

UNIVERSITY
OF

CALIFORNIA

—

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General Catalogue

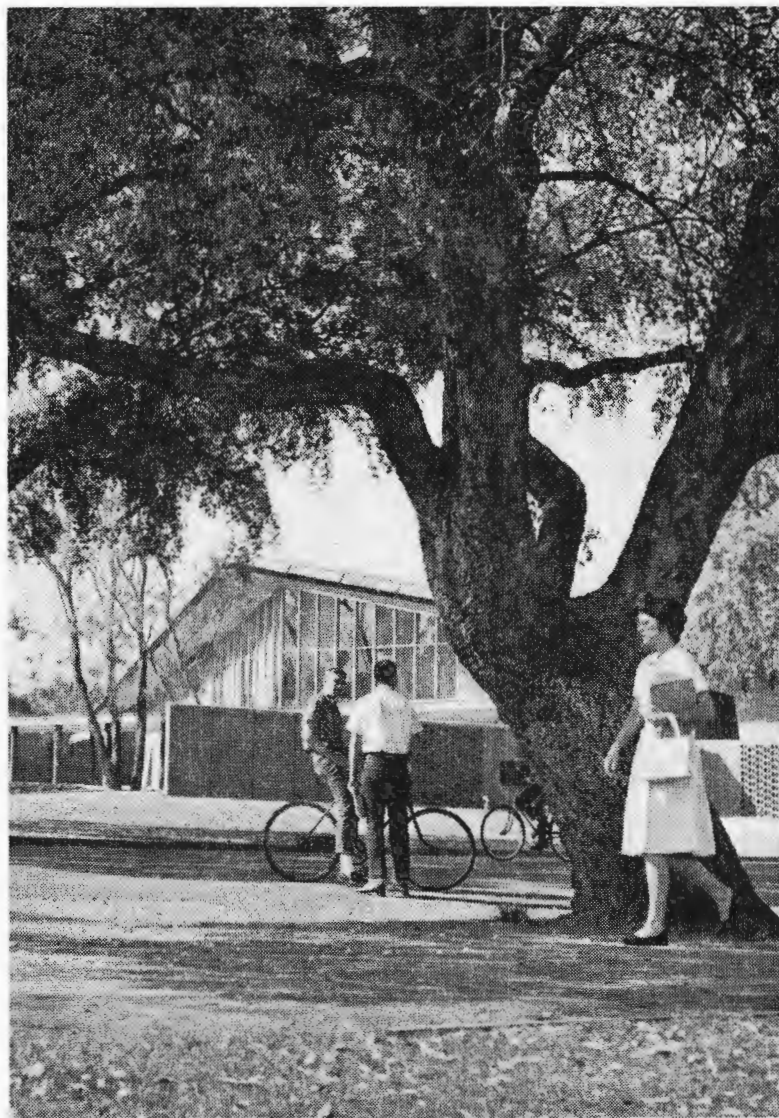
DAVIS

Fall and Spring Semesters

1963-1964

August 1, 1963

UNIVERSITY OF CALIFORNIA, DAVIS



Freeborn Hall

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University Calendar

1963-1964

Davis Campus

Fall Semester 1963-1964

July 15, Monday	Applications for admission to undergraduate standing, including applications for intercampus transfer and for graduate change of station in the fall semester, must be filed with complete credentials, with the Registrar on or before this date. Credentials received as late as this may not be evaluated in time for the enrollment of the student during the regular registration period.
Aug. 1, Thursday	Credentials and applications for admission to graduate standing for fall semester 1963 must be filed with the Dean of the Graduate Division on or before this date.
Aug. 19, Monday	Applications for readmission to undergraduate and graduate status for fall semester 1963 must be filed with the Registrar on or before this date.
Sept. 2, Monday	Labor Day—academic and administrative holiday.
Sept. 9, Monday	Fall semester begins.
Sept. 9, Monday	} Orientation and testing.
Sept. 14, Saturday	
Sept. 12, Thursday	} Registration.
Sept. 13, Friday	
Sept. 16, Monday	Instruction begins.
Sept. 27, Friday	Candidates who expect to complete work for master's degrees to be conferred in January 1964 must file for candidacy on or before this date.
Sept. 30, Monday	Candidates who expect to complete work for A.B. and B.S. degrees to be conferred in January 1964, must file announcement of candidacy with the Registrar on or before this date.
Oct. 4, Friday	Candidates who expect to complete work for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in June 1964 must file an application for candidacy with the Dean of the Graduate Division on or before this date.
	Petitions to enroll or add courses to study lists must be filed on or before this date.
Oct. 11, Friday	Petitions to drop courses without scholarship penalty must be filed with the Registrar on or before this date.
Oct. 26, Saturday	Applications to take engineering examinations required for admission in the spring semester 1964 must be filed on or before this date.
Nov. 8, Friday	Theses for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in January 1964 must be filed in final form with the committees in charge on or before this date.
Nov. 9, Saturday	Engineering examinations, lower division and upper division.
Nov. 28, Thursday	} Thanksgiving holiday—academic and administrative holiday.
Nov. 29, Friday	
Nov. 28, Thursday	} Fall recess.
Nov. 30, Saturday	
Dec. 15, Sunday	Applications for admission to undergraduate standing, including applications for intercampus transfer, for spring semester 1964 must be filed, with complete credentials, with the Registrar on or before this date.
Dec. 20, Friday	Theses for master's degrees to be conferred in January 1964 must be filed in final form with the committees in charge on or before this date.
Dec. 16, Monday	} Christmas recess.
Jan. 1, Wednesday	

- Dec. 23, Monday } Christmas holiday—academic and administrative holiday.
 Dec. 25, Wednesday }
 Jan. 1, Wednesday } New Year's holiday—academic and administrative holiday.

1964

- Jan. 2, Thursday } Instruction resumes.
 Credentials and applications for admission to graduate standing
 for spring semester 1964 must be filed with the Dean of the
 Graduate Division on or before this date.
 Jan. 10, Friday } Theses for the degrees of Doctor of Philosophy and Doctor of
 Engineering to be conferred in January 1964 must be filed
 with the Dean of the Graduate Division on or before this date.
 Jan. 13, Monday } Applications for readmission to undergraduate and graduate status
 for spring semester 1964 must be filed with the Registrar on or
 before this date.
 Jan. 15, Wednesday } Applications for graduate change of station for spring semester
 1964 must be filed, with complete credentials, with the Registrar
 on or before this date.
 Jan. 18, Saturday } Instruction ends.
 Jan. 20, Monday }
 Jan. 29, Wednesday } Final examinations.
 Jan. 29, Wednesday } Fall semester ends.
 Theses for master's degrees to be conferred in January 1964 must
 be filed with the Dean of the Graduate Division on or before
 this date.
 Feb. 1, Saturday } Applications for 1964–1965 undergraduate scholarships for cur-
 rent students must be filed on or before this date.

Spring Semester 1964

- Feb. 3, Monday } Spring semester begins.
 Feb. 3, Monday }
 Feb. 8, Saturday } Orientation and testing.
 Feb. 6, Thursday }
 Feb. 7, Friday } Registration.
 Feb. 10, Monday } Instruction begins.
 Feb. 12, Wednesday } Lincoln's birthday—academic and administrative holiday.
 Feb. 14, Friday } Candidates who expect to complete work for the master's degrees
 to be conferred in June 1964 must file application for candidacy
 on or before this date.
 Feb. 15, Saturday } Applications for fellowships and graduate scholarships for 1964–
 1965 must be filed on or before this date.
 Applications for 1964–1965 undergraduate scholarships for new
 students must be filed on or before this date.
 Feb. 21, Friday } Candidates who expect to complete work for the degrees of Doctor
 of Philosophy and Doctor of Engineering to be conferred in
 January 1965 must file applications for candidacy on or before
 this date.
 Feb. 24, Monday } Candidates who expect to complete the work for A.B. and B.S.
 degrees in June 1964 must file announcement of candidacy with
 the Registrar on or before this date.
 Feb. 28, Friday } Petitions to enroll or add courses to study lists must be filed with
 the Registrar on or before this date.
 Feb. 29, Saturday } Applications for admission to the School of Veterinary Medicine
 must be filed with the Registrar on or before this date.
 March 6, Friday } Petitions to drop courses without scholarship penalty must be filed
 with the Registrar on or before this date.
 March 13, Friday } Theses for the degrees of Doctor of Philosophy and Doctor of
 Engineering to be conferred in June 1964 must be filed in final
 form with the committee in charge on or before this date.
 March 23, Monday }
 March 28, Saturday } Spring Recess—an academic holiday.
 May 7, Thursday } Theses for master's degrees to be conferred in June 1964 must be
 filed in final form with the committees in charge on or before
 this date.

- May 15, Friday Theses for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in June 1964 must be filed with the Dean of the Graduate Division on or before this date.
- May 29, Friday Instruction ends.
- May 30, Saturday Memorial Day—academic and administrative holiday.
- June 1, Monday } Final examinations.
 June 10, Wednesday }
 June 10, Wednesday } Spring semester ends.
- Theses for master's degrees to be conferred in June 1964 must be filed with the Dean of the Graduate Division on or before this date.
- June 11, Thursday Commencement.

First Summer Session 1964

- June 15, Monday Registration and first day of instruction.
- July 24, Friday First Summer Session instruction ends.

Special Summer Session 1964

- June 29, Monday Registration and first day of instruction.
- August 7, Friday Special Summer Session instruction ends.

Second Summer Session 1964

- July 27, Monday Registration and first day of instruction.
- Sept. 7, Monday Labor Day—academic and administrative holiday.
- Sept. 4, Friday Second Summer Session instruction ends.

THE REGENTS OF THE UNIVERSITY

REGENTS EX OFFICIO

- His Excellency EDMUND G. BROWN, LL.B.
Governor of California and President of
the Regents
State Capitol, Sacramento 14
- GLENN M. ANDERSON, A.B.
Lieutenant-Governor of California
State Capitol, Sacramento 14
- JESSE M. UNRUH, A.B.
Speaker of the Assembly
State Capitol, Sacramento 14
- MAX RAFFERTY, A.B., M.A., Ed.D.
State Superintendent of Public
Instruction
721 Capitol av, Sacramento 14
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President of the State Board of
Agriculture
498 Pepper rd, Petaluma
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President of the Mechanics' Institute
Brobeck, Phleger and Harrison
111 Sutter st.
San Francisco 4
- ROBERT E. ALSHULER, A.B.
President of the Alumni Association of
the University of California
505 Shatto pl, Los Angeles 5
- CLARK KERR, Ph.D., LL.D.
President of the University
714 University Hall, Berkeley 4
2147 Administration bldg,
Los Angeles 24

APPOINTED REGENTS

The term of the appointed Regents is sixteen years, and terms expire March 1 of the years indicated in parentheses.

