturer and Supervisor of Physical Education:

George A. Stromgren, M.S.

Supervisor:

Herbert A. Schmalenberger, M.A.

Associate Supervisors:

Robert R. Brooks, M.A.
Joseph E. Carlson, M.A.
Robert I. Hamilton, M.S.
Barbara J. Heller, Ed.D.
John W. Pappa, M.A.

Assistant Supervisors:

Jerry W. Hinsdale, A.B.
Judith L. Meyers, M.A.
James L. Sochor, Ed.D.
Phillip S. Swimley, M.A.

The incidental fee payable by all students at the time of registration, entitles students to the use of gymnasium, shower, towels, lockers, tennis courts, and the athletic fields. Certain equipment for games and sports is available for exercise and recreation, either with or without instruction. Courses may be elected with or without academic credit. Lockers will be turned in on the last day of class, before the final examination period.

Fines are imposed for each formal transaction necessitated by failure of the student to comply with the regulations of the department.

Major Advisers.—Mr. Adams, Mr. Bernauer, Mr. Kovacic, Mr. Lakie, Mr. Lotter, Mr. Ryan, Miss Welch.

The Major Program

Students will specialize in one of two areas: biological aspects or psychological aspects of physical education.

Lower Division Courses.—Required of all students: Biology 1, Chemistry 1A, Human Anatomy 102, Mathematics 13, Physical Education 45, Physics 2A or 10, Physiology 2, Psychology 1A. Students interested in the biological aspects of physical education will be required to take Chemistry 8B and Zoology 2.

Upper Division Courses.— Required of all students: Human Anatomy 102, Physical Education 103, 104, 104L, 110, 120, and 135. Required of students in the biological area; Physiology 110A–110B and a minimum of 6 units selected from the following: Zoology 100, 106A, 106B, and Physiology 102. Required of students in the psychological area: Psychology 112 and three courses selected from one of the following groups: a) Psychology 108, 130, 134, 147A; b) Psychology 145, Sociology 152, 160.

Students who are preparing for careers as teachers will, in consultation with their adviser, elect additional physical education courses that satisfy requirements for the teaching credential.

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. (1/2)**

I, II, III.

Laboratory—2 hours. Sections in archery, badminton, dance (modern, social, folk and square), baseball, basketball, football, golf, trampolining, tumbling, wrestling, volleyball, handball, soccer, tennis, touch football, track, swimming. (Men qualified for athletics may enroll in any sport pursued at Davis, such as baseball, basketball, football and receive credit.) This course may be repeated for credit not to exceed a total of 6 units.

The Staff (Mr. Kovacic in charge)

5. First Aid. (2) I, II, III.

Lecture—2 hours. Standard course. Upon successful completion of the course the Red Cross Certificate is awarded.

Messrs. Stromgren, Pappa, Sochor, Swimley

10. Professional Physical Education Activities

(Men). (1) I, II, III.

Lecture—1 hour; laboratory—2 hours. Fundamental knowledges and skills in swimming, basketball, football, track, baseball, tennis, golf, combative sports, developmental activities, court sports, tumbling and gymnastics.

The Staff (Mr. Kovacic in charge)

22. Professional Physical Education Activities

(Women). (1) I, II, III.

Lecture—1 hour; laboratory—2 hours. Fundamental skills in aquatics (swimming—beginning, intermediate, advanced, synchronized diving; lifesaving; water safety); archery; badminton; basketball; dance (folk and square, modern, social); tennis; track; tumbling; gymnastics; volleyball.

The Staff (Mr. Kovacic in charge)

25. The Theory of Lifesaving and Water Safety.

(1) I, II, III.

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 1 and a course in intermediate swimming. Basic skills in swimming and small craft safety. Life saving procedures and techniques for which Red Cross Senior Lifesaving Certificates will be awarded upon successful completion of necessary requirements.

Mr. Hinsdale

27. Organization and Teaching of Recreational and Competitive Swimming and Diving Skills.

(1) I, II, III.

Lecture—1 hour; laboratory—2 hours. Prerequisite: Red Cross Lifesaving Certificate and Advanced Swimming and Diving. Organization and teaching of swimming and lifesaving skills. (Red Cross Water Safety instructors certificate awarded upon successful completion of necessary requirements.) Organization of competitive swimming and diving programs and coaching techniques.

Mr. Hinsdale

35A-35B. Dance Composition. (2-2) I-II.

Discussion-demonstration—three 3-hour sessions. Prerequisite: intermediate dance. Principles of choreography for solo and group compositions.

36A-36B. History of Dance. (3-3) I-II.

Lecture—3 hours. A 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) II.

Lecture—2 hours. Use of scientific information, proper attitudes, knowledge, and health practices in daily living.

Miss Heller

45. Foundations of Physical Education. (4) I.

Lecture—4 hours. An introduction to the historical, biological, psychological, sociological and philosophical foundations of physical education.

Mr. Adams

Upper Division Courses**103. Analysis of Human Movement. (5) I.**

Lecture—4 hours; laboratory—3 hours. Prerequisite: Physics 2A; Human Anatomy 102. Anatomical and physiological concepts and physical laws as applied to human movement.

Mr. Kovacic

104. Physiology of Muscular Activity. (4) II.

Lecture—4 hours. Prerequisite: Biology 1; Physiology 2. Circulatory-respiratory and metabolic response to exercise in man under various physiological and ambient conditions.

Mr. Bernauer

104L. Physiology of Muscular Activity Laboratory.

(2) II.

Laboratory—6 hours. Prerequisite: course 104 to be taken concurrently. Laboratory in the systemic physiological response of man to exercise and physical stress.

Mr. Bernauer

110. Psychosocial Factors in Motor Performance.

(4) III.

Lecture—3 hours. Prerequisite: Psychology 1A. Analysis of various psychological and social factors affecting the development and use of motor skills.

Mr. Ryan

120. Sports in American Society. (4) II.

Lecture—4 hours. Prerequisite: History 17A. The interrelationships of sports with other aspects of society, including the family, church, school and government; consideration of the manner in which sports may be used to contribute to human welfare in our advanced technological society.

Mr. Lakie

130. Principles and Theory of Physical Education.

(4) III.

Lecture—4 hours. A critical analysis of the assumptions underlying the physical education program.

Miss Welch

135. Research Design and Instrumentation in Physical Education. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 13. Methods, techniques, and design of experimental research in physical education.

Mr. Bernauer

140. Recreation in the Community. (3) II.

Lecture—3 hours. The nature, scope and significance of recreation with its implications for leisure. The development, organization, and purpose of public and voluntary agencies which serve the recreational needs of the community.

Miss Welch

145. School Health Education. (3) III.

Lecture—3 hours. Prerequisite: course 44; or consent of instructor. A study of the school health program as an integral part of the school curriculum; the underlying principles and functions of health instruction, health service, healthful school living and the contributing community health agencies. Miss Heller

171. Conditioning of Athletes and Care of Injuries

(Men). (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 5; Human Anatomy 102; Physiology 2. Modern principles and practices in conditioning and care of athletes. Prevention and care of athletic injuries; therapeutic exercises applied to athletic injuries; training room equipment, protective devices, and supplies.

Mr. Stromgren

180. Physical Education in the Secondary School.

(3) I.

Lecture—3 hours. An analysis and study of the principles and methods basic to physical education in the secondary school.

Miss Meyers, Mr. Schmalenberger

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of department.

The Staff (Mr. Kovacic in charge)

Graduate Courses**200. Proseminar in Physical Education. (3) I, II, III.**

Seminar—3 hours. Prerequisite: course 135. The meaning, methods, and techniques of research procedure as applied to physical education; a critical review of selected studies, literature, practices, and procedures in the field; application to a particular problem in the field.

Mr. Adams

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.

Mr. Lakie

220. Kinesiology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103. Critical review of current literature and research in kinesiology; neurophysiological concepts and physical laws.

Mr. Kovacic

221. Anthropometry in Relation to Physical Performance. (4) II.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 104 and 135. Consideration of growth, physical constitution, body proportions and body composition in man as they affect physical performance; measurement of selected structural and functional changes accompanying prolonged, systematic physical conditioning. Mr. Adams

222. Metabolic Functions in Exercise. (4) III.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 104, Physiology 110B. A review of the current research literature on the metabolic responses to exercise in man; a laboratory survey of respiratory response, metabolic and water balances, blood gas adjustments and acid-base balance with particular reference to the effect of environmental conditions.

Mr. Bernauer

230. Motor Performance: Psychological Aspects.

(4) II.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 110. Critical review of current literature on motor learning; coordination; kinesiology; and reaction time; consideration of sensory-motor perception, motivation, and personality factors in relation to physical activities.

Mr. Ryan

290. Physiological Basis of Physical Fitness.

(2) III.

Seminar—2 hours. Prerequisite: graduate standing. Review and critical discussion of current research topics concerned with the physiological aspects of physical fitness. Mr. Bernauer

299. Research. (1-12) I, II, III.

The Staff

Professional Courses**300. Physical Education Activities and Methods in the Elementary School. (2) II.**

Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing. Principles, theories, materials, and practices of the elementary school physical education program. ———, Mr. Adams

380A-380B. Methods of Physical Education in the Secondary School. (3-3) II-III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 180 and demonstrated competence in selected skills. The methods of teaching group and individual activities in the secondary school; program planning; class management; organization of the intramural and extramural programs.

Miss Meyers, Mr. Schmalenberger

PHYSICAL SCIENCES

James S. Vincent, Ph.D., *Chairman of the Committee*
Committee Office, 128 Chemistry

Committee in Charge:

Assistant Professors:

- Olaf S. Leifson, Ph.D. (*Physics*)
- Eldridge M. Moores, Ph.D. (*Geology*)
- James S. Vincent, Ph.D. (*Chemistry*)

Major Adviser: See Schedule and Directory.

The major in physical sciences is designed primarily for students who wish to obtain a general secondary credential. The lower division course requirements are similar to those of the major in chemistry or physics. This major may lead to the Bachelor of Arts or the Bachelor of Science degree.

Preparation for the Major

Required: Chemistry 1A, 1B, 1C or 1A, 7A, 7B; Physics 4A, 4C, 4D, 4E; Geology 1, 1L; Mathematics 21A, 21B, 21C. Recommended: Chemistry 5; Physics 101A; Mathe-

matics 22A, 22B. The choice of recommended courses will be governed by the field of specialization within the major.

The Major Program

A total of 36 units of upper division courses in the physical sciences, of which not less than 23 units must be taken in a single subject, e.g., chemistry, physics, or geology.

Teaching Major.—Requirements for the teaching major are the same as for the undergraduate major.

Teaching Minor.—The teaching minor must take at least 30 quarter units in two of the physical science fields with at least 18 units in one of these two fields. The program must have the approval of the subject representative.

Subject Representative: Mr. Vincent, Chemistry.

PHYSICS

James E. Draper, Ph.D., *Chairman of the Department*
Department Office, 141 Young Hall

Professors:

- James E. Draper, Ph.D.
- Milton E. Gardner, Ph.D. (*Emeritus*)
- Kenneth R. Greider, Ph.D.
- John A. Jungerman, Ph.D.
- William J. Knox, Ph.D.
- Charles G. Patten, Ph.D.

Associate Professors:

- Franklin P. Brady, Ph.D.
- Glen W. Erickson, Ph.D.
- Richard L. Lander, Ph.D.
- Douglas W. McColm, Ph.D.
- William W. True, Ph.D.

Assistant Professors:

- Thomas A. Cahill, Ph.D.
- Ching-Yao Fong, Ph.D.
- Claude Garrod, Ph.D.
- James P. Hurley, Ph.D.
- Olaf S. Leifson, Ph.D.
- David E. Pellett, Ph.D.



Assistant Professor:

- Philip M. Yager, M.S. (*Acting*)

Lecturers:

- Natalie R. Leonard, A.B. (*Astronomy*)
- Neal Peak, Ph.D.

Major Subject Advisers.—Mr. Leifson, Mr. Pellett, Mr. Patten.

The Major Programs

Lower Division Courses.—Required: Physics 4A, 4B, 4C, 4D, 4E; Chemistry 1A, 1B or 7A, 7B; Mathematics 21A, 21B, 21C, 22A, 22B, 22C. Recommended: A reading knowledge of French, German, or Russian.

Upper Division Courses.—Both *Bachelor of Arts* and *Bachelor of Science* programs require the completion of the core program consisting of: Physics 104A–104B, 105A–105B, 115A, 110A–110B–110C, one quarter of an upper division lab, Physics 112A. Additional upper division units are required to add up to the following requirement totals: *Bachelor of Arts*—36 upper division units total. *Bachelor of Science*—51 upper division units total. Any upper division physics courses open to majors satisfy the additional units requirement. Substitutions from other departments for these upper division units, as well as the core, may be made by written permission of the Undergraduate Curriculum Committee Chairman as approved by the Department Chairman. Upper division lab

requirement satisfied by any one of the following: Physics 108, 116A, 116B, 122, or approved substitution. Recommended: Mathematics 24, 118, 119, 185; Mathematics 128 or Applied Science 115. Physics 10 is recommended to give an historical and philosophical overview of the subject.

Honors and Honors Program.—The honors program in physics consists of 4 units of course 194H, open to seniors who qualify for the honors program. Students may be graduated with honors in physics on completion of the required major and this program.

Graduate Study.—The Department of Physics offers programs of study and research leading to the M.A. and Ph.D. degrees.

Lower Division Courses

Physics 4A, 4B, 4C, 4D, and 4E are for students whose major is physics and for students preparing for applications of physics in Engineering and Chemistry.

All students planning to take lower division courses (except course 10 and 11) should have completed trigonometry.

The Physics 2 series may be started in any quarter and completed without interruption since either sequence, 2A, 2B, 2C or 2A, 2C, 2B, is satisfactory. Also, 2B and 2C may be taken concurrently.

The Physics 4 series may be started in either winter or spring quarter and completed without interruption since either sequence, 4A, 4B, 4C, 4D, 4E or 4A, 4C, 4D, 4B, 4E, is satisfactory.

Upper Division Courses

Courses 4A, 4B, 4C, 4D, 4E, or their equivalent, and Mathematics 21A, 21B, and 21C are prerequisite to all upper division courses except courses 107; in addition, Mathematics 22A, 22B, 22C or their equivalents are recommended. Some prerequisites may be waived with consent of the instructor.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major for degree (A.B. or B.S.).

Teaching Minor.—The teaching minor must take Physics 4A, 4B, 4C, 4D, 4E, and any other upper division physics courses necessary to complete 30 quarter units.

Subject Representative: Mr. Patten.

Astronomy

Lower Division Courses

1A. Introduction to General Astronomy: The Solar System. (4) II.

Lecture—4 hours. Introduction to the celestial sphere, constellations of the seasons, effects of

diurnal and annual motions of the earth; planetary motions, phases and configurations, including study of earth as planet. Not intended for advanced physical science majors. (Courses 1A and 1B may be taken in either order.)

Mrs. Leonard

1B. Introduction to General Astronomy: Stars and the Universe. (4) III.

Lecture—4 hours. Introduction to stellar motions, magnitudes and distances; distribution of stars in space; the sun; the galaxy. Not intended for advanced physical science majors. (Courses 1A and 1B may be taken in either order.)

Mrs. Leonard

Physics

Lower Division Courses

2A. General Physics Lecture. (3) I, II, III.

Lecture—3 hours. Mechanics; introduction to electricity and magnetism.

I. Mr. Erickson, Mr. Peek, II. Mr. Peek,
III. Mr. Patten

2B. General Physics Lecture. (3) II, III.

Lecture—3 hours. Prerequisite: course 2A. Electricity and magnetism, heat, kinetic theory, and thermodynamics.

II. Mr. Erickson, Mr. Patten, III. Mr. Peek

2C. General Physics Lecture. (3) I, III.

Lecture—3 hours. Prerequisite: course 2A. Wave motion, optics, modern physics.

I. Mr. Pellett, III. Mr. Erickson

3A. General Physics Laboratory. (1) I, II, III.

Laboratory—3 hours. Prerequisite: course 2A (may be taken concurrently). Mechanics, introduction to electricity and magnetism. Experimental work planned to accompany the lectures in course 2A. Recommended for all students who elect course 2A.

I. Mr. Erickson, Mr. Peek, II. Mr. Peek,
III. Mr. Patten

3B. General Physics Laboratory. (1) II, III.

Laboratory—3 hours. Prerequisite: course 2B (may be taken concurrently). Electricity and magnetism, heat, kinetic theory, and thermodynamics. Experimental work planned to accompany the lectures in course 2B. Recommended for all students who elect course 2B.

II. Mr. Erickson, Mr. Patten, III. Mr. Peek

3C. General Physics Laboratory. (1) I, III.

Laboratory—3 hours. Prerequisite: course 2C (may be taken concurrently). Wave motion, optics, modern physics. Experimental work planned to accompany the lectures in course 2C. Recommended for all students who elect course 2C.

I. Mr. Pellett, III. Mr. Erickson

4A. General Physics. (4) II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 21B (may be taken concurrently). Mechanics.

II. Mr. Greider, III. Mr. Knox

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.

Mr. Leifson

4C. General Physics. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4A; Mathematics 21C; Mathematics 22A and 22C recommended. Fundamentals of electromagnetic theory; Maxwell's equations.

Mr. Grieder

4D. General Physics. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4C; Mathematics 22B recommended. Application of electromagnetism; A.C. circuitry, electromagnetic waves, optics, electric and magnetic fields in matter.

Mr. McColm

4E. General Physics. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4D; Mathematics 22A recommended. Physics since 1900: special relativity, quantum mechanics and particle physics.

Mr. Greider

10. Basic Concepts of Physics. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra. Survey of the basic principles of physics and how they have evolved since the time of Copernicus. Includes lecture-demonstrations and problem solving using elementary algebra.

I. Mr. Greider, III. Mr. Knox

11. The Relevance of Physics. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: consent of instructor. The mutual relations between physics and other disciplines in the humanities, natural sciences, social sciences and technology.

Mr. Greider

Upper Division Courses**104A-104B. Introduction to Methods of****Mathematical Physics. (3-3) I-II.**

Lecture—3 hours. Prerequisite: course 4C; Mathematics 22C. Elements of vector and tensor analysis, matrix methods, boundary value problems, integral transforms with applications to physics.

Mr. Erickson

105A-105B-105C. Analytical Mechanics.**(3-3) I-II-III.**

Lecture—3 hours. Prerequisite: course 4A; Mathematics 22C. Principles and applications of Newtonian mechanics.

Mr. Patten

107. Introduction to Electronics. (3) I.

Lecture—3 hours. Prerequisite: course 2B and calculus. Elementary principles of single-phase alternating-current circuits, characteristics of thermionic tubes and a study of simple electronic circuits. Not primarily intended for physics majors.

Mr. Cahill

108. Physical Optics. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4E; Mathematics 22C. The phenomena of diffraction, interference, and polarization of light, and their applications.

Mr. Cahill

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.

I. Mr. Clement, II. Mr. Clement,

III. Mr. Jungerman

112A-112B. Thermodynamics and Statistical**Physics. (3-3) I-II.**

Lecture—3 hours. Prerequisite: course 4; Mathematics 22C. Thermodynamics, kinetic theory, and introduction to statistical mechanics.

Mr. Knox

115A-115B. Introduction to Quantum Mechanics.**(3-3) III, I.**

Lecture—3 hours. Prerequisite: courses 4E, 104B, 105B. The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.

Mr. Lander

116A. Electronic Instrumentation. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4D; Mathematics 22C. Recommended: course 104B, partial differential equations and Laplace transforms. An experimental and theoretical study of important electronic circuits commonly used in physics.

Mr. Cahill

116B. Electronic Instrumentation. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 116A. Continuation of course 116A with special emphasis on recent developments in semiconductor circuitry.

Mr. Cahill

121. Foundations of Atomic and Molecular Physics.**(3) III.**

Lecture—3 hours. Prerequisite: course 4E; Mathematics 21C. The phenomena of atomic physics; introduction to quantum phenomena and quantum mechanics; selected topics dealing with atoms, molecules, nuclei, and the solid state.

Mr. McColm

122. Advanced Physics Laboratory. (1-2) II, III.

Laboratory—3-6 hours. Prerequisite: course 4. Experimental techniques and measurements

in atomic, nuclear, and solid-state physics. May be repeated for credit not to exceed a total of 4 units.

II. Mr. Leifson, Mr. Pellett
III. Mr. Lander, Mr. Patten

129A. Nuclear Physics. (3) II.

Lecture—3 hours. Prerequisite: course 4E; Mathematics 22C. Survey of basic nuclear properties and concepts requiring only rudimentary knowledge of quantum mechanics. Mr. Pellett

129B. Nuclear Physics. (3) III.

Lecture—3 hours. Prerequisite: courses 115B, 129A. Continuation of course 129A.

Mr. Cahill

140A. Introduction to Solid State Physics. (3) II.

Lecture—3 hours. Prerequisite: course 115A. A survey of basic concepts and classification of experimental phenomena in solids. Introduction to band theory. Mr. Fong, Mr. Leifson

140B. Introduction to Solid State Physics. (2) II.

Lecture—2 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. Mr. Fong, Mr. Leifson

150. Topics in Current Physics Research. (1)

I, II, III.

Discussion—1 hour. 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

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff

Graduate Courses

205A–205B. Theoretical Mechanics. (3–3) I, II.

Lecture—3 hours. Prerequisite: course 105C. I. The generalized methods of Lagrange and Hamilton. II. Hamilton and Jacobi theory; the formulation of quantum mechanics.

I. Mr. Garrod, II. Mr. Hurley

210A. Theory of Electricity and Magnetism. (3) III.

Lecture—3 hours. Prerequisite: course 110C; a course in differential equations. Classical description of static electromagnetic fields with emphasis on boundary value problems.

Mr. True

210B. Theory of Electricity and Magnetism. (3) I.

Lecture—3 hours. Prerequisite: course 210A. Maxwell's equations, conservation laws, plane waves.

Mr. Jungerman

210C. Theory of Electricity and Magnetism. (3) II.

Lecture—3 hours. Prerequisite: course 210B. Special theory of relativity, covariant formulation of electromagnetic theory, radiating systems, and electron theory. Mr. Jungerman

215A. Quantum Mechanics. (3) I.

Lecture—3 hours. Prerequisite: course 115B. Non-relativistic quantum mechanics. Formal development and interpretation of quantum mechanics, including the Schrödinger wave equation, matrix mechanics, and use of state vectors in describing a dynamical system. Mr. 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. Mr. 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. Mr. True

219A. Statistical Mechanics. (3) I.

Lecture—3 hours. Prerequisite: courses 112B and 115B. Foundations of classical and quantum statistical mechanics. Mr. Hurley

219B. Statistical Mechanics. (3) II.

Lecture—3 hours. Prerequisite: course 219A. Applications to properties of solids, real gases, nuclear matter, fluctuations about the equilibrium state. Mr. Hurley

*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 radical integrals; splitting in external fields; term structure in crystals; scattering and collisions.

I. Mr. Leifson, II. Mr. McColm, III. —————

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. Mr. 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. Mr. Draper

* Not to be given, 1969–70.

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. Mr. Draper

229A. Advanced Nuclear Theory. (3) I.

Lecture—3 hours. Prerequisite: course 224C. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for two-body scattering. Mr. Greider

229B. Advanced Nuclear Theory. (3) II.

Lecture—3 hours. Prerequisite: course 229A. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for three-body scattering. Mr. Greider

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. Mr. Erickson

230B. Quantum Theory of Fields. (3) II.

Lecture—3 hours. Prerequisite: course 230A. Continuation of 230B, with selected advanced topics, such as S-matrix theory, dispersion relations, axiomatic formulations. Mr. Erickson

239A. Quantum Many-Body Systems. (3) III.

Lecture—3 hours. Prerequisite: courses 215C and 219B. The quantum theory of many-particle

systems. Theoretical analysis of superfluids, superconductors, and nuclear matter. Mr. Garrod

239B. Quantum Many-Body Systems. (3) I.