- EDWIN W. PAULEY, B.S., LL.D. (1970)
Ten Thousand Santa Monica blvd,
Los Angeles 25
- CORNELIUS J. HAGGERTY (1966)
A.F.L.-C.I.O. bldg, 815 Sixteenth st NW
Washington 6, D.C.
- DONALD H. MCLAUGHLIN, B.S., M.A.,
Ph.D., D.Eng. (1966)
100 Bush st, San Francisco 4
- GERALD H. HAGAR, A.B., J.D. (1964)
1520 Central bldg, 14th and Broadway,
Oakland 12
- EDWARD W. CARTER, A.B., M.B.A., LL.D.
(1968)
14th Floor, United California Bank bldg,
600 S Spring st, Los Angeles 14
- MRS. DOROTHY B. CHANDLER, LL.D.
(1970)
202 W First st, Los Angeles 53
- MRS. RANDOLPH A. HEARST (1974)
233 W Santa Inez av, Hillsborough
- SAMUEL B. MOSHER, B.S. (1972)
1010 Wilshire blvd, Los Angeles 17
- JOHN E. CANADAY, A.B. (1974)
Lockheed Aircraft Corporation,
Burbank
- PHILIP L. BOYD, A.B. (1972)
3900 Market st, Riverside
- JERD F. SULLIVAN, JR. (1964)
Crocker-Anglo National Bank
1 Montgomery st, San Francisco 4
- NOELTON SIMON (1976)
1645 W Valencia dr, Fullerton
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637 S Hill st, Los Angeles 14
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215 Market st, San Francisco 5
- MRS. EDWARD H. HELLER, A.B., LL.D.
(1976)
99 Faxon rd, Atherton
- FREDERICK G. DUTTON, A.B., LL.B.
(1978)
2700 35th pl NW, Washington 7, D.C.

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Oakland 12
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A.M.P., Treasurer
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Assistant Treasurer
615 University Hall, Berkeley 4
- Miss Marjorie J. Woolman, Secretary
689 University Hall, Berkeley 4
- Mrs. Elizabeth O. Hansen, A.B.
Assistant Secretary
689 University Hall, Berkeley 4
- Thomas J. Cunningham, A.B., LL.B.,
LL.D.
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590 University Hall, Berkeley 4
- John E. Landon, A.B., LL.B.
Associate Counsel
590 University Hall, Berkeley 4
- John P. Sparrow, A.B., LL.B.
Associate Counsel
590 University Hall, Berkeley 4
- Robert O. Field, A.B., LL.B.
Assistant Counsel
590 University Hall, Berkeley 4
- Milton H. Gordon, A.B., LL.B.
Assistant Counsel and Assistant
Secretary
590 University Hall, Berkeley 4
- Mark Owens, Jr., A.B., LL.B.
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and Attorney in Residence Matters
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- Donald L. Reidhaar, A.B., LL.B.
Assistant Counsel
590 University Hall, Berkeley 4

University of California

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General Administrative Officers—Davis Campus

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James D. Andrews, M.S., *Dean of Men and Associate Dean of Students.*

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Fred N Briggs, Ph.D., *Dean of the College of Agriculture, Emeritus.*

College of Engineering

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College of Letters and Science

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School of Veterinary Medicine

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Charles E. Cornelius, D.V.M., *Associate Dean.*

The Graduate Division

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Harold G. Reiber, Ph.D., *Associate Dean.*

The University of California

Founded 1868

HISTORY

The Beginning

In 1868 the University of California was established, 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 California. Five years later the University moved to Berkeley, when the first buildings were completed.

Today

The University, currently serving the State of California with nine campuses—Berkeley, Davis, Irvine, Los Angeles, Riverside, San Diego, San Francisco, Santa Barbara, and Santa Cruz—is composed of academic and professional schools and colleges, divisions, departments of instruction, museums, libraries, research institutes, bureaus, and foundations.

In addition to the educational facilities centered on its campuses, the University operates the University Extension and Agricultural Extension Service everywhere in the State where a public demand is apparent. Special instruction and research are carried on throughout the State, in other states, and in foreign countries.

Scope

The University is continuing, as in the past, to keep pace with the growth of the State. Present campuses are being expanded; new campuses are in the planning stage. The University's steady increase in quality as well as in size has won it general recognition as one of the four or five greatest universities in the country. The University of California provides a college education for all qualified students, without distinction of sex, creed, or race. It offers instruction in the arts, sciences, and literature, as well as fundamental training for many of the professions.

GOVERNMENT

The government of the University is entrusted to a corporation, The Regents of the University of California, consisting of twenty-four members. Sixteen are appointed by the Governor; the others are members ex officio.

The Regents select a President of the University, who becomes responsible to the Regents for the proper administration of the University on all of its campuses. The President, in turn, recommends chief administrative officers (chancellors and provosts) for the campuses of the University, state-wide vice-presidents, and administrative deans.

In line with full powers of organization and government granted by the State of California, the Regents are authorized to delegate to committees or to the faculty or to others, such authority or functions in the administration of the University as they may deem wise. Therefore, the Regents have created an academic administrative body called the Academic Senate.

The Academic Senate consists of the President, Chancellors, Vice-Chancellors, Vice-Presidents, Provosts, Deans, Directors, Registrars, University Librarians, and all professors and instructors giving instruction in any curriculum under the control of the Academic Senate. The Davis Division of the

Northern Section of the Academic Senate is the academic administrative body for the Davis campus. It determines the conditions for admission, for certificates, and for degrees (subject to the approval of the Regents).

The Senate also authorizes and supervises all courses of instruction in the academic and professional colleges and schools, and also recommends to the President all candidates for degrees.

SITE AND GROWTH OF THE DAVIS CAMPUS

Davis, a general campus of the University, continues to offer more courses each year in the letters and sciences and engineering. Davis remains the University's principal campus for teaching and research in the agricultural sciences and veterinary medicine.

The College of Agriculture and the College of Letters and Science account for over 75 per cent of the undergraduate enrollment, while the College of Engineering and the School of Veterinary Medicine make up the remainder. The Graduate Division, with nearly 25 per cent of total enrollment, offers work to the Ph.D. in many areas, largely in the agricultural and basic sciences but increasingly in the humanities and social sciences. Davis now enrolls students aiming toward all branches of engineering and offers specialized training in agricultural, chemical, civil, electrical, and mechanical engineering. Education programs lead to credentials for elementary and secondary teaching.

The 3,710-acre Davis campus is essentially a residential campus with 1,600 students living in new University halls. Flat terrain makes bicycles a favorite mode of travel, both on campus and in town.

The city of Davis, a college town of 10,000, lies on main rail and highway junctions 13 miles west of the State capital, Sacramento. Davis is also about 90 minutes away from metropolitan San Francisco and surrounding cities.

SURVEY OF CURRICULA

Instruction is offered in the College of Agriculture; the College of Letters and Science; the College of Engineering; the School of Veterinary Medicine; and the Graduate Division.

The undergraduate curricula of four years in applied science in the College of Agriculture lead to the bachelor's degree in science (B.S.). The curricula include major subject offerings in:

Agricultural Business Management	Animal Physiology
Agricultural Economics	Genetics
Agricultural Education	Poultry Husbandry
Agricultural Production	Entomology
Agricultural Economics	Food Science
Agronomy	Home Economics
Animal Husbandry	Child Development
Dairy Industry	Design
Enology	Dietetics
Food Technology	Foods
General Agriculture	General Home Economics
Irrigation	Nutrition
Landscape Horticulture	Textile Science
Pest Control	International Agricultural
Pomology	Development
Range Management	Irrigation Science
Soils and Plant Nutrition	Plant Science
Vegetable Crops	Agronomy
Viticulture	Genetics
Animal Science	Landscape Horticulture
Animal Husbandry	Park Administration

Plant Pathology
 Pomology
 Vegetable Crops
 Viticulture

Preforestry
 Preveterinary Science
 Range Management
 Soil Science

Preprofessional training in forestry and veterinary medicine is offered.

The College of Engineering offers a curriculum in engineering which permits specialization in agricultural, chemical, civil, electrical, and mechanical engineering.

The undergraduate curricula of four years in the College of Letters and Science lead to the bachelor's degree in arts (A.B.) and science (B.S.). Organized majors and professional curricula include:

American History and Literature
 Anthropology
 Art
 Biological Sciences
 Botany
 Chemistry
 Dramatic Art
 Dramatic Art and Speech
 Economics
 English
 French
 Geography
 Geological Sciences
 German
 History
 International Relations
 Mathematics
 Microbiology
 Music

Philosophy
 Physical Education
 Physical Sciences
 Physics
 Political Science
 Preprofessional Training
 Pre dental
 Prelegal
 Premedical
 Prenursing
 Preoptometry
 Prepharmacy
 Prephysical Therapy
 Presocial Welfare
 Psychology
 Sociology
 Spanish
 Zoology

The School of Veterinary Medicine offers a curriculum of four years, following two or more years of preprofessional work, leading to the degree of Doctor of Veterinary Medicine (D.V.M.).

Graduate study, leading to advanced degrees, is offered to college graduates formally admitted to the Graduate Division (see page 25).

DEGREES AWARDED

Approximately 200,000 degrees and certificates have been granted by the University of California to students on its various campuses since it was established. Candidates for degrees must satisfy academic and residence requirements as set forth in the collegiate section of this bulletin and bulletins of the schools and colleges, and the Graduate Division.

The prospective student is advised to give careful attention to determining the major or subject in which he wishes to receive a degree before entering the University, and to plan his curricula beginning with his freshman year to facilitate completion necessary to obtain the degree.

Undergraduate Degrees

The degree of Bachelor of Arts (A.B.) is offered in organized majors or programs in the College of Letters and Science. However, students are permitted to prepare programs that may not be included in the published announcements, upon approval from the Executive Committee.

The degree of Bachelor of Science (B.S.) is offered in the colleges of Agriculture, Engineering, Letters and Science, and in the School of Veterinary Medicine. Detailed descriptions of the departmental and college and school programs will be found in later pages of this Catalogue and in the announcements of the schools and colleges.

Graduate Degrees

In the Graduate Division the degrees of Master of Arts (M.A.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) are conferred. Professional degrees offered are Master of Education (M.Ed.), Master of Engineering (M.Eng.), Doctor of Engineering (D.Eng.), and Doctor of Veterinary Medicine (D.V.M.).

More detailed information may be found in the specialized bulletins and publications and in the graduate announcements of the individual schools and departments, obtainable on request from the Office of the Registrar, University of California, Davis.

SUMMER SESSIONS

In 1964 there will be two regular six-week Summer Sessions beginning on June 15 and on July 27. The first regular Summer Session 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. The second Summer Session will offer courses for teacher candidates who have been admitted to internship programs and to other qualified graduate students who may wish to complete requirements for teaching credentials or degrees. In addition, the courses numbered 199 for advanced undergraduates and graduate research courses numbered in the 299 series will be available for qualified students in both regular sessions.

A special Summer Session is offered during the period June 29 through August 7 to provide: 1. Upper division and graduate courses in agriculture and education for interested agricultural students, vocational agriculture teachers, and agricultural extension personnel. 2. Special study courses numbered 199 for advanced undergraduates and/or graduate research courses in the 299 series.

Summer sessions are also conducted on the Berkeley, Los Angeles, and Santa Barbara campuses. Information about these summer sessions is available in the Summer Sessions bulletins, obtainable from the Registrar, or from the Office of the Summer Sessions on the respective campuses.

UNIVERSITY EXTENSION*

University Extension, as a special educational service agency of the University, makes available educational facilities to adults who seek training in some form of higher education. The program includes classes, conferences, correspondence courses, and special activities in a wide range of subject fields and interests. During the past few years, there has developed an increasingly large program of courses designed for those in the professions and those with advanced training. In addition, University Extension offers a large number of courses designed primarily for intellectual and cultural interests in the arts, social sciences, and other fields.

The educational services of University Extension are organized around three primary aims: to help men and women advance professionally; to aid them in meeting their responsibilities as citizens; to assist in their pursuit of intellectual interests.

Five principal methods of instruction are used:

1. Classes are organized in cities and communities wherever a sufficient number of people indicate an interest in a particular subject.

2. Conferences, institutes, and workshops for periods ranging from one day to several weeks, provide intensive instruction for groups interested in pursuing specialized knowledge.

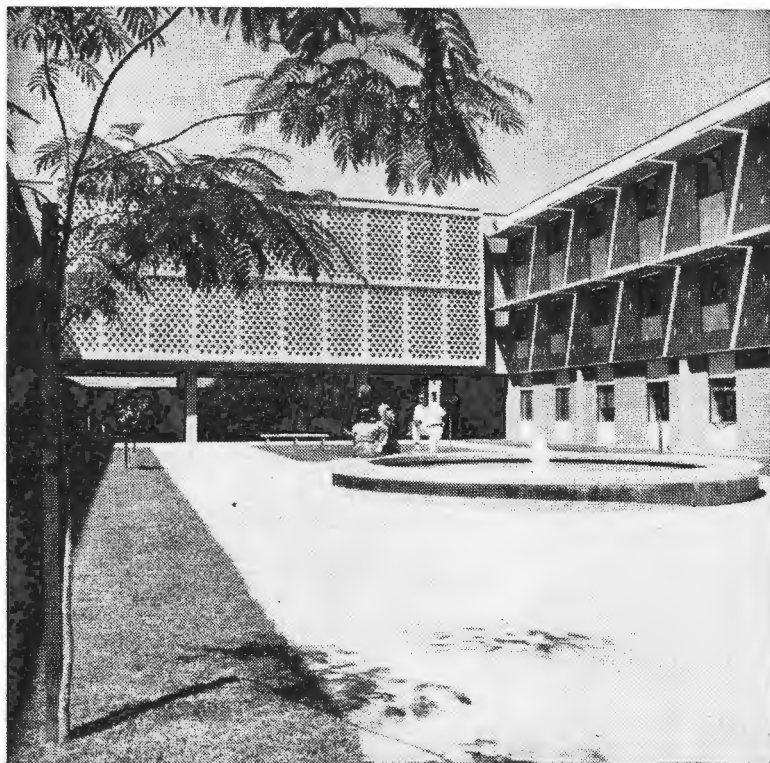
* For information concerning admission to the University through University Extension, see page 22.

3. Lectures, singly or in series, are provided for committees, clubs, organizations, or communities which make the necessary arrangements for securing this service.

4. Correspondence courses offer lessons, study materials, and University guidance by mail.

5. Visual education aids in the form of motion picture films are available from film libraries maintained by University Extension in Berkeley and Los Angeles.

For information regarding any of these services, contact University Extension on any of the following University campuses: Davis, Berkeley, Los Angeles, Riverside, or Santa Barbara.



Academic Office Building

Admission to the University

The admission requirements of the University are based on two principles: that the best assurance of success in the University is shown by high quality of scholarship in previous work and that the study of certain specified subjects will give the student both good preparation for the work of the University and reasonable freedom in choosing his field of specialization. These principles apply to admission to either freshman or advanced standing.

APPLICATION FOR ADMISSION

Applications should be filed with the Office of Admissions, Room 5, Freeborn Hall. An application form, supplied upon request by the Office of Admissions, should be filed between October 1 and July 15 for the fall semester and between March 1 and December 15 for the spring semester.

Admission requirements are uniform on all campuses of the University. Admission to the University entitles the student to attend the campus of his choice if the required facilities are available there. Since applications will be processed and acted upon in only one Office of Admissions, applications to more than one campus should not be filed.

If, after an application has been filed, the applicant decides to register on a different campus, he should write to the Director of Admissions, 521 University Hall, University of California, Berkeley 4, indicating the campus where he filed his application, the campus where he now wishes to register, and the reason for his change. His records will be transferred to the campus he wishes to attend provided facilities are available there. Such requests should be received at least three weeks before registration.

APPLICATION FEE

Each applicant for admission is required to pay a nonrefundable fee of \$5 when an application is filed. Remittance by bank draft or money order payable to The Regents of the University of California should be attached to the application.

TRANSCRIPTS OF RECORD

Official transcripts of record should be sent by the applicant's high school and by each college attended directly to the Office of Admissions. Transcripts should include a statement of good standing or honorable dismissal from the last college attended. A preliminary transcript should show work in progress. *The applicant is responsible for requesting these transcripts to be sent to the Office of Admissions.*

NOTIFICATION OF ELIGIBILITY

So that students may be informed as early as possible about eligibility, they are urged to apply early in the application period and to make arrangements for transcripts of record to be sent to the Office of Admissions.

The time between receipt of an application by the Office of Admissions and notification to the applicant about his eligibility will vary. Students applying as first-semester freshmen should ask the high school to submit preliminary transcripts showing the complete record through the next-to-last semester before graduation and listing courses in progress during the final semester. Those applying after April 1 for the fall semester or after December 1 for the spring semester should not expect answers until at least four weeks after

final transcripts reach the Office of Admissions. Those applying before these dates may receive notification somewhat more promptly.

Students applying for admission in advanced standing may expect notification about four weeks after final transcripts have been received. The receipt of preliminary transcripts may shorten this interval, and applicants for the spring semester should arrange for the submitting of preliminary transcripts showing work in progress, since provisional admission may be possible.

VACCINATION CERTIFICATE

Every new student and every student returning to the University after an absence must present, at the time of appointment for a medical 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 sent routinely to all new students. Vaccination should be completed before registration.

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 was 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 July 15 for the fall semester and by December 15 for the spring semester.

PREPARATION FOR UNIVERSITY CURRICULA

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 and which may be obtained from the Office of Admissions or the University Dean of Educational Relations, 521 University Hall, University of California, Berkeley 4.

All students should pursue a full program of academic subjects during their senior year in high school.

A statement of the requirements for the bachelor's degree is contained in this bulletin and in the *Announcement* of each school or college of the University. A copy of the desired *Announcement* may be obtained by writing to the particular School or College in which the student is interested.

Graduates of California high schools who are not eligible for admission to the University are usually advised to attend one of the California junior colleges and take courses applicable toward the requirements of the college in which they wish to enroll in the University.

ADMISSION TO FRESHMAN STANDING

An applicant for admission to freshman standing is one who has not attended any college-level institution since graduation from high school.

If the applicant does not meet at the time of high school graduation the requirements given below for admission to freshman standing, he must qualify for admission to advanced standing (see page 21). An exception to this regulation will be made only if the student's deficiency was the result of his having omitted one or more required high school subjects. Such a student can some-

times remove the deficiency during the summer if approval to do so is obtained in advance from the Office of Admissions.

If the applicant has attended a junior college, a four-year college, a university, extension classes of college level, or any comparable institution since graduating from high school, he is subject to regulations governing admission in advanced standing, regardless of whether he completed any courses.

Requirements for Admission to Freshman Standing

Applicants for admission to freshman standing must meet the requirements listed below. These requirements apply to California residents; for special requirements for out-of-state applicants, see page 22.

Graduation From an Accredited High School

An accredited high school in California is one that has been officially designated by the Board of Regents of the University as a school from which students will be admitted to the University primarily on the basis of their record of subjects completed and scholarship attained. The University publishes a list of accredited schools annually in September. Accreditation by the University refers to the college preparatory program of the high school and implies no judgment of other functions of the school. If the applicant comes from a high school that is not accredited, the Admissions Officer, upon request, will instruct him regarding the procedure he should follow. When residents of California have attended high schools outside California, the University determines acceptability of the high school records by consulting other accrediting agencies.

Subject Requirements

For grades required in the following subjects, see *Scholarship Requirements* below.

(a) History, 1 Unit

This must consist 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 must consist of six semesters of English composition, literature, and oral expression, certified by the high school principal as University preparatory.

(c) Mathematics, 2 Units

These must consist of two semesters of algebra and two semesters of plane geometry, or an integrated two-year course covering the same material. Advanced algebra and trigonometry may be substituted for algebra, and trigonometry and solid geometry for plane geometry.

(d) Laboratory Science, 1 Unit

This must consist 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) Units

This must be chosen from one of the following:

Mathematics, a total of 1 unit composed of second-year algebra, solid geometry, trigonometry, or an advanced course for which trigonometry is a prerequisite.

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

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

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

Scholarship Requirements

At least an average grade of B is required in courses taken in the tenth, eleventh, and twelfth years used to meet the *a* to *f* subject requirements. Courses taken for subject credit in the ninth year need show passing grades only.* Grades are considered on a semester basis except from schools that give only year grades.

In determining the B average, a grade of A in one course will be used to balance a C in another, but an A grade may not be used to compensate for D, E, or F grades. Courses completed in the tenth, eleventh, and twelfth years in which a grade of D is received will not be counted in satisfaction of the subject requirement.

Courses taken in the tenth, eleventh, and twelfth years in which a grade of C or lower is received may be repeated to raise grades in an amount not to exceed 2 units of the *a* to *f* pattern, if approved by the principal of an accredited high school from which the student graduates. Only the first repetition may be used to satisfy scholarship requirements, but additional repetitions are allowed to satisfy a subject requirement.

Minor Deficiencies

The Admissions Officer has authority and responsibility for waiving minor deficiencies when justified by unusual academic records or recommendations.

Admission by Examination

High school graduates who are ineligible on their high school records and who have had no college work subsequent to graduation from high school (except during a summer session between high school graduation and registration in the University) may qualify for admission by examination.