Lecture—3 hours. Prerequisite: course 239A. Perturbation and variation techniques in many-particle systems. Band theory of solids, electron-phonon interactions, and other topics. Mr. Garrod

242A. Plasma Physics. (3) III.

Lecture—3 hours. Prerequisite: course 210C. Recommended: course 219B. Motion of charged particles in electromagnetic fields, macroscopic equations, and plasma oscillations. Offered in odd-numbered years. Mr. Hurley

242B. Plasma Physics. (3) I.

Lecture—3 hours. Prerequisite: course 242A. Boundary layer problems, diffusion and stability. Offered in odd-numbered years. Mr. Hurley

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. Mr. Lander

290. Seminar. (1–3) I, II, III.

Seminar—1–3 hours. The Staff

291. Seminar in Nuclear Physics. (1–2) I, II, III.

The Staff

292. Seminar in Theoretical Physics. (1–2) I, II, III.

The Staff

299. Research. (1–12) I, II, III.

The Staff

PHYSIOLOGICAL SCIENCES

Arthur L. Black, Ph.D., *Chairman of the Department*
Department Office, 2163 Haring Hall

Professors:

Arthur L. Black, Ph.D.
Leo K. Bustad, D.V.M., Ph.D.
Stuart A. Peoples, M.D.
Robert E. Smith, Ph.D.

**Associate Professors:**

Victor W. Burns, Ph.D.
Richard A. Freedland, Ph.D.
Alfred A. Heusner, Ph.D.
Harold R. Parker, D.V.M., Ph.D.

Assistant Professors:

Donald L. Curry, Ph.D.
Shri N. Giri, Ph.D.
Mary F. Guest, Ph.D.
Robert J. Hansen, Ph.D.
Quinton R. Rogers, Ph.D.

Assistant Professor:

Richard L. Bell, Ph.D.

Lecturers:

Allen C. Andersen, V.M.D., Ph.D.
Gaylord M. Conzelman, Ph.D.
Rocco J. Della Rosa, Ph.D.
Marvin Goldman, Ph.D.
Sally Huff, Ph.D.
Douglas G. Stuart, Ph.D.

Upper Division Courses**101A–101B. Physiological Chemistry. (4–3) I, II.**

Lecture—4–3 hours. Prerequisite: quantitative and organic chemistry. Recommended: a course in physiology (may be taken concur-

rently). Chemical and physical properties of substances comprising the animal body, with major emphasis on the changes during metabolism and factors influencing these reactions. Biochemistry of the endocrine glands and other specialized tissues and body fluids; energy metabolism and nutrition.

Messrs. Black, Freedland, Hansen, Rogers

102A–102B. Physiological Chemistry Laboratory. (1–2) I–II.

Laboratory—3 hours. Prerequisite: course 101A–101B (should be taken concurrently). Laboratory practice to illustrate the chemical and physical properties of important constituents of animal cells including enzymes; blood and urine analysis; animal experiments on intermediary metabolism using isotopes.

Sec. 1: The Staff, Mr. Rogers in charge

Sec. 2: The Staff, Mr. Hansen in charge

123. Comparative Pharmacology. (5) III.

Lecture—4 hours; laboratory—3 hours. Prerequisite: regular standing in the School of Veterinary Medicine or consent of instructor. The action of drugs on the physiological mechanisms of domestic animals. Mr. Peoples, Mr. Giri

124. Comparative Pharmacology. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 123 or consent of instructor. The effect of drugs on organ systems of domestic animals and their application to the treatment of disease. Laboratory exercises to illustrate the principles of therapeutics and toxicology. Mr. Peoples, Mr. Giri

140A. Mammalian Physiology. (5) II.

Lecture—5 hours. Prerequisite: good standing in the School of Veterinary Medicine or consent of instructor, based upon evidence of adequate preparation in mathematics and the physical and biological disciplines. A general survey of comparative mammalian physiology with emphasis on systemic mechanisms.

The Staff (Mr. Heusner in charge)

140B. Mammalian Physiology. (5) III.

Lecture—5 hours. Prerequisite: course 140A and good standing in the School of Veterinary Medicine or consent of instructor, based upon evidence of adequate preparation in mathematics and the physical and biological disciplines. A general survey of comparative mammalian physiology with emphasis on systemic mechanisms. The Staff (Mr. Heusner in charge)

141A. Laboratory in Mammalian Physiology. (2) II.

Laboratory—6 hours. Prerequisite: course 140A (may be taken concurrently). Non-veterinary students must receive consent of instructor. Laboratory exercises designed to illustrate physiological interactions among systems in different animal species.

The Staff (Mr. Parker in charge)

141B. Laboratory in Mammalian Physiology. (1) III.

Laboratory—3 hours. Prerequisite: courses 140B (may be taken concurrently), 141A. Non-veterinary students must receive consent of instructor. Laboratory exercises designed to illustrate physiological interactions among systems in a different animal species.

The Staff (Mr. Parker in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff

Graduate Courses

205A. Intermediary Metabolism of Animals. (3) I.

Lecture—3 hours. Prerequisite: biochemistry and physiology or consent of instructor. General considerations in use of biochemical data as related to metabolism of intact animals. Pathways and control in biosynthesis and degradation of carbohydrates and lipids; including hormonal, nutritional, and genetic effects. Dynamics of animal metabolism including pools and turnover rates.

Messrs. Black, Freedland, Hansen, Rogers

205B. Intermediary Metabolism of Animals. (3) II.

Lecture—3 hours. Prerequisite: 205A or consent of instructor. Pathways and control in animals of the biosynthesis and degradation of amino acids, proteins, nucleotides and porphyrins; including hormonal, nutritional, and genetic effects.

Messrs. Black, Freedland, Hansen, Rogers

225. Fundamentals of Radiation Biology. (5) I.

Lecture—5 hours. Prerequisite: one year of physics, introductory biochemistry, introductory physiology. Recommended: first course in analytical geometry and calculus. Course emphasizes mechanisms and effects of ionizing radiation at atomic, molecular, cellular, tissue, and organism levels. Subjects covered also include cytogenetics, immune response, aging, carcinogenesis, radiobiology, space radiation, effects of fallout, radiation protection, radiation therapy, and effects of non-ionizing radiation.

Mr. Bustad, Mr. Goldman

243A–243B. Use of Isotopes as Tracers in Biological Research. (2–2) I–II.

Lecture—2 hours. Prerequisite: biochemistry or physiological chemistry, elementary physics and calculus or consent of instructor. Discussion of the properties of isotopes and their use as tracers in biological systems.

Mr. Burns

243L. Laboratory in Use of Isotopes as Tracers in Biological Research. (2) II.

Laboratory—6 hours. Prerequisite: courses 243A and 243B. Study of radioisotope properties, uses and measurement methods relevant to the biological sciences.

Mr. Burns

253. Drug Metabolism. (2) II.

Lecture—2 hours. Prerequisite: courses 101A–101B, 140A, 140B or Physiology 110A–110B; consent of instructor. General pathways of drug metabolism; and factors influencing the drug metabolism. Emphasis will be laid upon the species, age, and genetic differences affecting the biological disposition of the drugs.

Mr. Giri

255. Pharmacogenetics. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: consent of instructors. The genetic basis of interspecific and intraspecific differences in animals to the action of drugs. The laboratory exercises are designed to illustrate these differences and their biological basis.

Mr. Peoples, Mr. Stormont

265. Experimental Physiology. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. Selected lectures and experiments on cardiovascular, renal and pulmonary mechanisms with emphasis on chronically maintained preparations and perinatal problems. Offered in odd-numbered years.

Mr. Parker

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff

298. Group Study. (1–4) I, II, III.

The Staff

299. Research. (1–12) I, II, III.

The Staff

PHYSIOLOGY—See Animal Sciences, and Zoology

The Department of Animal Physiology offers two undergraduate majors in Physiology: Bachelor of Science, College of Letters and Science; and Bachelor of Science, College of Agricultural and Environmental Sciences. These majors are designed to provide a broad background in the biological, mathematical and physical sciences, and are suitable for students who plan to do graduate work in a biological science or who wish to pursue a professional career in physiology.

Major Adviser.—Mr. Boda

The Major Program (College of Agricultural and Environmental Sciences). See page 86.

The Major Program (Letters and Science)

Lower Division Courses.—Required: Biology 1; Chemistry 1A–1B–1C, 5, and 8A–8B, or Chemistry 1A, 7A–7B, and 8A–8B; Mathematics 13 and one year of calculus; Physics

2A–2B–2C, and 3B or 4A and two of the following: 4B, 4C, 4D, 4E; Zoology 2.

Upper Division Courses.—Required: Biochemistry 101A–101B or Physiological Sciences 101A–101B; Biochemistry 101L or Animal Biochemistry 102; Physiology 100A–100B, 100L, 110A–110B, 111A–111B; 16 additional units of Physiology or closely related courses; 14 additional units of biological science courses other than physiology and including one of the following: Anatomy 100, Zoology 100, 106A or 107. Recommended: Zoology 158 or Chemistry 109A–109B, Genetics 100A–100B or 115, Nutrition 110.

In addition to the courses listed above, the student must also complete those courses satisfying the College and University requirements summarized on page 122.

PLANT NUTRITION—See Resource Sciences and Plant Sciences

PLANT PATHOLOGY—See Plant Sciences

PLANT PROTECTION—For major requirements, see page 87.

PLANT SCIENCES

Participating Departments:

AGRONOMY AND RANGE SCIENCE

R. Merton Love, Ph.D., *Chairman of the Department*

Department Office, 131 Hunt Hall

Professors:

Fredrick T. Addicott, Ph.D.

Robert W. Allard, Ph.D.

John P. Conrad, Ph.D. (*Emeritus*)

Paulden F. Knowles, Ph.D.

Horton M. Laude, Ph.D.

Robert S. Loomis, Ph.D.
R. Merton Love, Ph.D.
Ben A. Madson, B.S.A. (*Emeritus*)
Duane S. Mikkelsen, Ph.D.
Maurice L. Peterson, Ph.D.
Charles W. Schaller, Ph.D.
Francis L. Smith, Ph.D. (*Emeritus*)
Ernest H. Stanford, Ph.D.
William A. Williams, Ph.D.
Frederick P. Zscheile, Jr., Ph.D.

Associate Professor:
Ray C. Huffaker, Ph.D.

Assistant Professors:
Calvin O. Qualset, Ph.D.
Charles A. Raguse, Ph.D.
◊ ◊ ◊
Lecturers:
R. William Breidenbach, B.S.
Beecher Crampton, M.A.
Subodh K. Jain, Ph.D.
Milton B. Jones, Ph.D.
Dale G. Smeltzer, Ph.D.
Barbara D. Webster, Ph.D.
C. H. E. Werkhoven, Ph.D.

ENVIRONMENTAL HORTICULTURE

Harry C. Kohl, Jr., Ph.D., *Chairman of the Department*
Department Office, 140 Environmental Horticulture

Professors:
Richard W. Harris, Ph.D.
Anton M. Kofranek, Ph.D.
Harry C. Kohl, Jr., Ph.D.
Roy M. Sachs, Ph.D.

Associate Professors:
Wesley P. Hackett, Ph.D.
Andrew T. Leiser, Ph.D.
John H. Madison, Ph.D.

Assistant Professors:
James A. Harding, Ph.D.
Jack L. Paul, Ph.D.
Associate Professor:
Seymour M. Gold, M.S. (*Acting*)
◊ ◊ ◊

Lecturer:
William J. Newton, B.L.A.

PLANT PATHOLOGY

_____, *Chairman of the Department*
Department Office, 354 Hutchison Hall

Professors:
James E. DeVay, Ph.D.
W. Harley English, Ph.D.
Raymond G. Grogan, Ph.D.
William B. Hewitt, Ph.D.
Byron R. Houston, Ph.D.
Lysle D. Leach, Ph.D. (*Emeritus*)
George Nyland, Ph.D.
Joseph M. Ogawa, Ph.D.
Edward E. Wilson, Ph.D. (*Emeritus*)

Associate Professors:
Edward E. Butler, Ph.D.

Robert N. Campbell, Ph.D.
Tsune Kosuge, Ph.D.
Thomas A. Shalla, Ph.D.
Robert J. Shepherd, Ph.D.
Assistant Professors:
Clarence I. Kado, Ph.D.
Robert K. Webster, Ph.D.
◊ ◊ ◊

Lecturer:
Dennis H. Hall, Ph.D.

POMOLOGY

Dillon S. Brown, Ph.D., *Chairman of the Department*
Department Office, 1043 Wickson Hall

Professors:
Frank W. Allen, M.S. (*Emeritus*)
Royce S. Bringhurst, Ph.D.

Dillon S. Brown, Ph.D.
Lawrence L. Claypool, Ph.D.
Julian C. Crane, Ph.D.

Luther D. Davis, Ph.D., LL.D. (*Emeritus*)

William H. Griggs, Ph.D.

Carl J. Hansen, M.S. (*Emeritus*)

Hudson T. Hartmann, Ph.D.

Claron O. Hesse, Ph.D.

Edward C. Maxie, Ph.D.

E. Louis Proebsting, Ph.D. (*Emeritus*)

Associate Professors:

Paul E. Hansche, Ph.D.

Dale E. Kester, Ph.D.

◊ ◊ ◊

Lecturers:

Muriel V. Bradley, Ph.D.

Robert M. Carlson, Ph.D.

Peter B. Catlin, Ph.D.

Omund Lilleland, Ph.D. (*Emeritus*)

George C. Martin, Ph.D.

Roger J. Romani, Ph.D.

Kay Ryugo, Ph.D.

Noel F. Sommer, Ph.D.

Kiyoto Uriu, Ph.D.

VEGETABLE CROPS

Oscar A. Lorenz, Ph.D., *Chairman of the Department*

Department Office, 150 Hunt Hall

Professors:

Glen N. Davis, Ph.D.

William J. Flocker, Ph.D.

James F. Harrington, Ph.D.

James E. Knott, Ph.D., Sc.D., (hon.c.)
(*Emeritus*)

Oscar A. Lorenz, Ph.D.

John H. MacGillivray, Ph.D. (*Emeritus*)

Leonard L. Morris, Ph.D.

Harlan K. Pratt, Ph.D.

Lawrence Rappaport, Ph.D.

Charles M. Rick, Jr., Ph.D.

Paul G. Smith, Ph.D.

Associate Professor:

Arthur R. Spurr, Ph.D.

◊ ◊ ◊

Lecturers:

Frederick D. Howard, Ph.D.

Masatoshi Yamaguchi, Ph.D.

Shang Fa Yang, Ph.D.

VITICULTURE AND ENOLOGY

Harold W. Berg, M.S., *Chairman of the Department*

Department Office, 1023 Wickson Hall

Professors:

*Maynard A. Amerine, Ph.D.

Harold W. Berg, M.S.

James A. Cook, Ph.D.

James F. Guymon, Ph.D.

Klayton E. Nelson, Ph.D.

Harold P. Olmo, Ph.D.

Robert J. Weaver, Ph.D.

A. Dinsmoor Webb, Ph.D.

Albert J. Winkler, Ph.D., LL.D. (*Emeritus*)

Associate Professor:

Lloyd A. Lider, Ph.D.

Assistant Professor:

Ralph E. Kunkee, Ph.D.

◊ ◊ ◊

Professor:

Frederick T. Addicott, Ph.D. (*Agronomy and Range Science*)

Lecturers:

W. Mark Kliewer, Ph.D.

Cornelius S. Ough, B.S.

Vernon L. Singleton, Ph.D.

Major Advisers.—See *Schedule and Directory Listing.*

Bachelor of Science Major Program and Graduate Study. See pages 56 and 153.

Plant Science

Lower Division Courses

1. Plants and Man. (3) I, II.

Lecture—3 hours. Plants as a basic resource for food, fiber, shelter, and recreation; their use and effect on man, past, present, and future.

Mr. Howard, Mr. Smeltzer

2. Production of Cultivated Plants. (3) I, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 1. Principles of crop improvement, propagation, production, processing, storage, and marketing; conservation and utilization of land and water resources.

Mr. Flocker, Mr. Lider

² Absent on leave, fall quarter 1969.

Upper Division Courses**101. Ecology of Cultivated Plants. (3) II.**

Lecture—3 hours. Prerequisite: course 2; or consent of instructor. Plant population dynamics in cultivated ecosystems; the response of plant communities to light, temperature, soil, water, and air-pollution. Mr. Loomis, Mr. Kohl

102. Physiology of Cultivated Plants. (3) I.

Lecture—3 hours. Prerequisite: Botany 111, course 101 recommended. The plant as a dynamic unit; physiological processes in the vegetative growth, development, flowering and fruiting of cultivated plants.

Mr. Sachs, Mr. Rappaport

109. Principles of Plant Propagation. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2. Principles of propagating horticultural plants with emphasis on anatomical and physiological relationships. Mr. Hartmann

112. Postharvest Physiology and Handling of Horticultural Commodities. (3) I.

Lecture—3 hours. Prerequisite: Botany 111 or consent of instructor. Course 112L is recommended to be taken concurrently. Physiological processes related to the maturation and senescence of fruits and vegetables; fundamentals involved in handling, transportation, storage, and marketing practices, e.g., temperature and humidity control, protective treatments, controlled atmospheres.

Messrs. Claypool, Morris, Nelson

112L. Postharvest Physiology and Handling Laboratory. (2) I.

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 112 (should be taken concurrently). Demonstrations and exercises following the subject matter of course 112. One or more field trips to observe commercial practices.

Messrs. Claypool, Morris, Nelson

113. Plant Breeding. (3) II.

Lecture—3 hours. Prerequisite: Genetics 100B. The principles of plant breeding.

Mr. Knowles, Mr. Hansche

116. Principles of Plant Nutrition. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Botany 111; Chemistry 5. 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; relation to animal nutrition; experimental techniques, including solution culture and radioactive tracing.

Mr. Epstein

120. Introduction to Weed Science. (2) II.

Lecture—2 hours. Prerequisite: Botany 2; Chemistry 8B. A general course covering the principles underlying the control of weeds.

Mr. Ashton

Agronomy and Range Science**Lower Division Course****2. Forage Crops. (3) III.**

Lecture—2 hours; laboratory—3 hours. Adaptation, establishment, management, and utilization of forage plants as irrigated pasture, range, hay, and silage; aspects of forage quality which affect feeding value to livestock. Field trips will be arranged to observe developments in irrigated pasture management and range improvement.

Mr. Jones, Mr. Love

Upper Division Courses**100. Science and Technology of Field Crop Production. (3) I.**

Lecture—3 hours. Prerequisite: six units of plant science, botany, and/or biology, or consent of instructor. The use of science, technology and agricultural organizations to solve agronomic problems and advance the economic development of agriculture.

Mr. Peterson

111. Small Grains, Corn, Sorghum and Beans. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 2, and 9 units of plant and/or soil and water science, or consent of instructor. Adaptation, distribution, culture, utilization, processing, and factors determining quality of wheat, oats, barley, rye, rice, corn, sorghum, and field beans.

Mr. Schaller

112. Forage Crop Ecology. (3) III.

Lecture—3 hours. Prerequisite: Botany 2 or consent of instructor. Forages as a world resource in food production. Ecological principles governing the adaptation, establishment, growth and management of perennial and annual forages, including pastures, rangelands and hay; aspects of forage quality which affect feeding value to livestock.

Mr. Raguse

112L. Forage Crops Ecology Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 112. Laboratory work in forage crop ecology to supplement course 112.

Mr. Raguse

113. Cotton, Sugar Beets, and Miscellaneous Crops. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 2 and 9 units of plant and/or soil and water science, or consent of instructor. Adaptation, distribution, culture, utilization, processing, and other factors determining quality of cotton and other fiber crops, sugar crops, oil crops, and miscellaneous crops.

Mr. Mikkelsen

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: open only to majors who are honors students of senior standing. Independent study, research and/or reading on selected

topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis.

The Staff

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

Prerequisite: consent of instructor.

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: 6 upper division units of agronomy.

The Staff

Graduate Courses

205. Design, Analysis, and Interpretation of Experiments. (3) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: Mathematics 105A. The planning and analysis of field and laboratory experiments with emphasis on the biological interpretation of results.

Mr. Qualset

206. Chemical and Physical Methods in Biological Research. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Chemistry 5 and 9. Advanced laboratory techniques and instrumental methods of analytical chemistry in biological research. Includes an introduction to laboratory research methods, preparation of samples, principles and operation of research instruments, and laboratory practice in methods of plant analysis.

Mr. Zscheile, Mr. Huffaker

221. Advanced Plant Breeding. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Science 113. Advanced topics in plant breeding. Genetic diversity and centers of origin of cultivated plants, mating systems in plants, polyploidy, host-pathogen relationships, role of mutagens in plant breeding, and other topics of current interest.

Mr. Stanford

222. Quantitative Genetics and Plant Improvement. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Science 113; Genetics 105; or consent of instructor. The genetic forces affecting populations. Formulation of breeding plans based on principles of population and quantitative genetics. Offered in even-numbered years.

Mr. Allard

231. Advanced Topics in the Ecology of Crop Plant Communities. (3) II.

Lecture—3 hours. Prerequisite: Plant Science 101; or consent of instructor. Analytical models and quantitative description of the structure and dynamics of field crop communities in relation to interplant competition, population functions and environmental adaptation.

Mr. Laude

232. Advanced Topics in the Physiology of Crop Plants. (3) I.

Lecture—3 hours. Prerequisite: Plant Science 102; or consent of instructor. Physiological aspects of vegetative and reproductive growth of field crop plants in relation to their field behavior.

Mr. Huffaker

290. Seminar. (1) I, II, III.

Seminar—1 hour.

Mr. Werkhoven

298. Group Study. (1-3) I, II, III.

Directed study in the areas of plant physiology, plant genetics, plant bio-chemistry, agricultural chemistry, or soil-plant relationships of field crops or range and pasture plants.

The Staff

299. Research. (1-9) I, II, III.

Original research involving plant physiology, plant genetics, plant bio-chemistry, agricultural chemistry, or soil-plant relationships of field crops or range and pasture plants.

The Staff

Environmental Horticulture

Lower Division Courses

1. Introduction to Landscape Design. (3) II.

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.

Mr. Newton

1L. Introduction to Landscape Design Laboratory. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1 (may be taken concurrently); recommended for non-majors. Practice in analysis and design with reference to landscape problems.

Mr. Newton

5. Introduction to Environmental Plants. (2) I.

Lecture—1 hour; laboratory—3 hours. Recommended for non-majors. The course introduces plants commonly used in the landscape. The origin, domestication and breeding of cultivated plants is discussed. Students learn to identify the more important environmental plants of California.

Mr. Harding

6. Environmental Plants. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 5. Environmental plants are identified and their landscape use and adaptation studied. Techniques of identification and the bases of nomenclature are discussed.

Mr. Leiser

7. Environmental Plants. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 6. The use of environmental plants as related to elements of plant geography,

ecology and design principles. Ornamental plants are identified with emphasis on herbaceous plants.

Mr. Madison

10. Landscape Horticulture for the Home and Community. (3) III.

Lecture—2 hours; discussion—1 hour. Recommended for non-majors. The influences of climate, soil, and cultural practices on the growing of turf, flowers, and herbaceous and woody plants in the landscape.

Mr. Kofranek, Mr. Hackett

47. Introduction to Environmental Horticulture.

(1) III, §§

Field Study—30 hours. Prerequisite: consent of instructor. An introduction to environmental horticulture including parks and recreation; landscape architecture; urban and resource planning; landscape construction and contracting; nursery production; commercial floriculture; arboriculture; sales and services; teaching, research and extension. Offered in odd-numbered years.

Mr. Harris

Upper Division Courses

105A-105B-105C. Taxonomy and Ecology of Environmental Plants. (2-2-2) I-II-III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 7; or consent of instructor. The taxonomy, ecology and uses of environmental plants. Special emphasis will be placed on the solution of problems of variability and horticultural nomenclature, and on plants of importance in the West. Several field trips required.