The University does not offer entrance examinations but accepts the results of examinations given by the Educational Testing Service for the College Entrance Examination Board. Arrangements to take the test should be made with the Educational Testing Service, P.O. Box 27896, Los Angeles 27, California, or P.O. Box 592, Princeton, New Jersey. The fee for the Scholastic Aptitude Test is 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.*

Scholastic Aptitude and Achievement Test Dates

Test Dates

Saturday, December 7, 1963
 Saturday, January 11, 1964
 Saturday, March 7, 1964
 Saturday, May 2, 1964
 Wednesday, July 8, 1964

Application Deadlines

November 9, 1963
 December 14, 1963
 February 8, 1964
 April 4, 1964
 June 10, 1964

Since applications to take tests must be submitted at least four weeks before the date of the test, applicants should communicate with Educational Testing Service early in the year. Scores for the January tests are received too late for consideration for admission to the spring semester.

* Effective with respect to applicants for admission in the fall semester of 1964 and thereafter, subject requirements in the *a* to *f* pattern may be satisfied only by courses in which a grade of C or higher has been assigned.

To qualify by examination the applicant must take the tests after completion of the first half of the eleventh grade. Test results must be forwarded directly from Educational Testing Service to the Office of Admissions.

To qualify for admission by examination, the applicant must take the Scholastic Aptitude Test and three Achievement Tests, one in English Composition, one chosen from Mathematics or Science, and one chosen from Foreign Language or Social Science. On the Scholastic Aptitude Test he must achieve a total score of at least 1000 and on the three Achievement Tests a total score of at least 1650 with no score in any Achievement Test of less than 500, regardless of the total score.

For examinations for out-of-state students, see page 23.

ADMISSION TO ADVANCED STANDING

An applicant who has attended a junior college, a four-year college, a university, extension classes of college level, or any comparable institution since graduation from high school is subject to regulations governing admission to advanced standing. The applicant may not disregard his college record and apply for admission to freshman standing.

Requirements for Admission to Advanced Standing

Applicants for admission to advanced standing must meet the requirements listed below. These requirements apply to California residents; for special requirements for out-of-state students, see page 23.

Satisfaction of High School Requirements

Students must satisfy, through either high school or college courses, the subjects required for admission of high school graduates to freshman standing (see page 18). The applicant must therefore have included in his college program courses acceptable for removing high school subject shortages caused by omission or by grades of D, E, or F. These courses may be taken in any approved college.

An applicant who was eligible for admission in freshman standing or whose only deficiency arose from not having studied one or more required high school subjects may be admitted at any time if he has satisfied the subject requirements for admission of high school graduates and his advanced standing work in institutions of college level has met the minimum scholarship standard required of transferring students, in no case lower than C average in the last college attended and a C average in all college work attempted.

Deficiencies in subject requirements will be waived in an amount not exceeding two high school units if the applicant presents at least 56 units acceptable for advanced-standing credit with a grade-point average of 2.4 or higher in all advanced-standing credit accepted.

Minimum Scholarship Requirements

The applicant's record in institutions of college level must have met the minimum scholarship standard required of transferring students, in no case lower than a 2.0 average in transfer courses in the last college attended and an over-all 2.0 average in all transfer courses attempted. If the applicant was ineligible at the time of high school graduation because of low scholarship or a combination of low scholarship and incomplete subject preparation, he must present a minimum of 56 units of transfer courses with a grade-point average of at least 2.4.

The applicant must also be entitled to return as a student in good standing to the last college attended.

Scholarship standard is expressed by a system of grade points and grade-point averages in courses acceptable for transfer to the University of California. The grade points are computed as follows: 1 unit of A counts 4 grade points; 1 unit of B counts 3 grade points; 1 unit of C counts 2 grade points; 1 unit of D counts 1 grade point; and units of E and F yield no grade points. The grade-point average is determined by dividing the total number of acceptable units attempted into the number of grade points earned on those units. Courses completed with a grade lower than C may be repeated, but the units and grade points count each time the course is taken.

Credit for Work Taken in Other Colleges

The University grants credit for courses appropriate to the curriculum in the University that have been completed in other accredited colleges and universities. This credit is subject to the restrictions of the senior residence requirement of the University.

As an integral part of the system of public education of California, the University accepts, usually at full unit value, 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 their college courses in one of the many excellent California public junior colleges. After a student has earned 70 units acceptable toward a degree (except credit allowed for military service and training) no further unit credit will be granted for courses completed at a junior college.

No applicant may receive transfer credit in excess of an average of 18 units per semester.

Extension courses taken at an institution other than the University may not be acceptable. The decision regarding their acceptability rests with the Admissions Officer. Students who plan such a program with the intention of applying it toward a degree at the University should have the approval of the Office of Admissions in advance.

Removal of Scholarship Deficiencies by Applicants from Other Colleges

Applicants from other collegiate institutions whose college records fail to show a satisfactory scholarship average but who are otherwise eligible may be admitted only when the deficiency has been removed by additional work completed with grades high enough to offset the shortage of grade points. Removal of deficiencies may be accomplished by work in other approved higher institutions, in summer sessions, or by courses in University Extension.

Minor Deficiencies

The Admissions Officer has authority and responsibility for waiving minor deficiencies when justified by unusual records or recommendations.

REQUIREMENTS FOR OUT-OF-STATE APPLICANTS

It has been necessary to place some limitation on enrollment of applicants who are not residents of California; therefore, only those of exceptional promise will be eligible for admission. The regulations below are designed to admit out-of-state applicants whose standing, as measured approximately by scholastic records, is in the upper half of those who would be eligible under regular rules.

Requirements for Admission to Freshman Standing

Graduation From an Accredited High School

For schools outside California, regional or other accrediting agencies are consulted. The University makes the final decision regarding acceptability.

Subject Requirements

The same subject pattern as for California residents is required (see page 19).

Scholarship Requirements

The applicant must present evidence that he has maintained a grade-point average of 3.4 or higher on the required high school subjects. (1 unit of A counts 4 points; 1 unit of B counts 3 points; 1 unit of C counts 2 points; 1 unit of D counts 1 point; and units of E and F yield no points.)

Admission by Examination

Out-of-state applicants who are ineligible on their high school records and who have had no college work subsequent to graduation from high school (except during a summer session between high school graduation and registration in the University) may qualify for admission by examination. The requirements are the same as for in-state applicants (see page 20) except that the total score on the Scholastic Aptitude Test must be at least 1100 and the scores on the three Achievement Tests must total at least 1725.

Requirements for Admission to Advanced Standing

In addition to the regular admission requirements (see page 21), out-of-state applicants for admission to advanced standing must meet the following regulations.

Required Subjects and Scholarship

The applicant must have maintained a grade-point average of 2.8 or higher in college subjects acceptable for transfer credit.

The applicant is expected to have fulfilled the pattern of required high school subjects, if not before high school graduation then by having included in his college program the courses needed to remove any subject shortages. However, deficiencies in subject requirements will be waived in an amount not exceeding 2 high school units if the applicant presents 56 or more units acceptable for advanced standing credit with a grade-point average of 2.8 or higher.

If the applicant did not have at the time of high school graduation an average of 3.4 or higher in courses satisfying the required subject pattern, he must offset this deficiency by presenting a minimum of 56 acceptable college units with a grade-point average of at least 2.8.

ADMISSION OF SPECIAL STUDENTS

Special students are students of mature years who have not had the opportunity to complete a satisfactory high school program or who have not completed a substantial amount of college work and who by reason of special attainments may be prepared to undertake certain courses in the University toward a definite and limited objective. Only cases of unusual merit will be considered. A personal interview is usually required before final action in any individual case can be taken.

Conditions for admission are assigned by the Admissions Officer and are subject to the approval of the dean of the college in which the applicant

plans to study. Admission is for a specified time only and a prescribed scholarship average must be maintained.

No person under twenty-one years of age will be admitted as a special student, nor will an applicant be admitted directly from high school. Graduates of high schools are expected to qualify for admission in accordance with the usual rules. A student admitted to regular status, if not a candidate for a degree, may pursue an elective or limited program with the approval of the dean of his college.

An applicant for special status must ordinarily submit transcripts of record from all schools attended beyond the eighth grade. He may also be required to take the examination in Subject A.

The University has no special courses. All courses are organized for regular students. A special student may be admitted to those regular courses for which, in the judgment of the instructor, he has satisfactory preparation. A special student will seldom be able to undertake the work of the 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.

ADMISSION TO 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 and who by reason of special attainments may be prepared to undertake certain courses in the University toward a definite and limited objective. Transcripts of record from all schools attended beyond the eighth grade must ordinarily be submitted. The applicant may also be required to take the examination in Subject A.

Conditions for admission are assigned by the Admissions Officer and are subject to the approval of the dean of the college or school. Admission is for a definite period, and a prescribed scholarship average must be maintained.

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

ADMISSION OF APPLICANTS WITH BACHELORS' DEGREES

Ordinarily, an applicant with a bachelor's degree substantially equivalent to the bachelor's degree granted by the University of California should apply for admission to graduate status. An applicant with a superior record may occasionally qualify as a student in limited status or, after a complete change of objective, as an undergraduate seeking a second baccalaureate. In either case, the previous scholarship record must be such as to indicate very strong probability of academic success. Admission is subject to the approval of the dean of the school or college in which the applicant plans to enroll.

ADMISSION OF APPLICANTS FROM OTHER COUNTRIES

The credentials of an applicant for admission from another country in either undergraduate or graduate standing are evaluated in accordance with the general regulations governing admission. An application, official certificates, and detailed transcripts of record should be submitted to the Office of Admissions several months in advance of the opening of the semester in which the applicant hopes to gain admittance. Early application 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 is sufficient to permit him to profit by instruction in the University. An ap-

plicant's knowledge of English is tested by an oral and written 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.

College credit for the language and literature of a student from a country where the language is not English is given only for courses taken in native institutions of college level or for upper division or graduate courses taken in the University or in another English-speaking institution of approved standing.

A student who is outside the United States and applies for admission to the lower division of the College of Engineering must pass with satisfactory scores the College Entrance Examination Board Scholastic Aptitude Test (verbal and mathematics sections) and achievement examinations in English composition, physics, and advanced mathematics. If he does not present satisfactory scores in these tests he will not be able immediately to undertake courses in the College of Engineering even though he is admitted to the University. Arrangements to take the tests in another country should be made directly with the Educational Testing Service, P. O. Box 592, Princeton, New Jersey. A fee of \$13 is charged for these examinations and should be sent to the Educational Testing Service, not to the University. The applicant should request that his scores in the tests be forwarded to the Office of Admissions.

An adviser will assist foreign students in all matters pertaining to their attendance at the University. It is urged that every student from another country, upon his arrival at the University, consult the foreign student adviser.