Mr. Leiser

125. Floriculture and Nursery Management. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Science 2 or Botany 2. Practices and principles in planning, establishing, and maintaining container grown crops with special consideration of green house production. Several field trips required.

Mr. Kofranek, Mr. Hackett

128A. Advanced Landscape Horticulture. (3) I.

Lecture—2 hours; laboratory—2 hours. Prerequisite: Plant Science 2 or Botany 2. Practices and principles of planting, establishing, and maintaining plantings in the landscape with emphasis on turf. Laboratory methods are used to analyze problems related to nutrition, salinity and water quality.

Mr. Madison, Mr. Paul

*128B. Landscape Horticulture. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: Plant Science 2 or Botany 2; course

* Not to be given, 1970-71.

§§ To be given between the winter and spring quarters. Considered a spring quarter course for preenrollment.

128A recommended. Practices and principles of planning, establishing, and maintaining plantings in the landscape with emphasis on turf, trees and shrubs.

Mr. Harris

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: open only to majors who are honors students of senior standing. 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.

Mr. Harris

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

Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. Selected problems in floriculture, nursery management, and landscape horticulture.

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: 3 units of upper division work in landscape horticulture; consent of instructor.

The Staff

Graduate Courses

290. Seminar. (1) I, II, III.

Seminar—1 hour. Selected topics in floriculture, nursery management, and landscape horticulture.

The Staff

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

Group study on advanced topics in floriculture, nursery management, and landscape horticulture.

Mr. Sachs

299. Research. (1-6) I, II, III.

Prerequisite: graduate standing. Research in floriculture, nursery management, and landscape horticulture.

The Staff (Mr. Paul in charge)

Plant Pathology

Upper Division Courses

120. Introduction to Plant Pathology. (4) I, III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2; Bacteriology 2 recommended. The nature, cause, and control of plant diseases.

I. Mr. Campbell, III. Mr. English

122. Diagnostic Techniques. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 120. Elementary diagnostic techniques used in the study of plant diseases and their causal agents.

Mr. Nyland

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**202A-202B. Research Techniques in Plant Pathology. (3-3) II-III.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 120. Principles and practices of advanced techniques used in plant pathological research.

II. Mr. Nyland

III. Mr. Nyland, Mr. Shalla

205. Advanced Study of Field and Vegetable Crop Diseases. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 202A; Botany 119A. A clinical study of the factors affecting disease development and severity with emphasis on ecology and the techniques involved in diagnosis. Frequent field trips are required.

Mr. Shepherd

206. Advanced Study of Fruit and Nut Diseases. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 202A; Botany 119A. A clinical study of the factors affecting initiation, development, and control of selected fungus, bacterial, and virus diseases of perennial fruit and nut plants. Frequent field trips are required.

Mr. Ogawa

210A-210B. Physiology and Biochemistry of Plant Pathogens. (3-3) I-II.

Lecture—3 hours. Prerequisite: Biochemistry 101B or equivalent. A study of the fundamental concepts and current information on the physiology and biochemistry of plant pathogens and host-parasite relationships.

I. Mr. DeVay, II. Mr. Kosuge

212. Physiology of Plant Pathogens Laboratory. (4) II.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: Biochemistry 101L or equivalent. Advanced laboratory methods and techniques applicable to the study of physiology and biochemistry of plant pathogens and host-parasite interaction.

Mr. DeVay, Mr. Kosuge

215. Genetics of Plant Pathogens. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 120; Genetics 100B; Botany 119B. Study of fundamental concepts, research techniques and current information on the genetics of plant pathogenic microorganisms; origin and determination of physiologic specialization, host resistance and virulence in the pathogen as related to the host-parasite interaction. Special emphasis on the fungi.

Mr. Webster

224. Pathogenic Fungi. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 119B. Morphology and taxonomy of plant pathogenic fungi.

Mr. Butler

226. Plant Virology. (5) II.

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 202B. Viruses as causal agents of plant diseases; chemical and physical properties of viruses; methods of transmission; procedures for assay and diagnosis; multiplication of viruses; pathological cytology and anatomy; application of equipment and techniques used in research.

Mr. Shalla, Mr. Shepherd

228. Bacterial Plant Diseases. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 120; Bacteriology 2 or equivalent; general biochemistry recommended. Study of plant diseases caused by bacteria. Fundamentals on the mechanisms of disease development and the biology of plant bacteria.

Mr. Kado

235A-235B. Advanced Plant Pathology. (4-4) I-II.

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.

I. Mr. Webster, II. Mr. Grogan

290. Seminar. (1) I, II, III.

Seminar—1 hour. I. Mr. Campbell,
II. Mr. Kado, III. Mr. Nyland

291. Seminar in Host-Parasite Physiology. (1) I, II, III.

Seminar—1 hour. Prerequisite: course 120.

I. Mr. Kado, II. Mr. DeVay, III. Mr. Kosuge

298. Special Group Study. (1-4) I, II, III. The Staff**299. Research. (1-9) I, II, III. The Staff****Pomology****Lower Division Course****3. Citrus and Other Subtropical Fruits. (3) III.**

Lecture—3 hours. The production of the subtropical fruits including avocados, dates, olives, and citrus with special emphasis on citrus. A study of the fundamental information relating to orchard management as applied to these fruits.

Mr. Hesse

Upper Division Courses**100A. Principles of Pomology. (3) I.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2. Origin, history, distribution, and adaptation of fruit and nut plants; their structure and function in relation to environment and cultural practices.

Mr. Kester

100B. Principles of Pomology. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2. Development of the vegetative structure of fruit and nut plants; the physiological responses to environment and cultural modification.

Mr. Crane

100C. Principles of Pomology. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2. Flowering and fruiting; the nature and development of buds, flowers, and fruits in relation to the culture of fruit and nut plants and to their environment. Mr. Griggs

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

Prerequisite: consent of instructor.

The Staff (Mr. Hesse in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**201. Biochemistry and Physiology of Fruits. (3) III.**

Lecture—3 hours. Prerequisite: Biochemistry 101B; Botany 111; or consent of instructor. Biochemical and physiological phenomena of growth, maturation, ripening, and senescence of fruit. (Open to qualified undergraduates.)

Mr. Maxie

210. Fruit Morphology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2. The development of flower, fruit, and seed structures of representative fruit types.

Miss Bradley

216. Physiology of Fruit Plants. (4) II.

Lecture—4 hours. Prerequisite: courses 100A, 100B, 100C; Botany 111. Physiological processes in the growth and development of fruit plants; metabolic relationships; influence of environment and culture.

The Staff (Mr. Uriu in charge)

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff (Mr. Catlin in charge)

291. Seminar in Post-Harvest Physiology.

(1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Selected topics in the field of post-harvest physiology of fruits and vegetables. Conducted jointly with Vegetable Crops 291.

Mr. Maxie

299. Research. (1-6) I, II, III. (Summer)

The Staff

Vegetable Crops**Upper Division Courses****100. Principles of Vegetable Crops. (3) I.**

Lecture—3 hours. Prerequisite: Plant Science 1 and 2; or consent of instructor. The vegetable industry. Fundamentals of vegetable crop production, handling, processing and utilization. Demonstrations will supplement the lecture.

Mr. Lorenz

101. Major Vegetable Crops. (4) II.

Lecture—4 hours. Prerequisite: Plant Science

1 and 2; or consent of instructor. Adaptation, growth habits and methods of culture and handling of the principal vegetable crops. The application of experimental evidence to production problems is stressed.

Mr. Smith

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.

Mr. Smith

118. Seed Physiology and Production. (3) II.

Lecture—3 hours. Prerequisite: Botany 111. Physiological factors affecting induction of seedling, seed development, viability and longevity of seed. Principles of seed production. One or more field trips.

Mr. Harrington

150. Vegetables as World Food Crops. (3) II.

Lecture—3 hours. Prerequisite: Botany 2; or consent of instructor. A technical course concerned with historical and current aspects of production and use of vegetables as human food; ecology, economics, geography, human cultural patterns, dietary preferences, nutritional values, and use of microclimates related to commercial and subsistence production.

Mr. Yamaguchi

197. Field Study of Vegetable Industry. (1) III.

Lecture—1 hour; field study—56 hours (given between winter and spring quarters). Prerequisite: consent of instructor; limited to 25 students. A field study trip covering the major vegetable producing areas of California. Visits are made to packing sheds, seed companies, plant breeding industry, processors, vacuum coolers, mushroom plant, farmer operations, canneries, Los Angeles market, California Institute of Technology phytotron, etc.

Mr. Flocker

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

The Staff (Mr. Davis in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**212. Postharvest Physiology of Vegetables. (4) III.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: consent of instructor. Comparative physiology of harvested vegetables representing diverse plant structures; emphasis on experimental studies of maturation, compositional and morphological changes, senescence, and physiological disorders; lecture stresses species responses and requirements; laboratory stresses concepts and research procedures. Offered in even-numbered years.

Mr. Morris, Mr. Pratt

220. Vegetable Genetics and Improvement. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 100B; course 105 and Plant Science 113 recommended. Breeding systems of vegetable species as affected by self-incompatibility, flower structure, pollen vectors, and other reproductive factors. Problems of chromosome number and structure, heterosis, pest resistance, and species hybrids peculiar to vegetable improvement.

Mr. Rick

221. Vegetable Physiology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 111 and consent of instructor. Physiological principles involved in the production of vegetable crop species.

Mr. Pratt, Mr. Rappaport

290. Seminar. (1) I, II, III.

Discussion—1 hour. (Satisfactory/Unsatisfactory grading only.)

The Staff (Mr. Spurr in charge)

291. Seminar in Postharvest Physiology. (1) I, II, III.

Discussion—1 hour. Prerequisite: consent of instructor. An intensive study of selected topics in the field of postharvest physiology of fruits and vegetables. This seminar will be conducted jointly with Pomology 291. (Satisfactory/Unsatisfactory grading only.)

The Staff (Mr. Pratt in charge)

298. Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. Current concepts, techniques, and procedures applicable to research and to the production of vegetables.

The Staff (Mr. Yamaguchi in charge)

299. Research. (1–9) I, II, III.

(Satisfactory/Unsatisfactory grading only.)

The Staff

Viticulture and Enology†**Lower Division Course****3. Introduction to Wine Making. (3) II, III.**

Lecture—3 hours. An introduction to wine technology, including history, fermentation, production practices, wine types, and the wine industry of California and other wine producing areas.

Mr. Singleton, Mr. Amerine

Upper Division Courses**105. Systematic Viticulture Including Fruit****Maturation and Handling. (3) I.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2; or consent of instructor. Botanical classification of the grape—the principal varieties, rootstocks, and species; environmental factors affecting maturity and quality of the fruit for raisins, wine and table grapes; raisin making; costs and returns.

Mr. Nelson, Mr. Lider

† Additional Viticulture and Enology courses listed under Plant Science, page 267.

116A. General Viticulture. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2; or consent of instructor. Principles underlying pruning, training, grafting, and propagation of vines; environmental and economic factors affecting choice of vineyard type and location; establishment of vineyards.

Mr. Cook

116B. General Viticulture. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 116A. Economics and scientific principles of recommended vineyard management practices including irrigation, mineral and carbohydrate nutrition, flower development and fruit set, virus and fungal diseases, and insect control.

Mr. Cook

190. Proseminar in Viticulture. (1) I.

Lecture—1 hour. Prerequisite: consent of instructor. Reports and discussions of recent advances in viticulture.

Mr. Olmo

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

Prerequisite: consent of instructor.

The Staff (Mr. Berg in charge)

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

The Staff (Mr. Berg in charge)

Graduate Courses**208. Plant Hormones and Regulators. (3) I.**

Lecture—3 hours. Prerequisite: Botany 111; Chemistry 8B; or consent of instructor. Open to qualified upper division students. History, occurrence, extraction, measurement, chemical nature, developmental and physiological effects, role, and theories of action of plant hormones and growth regulators; methods of application of growth regulators and factors altering effectiveness; application in the control of plant and fruit responses.

Mr. Weaver, Mr. Addicott

208L. Plant Hormones and Regulators Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 208 (may be taken concurrently); or consent of instructor. Experiments in plant hormones and regulators using various bioassay methods for auxins, gibberellins, and kinins; preparation and testing of gibberellic acid; extraction and identification of naturally occurring plant hormones.

Mr. Weaver

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.

Mr. Singleton

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor.
Mr. Kunkee

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

The Staff (Mr. Berg in charge)

299. Research. (1-12) I, II, III.

The Staff

POLITICAL SCIENCEPaul E. Zinner, Ph.D., *Chairman of the Department*

Department Office, 227 Voorhies Hall

Professors:

Richard W. Gable, Ph.D.
Charles M. Hardin, Ph.D.
Clyde E. Jacobs, Ph.D.
Lloyd D. Musolf, Ph.D.
Vernon J. Puryear, Ph.D. (*Emeritus*)
Donald S. Rothchild, Ph.D.
Paul E. Zinner, Ph.D.

Associate Professors:

Alexander J. Groth, Ph.D.
John R. Owens, Ph.D.
Marvin Zetterbaum, Ph.D.

Assistant Professors:

Edmond Costantini, Ph.D.
Kenneth I. Hanf, Ph.D.
Joyce K. Kallgren, Ph.D.
Robert J. Lieber, Ph.D.
Alvin D. Sokolow, Ph.D.
William S. Tuohy, Ph.D.
Louis F. Weschler, Ph.D.

◇ ◇ ◇

*Assistant Professor:*Stanley B. Bernstein, M.A. (*Acting*)*Lecturers:*

Brian Muller, M.A.
Larry Peterman, M.A.
Hyman R. Shevelew, M.A.
Larry Wade, Ph.D.

Department Major Advisers.—Mr. Bernstein, Mr. Costantini, Mr. Gable, Mr. Hanf, Mrs. Kallgren, Mr. Sokolow, Mr. Tuohy, Mr. Weschler.

Graduate Advisers.—Mr. Owens, Mr. Rothchild.

The American History and Institutions Requirement may be satisfied by any two of the following courses: 1A, 1B, 100, 102, 103A, 103B, 104, 105, 106, 113, 128A, 128B, 163, 164, 166. See also page 32.

The Major Program

Lower Division Courses.—Required: courses 1A, 1B, 2, 3, and two of the following: History 4A, 4B, 4C.

Upper Division Courses.—Required: 40 units as follows:

(a) 28 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 102-109).

Political Parties (courses 160-169).

Public Law (courses 150-159).

Public Administration (courses 180-189).

Group C

Comparative Government (courses 140-149, 170-179).

International Relations (courses 120-139).

(b) 12 additional units in Political Science or related subjects.

Political Science students *must* maintain at least a grade C average in the major.

Graduate Study.—The Department offers programs of graduate study leading to the M.A. and Ph.D. degrees. Information concerning admission to these programs and requirements for completion is available in the department office.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Thirty units of political science to be selected in consultation with the subject representative.

Subject Representative: Mr. Sokolow**Lower Division Courses****1A. American Government. (4) I, II, III.**

Lecture—3 hours; discussion—1 hour. National, state and local government in the United States.
The Staff

1B. American Government. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. National, state, and local government in the United States.
The Staff

2. Introduction to Comparative Politics. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Introduction to various methods of political analysis and their application to the study of

politics in selected foreign countries. Psychological and cultural dimensions of the political process as well as more formal structures and institutions of government. The Staff

3. International Relations. (4) I, III.

Lecture—3 hours; discussion—1 hour. Rise and development of the Western State systems; problems of nationalism and imperialism, particularly in connection with the peace settlement following World War II. The Staff

Upper Division Courses

100. American National Government. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 1A or 1B. Presidential leadership; executive-legislative relationships; the development of effective and accountable administration; defense and foreign policy; and government and science. The Staff

102. Comparative State Government and Politics (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students who have credit in course 104. The comparative study of the government and politics of American states, including their constitutional frameworks, their participation in the federal system, the dynamics of governmental institutions, and the behavior of parties and interest groups. Mr. Sokolow

103A. Local Government and Politics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A or consent of instructor. The politics and government of local communities in the United States, including cities, counties, and special districts. The expression and resolution of political conflict in communities, local government structure and functions, municipal reform, and community power structures. Mr. Sokolow, Mr. Weschler

103B. Local Government and Politics: Urban Problems. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103A or consent of instructor. The politics and government of urban communities in the United States. Special attention to the problems of metropolitan and regional areas. Mr. Sokolow, Mr. Weschler

104. California State and Local Government. (3) III.

Lecture and discussion—3 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. Offered in odd-numbered years. Mr. Weschler

105. The Legislative Process. (4) I.

Lecture—3 hours; discussion—1 hour. An analysis of the legislative process with emphasis on the United States Congress; legislative organization and procedures, legislative leadership and policy making, legislators and constituents, relations between Congress and other agencies. Mr. Owens

106. The Presidency. (4) III.

Lecture—3 hours; discussion—1 hour. The office, powers, and role of the President of the United States. Mr. Hardin

110. Contemporary Political Science. (4) I.

Lecture and discussion—4 hours. History, nature, and methodology of the discipline; the problems, schools of thought, and trends within the field at present. To be offered in even-numbered years. Mr. Weschler

***111. Systematic Political Science. (4) II.**

Lecture and discussion—4 hours. Philosophical basis of modern political science; major specific approaches; selected concepts relevant to modern political concerns; and research design and execution.

112. Contemporary Democratic Theory. (4) I.

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. Mr. Zetterbaum

***113. The American Political Experience. (4) I.**

Lecture and discussion—4 hours. Origins and nature of American political thought and practice from medieval background to the present. Study of America in comparative context to develop a comprehensive understanding of the unique character and limits of our heritage. Mr. Peterman

114. Politics and Political Man in Political Theory. (4) II.

Lecture—3 hours; discussion—1 hour. The defense and criticism of political life; an investigation of those political writers who have defended political life and political man against its critics. Offered in odd-numbered years. Mr. Peterman

115. Medieval Political Thought. (4) III.

Lecture—3 hours; discussion—1 hour. An analysis of the political thought of the Middle Ages—St. Thomas, Maimonides, Marsilius, Dante, Pico della Mirandola. Offered in even-numbered years. Mr. Peterman

***117A. Marxism. (4) I.**

Lecture and discussion—4 hours. Historical background and context of Marxism. Exploration

* Not to be given, 1969-70.

of Marx's writings toward understanding his significance in the nineteenth century and his relevance today. Offered in odd-numbered years.

***117B. Contemporary Marxism. (4) II.**

Lecture and discussion—4 hours. Marxism after Marx to the present, with reference to Engels, Kautsky, Bernstein, Lenin, and contemporary figures and movements. Special attention to Marxism in America. Communism and democratic socialism as legacies of Marx related to contemporary problems. To be offered in even-numbered years.

118A. History of Political Theory. (4) I.

Lecture—3 hours. Critical analyses of the works of major political philosophers. Classical and medieval political philosophy—Plato, Aristotle, Cicero, St. Thomas. Mr. Peterman

118B. History of Political Theory. (4) II.

Lecture—3 hours. Critical analyses of the works of major political philosophers. Modern political philosophy—Machiavelli, Hobbes, Locke, Rousseau, Burke, Nietzsche.

Mr. Zetterbaum

***119. Modern Political Thought. (4) III.**

Lecture and discussion—4 hours. The search for community from Marx to the present. Communism, fascism, capitalism, socialism, irrationalism, moralism, and existentialism as responses to the decline of liberalism and the nature of modern problems. Offered in odd-numbered years.

***120. Science and International Relations. (4) II.**

Lecture—4 hours. The impact of science and technology upon the international legal and political order.

***122A. International Law. (4) II.**

Lecture—4 hours. Sources and theories of international law. The relation of international law to municipal law. Territory, sovereign immunity, responsibility, recognition, and succession in the law of nations.

***122B. International Law. (4) III.**

Lecture—4 hours. Neutrality, belligerency, and war in the international community. Pacific settlement of disputes.

123. Theories of International Politics. (4) II.

Lecture—4 hours. Major contemporary approaches to the study of international politics, including balance of power, national interest, Marxist-Leninist theory, systems theory, and decision-making analysis.

Mr. Lieber

124. International Organization. (4) I.

Lecture—4 hours. The preservation of world peace through collective security arrangements.

* Not to be given, 1969-70.

Analysis of the conditions under which international organizations can or cannot preserve peace, through examination of the record of the United Nations, League of Nations, and more restricted security organizations. Mr. Shevelew

128A. Recent American Foreign Policy. (4) I.

Lecture—4 hours. Abandonment of isolation and assumption of leadership during the First World War. Return to isolationist policies in the twenties. The neutrality acts of the thirties. The second World War and reversal of the policy of isolation.

Mr. Muller

128B. The Conduct of American Foreign Relations. (4) II.

Lecture—3 hours; discussion—1 hour. Diplomacy and the conduct and control of foreign relations. The Department of State and the Foreign Service. Case studies in recent diplomacy to illustrate policy formation and execution. Some comparative materials will be introduced but emphasis will be placed upon the United States.

Mr. Muller

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. To be offered in odd-numbered years.

Mr. Zinner

132. The Role of the United States in the Far East. (4) I.

Lecture—4 hours. Recommended: course 3. A survey of the role the United States has played in the Far East through an examination of such topics as America's participation in Asiatic westernization, United States Far Eastern policy, Oriental attitudes toward the United States. An evaluation of present problems. To be offered in odd-numbered years.

Mrs. Kallgren

134. International Relations in Africa. (4) III.

Lecture—3 hours; discussion—1 hour. Inter-African state relations, pan-Africanism, regional integration, policies toward South Africa, and relations between African and major non-African powers.

Mr. Rothchild

137. Nationalism and Imperialism. (4) III.

Lecture—4 hours. Recommended: course 3. The theory of nation building illustrated by Western and non-Western experience. To be offered in even-numbered years.

Mrs. Kallgren

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.

Mr. Lieber

141. Communist Political Systems. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Systematic comparative analysis of the origin, structure and performance of communist political systems with emphasis on the Soviet Union and the states of Eastern Europe. Mr. Zinner

142. Revolution and Political Change. (4) II.

Lecture—4 hours. The attributes, problems, means, and impact of political change through evolution and revolution in the twentieth century. Emphasis upon movements and systems representative of communism, fascism, and nationalism. Mr. Groth

143. Politics and Processes of Foreign Aid. (4) II.

Lecture—3 hours; discussion—1 hour. Comparative analysis of multilateral and bilateral assistance to developing nations; perspectives of donor and recipients; politics, types, and instruments of aid. Mr. Gable

144. Government in Great Britain and the British Commonwealth. (4) III.

Lecture—3 hours; discussion—1 hour. The democratic process in Britain; party politics; the cabinet system; the colonies; the evolution of the British Commonwealth. Mr. Groth

145. Government and Politics in Emergent Nations. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. 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. To be offered in even-numbered years. Mr. Shevelew

146A. African Governments and Politics. (4) I.

Lecture—4 hours. An analysis of political systems in Africa south of the Sahara. Mr. Rothchild

146B. African Governments and Politics. (4) II.

Lecture—4 hours. A continuation of course 146A. Mr. Rothchild

147A. Western European Governments: France and Italy. (4) I.

Lecture—4 hours. The evolution and contemporary nature of French and Italian political institutions. Mr. Groth

147B. Western European Government: Germany. (4) II.

Lecture—4 hours. Comparative study of the politics and institutions of constitutional and totalitarian government in Germany since 1930. Current problems of a divided Germany. Mr. Hanf

148A. Government and Politics in East Asia. (4) I.

Lecture—4 hours. The structure and evolution of political institutions in China, Japan, and Korea. Emphasis upon such topics as nationalism, political modernization, and ideology up to World War II. Mrs. Kallgren

148B. Government and Politics in East Asia. (4) II.

Lecture—4 hours. The structure and evolution of political institutions in China, Japan, and Korea since World War II, with emphasis upon political modernization, ideology, and nationalism. Mrs. Kallgren

149. International Communism. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or 3 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. To be offered in even-numbered years. Mr. Zinner

150. Jurisprudence. (4) II.

Lecture—4 hours. An analysis of the nature and functions of law. Particular attention will be directed to law as an instrument of social control and the relationship between law and morality. To be offered in even-numbered years. Mr. Bernstein

151. Civil Rights and the Constitution. (4) I.

Lecture—4 hours. Prerequisite: course 1A. The constitutional rights and political possibilities of minority groups. Citizenship in the American federal system. Offered in odd-numbered years. Mr. Bernstein

152. The Administration of Justice. (4) I.

Lecture—4 hours. Prerequisite: course 1A, 1B, or 100, or consent of instructor. The evolution of judicial machinery; present arrangements and plans for reorganization; justice and social classes; the revolution in the constitutional law for the criminally accused; problems in welfare and family law. To be offered in even-numbered years. Mr. Bernstein

156. Administrative Law. (4) I.

Lecture—3 hours; discussion—1 hour. The political-legal factors in the decision-making processes of administrative legislation, adjudication and discretion; legal controls as an aspect of administrative responsibility; relationship of substance and procedure in regulatory action. Mr. Musolf

157A. American Constitutional Law. (4) II.

Lecture—1 hour; discussion—3 hours. Prerequisite: courses 1A and 1B; or consent of instructor. Judicial review, jurisdiction of the federal courts, interstate and foreign commerce, and taxation. Mr. Jacobs

157B. American Constitutional Law. (5) III.

Lecture—1 hour; discussion—3 hours. Prerequisite: course 157A. The Bill of Rights of the Federal Constitution. Mr. Jacobs

158. American Legal Thought and Institutions. (4) III.

Lecture—4 hours. Prerequisite: course 1A, 1B, or 100, 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. To be offered in odd-numbered years. Mr. Bernstein

159. Judicial Behavior. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A. 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. Mr. Bernstein

161. Political Behavior. (4) III.

Lecture—3 hours; conference—1 hour. Prerequisite: course 1A. The individual and group aspects of partisan behavior; political socialization, partisanship and political participation, voting behavior and group influence processes. Mr. Owens

163. Political Parties. (4) II.

Lecture—3 hours; discussion—1 hour. An analysis of the structure and operations of the party system in the United States; party functions and organization, nomination processes, campaigns and elections, party trends and reforms. Mr. Owens

164. Group Politics. (4) II.

Lecture—3 hours; discussion—1 hour. An analysis of class, sectional, ethnic, religious, economic, and other interests in relation to constitutional government. The problem of balancing liberty and order and of reconciling claims of diversity with those of uniformity. Mr. Hardin

165. Public Opinion and Propaganda. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A. The nature and function of public opinion; the formation of opinion with emphasis on the role of propaganda; the distribution of political attitudes among the public; the impact of public opinion. Mr. Costantini

166. Public Policy and the Government Process. (4) I.

Lecture—3 hours; discussion—1 hour. An examination of the processes of formulating public policy. Methods of policy making by executive, legislative, judicial, and party agencies illustrated with case studies from agriculture, labor, civil rights, and other areas. Mr. Weschler

167. Government and the Economy. (4) I.

Lecture—3 hours; discussion—1 hour. The legal and political environment of economic controls; types and techniques of regulating and assisting various sectors of the economy; policy alternatives and administrative processes; the search for the public interest. Mr. Gable

168. Policy and Politics in Agriculture and Water. (4) III.

Lecture—3 hours; discussion—1 hour. Agricultural and water policies and their political implications, with chief emphasis upon the United States and with special attention to water policies in California. Mr. Hardin

172. Latin American Politics. (4) I.

Lecture—4 hours. Prerequisite: course 2 and a basic economics course, or consent of instructor. Survey of political processes in Latin America, with special attention to basic political problems, and major socio-political groups in three nations: Argentina, Brazil and Mexico (a fourth country may be added). Mr. Tuohy

174. Political Culture and Politics. (4) III.

Lecture—4 hours. Prerequisite: courses 1A, 1B, or 2, or consent of instructor. Examination of the relationships between politically relevant attitudes, beliefs and values, on the one hand, and political behavior and governmental performance. To be offered in odd-numbered years. Mr. Tuohy

178. Community Politics: Power and Influence. (4) III.

Lecture—4 hours. Prerequisite: courses 1A, 1B or 2, or consent of instructor. Consideration of political power in local communities; emphasis on empirical bases for making judgments on the nature and location of such power, as well as ideological assumptions reflected in the literature. To be offered in even-numbered years. Mr. Tuohy

181. Elements of Public Administration. (4) I.

Lecture—3 hours; discussion—1 hour. The role of public administration in modern government; the nature of administrative agencies; human behavior in the administrative process, executive leadership and decision making; bureaucracy and bureaucratic accountability in a democratic society. Mr. Hanf

183. Administrative Behavior. (4) II.

Lecture—4 hours. The implications for American public administration of evolving concepts about behavior in organizations. Mr. Musolf

185. Comparative Administration. (4) III.

Lecture—3 hours; discussion—1 hour. Theories and models of comparison; the ecology of administrative systems; functional processes of

administration in developed and developing nations; role of bureaucracy in development and nation-building.

Mr. 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. An 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; and examination of the role of government bureaucracies in the total society.

Mr. Hanf

190. Selected Problems in State and Local Government. (4) II.

Seminar—4 hours. An undergraduate seminar for students enrolled in the Sacramento Seminar Program. Guests and staff members will conduct seminar sessions on contemporary problems in California government and politics. Students will have the opportunity to share in the experiences of actual practitioners.

The Staff

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: honors status. A program of research, culminating in the writing of a senior honors thesis, under the direction of a faculty adviser.

Mr. Bernstein

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

Prerequisite: consent of instructor. The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses

202. American State and Local Government. (4) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: courses 102, 103A, 103B or consent of instructor. The analysis of American state and local government and politics. Special emphasis on community power structure, federalism, state legislatures, and state administration.

Mr. Sokolow, Mr. Weschler

213. Modern Political Thought. (4) II.

Seminar—3 hours. Mr. Peterman

215. Basic Problems of Political Theory. (4) III.

Lecture—3 hours. Prerequisite: 4 units of political theory or consent of instructor. An examination of the fundamental assumptions underlying various approaches to an understanding

of politics, emphasizing the scientific or value-free school, the historicist school, and the contributions of analytic philosophy.

Mr. Zetterbaum

218. Political Theory. (4) I.

Seminar—3 hours. Mr. Zetterbaum

223. International Relations. (4) II.

Seminar—3 hours. Mr. Lieber

224. International Organization. (4) I.

Seminar—3 hours. Mr. Shevelew

230. American Foreign Policy. (4) I.

Seminar—3 hours. Mr. Lieber

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. To be offered in odd-numbered years.

Mr. Zinner

241A-241B. Soviet and East European Governments. (4-4) I-II.

Seminar—3 hours. Mr. Zinner

242. Seminar in Comparative Politics. (4) III.

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

246. Government in Africa. (4) II.

Seminar—3 hours. Mr. Rothchild

247A. Western European Governments. (4) I.

Seminar—3 hours. Contemporary problems, with emphasis on France and Italy. Mr. Groth

247B. Western European Governments. (4) III.

Seminar—3 hours. Prerequisite: consent of instructor. Contemporary problems, with emphasis on Germany.

The Staff

248. The Far East. (4) III.

Seminar—3 hours. Selected contemporary problems of government and international relations in the Far East.

Mrs. Kallgren

261. Political Behavior. (4) III.

Seminar—3 hours. Mr. Owens

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. An examination of the means and motives of regional integration as well as the problems involved in operating and maintaining federations. Classical federal experience and experiments in developing countries will be considered.

Mr. Rothchild

272. Latin American Political Problems. (4) II.

Seminar—3 hours. Prerequisite: course 172 or consent of instructor. Selected contemporary problems of government and international relations in Latin America. Mr. Tuohy

282. Concepts and Problems in Public Administration. (4) III.

Discussion—3 hours. The nature of administrative processes in modern society; analysis of complex organizations; contemporary management practices and processes; and means of controlling bureaucracy. Offered in even-numbered years. Mr. Gable

285. Modernization and Administration in Transitional Societies. (4) II.

Seminar—3 hours. Nature of traditional and transitional societies; theories and processes of modernization; role of bureaucracy in development; problems of national integration and maintaining stability. Offered in odd-numbered years. Mr. Gable

286. Public Administration. (4) III.

Seminar—3 hours. An examination of American administrative values. Offered in odd-numbered years. Mr. Musolf

291. Seminar in American Constitutional Law. (4) III.

Seminar—3 hours. Prerequisite: course 157B, or consent of instructor. Mr. Jacobs

POMOLOGY—See Plant Sciences**PORTUGUESE—See Spanish****PSYCHOLOGY**

Robert Sommer, Ph.D., *Chairman of the Department*
Department Office, 149 Young Hall

Professors:

William F. Dukes, Ph.D.
Joseph Lyons, Ph.D.
Robert Sommer, Ph.D.

Associate Professors:

Jarvis R. Bastian, Ph.D.
¹Gordon H. Bermant, Ph.D.
Stanley Coopersmith, Ph.D.
Thomas Natsoulas, Ph.D.

Assistant Professors:

John J. Bintz, Ph.D.
Alan C. Elms, Ph.D.
Albert A. Harrison, Ph.D.
Neal A. Kroll, Ph.D.

¹ Absent on leave, 1969-70.

295. Political Parties. (4) I.

Seminar—3 hours. Mr. Hardin

296. Selected Problems in State and Local Government. (4) II.

Seminar—3 hours. Prerequisite: course 202, or consent of instructor. Selected topics in state and local government and politics.

Mr. Sokolow, Mr. Weschler

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.

The Staff

299. Research. (1-12) I, II, III.

The Staff

299D. Directed Reading. (1-6) I, II, III.

The Staff

Professional Course**400. Field Work in Political Science. (1-4) I, II, III.**

Directed study and internship in a government agency, office, or political party. May be repeated twice for credit.

The Staff

Dale F. Lott, Ph.D.

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.

Morris H. Woskow, Ph.D. (*Psychology and Food Science and Technology*)

*Lecturers:*

Paul A. Aiken, M.A.

Benjamin L. Hart, Ph.D., D.V.M. (*Psychology and Anatomy*)

Rosalie Lynn, Ph.D.

Sumner B. Morris, Ed.D.

Jack C. Pflugrath, Ph.D.
V. J. Polidora, Ph.D.

Departmental Major Advisers.—Mr. Bastian, Mr. Berman, Mr. Bintz, Mr. Coopersmith, Mr. Elms, Mr. Harrison, Mr. Kroll, Mr. Lott, Mr. Lyons, Mr. Mitchell, Mr. Murphey, Mr. Nat-soulas, Mr. Parks, Mr. Sommer, Mr. Tart, Mr. Turner.

The Major Program

All Majors

Lower Division Courses.—Required: Psychology 1A, 1B, 1C, 3. (Psychology 3 or equivalent 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) including Psychology 196 (to be taken during the senior year).

Bachelor of Arts Degree

Lower Division Courses.—Required: Mathematics 15; either Biology 1 or a combination of Biology 10 and any one of the following: Anthropology 1, Physiology 10, Genetics 10.

Upper Division Courses.—Required: Two courses from one of the following groups and three courses from the other:

(Group A) Psychology 108, 130, 131, 134, 150.

(Group B) Psychology 112, 145, 147A, 168.

Before graduation, the student must complete one course in sociology or cultural anthropology and one course in philosophy. These may be taken at any time during the four years and may be either lower or upper division courses.

Bachelor of Science Degree

Lower Division Courses.—Required: Mathematics 15, 16A, 16B; Chemistry 1A, 1B; Biology 1; Physiology 2, 2L; Physics 2A, 2B, 2C.

Upper Division Courses.—Required: Genetics 100A; Zoology 106A; Psychology 106, 108, 150; any two of the following: Psychology 112, 145, 147A, 168.

Before graduation, the student must complete 8 units of philosophy and 8 units of sociology and/or cultural anthropology. These may be taken at any time during the four years and may be either lower or upper division courses.

Honors and Honors Program (see page 133).—The honors program comprises course 194H, which includes an honors thesis, to be taken normally during the senior year.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Thirty units in psychology.

Subject Representative: Mr. Turner.

Lower Division Courses

1A. Introduction to Psychology: General Processes.

(4) I, II, III.

Lecture—4 hours. Sensation, perception, learning, memory, motivation, and emotion.

The Staff

1B. Introduction to Psychology: Biological Bases of Behavior. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 1A. An analysis of behavior in terms of its evolutionary, genetic, and physiological determinants.

The Staff

1C. Introduction to Psychology: Personality and Social Psychology. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 1A. The normal and abnormal personality. The influence of social factors on the individual.

The Staff

3. Quantitative Description of Behavior.

(4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A; two years of high school algebra or equivalent. Not open for credit to students who have received credit for a course in statistics. Principles and problems of measurements; inference and prediction from psychological data. Primarily for psychology majors.

Mr. Kroll, Mr. Turner

10. General Psychology. (4) I, II, III.

Lecture—4 hours. Survey of the basic principles of psychology, and their empirical foundations. For students who do not plan to major in psychology.

The Staff

33. Personal and Social Adjustment. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A. The dynamics of normal personality development. Family relationships, social adjustment, and self-evaluation are emphasized. Primarily for students who will not major in psychology.

Mr. Pflugrath, Mr. Morris

38. Directed Group Study. (1-5) I, II, III. The Staff

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

The Staff

Upper Division Courses

107. Advanced Statistical Methods in Psychology.

(4) I.

Lecture—4 hours. Prerequisite: course 3. Application of hypothesis-testing techniques to specific problems of psychological research and related behavioral research areas.

Mr. Turner

108. Physiological Psychology. (5) I.

Lecture—5 hours. Prerequisite: course 1B; or course 1A and upper division standing in a biological science. An analysis of some of the

contributions of neuroanatomy, neurophysiology, and neurochemistry to a mechanistic understanding of human and animal behavior. A reductionistic approach within a behavioristic framework.

Mr. Polidora

112. Developmental Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A; not open for credit to students who have received credit for Human Development 131. An ontogenetic account of human behavior through adolescence with emphasis on motor skills, mental abilities, motivation, and social interaction.

Mr. Coopersmith, Mr. Mitchell

120. History of Psychology. (4) II.

Lecture—4 hours. Prerequisite: course 1A and upper division standing. The historical development of psychological theories and research.

Mr. Woskow

129. Sensory Processes. (4) III.

Lecture—4 hours. Prerequisite: course 1B; upper division standing in psychology; or consent of instructor. The sensory capabilities of man and animals. Behavioral evidence for sensory capacity and relationships to the structure and function of the sense organs.

Mr. Woskow

130. Learning. (4) I, III.

Lecture—4 hours. Prerequisite: Psychology 1A and Mathematics 15, or consent of instructor. Consideration of major theories of learning and memory with critical examination of relevant experimental data.

Mr. Kroll, Mr. Parks

131. Perception. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 1A. The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events.

Mr. Natsoulas, Mr. Turner

132. Language and Cognition. (4) I.

Lecture—4 hours. Prerequisite: course 1A and 6 units of upper division work in psychology. Psychological examination of linguistic actions, their development and role in human conduct; analysis of their contribution to perception and thought.

Mr. Bastian

134. Motivation. (4) I, II.

Lecture—4 hours. Prerequisite: course 1A. Factors activating and directing behavior; contemporary theories of motives; pertinent data from laboratory, clinic, and field observation.

Mr. Bintz, Mr. Lott

135. Psychology of Consciousness. (3) I.

Lecture—3 hours. Prerequisite: course 1A. Consideration of major theories of consciousness, with critical examination of relevant experimental, clinical, and field data.

Mr. Natsoulas

145. Social Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A. Behavior of the individual in the group. Examination of basic psychological processes in social situations, surveying various problems of social interaction: group tensions, norm-development, attitudes, values, public opinion, status.

Messrs. Harrison, Elms, Sommer

147A. Personality Theory and Assessment. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A and 6 units upper division work in psychology. A systematic consideration of contemporary theories of personality.

Mrs. Lynn, Mr. Elms

147B. Personality Theory and Assessment. (4) II.

Lecture—4 hours. Prerequisite: course 3 or equivalent; course 147A. An exploration and evaluation of the principal methods in personality assessment and research.

Mr. Harrison

150. Comparative Psychology. (4) I, II.

Lecture—4 hours. Prerequisite: course 1B or appropriate biological training. Perspectives in animal behavior: zoological, physiological, psychological. Functional behavior categories: orientation and locomotion, feeding, reproduction, communication, learning. Behavioral theory as derived from psychological and ethological contexts.

Mr. Berman, Mr. Lott

165. Introduction to Clinical Psychology. (4) II, III.

Lecture—4 hours. Prerequisite: course 1C; 145 or 168; and 112, 134, or 147A. Psychological assessment procedures in clinical psychology; psychological methods for modifying disordered behavior—rationale, process, and outcome.

Mrs. Lynn, Mr. Lyons

168. Abnormal Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A. A descriptive and functional account of behavioral disorders, with primary considerations given to neurotic and psychotic behavior.

Mr. Murphey, Mr. Sommer

171. Humanistic Psychology. (4) II, III.

Lecture—4 hours. Prerequisite: course 165 or equivalent and consent of instructor. A survey, including lectures and demonstrations of humanistic, existential, or "third-force" movements in contemporary psychology. Theory, data, and techniques in the work of Maslow, Rogers, and others who emphasize creativity and self-actualization.

Mr. Tart, Mr. Lyons

180. Experimental Psychology. (4) I, II, III.

Lecture—2 hours; laboratory—4 hours. Prerequisite: four upper division psychology courses or consent of instructor. Laboratory investigation of selected problems. Content area will rotate among major fields of psychology from quarter to quarter.

(180A. General

Methodology; 180B. Physiological; 180C. Developmental; 180D. Sensory Processes; 180E. Learning; 180F. Perception; 180G. Psycholinguistics; 180H. Motivation; 180I. Social; 180J. Personality; 180K. Comparative.) May be repeated for credit in different subject areas.

The Staff

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: 20 units in psychology and honors status. Independent investigation of an empirical problem.

The Staff

196. Advanced General Psychology. (4) I, 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. Required of all majors in their senior year.

Messrs. Bastian, Dukes, Lyons

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

Prerequisite: consent of instructor. Directed small group study on psychological topics of special interest and relevance to instructor and students.

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses

***201A. Psychobiology. (4) I.**

Seminar—4 hours. An intensive consideration of behavior studies in physiological and comparative psychology, and other biological sciences.

The Staff

***201B. General Experimental Psychology. (4) II.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. An intensive consideration of major areas and problems in general experimental psychology.

The Staff

***201C. Personality-Social Psychology. (4) III.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. An intensive consideration of basic psychological processes in social situations including the study of variables characterizing the individual personality.

The Staff

206. Advanced Research Methods. (4) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. A survey of research methods in various areas of psychology, including naturalistic observation, correlation studies, systematic assessment, and experimental studies, and an examination of the basic assumptions underlying the use of these methods.

Mr. Kroll

208. Physiological Psychology. (4) II.

Seminar—4 hours. A conceptual analysis of the contributions of neuroanatomy, neurophysiology and neurochemistry to an understanding of animal and human behavior.

212. Developmental Psychology. (4) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The original behavioral repertoire of the child and its subsequent development.

Mr. Coopersmith

230. Learning. (4) I.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theories of learning and memory as applied to the experimental study of simple and complex behavioral processes.

Mr. Parks, Mr. Kroll

231. Perception. (4) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. An analysis of the role of perception in experience and its effects on behavior.

Mr. Natsoulas

234. Motivation. (4) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The origin and function of basic motivational systems as they influence behavior.

Mr. Bermant, Mr. Lott

245. Social Psychology. (5) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in social psychology.

Mr. Harrison

247. Personality. (4) III.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in human personality.

Mr. Coopersmith, Mr. Lyons

250. Comparative Psychology. (4) III.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The study of animal behavior in an evolutionary and comparative framework.

Mr. Bermant, Mr. Lott

251. Genetic Correlates of Behavior. (4) I.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and experiment in the genetic determination of animal and human behavior.

Mr. Murphrey

288. Research Preceptorship. (4) I, II, III.

Laboratory and discussion—6-9 hours. Prerequisite: consent of instructor.

The Staff

* Not to be given, 1969-70.

290. Seminar. (4) I, II, III.

Seminar—4 hours. Prerequisite: consent of instructor. A 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

***291. Seminar in Psychobiology. (4) I, II, III.**

Seminar—4 hours. Recommended: course 201A.

The Staff

***292. Experimental Study of Personality.**

(4) I, III.

Seminar—4 hours.

Mr. Coopersmith, Mr. Lyons

293. Environment and Behavior. (4) II.

Seminar—4 hours. The social psychology of the environment. Research into the use of space and its design implications. Mr. Sommer

294. Psycholinguistics. (4) I.

Seminar—4 hours.

Mr. Bastian

***295. Comparative and Physiological Psychology of Reproductive Behavior. (4) III.**

Seminar—4 hours. Biological bases of reproductive behavior; neutral, hormonal, and environmental controls.

Mr. Berman

298. Group Study. (1-4) I, II, III.

The Staff

299. Research. (2-9) I, II, III.

The Staff

RANGE MANAGEMENT—See Resource Sciences

RESOURCE SCIENCES

Participating Departments:

AGRICULTURAL ECONOMICS

J. Herbert Snyder, Ph.D., *Chairman of the Department*
Department Office, 119 Voorhies Hall

Professor:

J. Herbert Snyder, Ph.D.

Associate Professor:

Warren E. Johnston, Ph.D.

AGRICULTURAL ENGINEERING

John R. Goss, M.S., *Chairman of the Department*
Department Office, 2030B Engineering

Professor:

Kinsell L. Coulson, Ph.D.

Assistant Professor:

Leonard O. Myrup, Ph.D.

AGRONOMY AND RANGE SCIENCE

R. Merton Love, Ph.D., *Chairman of the Department*
Department Office, 131 Hunt Hall..

Professors:

Robert W. Allard, Ph.D. (*Agronomy and Range Science and Genetics*)

Horton M. Laude, Ph.D.

R. Merton Love, Ph.D.

William A. Williams, Ph.D.

Assistant Professor:

Charles A. Raguse, Ph.D.



Lecturers:

Beecher Crampton, M.S.

Subodh K. Jain, Ph.D.

M. B. Jones, Ph.D.

* Not to be given, 1969-70.

ANIMAL PHYSIOLOGY

James M. Boda, Ph.D., *Chairman of the Department*
Department Office, TB-30

Professors:

James M. Boda, Ph.D.
Walter E. Howard, Ph.D.

◇ ◇ ◇

Associate Professor:

Harry W. Colvin, Jr., Ph.D.

Lecturers:

Alex J. Calhoun, Ph.D.
Robert G. Schwab, Ph.D.

ANIMAL SCIENCE

Magnar Ronning, Ph.D., *Chairman of the Department*
Department Office, 126 Animal Science

Professors:

Floyd D. Carroll, Ph.D.
William C. Weir, Ph.D.

Assistant Professor:

Graham A. E. Gall, Ph.D.

ENVIRONMENTAL HORTICULTURE

Harry C. Kohl, Jr., Ph.D., *Chairman of the Department*
Department Office, 166 Environmental Horticulture

Professor:

Richard W. Harris, Ph.D.

◇ ◇ ◇

Lecturer:

Samuel J. Cullers, M.A.

PHYSICAL EDUCATION

Charles R. Kovacic, Ed.D., *Chairman of the Department*
Department Office, 264 Gymnasium

Associate Professor:

Willard S. Lotter, Ed.D.

SOILS AND PLANT NUTRITION

C. C. Delwiche, Ph.D., *Chairman of the Department*
Department Office, 139 Hoagland Hall

Professors:

Daniel G. Aldrich, Ph.D. (*Irvine Campus*)
Frances E. Broadbent, Ph.D.

✉ C. C. Delwiche, Ph.D.