ENGINEERING EXAMINATIONS

All students who plan to register in the College of Engineering in the lower division with fewer than 15 units of college credit, or in the upper division, are required to take an Engineering qualifying examination.

The Lower Division Engineering Examination is an aptitude test that contains sections on technical vocabulary, mathematical reasoning, and scientific relationships. The achievement of a satisfactory score in this examination is not a condition of admission.

The Upper Division Engineering Examination is an achievement test that includes sections on English, mathematics, chemistry, physics, and lower division engineering subjects. It is required of all students who seek upper division status in the College of Engineering, including those from the lower division of the University.

Both examinations are given on announced dates at various test sites throughout the State. Applications for the examinations may be obtained from the Office of Admissions or the College of Engineering.

The appropriate examination should be taken the semester before the one in which the applicant plans to register. Formal application for admission to the University as well as the application to take the test must be filed before the date scheduled for the examination.

ADMISSION IN GRADUATE STANDING

Admission to the Graduate Division may be accorded holders of the bachelor's degree from institutions of acceptable standing on presentation of official transcripts showing all college or university work completed to date together with official evidence of the degree conferred, provided the undergraduate program represents the usual college course of four years, the scholarship record is satisfactory, and the student can be accommodated in the field in which he wishes to pursue study. The University may deny admission to graduate standing in cases where the scholarship record has not

been satisfactory or where the undergraduate program has not furnished an adequate basis for advanced work leading to academic or professional higher degrees or certificates. This proviso applies to graduates of the University as well as to graduates of other institutions. *In the absence of official records and official evidence of graduation or receipt of degree, registration will not in any case be permitted.*

Transcripts of students' records and all other official credentials furnished for admission are retained permanently in the files of the Graduate Division. *In addition to the record sent for admission, the student must furnish an additional set of his official transcripts for conference with departmental advisers and for his own reference in planning a program of study. The Graduate Division office copies may not be borrowed for any purpose.* Admission to the Graduate Division does not necessarily carry with it the privilege of proceeding to candidacy for a higher degree on the basis of minimum residence and subject requirements.

A formal application is required of all persons seeking admission to the Graduate Division. The application blank may be obtained from the Office of the Dean of the Graduate Division, Room 6, Freeborn Hall, and must be filed, preferably twelve weeks before the date of registration, and in no case later than August 1 for the fall semester and January 2 for the spring semester. It should be accompanied by a money order or bank draft for payment of the \$5 application fee.† *The application fee is chargeable to every person who files an application and is not returnable under any circumstances.* (For readmission of former graduate students, see below.) If applications and complete records are filed later than twelve weeks before the date of registration, the student's registration may be delayed and he must pay the \$10 late registration fee.

Every new student and every student returning to the University after an absence must present, at the time of appointment for a medical examination by the University Medical Examiner, a certificate establishing the fact that he has been successfully vaccinated against smallpox within three years. A form for this purpose will be furnished by the University. Vaccination should be completed prior to registration.

The level of work to which graduate students are assigned and their standing as candidates for degrees depend upon the extent and character of their undergraduate courses. If in the opinion of any department the preliminary training of an applicant has not qualified him for graduate work, he may be assigned to such undergraduate courses as are suited to his needs.

Readmission

An application for readmission is required of persons formerly registered in a regular session as graduate students who wish to return after an absence. The form for this purpose is obtainable from the Registrar, and no fee is charged. Each applicant is required, however, to file official evidence that he has been satisfactorily vaccinated as explained in the above paragraph for new students.

Transfer Within the Graduate Division

A graduate 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 was last registered.* The transfer application forms may be ob-

† Veterans who expect to enroll under the provisions of Public Law 894 or Public Law 16 are not required to remit this fee with their applications.

tained from the Office of the Registrar or the Graduate Division and must be filed with the Office of the Registrar by July 15 for the fall semester and by December 15 for the spring semester.

Intercampus Exchange Program for Graduate Students

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 host campus. The Intercampus Exchange Student will have library, infirmary, and other student privileges on the host campus but will be considered as a graduate student in residence on his home campus. The grades obtained in courses on the host campus will be 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.

Foreign Students

Applicants for admission to the Graduate Division on credentials from universities and colleges in foreign countries must take the Examination in English for Foreign Students described in the preceding section, to demonstrate whether their command of English will enable them to profit by instruction in the University.

For further information concerning the Graduate Division see the *Announcement of the Graduate Division, Davis*, obtainable from the Registrar or the Dean of the Graduate Division.

General Information and Regulations

Certain general regulations govern residence and eligibility for study in the academic departments. Unless otherwise stated, these apply to both graduate and undergraduate students.

ROUTINE OF REGISTRATION

All students must register with the Registrar before undertaking any work or examination for credit toward a University degree. This registration must also be accepted by the proper faculty before the work is undertaken.

Prospective students should plan to arrive early in the registration week. During that period, certain examinations, including Subject A, are scheduled for all new undergraduates. Students who fail to take required examinations at the prescribed time will be charged a \$1 fee.

Students in good standing carrying a limited amount of regular classwork may be permitted, on the basis of private study outside University classes, to take certain University examinations for the purpose of gaining advanced standing. The authorization of the proper faculty must, however, be obtained by written petition before preparation for the examinations is begun.

Students or prospective students should consult the *Registration Circular* for the dates to register and begin work. Registration later than the announced dates requires special permission. Late registration creates difficulties for students in making out their programs and retards their progress as well as that of the classes they are attending.

Students who register after the opening of the session and who later are found deficient in their work may not plead late admission as an excuse for deficiencies.

A \$10 fee is charged for late registration; this regulation applies both to old and new students.

A qualified student or applicant who fails to register on the stated registration days at the opening of the semester but who, nevertheless, appears during the *first two weeks of instruction* will usually be permitted to register. After the first week, however, he is required to obtain written approval from all the instructors in charge of his proposed courses and from the dean of his college before his registration can be completed. *In no event will a student be permitted to register or file his study list after Friday of the third week of instruction.*

STUDY-LIST REGULATIONS

At the beginning of each semester every student must file with the Registrar a detailed study list approved by a faculty adviser or other designated authority. Any changes in this program must then be made only with formal permission from the dean of the student's college. Otherwise, the student is liable to enforced withdrawal from the University or to other appropriate disciplinary action.

Each college has certain study-list limits with which the student must comply. Detailed regulations of the respective colleges are given in later pages of this Catalogue.

Every regular student must include in his study list all required work appropriate to the college and year of his work. The Committee on Study Lists of the appropriate college or school is authorized to withdraw study cards that do not comply with this regulation.

A student normally registers for course work at the beginning of each semester. He may sometimes register for year courses in the second semester

without having been registered in the first semester; credit is given for the work of the second semester only.

Concurrent enrollment in resident courses and in extension courses is permitted only when the student's entire program has received the approval of the proper dean or study-list officer and the student has been registered at the University before undertaking the work.

Authority of Instructors

No student will be permitted to enter upon the study of any subject if, in the instructor's opinion, he lacks the necessary preparation to ensure competent work.

Every student must satisfy his instructors that he has the necessary preparation in course work to ensure completion and that he is performing his work in a proper manner. Instructors will report to the Registrar from time to time the names of students whose attendance or work is unsatisfactory.

An instructor, with the Chancellor's and the President's approval, may at any time exclude from his course any student guilty of unbecoming conduct toward the instructor or the class, or a student who, in his judgment, has neglected the work. A student thus excluded will be recorded as having failed in that course unless the faculty determines otherwise.

MEDICAL AND PHYSICAL EXAMINATION

To safeguard the health of the student and the University community, every new student, as part of registration, must pass an examination by University Medical Examiners. Every new student must have at the time of registration a certificate of successful vaccination against smallpox within the past three years. A form for this purpose is furnished 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 having physical conditions that grossly disturb the classwork of other students, such as uncontrollable convulsive seizures, should not apply for admission and will be disqualified when detected.

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.

HEALTH INSURANCE REQUIREMENT FOR FOREIGN STUDENTS

The acquisition of health insurance is a condition of registration for all non-immigrant foreign students. Information about health insurance programs and appropriate application forms will be sent to foreign students with the application for admission. The completed application for health insurance can then be used to determine the insurability of the applicant before he departs for the United States.

PHYSICAL EDUCATION AND USE OF GYMNASIUM

All students may use the gymnasium, swimming pool, tennis courts, and athletic fields when these areas are not in use by classes or athletic teams. Certain equipment for games and sports is available for exercise and recreation, either with or without instruction.

MILITARY SCIENCE

The University has an Army Reserve Officers' Training Corps unit that offers courses in general military science. Enrollment in military science is on a voluntary basis.

The Reserve Officers' Training Corps, established by Act of Congress in 1916, trains junior officers and develops the qualities and attributes essential to their progressive and continued development in the United States Army Reserve and in the Regular Army. Military leadership is emphasized. Instruction includes subjects common to all branches of the Army, with special attention to tactics and techniques of the military team. The United States Government furnishes arms, equipment, uniforms, and textbooks for the use of all students enrolled in courses of the department.

The ROTC program has been divided into four phases:

1. The basic course (lower division) of 6 units within the department.
2. The advanced course (upper division) of 10 units within the department.
3. Summer camp (for upper division only) of 3 units.
4. Elective units outside the Military Science Department:

a. Freshman: A total of 2 units of academic subjects in the general areas of science, psychology, effective communication, or political science. The subject chosen may be one that is required in the student's normal curriculum, and must be approved by the Professor of Military Science.

b. Upper division: A total of 6 units as shown in paragraph 4a. One of the dual credit units must be taken in Physical Education 10 (Physical Conditioning Activities). The 6 units may fulfill dual requirements for the bachelor's degree in the colleges as well as for commissioning in the U. S. Army Reserve.

Lower Division

The lower division (basic) course is open to all first- and second-year undergraduate male students who are citizens of the United States, meet the required physical standards, and are under twenty-three years of age at the time of initial enrollment. The instruction is of a general type that prepares the graduate for duty with any branch of the Army upon completion of additional branch schooling.

Under certain conditions, nonresident aliens are permitted to enroll. Inquiry in this regard should be made to the Professor of Military Science.

Upper Division

Application for admission to the upper division (advanced) course may be made by all students who have successfully completed the basic course or who are eligible for equivalent credit and who can complete the course prior to their twenty-eighth birthday. It is also open to veterans having over one year of military service who meet the age and physical requirements.

Application for admission to the advanced course is made early in the fourth semester of the basic course. To be accepted, an applicant must pass an entrance examination, a physical examination, be selected by the Professor of Military Science and the Chancellor, and execute an agreement with the government to complete the course which includes attendance at a six-week summer camp between the junior and senior years. Students selected for the advanced course are those who have shown potentialities for leadership and command and the promise of developing into efficient officers. Acceptance and enrollment in the upper division course will make the completion of the advanced course a prerequisite to graduation from the University, unless the student is excused by authority of the Secretary of the Army.