^{2, 3}Emanuel Epstein, Ph.D.
Frank F. Harradine, Ph.D.
Victor V. Rendig, Ph.D.
Perry R. Stout, Ph.D.
Lynn D. Whittig, Ph.D.

Associate Professor:

Donald N. Munns, Ph.D.

Assistant Professor:

Richard G. Burau, Ph.D.

◇ ◇ ◇

Lecturers:

Eugene L. Begg, B.S.
Arthur L. Brown, Ph.D.
Gordon L. Huntington, M.S.
Donald W. Rains, Ph.D.
H. Michael Reisenauer, Ph.D.

² Absent on leave, fall quarter 1969.

³ Absent on leave, winter quarter 1970.

WATER SCIENCE AND ENGINEERING

Verne H. Scott, Ph.D., Chairman of the Department
Department Office, 121 Veihmeyer Hall

Professors:

²Jaime Amorocho, Ph.D. (*Water Science and Engineering and Civil Engineering*)

Robert H. Burgy, M.S. (*Water Science and Engineering and Civil Engineering*)

Lloyd D. Doneen, Ph.D.

Robert M. Hagan, Ph.D.

Delbert W. Henderson, Ph.D.

James N. Luthin, Ph.D. (*Water Science and Engineering and Civil Engineering*)

Donald R. Nielsen, Ph.D.

Verne H. Scott, Ph.D. (*Water Science and Engineering and Civil Engineering*)

Frank J. Veihmeyer, Ph.D. (*Emeritus, Water Science and Engineering and Civil Engineering*)

Associate Professors:

James W. Biggar, Ph.D.

Theodor S. Strelkoff, Ph.D. (*Water Science and Engineering and Civil Engineering*)

Assistant Professors:

Theodore C. Hsiao, Ph.D.

Allen W. Knight, Ph.D.

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Lecturers:

William E. Hart, M.S.

Donald L. Morgan, M.S.

William O. Pruitt, Jr., M.S.

Departmental Major Advisers—See Schedule and Directory Listing.

Bachelor of Science Major Programs and Graduate Study. See pages 56 and 153.

Atmospheric Science

Lower Division Courses

20. Introduction to Meteorology. (3) III.

Lecture—3 hours. Prerequisite: Mathematics 21B or equivalent. Basic concepts of modern meteorology: weather and weather elements, atmospheric circulations, clouds, precipitation, radiation, instruments and observations, meteorological satellites. Mr. Morgan

20L. Introduction to Meteorology Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 20 (preferably taken concurrently). Introduction to meteorological instruments and observations; weather station visits; weather maps and charts;

special films on weather modification, air pollution, and atmospheric circulation; physical experiments illustrating atmospheric phenomena.

Mr. Morgan

Upper Division Courses

110A. Weather Analysis and Forecasting. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 121 (may be taken concurrently). Theory and practice of three-dimensional scalar and vector analysis as applied to atmospheric circulations. Physics, structure, and evolution of large-scale weather systems. Techniques of drawing weather maps.

110B. Weather Analysis and Forecasting. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110A. Application of dynamic theory to atmospheric weather systems. Graphical integration techniques applied to weather maps. Beginning of numerical forecasting techniques.

Mr. Myrup

110C. Weather Analysis and Forecasting. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110B. Numerical forecasting techniques applied to the general circulation of the atmosphere. The World Weather Watch and its requirements. Use and limitations of satellite data. Long-range forecasting.

Mr. Coulson

120. Atmospheric Thermodynamics and Statics. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 4C. The atmosphere at rest: atmospheric composition and structure, thermodynamics of atmospheric gases, thermal properties of dry and moist air, hydrostatic equilibrium and stability criteria, and thermodynamic diagrams in meteorology.

Mr. Myrup

121. Dynamics of the Atmosphere. (3) II.

Lecture—3 hours. Prerequisite: course 120. The atmosphere in motion: the equations of motion on a rotating earth, pressure and temperature fields and their relations to atmospheric circulations, modern numerical methods in meteorology.

Mr. Myrup

122. Atmospheric Radiation. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 4C. Basic laws of radiation; properties of solar radiation; absorption, reflection and scattering in atmosphere; planetary albedo; absorption and emission by atmospheric gases and aerosols; atmospheric energy budget.

Mr. Coulson

123. Micrometeorology. (3) III.

Lecture—3 hours. Prerequisite: courses 120, 121, 122. Properties of the atmosphere near the

² Absent on leave, fall quarter 1969.

earth's surface: frictional effects, mass and energy transfers across the surface-atmosphere interface, and the effect of these in modifying the localized environment are the principal topics discussed.

Mr. Coulson

124. Meteorological Instruments and Observations.

(3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 20 or equivalent. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included.

Mr. Coulson

130. Atmospheric Turbulence. (3) III.

Lecture—3 hours. Prerequisite: course 121. Basic theory of atmospheric turbulence; observed characteristics of turbulence; eddy transports of mass, momentum, and thermal energy; effects of turbulence in diffusion processes in the atmosphere.

Mr. Myrup

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

Prerequisite: three upper division units in Atmospheric Science.

The Staff (Mr. 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.

The Staff (Mr. Coulson in charge)

Entomology

See Ecology (A Graduate Group), Page 215 for course offerings.

Park and Recreation Administration

Upper Division Courses

100. City and Regional Aesthetics. (3) I.

Lecture—3 hours. Recommended for non-majors. Perception of the environmental components of the city and region in concept and actuality. Influence of utopian ideas, analysis of existing solutions, and consideration of alternative approaches.

110. Introduction to City Planning. (4) II.

Lecture—4 hours. Recommended for non-majors. Studies of the physical, social and economic problems which have resulted in the evolution of city planning; major concepts and procedures used by city planners and local governments to improve the urban environment.

Mr. Cullers

134. Park and Recreation Area Planning. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Environmental Horticulture 1. Principles, standards, and procedures in planning

and design of areas for park recreation use. Offered in even-numbered years.

140. Park Administration. (3) III.

Lecture—3 hours. Prerequisite: consent of instructor. The acquisition, development, and management of parks, street tree plantings, and other landscaped areas.

Mr. McVicar

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: open only to majors who are honors students of senior standing. 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.

Mr. Harris

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

Prerequisite: consent of instructor.

Mr. Harris

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: 3 units of upper division work in park administration; consent of instructor.

Mr. Harris

Range Management

Lower Division Course

1. Introduction to Range Management. (4) II.

Lecture—3 hours; discussion—1 hour. Basic principles of range management and their relationships to the management of wildlands for livestock production, wildlife, water, recreation, and timber.

Mr. Laude

Upper Division Courses

100. Range Plants. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2. Systematic relationships and identification of range grasses; legumes, forbs, and shrubs; their distribution, environmental requirements, and use. One Saturday field trip.

Mr. Crampton

103. Grassland Inventory, Analysis and Planning.

(4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100; or consent of instructor. Sampling grasslands and other vegetational types to determine species composition, forage production and utilization, carrying capacity, and changes in the plant community. Range inventory analysis and planning range use. Offered in odd-numbered years.

Mr. Raguse

105. Field Course. (2) Extra-Session.

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.

Mr. Love

133. Grassland Ecology. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course in plant ecology; or consent of instructor. Composition, structure, development, and habitat factors of native North American grasslands. Concepts used in vegetative measurements. Principles of grassland management for forage production. Offered in even-numbered years. Mr. Raguse

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: open only to majors who are honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. The Staff

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

Prerequisite: consent of instructor. The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: senior standing and consent of instructor. The Staff

Graduate Courses**290. Seminar. (1-2) I, II, III.**

Seminar—1-2 hours.

Mr. Love

299. Research. (1-9) I, II, III.

The Staff

Renewable Natural Resources**Upper Division Courses****100. Concepts in Renewable Natural Resources.**

(3) I.

Lecture—3 hours. Prerequisite: junior standing or consent of instructor. Survey of renewable natural resources, interrelationships of climate, air, soil, water, plants, animals and their impact on society. Role of man in their management, preservation, and improvement for man's environment, his recreation, and the production of food and fiber.

101. Agriculture and Wildlife. (3) II.

Lecture—3 hours; one Saturday field trip. Prerequisite: upper division standing, or consent of instructor. A study of the central California Valley and the Delta region as an example of utilization for production agriculture and outdoor recreation—the conflicts and harmonies; lectures by distinguished biologists of the University, and the State Department of Fish and Game. Mr. Love

190. Proseminar in Renewable Natural Resources.

(1) I, II, III.

Seminar—1 hour. Prerequisite: senior standing in resource sciences curriculum. Selected topics in renewable natural resources. The Staff

[†] Additional Plant Science courses are listed under Plant Sciences, page 333.

198. Directed Group Study. (1-5) I, II, III. The Staff**Soil and Water Science, Plant Nutrition****Plant Science†****Upper Division Courses****116. Principles of Plant Nutrition. (5) III.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: Botany 111; Chemistry 5. 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; relation to animal nutrition; experimental techniques, including solution culture and radioactive tracing. Mr. Epstein

Soil Science**Upper Division Courses****105. Summer Field Course. (8) (Extra Session).**

Lecture—8 hours; field study—48 hours. Prerequisite: course 120B or consent of instructor. Field study of soils, *in situ*, with special emphasis on their characteristics, morphology, and genesis. Field exercises in classifying and mapping soils, and preparation of soil survey reports. Practice in identifying and evaluating soils for agricultural, range, forest, and other use.

Mr. Begg, Mr. Huntington

109. Soil Fertility and Fertilizers. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Soil and Water Science 2. The forms and availability of plant nutrient elements in soils; composition and use of fertilizers and soil amendments; laboratory exercises in fertility assays and their interpretation. Mr. Reisenauer

120A. Soil Genesis and Morphology. (2) II.

Lecture—2 hours. Prerequisite: Soil and Water Science 2; Geology 1 or 2. Basic principles of geomorphology; soil forming factors and processes as they influence the genesis and characteristics of soil properties. Mr. Harradine

120B. Soil Classification, Mapping, and Evaluation.

(3) III.

Lecture—2 hours; laboratory or field—3 hours. Prerequisite: course 120A. Basic principles underlying various systems of soil classification and mapping; methods of evaluating and rating soils for land use. Mr. Harradine

123. Chemistry of Arid Soils. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Chemistry 5; Soil and Water Science 102. Diagnostic procedures for assessing features of soil chemistry related to plant growth, with emphasis on soils of arid regions and problems of salinity. Theoretical basis of the procedures and its bearing on the interpretations of results.

Mr. Brown

144. Advanced Instrumentation in Biology. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. The application of electronic and mechanical devices to solution of problems of measurement and control in biological research; emphasis given to the synthesis and application of low current or low potential measurement equipment, vacuum techniques, optical processes, and electromagnetic transduction.

Mr. Delwiche

194H. Special Study for Honors Students.

(1–5) I, II, III.

Prerequisite: open only to majors who are honors students of senior standing. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis.

The Staff

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

Directed group study in soil science for advanced undergraduates.

The Staff

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff

Graduate Courses**207. Soil Physics. (3) III.**

Lecture—3 hours. Prerequisite: Soil and Water Science 101; Mathematics 22C recommended. Physical processes occurring in soils; selected topics in the soil-plant relationship.

208. Soil-Plant Interrelationships. (3) III.

Lecture—3 hours. Prerequisite: Botany 111; Soil and Water Science 104; or consent of instructor. An advanced course on the effects of soil factors on plant development; the influence of soil conditions, processes, and reactions on metabolic reactions in plants; effects of plant root activity on the nature of the rhizosphere.

Mr. Rendig

211. Soil Microbiology. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B; Soil and Water Science 102. Soil microorganisms and their biochemical activities; plant residue decomposition; soil organic matter and its properties. Mr. Broadbent

214. Soil Mineralogy. (5) I.

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Chemistry 109B or 110B; Soil and Water Science 102. Nature, properties, and occurrence of the more common minerals in soils and rocks. Application of mineral analysis methods in the study of the formation and properties of soils and of weathering of minerals. X-ray, thermal, and chemical analyses of mineral fractions.

Mr. Whittig

215. Physical Chemistry of Soils. (3) I.

Lecture—3 hours. Prerequisite: Chemistry 110C; Soil and Water Science 102. Physicochemical, colloidal, and surface aspects of the soil system. Offered in even-numbered years.

222. Salt-affected Soils. (3) II.

Lecture—3 hours. Prerequisite: Soil and Water Science 102, or consent of instructor. Scope of soil problems in salt-prone arid zone climates; origin and encroachment of salt; chemical interactions with alumino silicates under alkaline situations. Physiological characteristics of native and crop plant species governing salt tolerance and sensitivity.

Mr. Whittig

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: graduate standing in soil science, plant physiology, or related subjects. Topics of current interest in soil science, including research recently carried out by students, will be discussed. Each student will prepare and present reports to the seminar.

Mr. Delwiche

299. Research. (1–12) I, II, III.

The Staff

Soil and Water Science**Lower Division Courses****1. Soil, Water, and Air Resources. (3) I.**

Lecture—3 hours. Prerequisite: Biology 1 or consent of instructor. Interrelationships of man and environmental factors; utilization and development of renewable natural resources; characteristics of soil, water, and air and their relation to management and planning concepts. Open to non-majors.

Mr. D. Henderson

2. Soil, Water, and Air Resources. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 1, Biology 1; or consent of instructor. Physics 2A recommended. Development and properties of soils; source and properties of water; properties of the atmosphere; soil, water, and air management in relation to crop production; planning concepts related to agricultural development and production.

Mr. Munns

Upper Division Courses**101. Physics of Soil and Water Systems. (5) II.**

Lecture—3 hours; discussion and laboratory—4 hours. Prerequisite: course 2; Physics 2B; Mathematics 16B; or consent of instructor. Factors affecting soil physical condition and irrigation; soil texture, structure, aeration, and strength. Principles of soil management; basic concepts of hydraulics, soil water storage and movement, infiltration, water potential, irrigation and drainage. Principles of irrigation practices.

102. Soil and Water Chemistry. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Chemistry 5; course 2; or consent of instructor. Chemical nature of the mineral and organic constituents of soil and of the soil solution; ion exchange and other colloidal phenomena including the effect of soil amendments and fertilizers; microbiological processes in soils.

Mr. Bureau

103. Water Quality, Salt Control, and Reclamation. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 102 or consent of instructor. Water quality, water analysis, salinity, salt and plant relations, reclamation of water and soil, infiltration problems, and soil amendments.

Mr. Doneen

104. Soil-Water-Plant Relationships. (4) III.

Lecture—4 hours. Prerequisite: courses 101, 102; Botany 2. Influence of soil physical, chemical, and biological properties and of soil water supply on plant growth; availability, uptake, and use of nutrients and water by plants; principles of soil structure, irrigation, and fertilizer management for crop production. Mr. Hsiao

Water Science**Lower Division Course****10. Water and Man. (3) III.**

Lecture—3 hours. Water as a factor in civilization and man's environment. Water supply and utilization problems of agricultural, domestic, industrial, and other water users in developed and developing nations. A cultural and technical course providing an introduction to water science and engineering. Mr. Hagan

Upper Division Courses**106. Principles of Soil Water Movement. (3) I.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: Soil and Water Science 101 (may be taken concurrently or with consent of instructor). An introduction to basic mechanisms of soil water movement with emphasis on infiltration, evaporation, and redistribution within the soil profile. Laboratory measurements of the forces involved in soil water movement.

Mr. Nielsen

110A. Irrigation Principles and Practices. (3) II.

Lecture—3 hours. Prerequisite: Physics 2B. A general course for engineering and agricultural students. Principles for relating water, soil, plant and atmospheric conditions to irrigation planning and practices. Selecting lands for irrigation, water-soil-plant relations, irrigation requirements for principal crops, irrigation scheduling for maximum efficiency.

Mr. Henderson

110B. Irrigation Principles and Practices. (3) III.

Lecture—3 hours. Prerequisite: Physics 2B. A general course for engineering and agricultural students. Farm irrigation distribution systems, water measurement, farm water supply including wells and pumping plants, land preparation for irrigation, water application, and drainage requirements.

Mr. Henderson

116. Processes of Water and Soil Pollution. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: junior standing in the Resource Science Curriculum or consent of instructor. Physical, chemical and biological processes, natural and man-made, that cause pollution of water and soil; nature of pollutants, persistence, and control.

Mr. Biggar

118. Hydraulics. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 21C or 16C; Physics 2B and 2C. Principles of incompressible fluid mechanics and hydraulics. Applications to the analysis of water conveyance, control and measurement systems; laboratory practice on selected hydraulic problems.

Mr. Amorochio

120. Biological Aspects of Water Quality. (3) I.

Lecture — 3 hours. Prerequisite: Biology 1 and junior standing. The causes and nature of various types of pollution and their effects upon the river biota. Particular emphasis is given to the biological effects of toxic compounds, inorganic compounds, suspended matter, organic matter, salts and heated water on aquatic life.

Mr. Knight

140. Farm Drainage Systems. (2) III.

Lecture—2 hours. Prerequisite: Soil and Water Science 101. Drainage principles and methods including investigation of drainage problems, types of drainage systems and layout of farm drains, and drainage requirements for land reclamation and irrigated agriculture.

Mr. Luthin

141. Hydrology. (3) II.

Lecture—3 hours. Prerequisite: course 118 or Engineering 103A. Principles of hydrologic analysis including consideration of precipitation, stream flow and ground water phenomena.

Mr. Burgy

150. Water Rights and Irrigation Institutions. (3) I.

Lecture—3 hours. Water rights: kinds, acquirements, adjudication, administration, loss and evaluation. Irrigation enterprises: kinds, organization, financing, public regulation, operation, and usefulness under different conditions.

160. Water Application Systems. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: senior standing in Soil and Water Science or Civil Engineering, or consent of in-

structor. Design construction and operation of water-application systems (with emphasis on farm irrigation methods) and appurtenant structures. Preparation of land for irrigation. Problem solving and field and laboratory exercises.

Mr. Hart

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: open to majors in Soil and Water Science who are honors students of senior standing. Independent study of selected topics under direction of a member of the staff. Completion will involve writing of a paper.

The Staff

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

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: senior standing. The Staff

Graduate Courses

200. Water-Soil-Plant Relationships in Irrigation Programming. (3) III.

Lecture—3 hours. Prerequisite: Soil and Water Science 104, or consent of instructor. Selected topics including prediction of crop responses to irrigation, evapotranspiration and water requirements, production functions, strategy for using limited water supplies, and irrigation planning and operations for optimizing water use and crop production under conditions of developed and developing nations. Mr. Hagan

201. Water in Physiology and Biochemistry of Plants. (3) II.

Lecture—3 hours. Prerequisite: Botany 111; Chemistry 5. Recommended: Biochemistry 101B; Botany 120A and a course in physical chemistry. Solute-water interactions; water and the structure of biological macromolecules; cell-water relations; physiology and biophysics of water uptake, transport and dissipation by plants; physiology and biochemistry of stomata; water stress and plant metabolism. Mr. Hsiao

202. Evapotranspiration: Summer Course. (2).

Lecture—18 hours total; laboratory—9 hours total. Prerequisite: Agricultural Engineering 106. Analysis and prediction of evapotranspiration. Influence of climate, vegetative cover, and soil on crop water use. Field and laboratory techniques of measuring evaporation radiation, sensible heat fluxes, and determination of profiles of temperature, humidity, and wind.

Mr. Pruitt

215. Advanced Topics in Water Chemistry. (3) II.

Lecture—3 hours. Prerequisite: Soil and Water Science 102. Recommended: Chemistry 110C; Soil and Water Science 103. An advanced course in water chemistry emphasizing

principles governing interactions of ionic constituents in water with soils and plants. Topics include electro-kinetic properties of clays, diffusion mechanisms, hydrodynamic dispersion during leaching, and irreversible thermodynamics in soil-salt systems.

Mr. Biggar

215L. Advanced Topics in Water Chemistry Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 215 concurrently or consent of instructor. Laboratory techniques for studying the physical and chemical interactions of soil and water.

Mr. Biggar

250. Physics of Soil Water Movement. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 22C or consent of instructor. Recommended: course 106. 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.

Mr. Nielsen

290. Seminar. (1) II.

Seminar—1 hour. Required of all graduate students in Irrigation Science. Discussion of advanced problems in irrigation. Mr. Knight

298. Group Study. (1-9) I, II, III.

The Staff

299. Research. (1-9) I, II, III.

The Staff

Wildlife and Fisheries Biology

Upper Division Courses

108. Comparative Nutrition of Wildlife and Fish.

(4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B. The principles of nutrition and their application to feeding problems related to wild animals (ruminants and non-ruminants), birds and fish in their natural habitats and in captivity.

Mr. Weir

110A. Principles of Wildlife Management. (3) I.

Lecture—3 hours. Prerequisite: Zoology 2. History of game management; properties of game populations and their environment, principles of game populations control, wildlife husbandry methods, wildlife resource economics and aesthetics.

Mr. Schwab

110B. Principles of Fish Management. (3) II.

Lecture—3 hours. Prerequisite: Zoology 2. History of fish management; properties of fish populations and their environment; principles of fish population control; fish husbandry methods; fish resource economics and aesthetics. Primary emphasis upon fish of inland waters.

Mr. Calhoun

110C. Field Studies in Wildlife and Fish Management. (3) III.

Laboratory—9 hours. Prerequisite: courses 110A, 110B, or consent of instructor. A traveling field study program into the various key wildlife resource areas of the state managed under County, State, Federal and private jurisdiction.

The Staff

115. Wildlife and Fisheries Law. (2) II.

Lecture—2 hours. Prerequisite: courses 110A, 110B, or consent of instructor. The interpretation of laws, rules, treaties, agreements and regulations of State, Federal and International origin which pertain to wildlife and fisheries.

The Staff

RHETORIC**James J. Murphy, Ph.D., Chairman of the Department**

Department Office, 207 North Hall

Professor:

James J. Murphy, Ph.D.

Associate Professors:

Gerald P. Mohrmann, Ph.D.

Ralph S. Pomeroy, Ph.D.

Assistant Professor:

Harry W. Sharp, Jr., Ph.D.

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Assistant Professors:Gary G. Collier, M.A. (*Acting*)Michael C. Leff, M.A. (*Acting*)**Lecturer:**

John L. Vohs, M.A.

The Major Program

Departmental Advisers.—Mr. Collier, Mr. Mohrmann, Mr. Murphy, Mr. Sharp, and Mr. Vohs.

Lower Division Courses.—Required are courses 1A, 3, 15. Recommended: courses in classical languages.

Upper Division Courses.—Thirty-six units in rhetoric, including: (1) courses 110, 120 in the first quarter of upper division work; (2) at least one additional course from each of the following series: 110, 120, and 150; (3) course 190 in the senior year.

Required courses outside the Department of Rhetoric.—A coherent program of twelve quarter units selected in consultation with the Departmental adviser from appropriate courses outside the Department of Rhetoric. This program will ordinarily be chosen from a designated set of courses related to one of the four course series in the Department of Rhetoric (Series 110, 120, 150, or 160).

151. Wildlife in Land Use. (3) II.

Lecture—3 hours. Prerequisite: Biology 1 or a course in natural history. Wildlife and plant protection; population dynamics of vertebrates under various types of land use; applications of ecological principles to resource management-wildlife conflicts.

Mr. Howard

151L. Wildlife Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 151 which should be taken concurrently. Field trips, demonstrations and discussions of wildlife control problems and operations. Mr. Howard

The Department will certify completion of a major program only on the basis of at least a C average in the upper division courses taken in the Department.

Teaching Major.—Same as major.

Teaching Minor.—Thirty quarter units, including Rhetoric 1A, 3, 15, 41, and eighteen upper division units including either course 110 or 120.

Optional Minor.—Twenty or more quarter units, at least one course from each of the following sets:

- a. Lower division (Rhetoric 1A, 3, 15, 41).
- b. History of rhetorical theory (Rhetoric 110, 111, 112, 113).
- c. History of public speaking (Rhetoric 120, 121, 122, 123, 125).
- d. Rhetorical theory (Rhetoric 150, 151, 152, 153).