During the two-year period of the advanced course, the student will be paid a nominal commutation of subsistence in an amount prescribed by the Secretary of Army (currently \$27 per month).

During the third semester of the upper division (advanced) course, each student is classified according to his aptitude, qualifications, and desire for a particular branch of service, and recommendations are made to the Department of the Army for commissioning in the various Arms and Services of the Army. Also, during this semester, outstanding students may be designated by the Chancellor and the Professor of Military Science as Distinguished Military Students. If their high records are maintained, they may be designated, upon graduation from the University, Distinguished Military Graduates. These cadets may then apply for direct commission in the Regular Army as Second Lieutenants.

Successful completion of the advanced ROTC course, and graduation from the University, qualifies the student for appointment as a Second Lieutenant in the United States Army Reserve.

EXPENSES OF STUDENTS

Exact figures for the budget of a student will vary according to personal tastes and the financial resources of the individual. In general, the total expense for a college year of two semesters will average about \$1,670 for residents of California and \$2,270 for nonresidents. Expenses of about \$260 for resident students and \$560 for nonresident students are necessary during the first month after entering college.

Although each student must determine his own budget in keeping with his needs and resources, the University can provide the following as a guide. Room and board (twenty meals a week) for two semesters in a University residence hall costs, on the average, \$880. An additional sum should be budgeted to cover the one meal a week which is not provided in the University residence halls or in other residence facilities. These supplementary board costs, plus residence halls membership fees, will average about \$100 a year. Books, supplies, and miscellaneous expenses, including Student Body Membership fee, Memorial Union fee and one round trip from home to campus, will amount to about \$500 annually. The incidental fee is \$180 a year (students who are classified as nonresidents pay an additional \$600 a year). Thus, a typical budget for a student who is a resident of California and who lives in a University Residence Hall will approximate \$835 a semester or \$1,670 a year. Board and room costs for students making alternative housing arrangements will, of course, vary, and students who live in their own homes and commute to the campus will need to take this into account.

It is possible to live simply and to participate moderately in the life of the student community on a limited budget. The best that University authorities can do to assist the student in planning his budget is to indicate certain and probable expenses.

Incidental Fee

The incidental fee is \$90 each semester for graduates and undergraduates. This fee, which must be paid at the time of registration, covers certain expenses for use of library books; for athletic and gymnasium facilities and equipment; for lockers and washrooms; for registration and graduation; for all laboratory and course fees; and for such consultation, medical advice, and hospital care or dispensary treatment as can be furnished by the Student Health Service. No part of this fee is remitted to students who do not make use of these privileges.

Student Body Membership Fee

The student body membership fee of \$7.50 each semester must be paid by all undergraduates at the time of registration. Membership privileges include participation in student affairs, a free subscription to the student newspaper,

free admission to the many athletic contests, and reduced admission to others. *The student body membership fee is optional for graduate students.*

Memorial Union Fee

A Memorial Union fee of \$2.50 each semester is required of all students.

Miscellaneous Expenses

Books and stationery for a student average \$50 to \$70 a year. Books and special equipment for students in the preprofessional and professional programs cost \$50 to \$200. Exact information on these items may be obtained by writing directly to the school or department. Students who fail to pass the required examination in Subject A must pay a fee of \$35 for the course in Subject A (see page 38).

Parking Fee

A parking fee of \$10 per year is required of students who park cars on the campus.

Refunds

For students who leave before the end of any semester, part of the fees enumerated above may be refunded. A schedule of refunds and other information will be found in a separate circular, *Student Fees and Deposits*, which may be obtained from the Registrar.

TUITION

Tuition is free to every student who has been a legal resident of the State of California for a period of more than one year immediately preceding the opening day of the semester during which he proposes to enroll. Every student who has not been a legal resident of the state for said period is classified as a nonresident and is subject to payment of a nonresident tuition fee. A student entering the University for the first time should read carefully the rules governing the determination of residence as quoted below so that he may be prepared in the event of nonresident classification to pay the required tuition fee. Every entering student and every student returning to the University after an absence is required to make a Statement as to Residence on the day of registration upon a form that will be provided for that purpose and his status with respect to residence will be determined soon after registration by the Attorney in Residence Matters.

The eligibility of a student to register as a resident may be determined only by the Attorney in Residence Matters. If the student is in doubt about his residence status, he may communicate with that officer % Office of the Registrar or at 590 University Hall, University of California, Berkeley 4.

Students classified as nonresidents are required to pay a tuition fee of \$300 each semester. 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 semester during which the minor proposes to attend the University or to an unmarried minor child or spouse of a member of the University faculty.) Graduate students may have part or all of the nonresident tuition fee waived under certain conditions set forth in the *Announcement of the Graduate Division*.

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 semester during which he proposes to enroll.

The attention of the prospective alien student is directed to the fact that he is a nonresident unless, in addition to the general 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.

Every student who is classified as a resident but who becomes a nonresident of California is obliged to notify the Attorney in Residence Matters at once. Application for a change in classification with respect to a previous semester will not be received under any circumstances.

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.

FINANCIAL AIDS AND AWARDS

Through the generosity of alumni and other friends of the University, scholarships, fellowships, prizes, grants-in-aid, and loan funds are available to undergraduate and graduate students in accordance with the conditions laid down by the donors.

Undergraduate Scholarships

Information about scholarships for undergraduate students may be obtained from the Committee on Undergraduate Scholarships, Office of the Dean of Students. Awards are made on the basis of academic achievement, financial need (except for Regents Scholarships), character, and promise. Recipients of undergraduate scholarships must enroll for a minimum of 12 units a semester. Applications for scholarships for any academic year (July 1-June 30) must be filed with the Committee on Undergraduate Scholarships not later than the preceding *February 1* by students already in attendance and not later than *February 15* by entering students. These dates are subject to change. Application forms are available from the Undergraduate Scholarship Committee, Office of the Dean of Students, beginning the last week in November.

Graduate Scholarships and Fellowships

Information about fellowships for graduate students may be obtained from the Dean of the Graduate Division, Room 6, Freeborn Hall. Fellowships and graduate scholarships are ordinarily awarded as a mark of honor, on the basis of scholarship and not of need. The holders of fellowships or graduate scholarships are expected to devote all their time to graduate study and research in the University. Applications for fellowships and graduate scholarships must be filed with the Dean of the Graduate Division, Davis, not later than *February 15* prior to the academic year for which the award is sought. This date may be subject to change. For the latest information, applicants should consult the Office of the Dean of the Graduate Division.

Loans

All loans for both graduate and undergraduate students are initiated in the Office of Dean of Students. At various times numerous individuals and organizations have made contributions to student loan funds. These are administered by the University according to the wishes of the donors and are not usually available during the first semester of residence. The National Defense Education Act of 1958 is providing funds for granting loans up to \$500 per semester and to a maximum of \$5,000 per student. Prospective students, as well as students already in attendance, may apply for the NDEA loans. The number and amount of such loans available will depend upon federal allocation of funds. Repayment can be extended over eleven years after graduation or leaving the University. Loan applications should be submitted three months in advance of need. Small amounts for short periods may be obtained in less time.

Grants-in-Aid and Prizes

Grants-in-aid are available to undergraduate and graduate students in accordance with the conditions laid down by the donors. These funds are administered by the Office of the Dean of Students.

Prizes for student achievement awarded to students on the Davis Campus range from inscribed plaques to \$300 in cash. These prizes are administered by the Committee on Prizes appointed by the Chancellor. Further information is available through the Secretary to the Committee on Prizes, Office of the Dean of Students.

STUDENT EMPLOYMENT

Many students who attend the University expect to earn a 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 semester the student should know the demands of University life and his own capabilities well enough to plan a program combining studies and work for subsequent semesters.

A number of part-time jobs are available to students who can adjust their academic programs to the employers' needs. Usually, class schedules must be arranged before referrals for employment can be given.

The Financial Aids Service, Office of the Dean of Students, assists students in finding part-time employment both on and off the campus. No charge is made for this service. Personal interviews are necessary, as arrangements cannot be made satisfactorily by correspondence. Those wishing part-time work should register upon arrival on the campus.

Student and Alumni Placement Service

The Student and Alumni Placement Center registers graduates, students, and former students for career placement in business, industry, and teaching. The Placement Center assembles information into confidential files concerning the background, training, and professional experience in order to match qualifications of its candidates with specifications of available positions. Placement personnel counsel candidates, communicate with employers, and arrange interviews in the process of assisting students to find suitable employment.

Career placement services are available free of charge to terminating students, graduates, and alumni who have matriculated on one of the campuses of the University. Information may be obtained by writing the Student and Alumni Placement Center, University of California, Davis.

VETERANS AFFAIRS

Special Services assists students in becoming part of the life of the University and acts as liaison with certain veterans and veterans' dependents agencies, the Veterans Administration, the State Department of Veterans Affairs, and others offering veterans educational benefits. This office is located in the Office of the Dean of Students. Offices of the United States Veterans Administration are located as follows:

San Francisco Regional Office, 49 Fourth Street, San Francisco 3, California
Los Angeles Regional Office 1380 South Sepulveda Boulevard, Los Angeles 25, California

Veterans wishing to enroll under the provisions of Public Law 550 ("Korea" G.I. Bill) should obtain from the United States Veterans Administration a Certificate for Education and Training and file it with the Office of Special Services upon completion of registration. These veterans must be prepared to pay all fees and educational costs at the time of registration, since education and training allowances are paid to the veteran by the Veterans Administration and the first monthly payment will normally be received 60 to 75 days after compliance with the above.

Information regarding educational benefits available from the State of California (CVEI) may be obtained from the State Department of Veterans Affairs by writing to P. O. Box 1559, Sacramento 7, California; or to Room 225, 542 South Broadway, Los Angeles 13, California; or to 515 Van Ness Avenue, San Francisco 2, California.

LIVING ACCOMMODATIONS

The University maintains residence halls and dining units for men and women and apartments for married students. In providing meals and living accommodations for students, the University is mindful of two responsibilities: to assure wholesome living conditions and to make residence living contribute specifically to the educational experience of the student.

Within the framework of the ASUCD, the student government functions in the residence halls; each hall maintains its own council to act on matters concerning the welfare of the individual residents.

In accordance with the policy of the University, each student is expected to observe the commonly accepted standards of morality, behavior, and good taste. A willful disregard for the spirit of these standards may constitute sufficient cause for terminating the student's connection with the University.

Board and room in the University residence halls costs about \$420 per semester—approximately the same as for fraternities and private accommodations in the city of Davis. Rooms in the residence halls contain the necessary furniture, linen, blankets, and study lamps; the rent includes the weekly laundering of linen. Contracts for residence are on a semester basis.