Lower Division Courses**1A. Introduction to Public Speaking. (4) I, II, III.**

Lecture—4 hours. Practice in the preparation and delivery of speeches with an introduction to rhetorical theory and criticism as applied to public address.

The Staff

2. Oral Interpretation. (4) I, II, III.

Lecture—4 hours. Theory and practice in the oral reading of literature.

The Staff

3. Group Communication. (4) I, II, III.

Lecture—4 hours. Prerequisite: consent of instructor or course 1A. Study of the rhetorical process in informal situations. Topics include interaction, leadership techniques, and decision making in groups. Regular participation in discussions.

Mr. Vohs

15. Introduction to Rhetorical Studies. (4) III.

Lecture—4 hours. Illustration of various means available for the study of oral communication processes. Survey of the rhetorical tradition leading to exercises in rhetorical criticism and audience analysis, with extensive use of television and small-group methods. Mr. Murphy

38. Directed Group Study. (1–2) I, II, III.

Lecture—1 hour; discussion—1 hour.

The Staff

39. Special Study for Undergraduates.

(1–2) I, II, III.

Prerequisite: consent of instructor. The Staff

41. Introduction to Advocacy. (4) I, II.

Lecture—4 hours. Introduction to the rhetoric of controversy, with emphasis upon the nature of public debate, the analysis of issues, and the logical presentation of evidence in support of arguments. Provision for practice in intercollegiate debate.

Mr. Sharp

Upper Division Courses**110. Classical Rhetorical Theory. (4) I.**

Lecture—4 hours. Origins of Greek and Roman rhetorical theory, with emphasis upon the contributions of Isocrates, Plato, Aristotle, Cicero, and Quintilian.

Mr. 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.

Mr. Murphy

112. Early Modern Rhetorical Theory. (4) III.

Lecture—4 hours. English and continental theories of rhetoric to 1900, with reference to developments in psychology, philosophy, and belles lettres. Emphasis upon the works of Ward, Priestley, Campbell, Blair, and Whately.

Mr. Pomeroy

113. Contemporary Rhetorical Theory. (4) I.

Lecture—4 hours. Current approaches to rhetorical theory, from the James-Winans theory of attention to the Hovland, Janis, Kelley studies of persuasion.

Mr. Sharp

120. Classical Public Address. (4) I.

Lecture—4 hours. Public address as a force in the development of Greek and Roman civilizations, with special attention to Demosthenes, the Attic Orators, and Cicero.

Mr. Leff

121. British Public Address to 1914. (4) II.

Lecture—4 hours. British public address in the eighteenth and nineteenth centuries, with

special attention to the parliamentary speaking of Burke, Fox, Pitt, Crattan, Peel, Disraeli, and Gladstone.

Mr. Pomeroy

122. American Public Address from Edwards to Lincoln. (4) II.

Lecture—4 hours. A survey of major speakers from the colonial period to the era of the Civil War.

Mr. Mohrmann

123. American Public Address from Grady to Wilson. (4) III.

Lecture—4 hours. A survey of major speakers from the Reconstruction Period to the founding of the League of Nations.

Mr. Mohrmann

125. Contemporary Public Address. (4) III.

Lecture—4 hours. Public address in the twentieth century, with special attention to the speeches of Churchill, Roosevelt, Hitler, and Ghandi.

Mr. Sharp

150. Modes of Discourse. (4) III.

Lecture—4 hours. Examination of elements of the communication process, including sources, messages, media, and receivers. Study of the role of these elements as they are influenced by various communicative situations.

Mr. Vohs

151. Methods of Advocacy. (4) I.

Lecture—4 hours. Study of problems inherent in securing acceptance of ideas; consideration of logical and nonlogical means of persuasion.

Mr. Pomeroy

152. Study of a Major Rhetorician. (4) II.

Lecture—4 hours. Prerequisite: consent of instructor. Intensive study of a major theorist, such as Aristotle, Cicero, Whately, or Toulmin, with emphasis upon the relation of his theory to the cultural environment of his time.

Mr. Murphy

153. Empirical Studies in Rhetoric. (4) I.

Lecture—4 hours. Prerequisite: consent of instructor. Consideration of contributions derived from sociometric and psychometric approaches to analysis of rhetorical process.

Mr. Vohs

154. Forensics Laboratory. (1) I, II, III.

Laboratory—2 hours. Prerequisite: consent of instructor. Practice in the principles of forensics, including argumentation and debate. Inter-collegiate and tournament forensics. May be repeated for credit up to a total of six units.

Mr. Sharp

160. Rhetorical Criticism. (4) I.

Lecture—4 hours. Prerequisite: course 15; or consent of instructor. Methods of evaluating public address, with emphasis on such factors as structure, language, and effectiveness.

Mr. Mohrmann

* Not to be given, 1969–70.

190. Senior Proseminar. (4) II, III.

Lecture—2 hours; seminar—2 hours. Prerequisite: required of majors with senior standing. Individual research on a rhetorical topic approved by a committee of the faculty.

The Staff

RUSSIAN

Department Office, 416 Sproul Hall

Associate Professors:

Alex M. Shane, Ph.D.

²Valerie A. Tumins, Ph.D.

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*Assistant Professors:*James P. Apostolos, M.A. (*Acting*)Rodney L. Patterson, M.A. (*Acting*)*Departmental Major Adviser.*—Mr. Shane.*Graduate Adviser.*—Miss Tumins.*The Major Program*

The requirements are Russian 1 through 6 (or the equivalent); Russian 40, 41, 42, and a minimum of 36 units of upper division course work including Russian 101A, 101B, 101C, 102 or 103, and 190.

Honors and Honors Program (see page 133).

The honors program comprises two quarters of study under course 194H, which will include a research paper.

The Master of Arts Degree

The Department offers two programs of study (one with emphasis on language and culture, the other with emphasis on literature) leading to the M.A. degree. Detailed information may be obtained by writing to the Graduate Adviser.

Teaching Major.—Requirements for the teaching major are the same as those for the departmental major with the addition of course 300.

Teaching Minor.—Six quarter courses in the lower division or their equivalents. Usually these will consist of Russian 1, 2, 3, 4, 5, 6. A total of 20 upper division units is required, including courses 101A, 101B, 101C.

Subject Representative: Mr. Shane.**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. Students enrolling in a course just preceding normal placement will receive only partial credit. Contact

² Absent on leave, fall quarter 1969.**198. Directed Group Study. (1–4) I, II, III.**

Prerequisite: consent of instructor

The Staff

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

The Staff

Graduate Course

299. Individual Study. (1–12) I, II, III.

The Staff

the Dean's Office, College of Letters and Science, for further information.

1. Elementary Russian. (5) I.

Recitation—5 hours; supplementary language laboratory practice. Mr. Patterson

2. Elementary Russian. (5) II.

Recitation—5 hours; supplementary language laboratory practice. Prerequisite: course 1. The Staff

3. Elementary Russian. (5) III.

Recitation—5 hours; supplementary language laboratory practice. Prerequisite: course 2. Mr. Apostolos

4. Intermediate Russian. (5) I.

Recitation—5 hours. Prerequisite: course 3. Grammar review based on a selected literary text and conversational practice with everyday topics and situations. Mr. Apostolos

5. Intermediate Russian. (5) II.

Recitation—5 hours. Prerequisite: course 4. Composition, grammar review, and conversation on literary texts and everyday topics and situations. Mr. Patterson

6. Intermediate Russian. (5) III.

Recitation—5 hours. Prerequisite: course 5. Composition, grammar review, and conversation on literary texts and everyday topics and situations. Mr. Apostolos

30. Great Russian Writers. (3) I.

Lecture—3 hours. Knowledge of Russian not required. An introduction to the important prose and dramatic works of such writers as Gogol, Turgenev, Dostoevsky, Tolstoy, Chekhov, Sholokhov, and Pasternak. Offered in even-numbered years. Mr. Apostolos

40. Survey of Russian Literature to 1800. (4) II.

Lecture—3 hours. Knowledge of Russian not required. An introduction to the philosophic, historic, and stylistic elements of Russian literature from the earliest period up to Russian Sentimentalism with a discussion of the major writings and major literary figures. Offered in odd-numbered years. Miss Tumins

41. Survey of Russian Literature: Nineteenth Century. (4) I.

Lecture—3 hours. Knowledge of Russian not required. An introduction to the dominant literary trends, the major literary figures and landmarks of Russian prose and poetry from the period of Sentimentalism through Romanticism and Realism to the beginnings of Modernism. Offered in odd-numbered years. Mr. Apostolos

42. Survey of Russian Literature: Twentieth Century. (4) II.

Lecture—3 hours. Knowledge of Russian not required. An introduction to major literary trends such as Symbolism, Acmeism, Futurism, Neorealism, and Socialist Realism. Readings from representative writers such as Gorky, Bely, Pasternak, Solzhenitsyn, and Tertz. Offered in even-numbered years. Mr. Patterson

***1G. Russian for Graduate Students. No Credit. II.**

Lecture—3 hours. A course designed to prepare students for the graduate reading examination.

Upper Division Courses

101A. Advanced Grammar and Reading. (4) I.

Recitation—3 hours. Prerequisite: course 6. The study of advanced grammar with reading and discussion of literary and cultural texts.

Mr. Marvan

101B. Advanced Grammar and Reading. (4) II.

Recitation—3 hours. Prerequisite: course 6. The study of advanced grammar with reading and discussion of literary and cultural texts.

Mr. Apostolos

101C. Advanced Grammar and Reading. (4) III.

Recitation—3 hours. Prerequisite: course 6. The study of advanced grammar with reading and discussion of literary and cultural texts.

Mr. Marvan

102. Russian Composition. (4) II.

Recitation—3 hours. Prerequisite: course 6. Offered in even-numbered years.

103. Literary Translation. (4) II.

Discussion—3 hours. Prerequisite: course 6. Translation of Russian literary texts into stylistically equivalent idiomatic English. Offered in odd-numbered years.

Mr. Shane

105. Advanced Russian Conversation. (2) III.

Conversation—2 hours. Prerequisite: course 6. Intensive conversational practice and discussion based on current events and contemporary texts. May be repeated for credit. The Staff

121. The Nineteenth-Century Russian Novel. (4) II.

Lecture—3 hours. Knowledge of Russian not required. The origin and development of the novelistic tradition beginning with Pushkin,

Lermontov, Gogol, and continuing with such writers as Goncharov, Turgenev, and Saltykov (excluding Tolstoy and Dostoevsky). Offered in even-numbered years. Mr. Apostolos

123. The Twentieth-Century Russian Novel. (4) II.

Lecture—3 hours. Knowledge of Russian not required. The examination of various trends including Critical Realism, Symbolism, Neorealism, and Socialist Realism in the development of the novel. Readings from such writers as Gorky, Zhamiatin, Sholokhov, and Pasternak. Offered in odd-numbered years. Mr. Shane

125. Russian Drama to 1917. (4) III.

Lecture—3 hours. Prerequisite: course 6. The rise and development of Russian drama. Reading and analysis of Fonvizin and nineteenth-century dramatic works by authors such as Griboedov, Pushkin, Ostrovsky, A. K. Tolstoy, Leo Tolstoy, Chekhov, and Gorky. Offered in odd-numbered years. Miss Tumins

127. The Golden Age of Russian Poetry. (4) III.

Lecture—3 hours. Prerequisite: course 101A. A study of Russian versification, the historical background to the Golden Age, and readings from Derzhavin, Batishkov, Gnedich, Pushkin, Delvig, Baratynsky, Lermontov, and other poets of the first half of the nineteenth century. Offered in even-numbered years. Mr. Patterson

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. Mr. Patterson

140. Dostoevsky. (4) I.

Lecture—3 hours. Knowledge of Russian not required. Reading and analysis of Dostoevsky's principal works such as *Crime and Punishment*, *The Idiot*, *The Brothers Karamazov*, and *The Diary*. Study of social and political views as reflected in Dostoevsky's works. Offered in even-numbered years. Miss Tumins

141. Tolstoy. (4) I.

Lecture—3 hours. Knowledge of Russian not required. A 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.

Mr. Patterson

190. Senior Proseminar. (4) III.

Group conference and assigned reading in preparation for graduate study. Mr. Patterson

* Not to be given, 1969-70.

192. Research Essay. (2) I, II, III.

Prerequisite: concurrent enrollment or previous completion of a course in Russian literature. A research essay, based on primary and secondary sources, dealing in depth with a topic arising from or related to the prerequisite literature course. May be repeated for credit.

The Staff

194H. Special Study for Honors Students.

(5) I, II, III.

Prerequisite: open only to honor students. Guided research leading to an honors paper.

The Staff

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**200. Old Church Slavic. (4) I.**

Lecture—3 hours. Morphology and syntax of Old Church Slavic. Mr. Marvan

***201. Reading in Old Church Slavic. (4) II.**

Discussion—3 hours. Prerequisite: course 200. Reading and linguistic analysis of Old Church Slavic texts. Miss Tumins

202. Descriptive Russian Grammar. (4) II.

Lecture—3 hours. An introduction to modern Russian phonology and morphology. Mr. Marvan

210A. Style and Syntax. (4) I.

Discussion—3 hours. An examination of stylistic differences between spoken and written Russian

210B. Style and Syntax. (4) II.

Discussion—3 hours. Prerequisite: course 210A. An examination of stylistic differences between spoken and written Russian. Mr. Marvan

210C. Style and Syntax. (4) III.

Discussion—3 hours. Prerequisite: course 210B. An examination of stylistic differentiation between spoken and written Russian. Miss Tumins

***220. Old Russian Literature. (4) III.**

Seminar—3 hours. Prerequisite: course 201.

RUSSIAN HISTORY AND LITERATUREValerie A. Tumins, Ph.D., *Chairman of the Committee*

Department Office, 404 Sproul Hall

Committee in Charge:

C. Bickford O'Brien, Ph.D. (*History*)
 Andrzej Brzeski, Ph.D. (*Economics*)
 Valerie A. Tumins, Ph.D. (*Russian*)

* Not to be given, 1969-70.

Advanced study of intellectual movements and literary styles of works such as "The Song of Igor's Campaign," "Zadonshchina," Epifany's "Lives," Ivan IV's cycle of epistles. May be repeated for credit. Miss Tumins

221. Eighteenth Century Russian Literature.

(4) III.

Seminar—3 hours. Advanced study of literary movements and styles in prose or poetry. The works of writers such as Kantemir, Lomonosov, Sumarokov, Radishchev and Karamzin will be analyzed. May be repeated for credit.

Miss Tumins

***222. Nineteenth Century Russian Literature. (4) I.**

Seminar—3 hours. Advanced study in literary movement such as Romanticism, Naturalism, and Realism, or of a major writer such as Pushkin, Gogol, Dostoevsky, or Tolstoy. May be repeated for credit.

Mr. Shane, Miss Tumins, Mr. Patterson

***223. Early Twentieth Century Russian Literature.**

(4) I.

Seminar—3 hours. Reading and analysis of the achievements selected from the literary renaissance beginning with the Russian Symbolists and continued by such diverse groups as the Acmeists, the Futurists and the Serapion Brotherhood. May be repeated for credit.

Mr. Shane

***224. Soviet Russian Literature. (4) II.**

Seminar—3 hours. Analysis of selected works of Russian prose and poetry with particular emphasis on works of extraordinary literary merit or of unusual importance in the development of genres, schools, styles, techniques, and various formal elements. May be repeated for credit.

Mr. Shane

299. Research. (1-9) I, II, III.

The Staff

Professional Course***300. The 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.

The Staff

This major is designed to give the student a better understanding of Russian 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 His-

tory, 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

4A-4B-4C. History of Western Civilization. (4)

A minimum of 12 units from the following courses:

102H. Proseminar in Russian History. (4)

137A. Russian History: Kievan and Muscovite Russia. (4)

137B. Russian History: The Empire to 1856. (4)

137C. Russian History: The Empire, 1856-1914. (4)

137D. Russian History: Soviet Russia. (4)

A minimum of 8 units in another field of history (preferably Europe or East Asia).

Russian

1-2-3. Elementary Russian. (5)

4-5-6. Intermediate Russian. (5)

40. Survey of Russian Literature to 1800. (4)

41. Survey of Russian Literature: Nineteenth Century. (4)

42. Survey of Russian Literature: Twentieth Century. (4)

A minimum of 12 units from the following courses:

101A-101B-101C. Advanced Grammar, Composition, and Conversation. (4)

102. Russian Composition. (4)

103. Russian Literary Translation. (4)

A minimum of 8 units from the following courses:

121. The Russian Novel: Pushkin to Turgenev. (4)

123. The Russian Novel: Saltykov to Pasternak. (4)

125. Russian Drama of the Nineteenth Century. (4)

127. The Golden Age of Russian Poetry. (4)

128. Modern Russian Poets. (4)

140. Dostoevsky (4)

141. Tolstoy. (4)

SANSKRIT—See Classics

SOCIOLOGY

¹Bennett M. Berger, Ph.D., *Chairman of the Department*

Department Office, 308 Voorhies Hall

Professors:

¹Bennett M. Berger, Ph.D.
Cesar Graña, Ph.D.
Edwin M. Lemert, Ph. D.
Julius Roth, Ph.D.

Associate Professors:

Guenther Roth, Ph.D.
John F. Scott, Ph.D.

Assistant Professors:

Bruce Hackett, Ph.D.
¹J. Rolf Kjolseth, Ph.D.
Robert H. Maisel, Ph.D.
James McEvoy, Ph.D.
Abraham M. Miller, Ph.D.
Joseph Zelan, Ph.D.

Assistant Professor:

Isao Fujimoto, M.A. (*Acting; Sociology and Applied Behavioral Sciences*)

Lecturer:

Arthur Lipow, M.A.

Departmental Major Advisers.—(a) Undergraduate: Mr. J. Roth, Mr. Scott, (b) Pre-Social Welfare: Mr. Zelan, (c) Graduate: Mr. Berger, Mr. Hackett, Mr. Lemert, Mr. Maisel.

The Major Program

Lower Division Courses.—Required: Sociology 1, 2, 12, 46A, 46B, and 46C or their equivalent; 8 units selected from Anthropology 2, Economics 1A, 1B, and Psychology 1A, 1B and 1C. Recommended: Anthropology 1 and Philosophy 12A, 12B, 20A-20B-20C.

¹ Absent on leave, 1969-70.

Upper Division Courses.—Required: 36 units of Sociology including 165A, 165B and 165C. Recommended: Anthropology 102, 119A, 119B, 124, 128A, 128B; History 101A, 101B; Philosophy 107C, 151, 156; Political Science 150, 161; Psychology 145; Mathematics 105A, 105B.

Pre-Social Welfare Students

Lower Division Courses.—Required: Sociology 1, 3, 46A, 46B, 46C, or their equivalent, and Psychology 1A, 1B and 1C. Recommended: Anthropology 2, Sociology 2, Economics 1A, 1B, Philosophy 12A-12B, Political Science 1A, 1B.

Upper Division Courses.—Required: Sociology 120, 165A or 165B or 165C, 185, and Psychology 112, 147A, 147B, 165, 168; 8 additional units selected from Sociology 130, 131, 140, 150, 152, 170; Psychology 145. Recommended: Anthropology 119A, 119B, 128A, 128B; Economics 116, 130A, 130B, 150A, 150B; Family and Consumer Sciences 136, 138A, 138B; Political Science 103, 104, 181.

Graduate Study.—The Department offers a program of study leading to the M.A. and Ph.D. degrees in sociology. Further information regarding graduate study may be obtained at the department office.

Teaching Major.—Requirements for the teaching major are the same as for the departmental degree plus Sociology 122 or 124, 130 and 140.

Teaching Minor.—Thirty units of sociology taken in consultation with the subject representative.

Subject Representative: Mr. J. Roth.

Lower Division Courses

1. Introduction to Sociology. (4) I, II, III.

Lecture—3 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.

2. Introduction to Sociology: Social Organization. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. A study of social organization and institutions, with attention to the application of concepts and related research findings.

3. Social Problems. (4) I, III.

Lecture—3 hours; discussion—1 hour. A general sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement.

12. Introduction to Sociological Theory. (4) III.

Lecture—4 hours. An introduction to classic texts and problems in the tradition of sociological inquiry. Representative works of important

figures, such as Marx, Comte, Weber, and Durkheim; the relevance of these materials for contemporary sociology.

Mr. Maisel

25. Sociology of Popular Culture. (4) II.

Lecture—4 hours. The historical emergence of popular culture, "High" culture, "folk" culture and "mass" culture; the democratization of culture values; the organization of popular tastes; characteristic art forms of popular culture; literature, music, the graphic arts. The social structure of audiences.

Mr. Graña

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

Prerequisite: consent of instructor. The Staff

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

Prerequisite: consent of instructor. The Staff

46A. Introduction to Social Research. (4) I.

Lecture—4 hours. Prerequisite: 8 units of Sociology. Examination of the methodological problems of social research. Selection and definition of problems of investigation, data-gathering techniques, and sampling.

46B. Introduction to Social Research. (4) II.

Lecture—4 hours. Prerequisite: course 46A. Data-analysis techniques, measurement, scaling, multivariate analysis, and quantitative measures of association.

46C. Introduction to Social Research. (4) III.

Lecture—4 hours. Prerequisite: course 46B. An introduction to the statistical analysis of social data, emphasizing the logic and use of statistical measures and procedures especially relevant to sociological analysis.

Upper Division Courses

104. Empirical Social Research and Social Theory. (4) III.

Lecture—4 hours. Prerequisite: upper division standing and 8 units of sociology, or consent of instructor. An examination of important works in sociology, in the light of the ways in which theory informs and shapes actual research operations, and the ways in which the results of empirical research mold social theory. Mr. Zelan

105A-105B-105C. Survey Research. (5-5-5) I-II-III.

Lecture—4 hours; laboratory—3 hours. Prerequisite: one course in sociological research methods or Mathematics 13 or 15 or 30. Study design, drawing a sample from the city of Sacramento, and analysis of the data collected. Provides an introduction to survey methods, non-experimental research, and data collection and analysis.

Mr. McEvoy

106. Quantitative Methods of Research. (4) II.

Lecture—4 hours. Prerequisite: course 46C or equivalent. Logical and technical features of multiple and partial correlation and regression analysis. Scaling theory and factor analysis. Introduction to mathematical models in sociology.

107. Modes of Sociological Analysis. (4) I.

Lecture—4 hours. Prerequisite: junior or senior standing and 9 units of sociology. The place of sociology among the sciences and the humanities; generalization and explanation in sociology. Styles of sociological inquiry, functional analysis, historical sociology, social criticism.

Mr. Berger

108. Advanced General Sociology. (4) III.

Lecture—4 hours. Prerequisite: junior or senior standing and 9 units of sociology. Critical analysis of basic concepts in sociology: social organization, culture, socialization, stratification, and their application to specific problems. The bearing of such analysis on problems of social order and social change.

Mr. Berger

118. Political Sociology. (4) II.

Lecture—4 hours. Prerequisite: course 1; or consent of instructor. The relation of social cleavages and social cohesion to the functioning of political institutions; the social bases of local and national power structures; social sources of political movements; analysis of concepts of alienation, revolution, ideology, ruling class, and elite.

Mr. G. Roth

120. Deviation and Society. (5) I.

Lecture—4 hours. Prerequisite: course 2. Theory and studies of deviation in relation to societal reaction, group processes and social roles. Stigma and incapacity; cosmetic defect. Deviation theory applied to selected crimes, prostitution, drugs, alcohol use, and mental disorders. Creativity and society.

Mr. Lemert

122. Sociology of Adolescence. (4) III.

Lecture—4 hours. Prerequisite: 8 units of sociology. Chronological age and social status; analysis of social processes bearing upon the socialization of children and adolescents. The emergence of "youth cultures." Generational succession as a cultural problem.

123. American Society. (4) III.

Lecture—4 hours. Prerequisite: 8 units of social science; or consent of instructor. The institutional structure and social organization of the United States.

124. Sociology of Educational Institutions. (4) II.

Lecture—4 hours. Prerequisite: 4 units of sociology. Public schools as arenas of intergroup conflict and as instruments of social mobility. The meaning of local autonomy in the context of prevailing arrangements for certification and

public support. The relevance of public education to the ethos and mythos of American society.

Mr. Scott

125. Sociology of Intellectual Life. (4) I.

Lecture—4 hours. Prerequisite: upper division standing and consent of instructor. Sociological analysis of the intelligentsia; types of intellectuals, theories concerning their social role; research on the social sources of intellectual work in politics, literature, art, and science; historical considerations of intellectual milieu; international comparisons of intellectuals.

Mr. Graña

126. Social Structure and Personality. (4) I.

Lecture—4 hours. Prerequisite: course 2. Expression of concepts, theories, and research relating the disciplines of sociology and psychology. Mechanisms of social influence on behavior. Complementarity of personality and learned roles; processes of internalization of roles and norms.

130. Race Relations and Minority Groups. (4) I, III.

Lecture—4 hours. Prerequisite: 8 units of social science; or consent of instructor. A study of contacts and interaction between racial and ethnic groups; sources and effects of prejudice and discrimination; programs for reducing intergroup tensions.

131. The Family. (5) I.

Lecture—4 hours. Prerequisite: course 2. Social implications of primate reproductive physiology; the nuclear family; major familial roles; normative controls on sex and reproduction; inheritance groups; status ascription; the family and stratification; marital selection; relations between the family and industrial social change.

Mr. Scott

140. Social Stratification. (4) III.

Lecture—4 hours. Prerequisite: course 1. Systems of social ranking; theories of stratification; power, prestige, culture, and styles of life of various social classes; social mobility and its consequences for social structure.

Mr. Hackett

141. Industrialization and Social Change. (4) II.

Lecture—4 hours. Prerequisite: 4 units of sociology. The interrelations between technological and social change, the social conditions of economic development, and the social implications of automation in highly industrialized countries.

Mr. G. Roth

142. Comparative Institutions and Social Structures. (4) I.

Lecture—4 hours. Prerequisite: 8 units of sociology. The central institutions and cultural legacies of the principal complex societies. Western nations will be compared with the USSR and newly developing states with respect to their patterns of institutional persistence and change.

Mr. G. Roth

143. Urban Society. (4) I.

Lecture—4 hours. Prerequisite: 8 units of sociology. Urbanization as a social process; comparison of urban, suburban, metropolitan and rural phenomena; types of cities; the subcultures of cities; the urban future. Mr. Hackett

144. Rural Society. (4) II.

Lecture—4 hours. The characteristics of rural social systems in contrast to urban; the nature of peasant and folk societies; the impact of social change upon rural community life considered from the standpoint of regional differences in the United States and selected world areas. Mr. Fujimoto

145. Social Structure of the U.S.S.R. (4) II.

Lecture—4 hours. A survey of the major institutions of Soviet society, including the family, education, work, health and welfare, the arts, ethnic and national groups. Mr. Zelan

146. Sociology of Religion. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology; or consent of instructor. The relationship between social structure and religious life. Social class, political behavior, and religious affiliation. The passage from "sacred" to "secular" ways of life. Religion and social change in advanced societies. Churches as social organizations. "Established" churches and religious "cults." Mr. Graña

148. Collective Dynamics and Social Movements.

(4) III.

Lecture—4 hours. Prerequisite: course 1; or consent of instructor. Non-institutionalized forms of group behavior; social contagions, fashion movements, public opinion formation, reform and revolutionary movements. Their relations to social change in mass societies.

150. Criminology. (4) III.

Lecture—4 hours. Prerequisite: 8 units of social science; or consent of instructor. The sociological analysis of criminal behavior in relation to social structure and the criminalization process.

152. Juvenile Delinquency. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology or psychology. Study of juvenile delinquency in relation to the family, peer groups, community, and institutional structures. Consideration of processing of the delinquent by formal agencies of control, with special attention given to the juvenile court. Mr. Lemert

154. Sociology of Medicine. (4) I.

Lecture—4 hours. Prerequisite: 4 units of sociology. An overview of sociological research in medicine and health care, with emphasis on the organizational and institutional aspects. Mr. J. Roth

155. Sociology of Law. (4) III.

Lecture—4 hours. Prerequisite: 8 units of social science. Law considered as social control; relation of legal institutions to society as affecting judicial decision-making and administration of justice. Lawyers as an occupational group. Legal reform. Mr. Lemert

159. Sociology of Occupations. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology or consent of instructor. The natural history of occupations; the institutional matrix of occupations; colleague and client relationships; occupational social controls; career lines, and occupational-related self-definitions; occupational politics. Mr. J. Roth

160. Work and Leisure. (4) II.

Lecture—4 hours. Prerequisite: course 1. Historical and comparative analysis of problems associated with quality of work and quantity of leisure; impact of cultural and social change on occupational pattern and leisure activity. Mr. Berger

165A. Sociological Theory. (4) I.

Lecture—4 hours. Prerequisite: 8 units of sociology. Major sociological theorists of the nineteenth century. Conservative, liberal, and radical traditions of sociological thought. Thinkers discussed include Comte, Saint-Simon, Marx, Spencer, and Toennies.

165B. Sociological Theory. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology. Sociological theorists of the late nineteenth and early twentieth centuries. Theorists discussed include Weber, Durkheim, Pareto, and Simmel.

165C. Sociological Theory. (4) III.

Lecture—4 hours. Prerequisite: 8 units of sociology. The development of the American sociological tradition, with emphasis on major contemporary theorists. Theorists discussed include Mead, Cooley, Park, Merton, and Parsons.

170. Population. (4) I.

Lecture—4 hours. Prerequisite: 8 units of social science; or consent of instructor. Introduction to the study of human population, including theories and statistical measures; social causes and consequences of population trends; changes in population structure; geographical distribution; migration; socio-psychological factors affecting fertility. Mr. Scott

172. Art and the Egalitarian Society. (4) III.

Lecture—4 hours. Art as a product of aristocratic societies. Democratization of aristocratic traditions in contemporary society. Museums and collectors; the preservation of aristocratic art in capitalist and socialist societies. Industrial money and preindustrial tastes. Can there be a democratic art? Mr. Graña

173. Sociology through Literature. (4) II.

Lecture—4 hours. Prerequisite: 4 units of sociology. Introduction to analysis of literature as sociological data. Reading of numerous works on American and other societies by authors such as Steinbeck, Lewis, Dreiser, Schulberg, Orwell, etc.

Mr. McEvoy

174. Sociology of Language. (4) III.

Lecture—4 hours. Prerequisite: 6 units of sociology. The relation of language patterns to social patterns; "talk" as a multi-level social phenomenon; relationship of dialects to social groups; sociological analyses of stability and change in language; problems of learning and unlearning languages.

Mr. Kjolseth

175. Sociology of Communication. (4) I.

Lecture—4 hours. Prerequisite: course 46A, 46B, 46C. Studies of mass communications, media and public opinion; theories of information flow, ideology, group and personal influence on opinion formation.

Mr. McEvoy

176. Sociology of Knowledge. (4) III.

Lecture—4 hours. A 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. The sociology of personal knowledge in everyday life.

Mr. Kjolseth

180. Complex Social Organization. (4) II.

Lecture—4 hours. Prerequisite: course 1; or consent of instructor. Institutional analysis of administrative structures and voluntary associations; consideration of informal organization, ideologies, bureaucracy, decision-making, and morale in selected areas of government, industry, religion, and education.

Mr. Hackett

185. Sociology of Social Welfare. (4) I.

Lecture—4 hours. Prerequisite: course 3 and upper division standing. A sociological analysis of the evolution and current organization of welfare functions in modern societies.

Mr. Zelan

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

Prerequisite: consent of instructor. The Staff

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

Prerequisite: open to seniors only. The Staff

Graduate Courses**205. Methodological Critique of Research. (4) III.**

Lecture and discussion—3 hours. Prerequisite: course 46C; or consent of instructor. Methodological analysis and criticism of empirical research exemplifying different types of research design. Examination of surveys, experiments, historical and comparative studies, and studies using biographical and demographic data.

207. Methods of Survey Analysis. (4) I.

Lecture—3 hours. Principles and procedures in the analysis of survey data. Forms of multivariate relations; typologies; scaling; panel analysis; contextual analysis.

Mr. Zelan

219A-219B. Behavioral Political Sociology. (4-4) I-II.

Seminar—4 hours. Prerequisite: graduate status in sociology, political science or psychology. The development of behavioral and empirical political sociology; study of conflict, discontent, community politics, the international system, game theory and coalition formation. Empirically grounded theories.

Mr. McEvoy

220. Deviance, Law, and Social Control. (4) I.

Seminar—3 hours. Prerequisite: course 120 or consent of instructor. Report and discussions of literature on selected forms of deviance in relation to law and formal social control. Agency contacts and exploratory research projects.

Mr. Lemert

226. Social Interaction and Personality. (4) II.

Lecture and discussion—3 hours. Prerequisite: course 126; or consent of instructor. The influence of social structure, personality, and social interaction in face-to-face social situations; the relations of role-taking and personal autonomy to the development of the self; social-psychological processes in intimate and small-group situations.

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.

Mr. G. Roth

248. Social Movements and the Electoral Process. (4) II.

Lecture-discussion—4 hours. Prerequisite: graduate standing, undergraduates by consent of instructor. Mass movements, urban politics, and ethnic conflicts are analyzed from the vantage point of the interaction between mass political actions and the system components constraining political responses at the mass and elite level.

Mr. Miller

252. Sociology of Art. (4) III.

Lecture and discussion—3 hours. Prerequisite: course 25 and 125; or consent of instructor. The relationship of social class, institutions, and value system to art. The art of primitive, aristocratic, and democratic societies. Art and

political ideology. The question of art as "representative" of social values. Artists as a social type.

Mr. Graña

265. Sociological Theory. (4) II.

Lecture and discussion—3 hours. Prerequisite: courses 165A, 165B, and 165C; 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.

274. Sociolinguistics: Contemporary Research.

(4) I.

Seminar—3 hours. Prerequisite: course 174 or consent of instructor. Evaluation of recent investigations and research in progress: position papers, variables in speech communities (ethnography of communication), development of communicative competence(s), role repertoires and the management of consciousness in interaction, language and stratification, stylistics in social control, multilingualism, language planning and nationhood.

Mr. Kjolseth

280. Organizations and Institutions. (4) II.

Seminar—3 hours. Prerequisite: course 180 or consent of instructor. Theory of formal organizations and bureaucracy. Methods of research in organizational and institutional studies. Historical and comparative analysis of political, religious, educational, military and economic structure.

Mr. Hackett

288. Research Preceptorship. (1-9) I, II, III.

Prerequisite: consent of the instructor.

The Staff

290. Seminar. (4) I, II, III.

Seminar—3 hours.

The Staff

292A-292B-292C. Research as a Social Process.

(4-4-4) I-II-III.

Seminar—3 hours. Prerequisite: consent of instructor. Through reading, research exercises, discussion, and field work projects developed and conducted by each student, the student will examine the work of social scientists as a process of sociological and psychological contingencies.

Mr. J. Roth

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

The Staff

299. Individual Study. (1-9) I, II, III.

The Staff

SOIL SCIENCE—See Resource Sciences

SPANISH

Donald G. Castanien, Ph.D., *Chairman of the Department*

Department Office, 615 Sproul Hall

Professors:

Donald G. Castanien, Ph.D.
Homero Castillo, Ph.D.
Ricardo Navas-Ruiz, Ph.D.
Iver N. Nelson, Ph.D. (*Emeritus*)

Associate Professor:

Daniel S. Keller, Ph.D.

Assistant Professors:

David H. Allen, Jr., Ph.D.
M. Roberto Assardo, Ph.D.
Dale E. Enwall, Ph.D.
Didier T. Jaén, Ph.D.
Robert M. Scarl, Ph.D.

◇ ◇ ◇

Assistant Professor:

Reed Anderson, M.A. (*Acting*)

Associates:

Paula Kelley, M.A.
Earl L. Rees, M.A.
Ronald R. Senft, M.A.

The Major Program

Lower Division Courses.—Required: Spanish 1, 2, 3, 4, 5, and 6, or their equivalents; 26A-26B-26C. Recommended: one year of college Latin or the equivalent.

Upper Division Courses.—Required: 36 units of upper division courses including 101A-101B, 180, one course in each of the following areas: literature of the Golden Age, twentieth-century Spanish literature, twentieth-century Spanish American literature. The remaining units may be from any of the upper division courses.

Honors and Honors Program (see page 133).—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 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 Graduate Adviser, 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 Graduate Adviser.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Spanish 1, 2, 3, 4, 5, 6, 26A–26B–26C, or their equivalents. At least 16 units of upper division work, including Spanish 101A–101B, 134 or 135 and one of the following courses: Spanish 131A, 120A, 104C, or 122.

Subject Representative: Mr. Keller.

Portuguese

Lower Division Courses

1. Elementary Portuguese. (4) I.

Laboratory—2 hours; recitation—3 hours. Portuguese grammar, conversation, and reading. Mr. Assardo

2. Elementary Portuguese. (4) II.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 1. A continuation of course 1. Mr. Assardo

3. Elementary Portuguese. (4) III.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 2. A continuation of course 2. Mr. Assardo

Upper Division Courses

104. Survey of Brazilian Literature: Prose Fiction. (4) I.

Lecture—3 hours. Prerequisite: course 3. Mr. Assardo

105. Survey of Brazilian Literature: Poetry. (4) II.

Lecture—3 hours. Prerequisite: course 3. Mr. Assardo

106. Survey of Brazilian Literature: Drama and Essay. (4) III.

Lecture—3 hours. Prerequisite: course 3. Mr. Assardo

Spanish

Departmental Major Advisers.—Mr. Assardo, Mr. Enwall, Mr. Jaén, Mr. Keller, Mr. Scari.

Graduate Adviser.—Mr. Castanien.

Lower Division Courses

Duplication of Credit.—A student will not receive unit credit for Spanish 1, 2, 3, 4, or 5

when these duplicate courses previously completed in secondary school (see page 130), or at another university or college.

1. Elementary Spanish. (4) I, II, III.

Laboratory—2 hours; recitation—3 hours. The Staff

2. Elementary Spanish. (4) I, II, III.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 1. A continuation of course 1. The Staff

3. Elementary Spanish. (4) I, II, III.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 2. A continuation of course 2. The Staff

4. Intermediate Spanish. (3) I, II, III.

Recitation—3 hours. Prerequisite: course 3. The Staff

5. Intermediate Spanish. (3) I, II, III.

Recitation—3 hours. Prerequisite: course 4. Continuation of course 4. The Staff

6. Intermediate Spanish: Conversation and Reading. (3) I, II, III.

Recitation—3 hours. Prerequisite: course 5. Spoken Spanish stressed through class discussion of a variety of selected readings. The Staff

26A–26B–26C. Introduction to Spanish Literature. (3–3–3) I–II–III; II–III–I; III–I–II.

Lecture—3 hours. Prerequisite: course 6. The Staff

Upper Division Courses

101A–101B. Grammar and Composition. (4–4) I–II; II–III.

Lecture—3 hours. Prerequisite: course 6. The Staff

104A. History of Spanish-American Literature: Colonial Period to the Nineteenth Century. (4) I.

Lecture—3 hours. Prerequisite: course 26C. Mr. Keller

104B. History of Spanish-American Literature: the Nineteenth Century through Modernismo. (4) II.

Lecture—3 hours. Prerequisite: course 26C. Mr. Keller

104C. History of Spanish-American Literature: Modernismo to the Present. (4) III.

Lecture—3 hours. Prerequisite: course 26C. Mr. Keller

105. Spanish Drama of the Nineteenth Century. (4) I.

Lecture—3 hours. Prerequisite: course 26C. Offered in even-numbered years. Mr. Scari

109A–109B. Spanish Drama of the Golden Age.

(4–4) II–III.

Lecture—3 hours. Prerequisite: course 26C.
Offered in even-numbered years.

111. Don Quijote. (4) II.

Lecture—3 hours. Prerequisite: course 26C.
Offered in odd-numbered years. Mr. Castanien

112. Prose of the Golden Age. (4) II.

Lecture—3 hours. Prerequisite: course 26C.
Offered in even-numbered years. Mr. Castanien

115. Lyric Poetry of the Golden Age. (4) I.

Lecture—3 hours. Prerequisite: course 26C.
Offered in even-numbered years.

119. Spanish Novel of the Nineteenth Century.

(4) I.

Lecture—3 hours. Prerequisite: course 26C.
Offered in odd-numbered years. Mr. Scarl

120A. Twentieth-Century Spanish Prose. (4) I.

Lecture—3 hours. Prerequisite: course 26C.
Offered in even-numbered years. Mr. Navas-Ruiz

120B. Twentieth-Century Spanish Drama. (4) II.

Lecture—3 hours. Prerequisite: course 26C.
Offered in odd-numbered years. Mr. Navas-Ruiz

120C. Twentieth-Century Spanish Poetry. (4) III.

Lecture—3 hours. Prerequisite: course 26C.
Offered in odd-numbered years. Mr. Enwall

**122. Spanish-American Fiction of the Twentieth
Century.** (4) II.

Lecture—3 hours. Prerequisite: course 26C.
Offered in even-numbered years. Mr. Assardo

125A. Modernism: The Precursors. (4) I.

Lecture—3 hours. Prerequisite: course 26C.
Mr. Castillo

125B. Modernism: The Major Poets. (4) II.

Lecture—3 hours. Prerequisite: course 26C.
Mr. Castillo

127. Poetry of Post-Modernism and Vanguardism.
(4) III.

Lecture—3 hours. Prerequisite: course 26C.
Mr. Castillo

131A. Modern Spanish Syntax. (4) I.

Lecture—3 hours. Prerequisite: course 101B.
Mr. Navas-Ruiz

131B. Modern Spanish Syntax. (4) II.

Lecture—3 hours. Prerequisite: course 101B.
Mr. Navas-Ruiz

132. Introduction to Spanish Linguistics. (3) III.

Lecture—3 hours. Prerequisite: course 101B.
Principles of classical phonemics and mor-
phemics together with more recent develop-
ments; descriptive analysis of modern Spanish

sounds and forms. Theoretical and practical
comparison with English and other Romance
Languages.

134. Survey of Spanish Culture. (4) II.

Lecture—3 hours. Prerequisite: course 26C.
Mr. Enwall

135. Survey of Spanish-American Culture. (4) III.

Lecture—3 hours. Prerequisite: course 26C.
Mr. Allen

141. Introduction to Old Spanish Language. (4) II.

Lecture—3 hours. Prerequisite: courses 26C
and 101B. Major phonological and morphologi-
cal developments in Spanish with special atten-
tion to the verb system. Emphasis on the period
of old Spanish from the twelfth to the sixteenth
century. Offered in even-numbered years.

142. Medieval Spanish Literature. (4) III.

Lecture—3 hours. Prerequisite: courses 26C
and 101B. Literary analysis of representative
works of medieval Spanish literature. Offered in
even-numbered years.

150. Masterpieces of Spanish Literature. (4) I.

Lecture—3 hours. Reading, lectures, and dis-
cussion in English. May not be counted as part
of the major in Spanish. Mr. Castanien

151. Study of a Major Writer. (4) I, II, III.

Lecture—3 hours. Prerequisite: course 26C.
May be repeated for credit with consent of
instructor. The Staff

**175. Introduction to Literary Theory and
Criticism.** (4) II.

Lecture—3 hours. Prerequisite: course 26C.
Basic concepts for the analysis of literature
with emphasis on Spanish literary and critical
theory applied to Spanish literature. Mr. Jaén

180. History of Spanish Literature. (4) III.

Lecture—3 hours. Prerequisite: open only to
majors in their senior year; consent of instructor.
Mr. Scari

194H. Special Study for Honors Students.

(5) I, II, III.

Prerequisite: open only to honors students.
Guided research leading to an honors thesis.
The Staff

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff

Graduate Courses**200. Techniques of Literary Scholarship.** (4) III.

Lecture—3 hours. The elements of bibliog-
raphy and fundamental methods of literary re-
search. Mr. Castanien

210. Literary Criticism: Poetry. (4) I.

Seminar—3 hours. Offered in odd-numbered years.
Mr. Castillo

230A. History of the Spanish Language. (4) I.

Seminar—3 hours. Prerequisite: Latin 1.

230B. History of the Spanish Language. (4) II.

Seminar—3 hours. Prerequisite: Latin 1.

231A-231B. Spanish Literature of the Golden Age. (4-4) II-III.

Seminar—3 hours. Offered in odd-numbered years.
Mr. Navas-Ruiz

234A. Twentieth-Century Spanish Poetry. (4) I.

Seminar—3 hours. Offered in even-numbered years.
Mr. Enwall

234B. Twentieth-Century Spanish Poetry. (4) II.

Seminar—3 hours. Offered in odd-numbered years.
Mr. Enwall

235A. Twentieth-Century Spanish Prose. (4) I.

Seminar—3 hours. Offered in odd-numbered years.
Mr. Navas-Ruiz

235B. Twentieth-Century Spanish Prose. (4) II.

Seminar—3 hours. Offered in even-numbered years.
Mr. Navas-Ruiz

238A. Spanish-American Drama: 1880-1930. (4) III.

Seminar—3 hours. Offered in odd-numbered years.
Mr. Keller

238B. Spanish-American Drama: 1930 to Present. (4) III.

Seminar—3 hours. Offered in even-numbered years.
Mr. Keller

239. Nineteenth-Century Spanish Literature. (4) II.

Seminar—3 hours. Offered in even-numbered years.
Mr. Scari

241A. Spanish American Novel, 1900-1920. (4) I.

Seminar—3 hours. Offered in even-numbered years.
Mr. Castillo

241B. Spanish American Novel, 1920-1940. (4) II.

Seminar—3 hours. Offered in odd-numbered years.
Mr. Castillo

242. New Trends in Spanish American Fiction from 1940 to the Present. (4) III.

Seminar—3 hours. Offered in odd-numbered years.
Mr. Castillo

245. Darío and His Contemporaries. (4) II.

Seminar—3 hours. Offered in even-numbered years.
Mr. Castillo

247. New Directions in Spanish American Poetry. (4) III.

Seminar—3 hours. Offered in even-numbered years.
Mr. Castillo

299. Research. (2-5) I, II, III.

The Staff

Professional Course

300. The Teaching of Modern Foreign Language. (3) III.

Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language.
The Staff

SUBJECT A

Department Office, TB-123, Room 105-106

Instruction Supervisor:

Leonard G. Homann, A.B.

Subject A. English Composition (no credit). I, II, III.

Lecture—2 hours; discussion—2 hours. Principles of composition, with special emphasis on precision and exactness of sentences. The Staff

TEXTILES AND CLOTHING—See Family and Consumer Sciences

VEGETABLE CROPS—See Plant Sciences

VETERINARY MEDICINE, School of—See page 161 for course listings

VETERINARY MICROBIOLOGY

John W. Osebold, D.V.M., Ph.D., *Chairman of the Department*
 Department Office, 2004 Haring Hall

Professors:

- Norman F. Baker, D.V.M., Ph.D.
 Ernst L. Biberstein, D.V.M., Ph.D.
 Hugh S. Cameron, D.V.M., Ph.D., LL.D.
 (Emeritus)
 James R. Douglas, Ph.D.
 Michel M. J. Lavoipierre, M.B., Ch.B.
 Delbert G. McKercher, D.V.M., Ph.D.
 John W. Osebold, D.V.M., Ph.D.
 Clyde Stormont, Jr., Ph.D.

Associate Professor:

- Yuan C. Zee, D.V.M., Ph.D.

Assistant Professors:

- Audria Matheson, Ph.D.
 John B. Smith, B.V.Sc., Ph.D.

**Associate Professor in Residence:**
 Moshe Shifrine, Ph.D.**Lecturer:**

- Margaret E. Meyer, Ph.D.