Applications for residence in any of the University halls and for the married students' apartments should be addressed to the Office of Housing Services, University of California, Davis.

A residence card must be filed in the Office of the Dean of Women by every woman student before her registration can be completed. Every woman under 21 years of age not living in campus housing must have not only the permission of the Dean of Women for her college residence but also the permission of her parent or guardian, whose approval must be indicated by signature on the woman's residence card provided at registration.

Fraternities

There are nine national fraternities represented on the Davis campus. Membership is by invitation only. These organizations provide living quarters and meals for their members. Costs are comparable to those of the University Residence Halls. Men students who are interested in learning more about fraternities may do so by attending the Interfraternity Council Smoker during Orientation Week or by writing to the Dean of Students Office prior to arrival on campus.

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 in part by the general funds of the University and in part by the incidental fee. It is not a health insurance; the service is limited by the staff and facilities available.

Each student registering in any semester and paying the incidental fee may have such medical care as the Student Health Service is staffed and equipped to provide from the first day of the semester through the last day of the semester. Additional services may be provided for seven days after the last day of the semester at the discretion of the Director of the Student Health Service. Any prospective registrant who receives this extended health service and who does not register and pay the incidental fee for the next following semester may be required to pay for the cost of the service rendered to him up to the amount of the incidental fee. Hospitalization is also included in the services offered when, in the opinion of a University Physician this is necessary and within the limitations herein outlined.

In the event of serious illness during the semester, hospital care for a period of up to thirty days may be given on the recommendation of the University Physician. If the patient is still ill at the end of the semester, he will be released from the hospital to the care of his home or community as soon as the University Physician considers it safe. Also, if injuries or illnesses are of a nature requiring prolonged care that will obviously prevent continuance in college during the current semester, the patient will be returned to his community or home for definitive treatment.

Off-campus medical care on authorized trips will be provided if the student is unable to return safely to the Student Health Center for medical care.

No definitive surgical treatment will be undertaken (as, for example, tumors of the bone) if such treatment would prevent the student from returning to college the same semester. Charges will be made for unusual appliances or remedies not ordinarily available or for hospitalization in excess of thirty days.

The Student Health Service does not take responsibility for dealing with any chronic physical defects or illnesses present at the time of entrance to the University (for example, fitting of eyeglasses, hernias, chronic bone and joint diseases or deformities, chronic gastrointestinal disorders, fibroids of the uterus, chronically infected tonsils, tuberculosis, syphilis, malignant diseases, allergic and endocrine disorders). Except for first aid and emergency care, the Student Health Service does not take the responsibility for dental treatments and will not undertake to treat any injury or illness when treatment has been initiated elsewhere. It does not take responsibility for treating remedial defects where medical or surgical treatment is elective and not of an emergency nature and where the student's best interests will be served by treatment during vacation.

UNIVERSITY LIBRARY

The University Library on the Davis campus contains about 300,000 books and receives annually about 7,000 current periodicals and serials. These have

been selected to support the teaching and research needs of the College of Agriculture, the College of Letters and Science, and the School of Veterinary Medicine. As the center for printed materials, the main library serves both students and faculty. It is supplemented by several specialized departmental collections, which are primarily for laboratory or office use. Trained reference librarians are available for information and advice on a 68-hour-a-week basis.

For further information students are referred to a pamphlet, *Using Your Library*, copies of which are available at the Library.

SELECTIVE SERVICE

Matters relating to the registration and deferment of students eligible under Selective Service are handled by the office of the Dean of Students. Certifications regarding enrollment, class standing, and other pertinent information will be submitted to the student's Selective Service Board upon request. To be considered for deferment by Selective Service, the student must be pursuing a full-time course of instruction, which for undergraduates consists of at least 15 units. This does not include noncredit courses, such as Subject A. Students who plan to seek deferment continuously until qualified for the bachelor's degree should understand that present policies of Selective Service permit continuous deferment only through the eighth semester of college residence, including not only the period of residence at the University but also all semesters spent at junior colleges or other collegiate institutions. Students should plan course sequences for several semesters ahead so that prerequisites for all desired advanced courses can be satisfied within the eight-semester period. Under the present draft laws anyone who receives a draft deferment is eligible for the draft until age 35.

Graduate certification shall be based on the fact that the student is devoting himself primarily to graduate study and is progressing in his program at the normal rate which will permit completion of requirements for the master's degree in two calendar years and for the doctoral degree in five calendar years of graduate study beyond the bachelor's degree.

Students desiring deferment on the basis of enrollment in the University ROTC program should consult with the Professor of Military Science.

COUNSELING SERVICE

Professional counseling on an individual basis is offered to students with questions pertaining to vocational and educational planning or problems of a personal-social nature related to college life.

A choice of a major or future vocation, evaluation of scholastic aptitude as well as other personal characteristics, and improvement of academic effectiveness are common topics of consideration in the counseling interview. The counselor attempts to help the student make the best use of his own resources to achieve maximum benefit from the college experience.

Freshman orientation testing is conducted on a group basis by the counseling staff, and interpretation of test performance is made individually to students and academic advisers upon request.

Further information about the Counseling Service and appointments for counseling interviews are available through the Counseling Services Office.

Developmental Reading and Effective Study Habits

Short-term, noncredit classes in developmental reading and effective study habits are offered each semester. Students interested in these programs designed to aid academic efficiency may secure further information from the Counseling Services Office.

SUBJECT A: ENGLISH COMPOSITION

Every entering undergraduate (except as noted below) must, when first registering in the University, take the *Examination in Subject A*, as a test of his ability to write a coherent 500-word composition in English without gross errors in spelling, grammar, sentence structure, and punctuation.

This examination is offered at the opening of each fall and spring semester (see *Registration Circular*, obtainable from the Registrar). For late registrants a second examination is given (fee \$1), not later than two weeks after the beginning of the semester.

Results of the first examination are available on the following day. Students are graded as "passed" or "failed." Any student absent from the required examination in Subject A is treated as having failed.

Every student who fails the Subject A examination must enroll in the special *Course in Subject A* (three hours weekly for one semester), which is without unit credit toward graduation. This course is subject to the same rules of grading as other University courses. A fee of \$35, payable before the study list is filed, is required for this course; the fee is charged each time the student takes the course.

A student who has failed the examination in Subject A cannot take the second examination but must enroll in the course in Subject A. He is not permitted to enroll in English 1A, 1B or Speech 1A, 1B until he has passed Subject A with a grade of C or better.

A student must satisfy the Subject A requirement before he will be granted the bachelor's degree. A student who has received a score of at least 600 in the College Entrance Examination Board examination in English composition has satisfied the Subject A requirement. A student who has passed an examination in Subject A given by the University or given under the jurisdiction of the University at various centers in the State annually in May or June also has satisfied the Subject A requirement.

A student is exempt from the requirement in Subject A if he enters the University with credentials showing completion elsewhere, with a grade not lower than C, of one or more acceptable college courses in English composition (totaling at least 3 semester units, or the equivalent, of transferable college credit).

A student who maintains a grade of A in the course in Subject A and passes a special examination with a grade of A is permitted, on recommendation of the Committee on Subject A, to withdraw from the course at a date determined by that committee and is considered as having fulfilled the Subject A requirement. (Provisions for refund of fee are covered in the Subject A course section on page 312.) Should any student fail in this course, he will be required to repeat the work in the next succeeding semester of his residence in the University.

Students from other countries whose native language is not English should take the special examination in English for foreign students rather than the Subject A examination. Students who subsequently complete Speech 26, the advanced course in English for foreign students, with a grade of C or higher, will be credited as having met the Subject A requirement.

AMERICAN HISTORY AND INSTITUTIONS

Every student who intends to be a candidate for the bachelor's degree must demonstrate a knowledge of American History and Institutions. He may meet the requirement in any of the following ways:

1. By passing a single examination in American History and Institutions. Successful completion of the examination carries 3 units of course credit. Students electing to satisfy the requirement by examination are requested to do so before the senior year.

2. By completing any two of the following courses, subject to the conditions noted below:† History 17A, 17B, 170A, 170B, 171, 172A, 172B, 174A, 174B, 176A, 176B, 178A, 178B, 179A, 179B, 180, 183; Political Science 1A, 1B, 102, 105, 113, 128A, 157A, 157B, 163, 166.

3. Other:

a. By the automatic equivalence granted for courses offered by collegiate institutions in California, provided an official transcript of the student's record indicates satisfaction of the requirement by such courses, or by meeting the requirement as prescribed by other branches of the University.

b. By presenting a certificate of completion of acceptable courses at other collegiate institutions. Certificates may be obtained from the Office of the Supervisor.

All foreign students attending the University on student visas who are candidates for the bachelor's degree are advised to see the Supervisor of the American History and Institutions Requirement early in their academic work at the University.

Further information concerning this requirement and the examination to meet it may be obtained from the supervisor of the Requirement of American History and Institutions, Room 257, Academic Office Building.

CANDIDACY FOR DEGREES

Every student who intends to be a candidate for a bachelor's degree at the end of the semester must file with the Registrar, on a date to be fixed by the Registrar, an announcement of candidacy. For filing this announcement later than the appointed date, a fee of \$3 is charged. In 1963-1964 these dates are: Monday, September 30, 1963, for candidates who expect to complete their work in January 1964; and Monday, February 24, 1964, for candidates for graduation in June 1964.

During the 1964 Summer Sessions, candidates for bachelor's degrees in July should file an announcement by Monday, June 22, 1964, while candidates for September degrees should file by Monday, August 3, 1964.

All candidates for the bachelor's degree must have been enrolled throughout the senior or final year of residence in that college of the University in which the degree is to be taken. This applies both to students entering from other institutions and to students transferring from one college to another within the University. Of the 120-136 units required for the bachelor's degree, at least 24 must be completed at the University in resident courses of instruction during the final or senior year.

All graduates of any one calendar year—January 1 to December 31—are considered as belonging to the "class" of that year.

For filing dates concerning graduate degrees, see the *University Calendar*. Candidates for advanced degrees will file announcement of candidacy on the dates set by the Dean of the Graduate Division.

CREDIT AND SCHOLARSHIP

In both the University and the high school the amount of the student's work is evaluated in terms of units; the quality of his scholarship, in terms of grades. For more exact evaluation of his scholarship, the University assigns a numerical value in grade points to each scholarship grade.

High school credit offered for admission to the University is reckoned in matriculation units; each represents one year's work in a given subject in the high school.

† Students taking these courses are subject to the regular 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.

High school credit, when offered in satisfaction of high school graduation requirements, is measured in standard secondary units; that is, the credit granted for the study of a subject throughout the school year of thirty-six to forty weeks is stated in terms of the standard secondary unit. Each unit represents approximately one-quarter of a full year's work in high school and four standard secondary units represent one full year's work in high school.