Upper Division Courses**111. Immunogenetic and Electrophoretic Techniques. (2) I.**

Lecture—1 hour; laboratory—3 hours. Prerequisite: Animal Genetics 107 (may be taken concurrently) or consent of instructor. Immunologic and electrophoretic techniques used in the exploration of heritable differences in red cell antigens, serum proteins and enzymes of domestic animals. Mr. Stormont

120. Principles and Techniques of Bacteriology.

(2) I.

Lecture—3 hours; laboratory—6 hours (completed in 4 weeks). Prerequisite: second-year standing in the School of Veterinary Medicine or consent of instructor. The course deals with the structure and internal organization of microorganisms, nutrition, cultivation and physiology of bacteria, effects of chemical and physical agents on growth and death of bacteria and mechanisms of antibiotic sensitivity and resistance. Miss Matheson

121. Immunity and Serology. (3) I.

Lecture—3 hours; laboratory—6 hours (completed in 6 weeks). Prerequisite: course 120 or consent of instructor. The principles of immunity and serology. Mr. Osebold, Mr. Stormont

122. Bacterial and Mycotic Pathogens of Domestic Animals. (4) II.

Lecture—4 hours; laboratory—8 hours (completed in 5½ weeks). Prerequisite: course 121, or consent of instructor. The biology of infectious animal diseases caused by bacteria and fungi.

Mr. Biberstein, Miss Matheson, Mr. Smith

123. Viral Pathogens of Animals. (3) II.

Lecture—4 hours; laboratory—8 hours (completed in 4½ weeks). Prerequisite: course 122 or consent of instructor. The biology of infectious diseases caused by viruses. Virus-host relationship with emphasis on pathogenesis, immunity and diagnosis.

Mr. Zee

124. Veterinary Protozoology. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: second-year standing in the School of Veterinary Medicine or consent of instructor. The protozoan parasites of domestic animals with emphasis on biology, life history, identification, and control.

Mr. Baker

125. Veterinary Helminthology and Entomology.

(5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: second-year standing in the School of Veterinary Medicine or consent of instructor. The helminth and arthropod parasites of domestic animals with emphasis on biology, life history, identification, and control.

Mr. Baker, Mr. Douglas, Mr. Lavoipierre

127. Medical Microbiology. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Bacteriology 2. Principles of infection and resistance; nature and manifestations of immunity and allergy; the bacterial and mycotic pathogens of man.

Mr. Biberstein, Miss Matheson, Mr. Shifrine

128. Biology of Animal Viruses. (3) II.

Lecture—3 hours. Prerequisite: course 127 or the equivalent. Fundamental physical and chemical properties of animal viruses; methods of propagation, purification and assay. Mechanisms of viral replication and pathogenesis of virus infections in man and animals. Immunity to virus diseases and oncogenic properties of animal viruses.

Mr. Zee

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff

Graduate Courses**201. Clinical Microbiology. (2) II.**

Laboratory—6 hours. Prerequisite: course 121, junior standing in School of Veterinary

Medicine. Principles and methods of etiological diagnosis of bacterial, mycotic, viral, protozoan, helminthic, and ectoparasitic infections affecting domestic animals.

The Staff

270. Advanced Immunology. (6) III.

Lecture—3 hours; laboratory—9 hours. Prerequisite: courses 120–123 or 127 or consent of instructor. Dynamics of infection and resistance: antibody production and manifestations of antigen-antibody reactions, immuno-chemistry.

hypersensitivity. Immunological considerations of the groups of disease agents. Offered in even-numbered years.

Mr. Osebold

Miss Matheson, Mr. Shifrine, Mr. Smith

290. Seminar. (1) I, II, III.

Seminar—1 hour.

The Staff

298. Group Study. (1–5) I, II, III.

The Staff

299. Research. (1–12) I, II, III.

The Staff

VITICULTURE AND ENOLOGY—See Food Science and Plant Science

WATER SCIENCE AND ENGINEERING—See Resource Sciences

WILDLIFE AND FISHERIES BIOLOGY—See Resource Sciences

ZOOLOGY

Herman T. Spieth, Ph.D., *Chairman of the Department*

Everett W. Jameson, Jr., Ph.D., *Vice-Chairman of the Department*

Department Office, 2320 Storer Hall

Professors:

Charles R. Goldman, Ph.D.

Milton Hildebrand, Ph.D. (*Zoology and Applied Behavioral Sciences*)

Everett W. Jameson, Jr., Ph.D.

Loye H. Miller, Ph.D., LL.D. (*Emeritus*)

Milton A. Miller, Ph.D.

Lauren E. Rosenberg, Ph.D.

George W. Salt, Ph.D.

Herman T. Spieth, Ph.D.

Tracy I. Storer, Ph.D., LL.D. (*Emeritus*)

Kenneth E. F. Watt, Ph.D.

James R. Douglas, Ph.D. (*Veterinary Microbiology*)

Lecturer:

William M. Longhurst, Ph.D.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Biology 1, Zoology 2, Botany 2 or Bacteriology 2, Chemistry 1A, 1B, and 8A–8B, Physics 2A, 2B, and 2C, Mathematics 13 or 16A and 16B.

Upper Division Courses.—Required: 1) 36 units in zoology (not more than 5 units of courses in the 190 series may be counted in this requirement), 2) Genetics 100A–100B, 3) one course or course sequence selected from each of the four following core areas:

1) Morphology: Zoology 100, 106A, 106B, 107, 110, 112, Botany 130A.

2) Physiology with laboratory, Zoology 103, 103L, 121 and 121L, 142 and 142L, 160, Animal Physiology 110A, 110B, 111A, and 111B (all four courses).

3) Evolution: Zoology 148, Genetics 103.

4) Ecology: Zoology 114, 116, 125, 133, 134, 140.

Cross-listed courses may be used to satisfy only one core area requirement. Any course taken outside the department in partial satisfaction of the core course requirement will be counted toward the satisfaction of the 36-unit requirement.

¹ Absent on leave, 1969–70.

Associate Professors:

Ronald J. Baskin, Ph.D. (*Zoology and Animal Physiology*)

William J. Hamilton, III, Ph.D.

Robert L. Rudd, Ph.D.

²Stephen L. Wolfe, Ph.D. (*Zoology and Genetics*)

Assistant Professors:

Peter B. Armstrong, Ph.D.

Dennis Barrett, Ph.D.

David W. Deamer, Ph.D.

Robert D. Grey, Ph.D.

William M. Hamner, III, Ph.D.

Ann E. Kammer, Ph.D.

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Professors:

Norman F. Baker, D.V.M., Ph.D.
(*Veterinary Microbiology*)

Recommended: Biochemistry 101A, 101B.

Bachelor of Science Major Program

Lower Division Courses.—Required: Biology 1, Zoology 2, Botany 2, Bacteriology 2, Chemistry 1A, 1B, and 8A-8B, Physics 2A, 2B, 2C, Mathematics 13 or 16A and 16B.

Upper Division Courses.—Required: 1) 36 units, 18 of which must be in upper division courses in zoology. Not more than 5 units of courses in the 190 series may be counted in the 36-unit requirement. 2) Biochemistry 101A and 101B, Genetics 100A-100B. 3) One course in the evolution core area listed under the description of the Bachelor of Arts program. 4) One course or course sequence in each of two of the three remaining core areas listed under the description of the Bachelor of Arts program.

Cross-listed courses may be used to satisfy only one core area requirement. Any course taken outside the department in partial satisfaction of a core area requirement will be counted toward the satisfaction of the 36-unit requirement.

Graduate Study.—The Department of Zoology offers programs of study and research leading to the M.A. and Ph.D. degrees. For detailed information regarding graduate study write to the Graduate Adviser, Department of Zoology.

Teaching Major.—Requirement for students planning to be primary or secondary teachers, with a major in zoology, are the same as for the Bachelor of Arts degree in zoology.

Teaching Minor.—Required: 30 units in biological sciences, including Biology 1, Zoology 2, and 18 units of upper division courses in zoology or closely related fields chosen in consultation with the subject representative. Recommended: an upper division course in invertebrate zoology and an upper division course in each of as many other areas of zoology as possible (e.g., cell biology, physiology, ecology, genetics, morphology, evolution).

Students who plan to be teachers should consult the Department of Education in regard to further preparation for certification.

Subject Representative: Mr. Wolfe.

Physiology

Lower Division Courses

2. Introductory Physiology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Biology 1. The physiology of muscular contraction, nervous integration, sensation, circulation, respiration, excretion, and digestion.

Miss Kammer

2L Introductory Physiology Laboratory. (3) I.

Laboratory—6 hours. Prerequisite: course 2, completed or in progress. 1 credit for reading

and report writing done outside the laboratory.

Miss Kammer

10. Elementary Physiology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open for credit to students who have had Biology 1. An introductory course in physiology for nonscience majors. Mr. Deamer

Zoology

Lower Division Courses

2. General Zoology. (6) I, II, III.

Lecture—4 hours; laboratory—6 hours. Prerequisite: Biology 1. A survey of the diversity of animal life and the basic principles of adaptation, evolution, and integration in animals.

I. Mr. Hamner; II. Mr. Miller; III. —

39. Special Study for Lower Division Students.

(1-5) I, II, III.

Directed study of a specific topic selected by the student and the instructor. The Staff

Upper Division Courses

100. Embryology. (5) I, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biology 1; Zoology 2 recommended. The events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

I. Mr. Grey, Mr. Armstrong;
III. Mr. Armstrong, Mr. Grey

103. Developmental Biology. (3) I.

Lecture—3 hours. Prerequisite: course 100, Genetics 100B or 115. Mechanisms of development from bacteriophage to metazoans: growth, differentiation and morphogenesis. Mr. Barrett

103L Developmental Biology Laboratory. (3) I.

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 103. Experimental manipulation and biochemical analysis of a variety of developing materials. Mr. Barrett

106A. Analysis of Vertebrate Structure. (5) II.

Lecture—2 hours; laboratory and demonstration—6 hours. Prerequisite: course 2. The interpretation of vertebrate structure with emphasis on phylogeny. Mr. Hildebrand

106B. Analysis of Vertebrate Structure. (4) III.

Lecture—2 hours; laboratory and demonstration—4 hours. Prerequisite: course 2. The interpretation of vertebrate structure with emphasis on function. The application of basic concepts of mechanics to supportive, locomotor, and feeding mechanisms. Mr. Hildebrand

107. Microanatomy. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. The finer structure and activities of organs, tissues, and cells of vertebrates, with emphasis on those of mammals.

Mr. Rosenberg

110. Protozoology. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biology 1. Structure, life history, and ecology of the groups of protozoa with emphasis on relationships to biological problems.

Mr. Rosenberg

112. Invertebrate Zoology. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Comparative anatomy, classification, and phylogeny of the invertebrate Metazoa.

Mr. Miller

114. Invertebrate Physiological Ecology. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 112. Physiology, behavior, and ecology of the invertebrate Metazoa.

Mr. Hamner

116. Principles of Animal Resource Management.**(5) I.**

Lecture—3 hours; laboratory—3 hours; special projects. Prerequisite: Biology 1; Mathematics 13 and 16A. Population dynamics and management of marine, freshwater, and terrestrial animal resources; analysis and solution of problems in maximization of animal resource production.

Mr. Watt

121. Cell Biology. (4) II.

Lecture—4 hours. Prerequisite: Biochemistry 101A, 101B. Structure and function of living systems at the molecular and subcellular level, including such topics as molecular organization of membranes, photosynthesis and respiration, and ion transport as related to nerve impulse transmission and contractility.

Mr. Deamer

121L. Cell Biology Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 121. Exercises illustrating principles of cell biology; individual programs of research, employing one or more advanced techniques.

Mr. Deamer

125. Animal Ecology. (3) II.

Lecture—3 hours. Prerequisite: course 2 and one course in biological science having at least part of the studies conducted in the field (e.g., courses 112, 133L, 134, 140L, Botany 108 or Botany 117). Theory of relationships between animals and their environments.

Mr. Salt

125L. Field Ecology. (3) III.

Laboratory—9 hours. Prerequisite: course 125. Laboratory and field investigations of ecological phenomena.

Mr. Salt

130A. General Cytology. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2 or Botany 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 zone and their relationship to the metabolic nucleus. (Same course as Botany 130A.) Mr. Weier, Mr. Wolfe

130B. General Cytology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 130A. An analysis of the structure and function of cells during mitosis; meiosis, gametogenesis and fertilization at cellular and subcellular levels. (Same course as Botany 130B.) Mr. Weier, Mr. Wolfe

133. Biology of Cold-Blooded Vertebrates. (3) II.

Lecture—3 hours. Prerequisite: course 2. Biology, adaptive morphology, ecologic and environmental distribution of vertebrates, with emphasis on western North America.

Mr. Jameson

133L. Laboratory of Cold-Blooded Vertebrates.**(2) III.**

Laboratory—6 hours. Prerequisite: course 133. Field and laboratory studies of reptiles and amphibians, with emphasis on western North America.

Mr. Jameson

134. Biology of Birds and Mammals. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Identification; ecologic and geographic distribution; field study of habits and life histories; emphasis on species in California and western North America. Field trips included.

Mr. Rudd

140. Limnology. (4) III.

Lecture—3 hours; special projects. Prerequisite: Biology 1 and junior standing. The biology and productivity of inland waters with emphasis on the physical and chemical environment.

Mr. Goldman

140L. Limnology Laboratory. (3) III.

Laboratory—6 hours. Prerequisite: course 140 (may be taken concurrently). Limnological studies of lakes, streams, and reservoirs with interpretation of aquatic ecology.

Mr. Goldman

142. Invertebrate Physiology. (4) III.

Lecture—3 hours. Prerequisite: course 112, Chemistry 1A, 1B, Physics 2B. Comparative physiology of invertebrate organ systems. Extensive reading and written precis required.

Miss Kammer

142L. Invertebrate Physiology Laboratory. (3) III.

Laboratory—8 hours. Prerequisite: course

142 (may be taken concurrently). Experiments on the physiological mechanisms of invertebrate organ systems.

Miss Kammer

144. Oceanography. (4) II.

Lecture—3 hours; discussion—1½ hours; demonstration. Prerequisite: Biology 1. Biological, chemical, physical, and geological aspects of the marine environment. Consideration of biological communities, productivity, the distribution of currents and tides, the origin of ocean basins, and marine sedimentation. Term paper required.

Mr. Goldman

147. Zoogeography. (4) II.

Lecture—3 hours. Prerequisite: course 2 or Entomology 1. Movements of terrestrial animals. The role of geologic, climatic, and biologic changes in the geographic distribution of animals.

Mr. Jameson

148. Animal Phylogeny and Evolution. (5) I.

Lecture—5 hours. Prerequisite: course 2 or Entomology 1. Recommended: course 147 and Genetics 100B. The origins and relationships of the major groups of animals, with emphasis on the analysis of variation and the mechanics of evolutionary change.

Mr. Rudd

155. Animal Social Systems. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. The behavioral basis, organization, and evolution of animal societies.

Mr. Hamilton

156. Dynamics of Animal Coloration. (5) II.

Lecture—3 hours; discussion—1 hour; special project or term paper. Prerequisite: course 2. The role of animal coloration with respect to animal behavior; predator-prey relationships, and solar and animal radiation. Particular emphasis is given to the evolution of behavior and population dynamics as exemplified by coloration. Offered in even-numbered years.

Mr. Hamilton

158. Introduction to Physicochemical Biology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; Physics 2B; Chemistry 8B. Recommended: Mathematics 21B or 16B. The application of physicochemical principles to the study of living organisms.

Mr. Baskin

160. Invertebrate Neurophysiology. (5) III.

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: an upper division course in physiology or physicochemical biology or invertebrate zoology. Comparisons of the nervous systems of invertebrates with emphasis on nervous processes related to behavior.

Miss Kammer

197. Senior Colloquium in Zoology. (2) III.

Lecture and discussion—2 hours. Prerequi-

site: senior standing. The consideration of innovation and synthesis in broad areas of zoology.

The Staff

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

Directed study of a specific topic selected by the student and the instructor.

The Staff

Graduate Courses

201A. Ecological Theory. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology. The 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.)

The Staff (Mr. Salt and Mr. Major in charge)

201B. Analysis of A Selected Ecosystem. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 201A or consent of instructor. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit. (Same course as Botany, Ecology and Geology 201B.)

The Staff (Mr. G. L. Webster in charge)

201C. The Changing Biosphere. (3) III.

Lecture—2 hours; 1 assigned problem. Prerequisite: courses 201A, 201B; or consent of instructor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical and physical changes on living systems, changes in species diversity, effects of human population increase, and related topics. (Same course as Botany, Ecology and Geology 201C.)

The Staff (Mr. Myrup in charge)

202. Biomathematics. (6) II.

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.

Mr. Watt

210. Analysis of the Elements of Effective Teaching of College Biology. (3) I.

Lecture—1 hour; discussion—1 hour; assignments and reports. Undergraduate enrollment limited. Offered in even-numbered years.

Mr. Hildebrand

222. Mathematical Models of Ecosystems. (4) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: Mathematics 21B or 16B; 105B or 231C; Zoology 116 or 125. Use of mathematical models and computer simulation to discover effect of varying behavioral, physiological, population, and community parameters on energy flux in ecosystems. Offered in odd-numbered years.

Mr. Watt

223. Seminar in Fisheries Management. (4) III.

Seminar—4 hours. Prerequisite: course 116; Mathematics 16B, 105B. Analysis of fish population problems, including review of recent research. Offered in even-numbered years.

Mr. Watt

225. Cellular Aspects of Development. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Zoology 105 and 121, or equivalent. Interaction of cells and tissues in development; cellular basis of morphogenesis. Mr. Armstrong

226. Nuclear Aspects of Development. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103 and Biochemistry 101B, or equivalents with consent of instructor. Open to qualified undergraduates. Critical examination of the evidence for inputs to the nucleus and outputs from the nucleus in the control of development.

Mr. Barrett

230. Advanced Cytology. (2) II.

Seminar—2 hours. Prerequisite: consent of instructor. Topics of current interest in the ultrastructure of cells. Offered in odd-numbered years.

Mr. Wolfe

***231. The Ultrastructure of Self-Reproducing Systems. (3) III.**

Lecture—3 hours. Recommended: courses in cytology, cell biology or cytogenetics and Genetics 100B. Structure and function of self-reproducing subcellular organelles illustrated primarily in metazoan animals. Offered in even-numbered years.

Mr. Wolfe

***240. Muscle Physiology. (4) II.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: an upper division course in animal physiology; Mathematics 21B or 16B; or consent of instructor. The physical and chemical aspects of muscle function.

Mr. Baskin

250. Recent Developments in Zoology. (1) II.

Seminar—1 hour. Prerequisite: graduate standing in Zoology.

The Staff

287. Seminar in Animal Behavior. (2) II.

Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on the prin-

ciples and recent developments in invertebrate and vertebrate animal behavior.

Mr. Hamilton, Mr. Spieth

288. Seminar in Physicochemical Biology. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. Discussion of recent literature on the physicochemical aspects of the organization and function of living systems. Physicochemical properties on the molecular and cellular levels will be considered.

Mr. Baskin

289. Seminar in Analysis of Vertebrate Structure. (1) I.

Seminar—1 hour. Prerequisite: course 106A; course 106B recommended. Offered in odd-numbered years.

Mr. Hildebrand

291. Seminar in Protozoology. (2) I.

Seminar—2 hours. Prerequisite: course 110; or consent of instructor.

Mr. Rosenberg

292. Seminar in Development. (1) II.

Seminar—1 hour. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms.

Mr. Barrett

293. Seminar in Invertebrate Zoology. (2) II.

Seminar—2 hours. Prerequisite: course 112; or consent of instructor. Critical review of the literature in selected topics and taxa in the Invertebrata. Open to qualified undergraduates.

Mr. Hamner, Mr. Miller, Miss Kammer

294. Seminar in Animal Ecology. (3) I.

Seminar—3 hours. Prerequisite: course 125; or consent of instructor. Readings and discussions of advanced topics in the population and community ecology of animals.

Mr. Rudd, Mr. Salt

295. Seminar in Limnology. (3) III.

Seminar—3 hours. Prerequisite: course 140; or consent of instructor. Recent developments in limnology and related advances in oceanography.

Mr. Goldman

297. Seminar in Systematic Zoology and Evolution. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. Principles of animal classification, speciation, and the evolution of higher categories; emphasis on modern concepts and pertinent contributions from the fields of genetics and paleontology.

Mr. Rudd

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

The Staff

299. Research. (1-9) I, II, III.

The Staff

^{*} Not to be given, 1969-70.



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CAMPUS MAP

UNIVERSITY OF CALIFORNIA

DAVIS CAMPUS

CENTRAL AREA

(42) TO PRIMATE CENTER,
AIRPORT, FIELD AREAS,
ECOLOGY INSTITUTE,
AND HIGHWAY 133

RUSSELL BLVD.

NORTH GATE
TRAFFIC AND TRAILER
PARKING Lot 14, Lot 15

LA RUE ROAD

PARKING Lot 6

PARKING Lot 5

PARKING Lot 4

PARKING Lot 3

PARKING Lot 2

PARKING Lot 1

PARKING Lot 0

PARKING Lot -1

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TO: All Undergraduate Advisors
FROM: Department of Anthropology

The following changes to the catalogue will be effective 69-70:

108. Native Americans in Contemporary Society (4) I.
Lecture--3 hours; discussion--1 hour. Prerequisite: course 2 or consent of the instructor. An introduction to the socio-cultural development of American Indian populations in modern times with emphasis upon North America. Attention will be given to contemporary Indian affairs and problems as well as to the background for present-day conditions. Mr. Forbes
109. Phonetics (4) I.
Lecture--2 hours; laboratory--2 hours. Thorough grounding in articulatory phonetics with some attention to the fundamentals of acoustic phonetics. Mr. Hernandez
110. Elementary Linguistic Analysis (4) II.
Lecture--2 hours. Prerequisite: course 109. Phonetic theory and exercises in phonemic analysis. Mr. Olmsted
111. Intermediate Linguistic Analysis (4) II
Lecture--2 hours. Prerequisite: course 110 (may be taken concurrently). Morphophonemics, morphemics and tactics. Mr. Olmsted
112. Comparative Linguistics (4) III.
Lecture--2 hours. Prerequisite: course 109. Linguistic prehistory historical linguistics and reconstruction; dialect geography. Mr. Olmsted
200. Ethnohistorical Theory and Method (4) III.
Seminar--3 hours. A discussion of the ethnohistorical method; the utilization of diverse types of data, especially documentary sources, to reconstruct socio-cultural history. Particular attention devoted to the applied uses of ethnohistory in the solution of contemporary social problems. Mr. Forbes

The Major Program will now read:

...109, 110; 111 or 112 or 120...

Instead of:

...110B, 110C or 120...

The prerequisite to 120 will be course 110.

The following three changes are effective in the B.S. program as described on pages 181-182 of the General Catalog.

- (1) Geology 1, 1L, 3, 3L, are not required
- (2) Either Mathematics 16A, 16B OR Chemistry 8A-8B is required.
- (3) A minimum of 44 upper division units is required, of which twenty units shall be chosen from a list provided by the department.



UNIVERSITY

CALIFORNIA



In one of his last speeches Adlai Stevenson referred to Franklin, Jefferson, Madison, Adams, Hamilton, and Marshall in these words: "Our revolutionary leaders must have been, bar none, the most soundly educated group of radicals the world has ever seen. And I believe that that precise and precious balance between vision and practicability that we find in our early constitutional experiments reflects above all the wisdom and realism of well-nourished minds."

At a time when students are asking for a share in determining the form and means by which knowledge is transmitted, it is appropriate for us to consider Stevenson's words. The collaboration between Students and Faculty can well be important in determining the proper diet for "Well-Nourished Minds" today. The particular strength of students is in contributing new ideas generated by their practical concerns. The faculty, on the other hand, offers the wisdom to evaluate traditional forms of education. The result can be a better diet, balanced between "Wisdom and Realism."

EMIL M. MRAK, Chancellor 1959-69