Relation Between High School Matriculation Units and University Units

One year's work in the high school is regarded as equivalent to one University semester's work of college level; that is, a student desiring to make up any high school subject deficiency by offering work of college level can in one University semester earn as much credit as in one high school year.

The value of a University course in units is one unit for three hours of work, normally one class hour and two hours of preparation, by a student per week per semester. The credit value assigned to a course is determined by the number of hours of work required of the student and not by the number of class meetings per week. For most courses the average student is expected to spend two hours in preparing for one hour of lecture or recitation.

GRADES OF SCHOLARSHIP

The result of a student's work in each course (including courses in which credit is sought by examination) is reported to the Registrar in one of six scholarship grades, four of which are passing, as follows: A, excellent; B, good; C, fair; D, barely passing; E and F, not passing. Grades are not otherwise defined, as, for example, by percentages or by a rule stipulating the manner in which the several grades shall be distributed among the members of a class.

Grade E (not passed) indicates a record below passing but one that may be raised, without repetition of the course, by success in a further examination or by performing other tasks the instructor requires. Grade F (not passed) denotes a record so poor that it may be raised to a passing grade only by repeating the course.

The instructor is required to assign, for every student, a definite grade based upon the work actually accomplished, irrespective of the circumstances that may have contributed to the results achieved. The term "incomplete" is not used in reporting the work of students.

Course reports filed by instructors at the end of each semester are final.

A student who desires a report on his scholarship grades at the end of the semester should deposit with the Registrar a self-addressed, stamped envelope.

GRADE POINTS

Grade points are assigned to the respective scholarship grades for each unit of credit as follows: A, 4 points; B, 3 points; C, 2 points; D, 1 point; E and F, no points.

To qualify for the bachelor's degree the student must obtain at least twice as many grade points as there are units in the total credit value of all courses undertaken by him in the University.

MINIMUM UNDERGRADUATE SCHOLARSHIP REQUIREMENTS College of Agriculture and College of Letters and Science

The following provisions apply to all undergraduate students in the College of Agriculture and the College of Letters and Science.

Probation

A student shall be placed on probation:

1. If at the close of his first semester his record shows six or more grade points less than twice the number of units undertaken.

2. If at the close of any subsequent semester his grade-point average is less than two (a C average), computed on the total of all courses undertaken in the University for which he has received a final report.

Dismissal

A student shall be subject to dismissal:

1. If during any semester he fails to pass with a grade of C or higher courses totaling at least 4 units.

2. If while on probation his grade-point average for the work undertaken during any semester falls below two (a C average).

3. If after two semesters of probationary status he has not obtained a grade-point average of two (a C average), computed on the total of all courses undertaken in the University for which he has received a final report.

A student who becomes subject to the provisions of this regulation will also be subject to such supervision as the faculty of his college or school may determine. The faculty may dismiss from the University a student under its supervision, or, by suspending the provisions of this regulation it may permit a student subject to dismissal to remain in the University or permit the return to the University of a student dismissed under this regulation.

School of Veterinary Medicine

The following provisions apply to all undergraduate students in the School of Veterinary Medicine.

Probation

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

Dismissal

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

1. If at the end of any semester subsequent to his first he has failed to maintain a grade-point average of two (a C average), computed on the total of all courses taken in the veterinary curriculum subsequent to his admission to the School for which he has received a final report.

2. If during any semester he fails to pass with a grade of C or higher courses totaling at least 4 units.

3. If at any time he has, in the judgment of the faculty of the School, proved himself to be physically, morally, or mentally unfit for the profession of veterinary medicine.

A student in the School of Veterinary Medicine who becomes subject to the provisions of this regulation shall be under the supervision of the faculty of the School. The faculty, or persons designated by it, shall have the power to dismiss from the University students under its supervision or, at its discretion, to suspend the provisions of this regulation and permit the retention in the University of students thus subject to dismissal and the return to the University of students who have been dismissed under this regulation.

Graduate students who acquire scholarship deficiencies are subject to action at the discretion of the Dean of the Graduate Division.

College of Engineering

The following provisions apply to all undergraduate students in the College of Engineering.

Dismissal

A student will be subject to dismissal from the University:

1. If during any semester or summer session he fails to attain at least a grade C average in all courses for which he was enrolled.

2. If at the end of any semester or summer session he has failed to attain at least a grade C average in all courses undertaken in the University.

A student who becomes subject to the provisions of this regulation will also be subject to such supervision as the faculty of the College may determine. The faculty of the College, or persons designated by it, shall have the power to dismiss from the University students under its supervision, or, at its discretion, it may suspend the provisions of this regulation and permit the retention in the University of the students thus subject to dismissal and the return to the University of students who have been dismissed under this regulation.

CREDIT BY EXAMINATION

An undergraduate student in residence and in good standing may, under certain conditions, take examinations for degree credit either:

1. In courses offered in the University without formal enrollment in them.

2. In subjects appropriate to the student's curriculum but not offered as courses by the University.

The results of all such examinations, with grades and grade points, are entered on the student's record in the same manner as are regular courses of instruction. No fees are required.

The privilege of taking an examination for credit will ordinarily be granted only to students who have at least a B average for all University courses undertaken.

Arrangements must be made in advance with the dean of the student's college or school; his approval and that of the instructor appointed to give the examination are necessary before an examination can be given.

The application form for examinations may be obtained from the Registrar.

FINAL EXAMINATIONS

Final examinations are obligatory in most undergraduate courses. All examinations will, as far as practicable, be conducted in writing. For each examination, a maximum time is assigned beforehand; no student is allowed to exceed this maximum time. The time for examination sessions will be not more than three hours. Leave to be absent from a final examination must be obtained by written petition to the proper faculty.

If a final examination is among the regular requirements in a course, no individual exemption can be made, except as provided in the preceding paragraph.

Any department may examine a student at the end of the semester immediately preceding his graduation in the major subject in which the department has given instruction. A student to be examined in a major subject may, at the discretion of the department, be excused from all final examinations in courses in the department of the major subject in which he has been enrolled during the semester. Credit value may be assigned to this general examination in the major subject.

Re-examinations are permitted only for the purpose of raising grade E (not passed) to a passing grade. A student who received grade B, C, or D in any

course is not allowed a re-examination for the purpose of raising the grade. Methods of raising nonpassing grades to passing grades are described under "Removal of Deficiencies," below.

Application for examination for advanced standing on the basis of work done before entrance to the University should be made to the Registrar upon entrance.

REMOVAL OF DEFICIENCIES

A student who receives a grade lower than C in a lower division course may repeat the course. The units will count only once toward the degree; however, he will be charged with the units undertaken on each attempt. Upon repetition of the course, the student will receive the grade assigned by the instructor and grade points appropriate to that grade. The foregoing privilege does not apply to grades received in upper division or graduate courses. A student who receives grade E or F in an upper division or graduate course may repeat the course. The units will count only once toward the degree; however, he will be charged with the units undertaken on each attempt. Upon repetition, the student can receive no more than two grade points per unit.

Special provision is made for students whose university work has been interrupted by one year or more of service with the armed forces of the United States and who, before such service, had undertaken one or more courses forming part of an announced sequence. Such a student may, with the approval of the dean of his college or school (or if he is a graduate student, with the approval of the Dean of the Graduate Division), be permitted to repeat any course previously undertaken in the sequence, irrespective of the grade previously assigned, and to receive the new grade assigned by the instructor and grade points appropriate thereto. However, the unit credit thereby allowed toward graduation or the satisfaction of major requirements may not exceed the difference between the full unit value of the course and the number of units, if any, that he has previously received from the same course.

For the purpose of raising an E to a passing grade the student may, with the consent of the instructor concerned and of the dean of the appropriate school or college, have the privilege of a "condition examination."

Any examination, term paper, or other exercise that the instructor may require of the student to raise an E to a passing grade in a course is a "condition examination." For every such examination a formal permit, to be obtained in advance from the Registrar, must be shown to the instructor in charge; otherwise, he will lack authority to consider and report upon the work submitted by the student. A fee of \$4 is charged for each permit. No fee is charged for a re-examination (final examination taken with the class) if the final examination is the only task required by the instructor to raise E to a passing grade and if this final examination is taken with the class not later than the close of the next succeeding semester of the student's residence during which the course is offered. The Registrar will provide a form of petition for a special examination or for admission to an examination with a class, with instructions concerning procedure. Grade E in a course in which a final examination is regularly held can be raised to a passing grade only if the student passes a satisfactory final examination.

If a student who has received a grade E in any course fails to raise it to a passing grade by the end of the next semester of his residence in which the course is regularly given, the grade shall be changed to F. But if, meanwhile, the student has repeated the course and has again received an E, his grade in the course will remain grade E, as it would be if he were taking the course for the first time. A student who fails to attain a grade D or higher in any

course following a re-examination for the purpose of raising an E to a passing grade will be given a grade of F in the course.

With respect to conditioned examinations, no grade points will be assigned to a student who raises a grade E, incurred in any course (lower division, upper division, or graduate), to a passing grade by *examination* or by performing other tasks required by the instructor (short of actual repetition of the course). An exception to this rule is permitted, however, when the deficiency consists solely in the *omission* of the final examination or other required exercise because of illness or other unavoidable circumstances, the student's performance in all other respects having been satisfactory. In such circumstances the student may petition to have the grade assigned that he would have received had the work been completed without delay, together with the appropriate number of grade points. His petition must set forth in detail the reasons for his failure to complete the course within the usual limit of time. The petition must be endorsed by the instructor concerned and must be submitted for final approval as follows: by undergraduate students, to the Dean of his college or school; by graduate students, to the Dean of the Graduate Division.

THE HONOR SPIRIT—A CHERISHED TRADITION

Since 1922 the Davis Campus of the University of California has operated under the Honor Spirit. It embraces a code of sincerity and honesty in all activities throughout the campus. This code, common to students, faculty members, and administration alike, is the basis for cooperative relations and an atmosphere of academic and personal integrity.

The basis of the Honor Spirit in the classroom is in the pledge on the cover of the bluebooks used for examinations: "We, the students of the University of California, Davis, do not tolerate the giving or receiving of aid during examinations." Thus, there are no proctors, no policing of examinations. Each student takes pride in doing his own work.

The Honor Spirit is promoted and upheld by the Student Welfare Council, an organization whose members are elected by the Associated Students.

STUDENT CONDUCT AND DISCIPLINE

The University authorities assume that the student has an earnest purpose and that his conduct will bear out this presumption. If, however, he should be guilty of unbecoming behavior or should neglect his academic duties, the authorities will take such action as, in their opinion, his conduct warrants. Students who fail to use properly the opportunities freely given to them by the University must expect to have their privileges curtailed or withdrawn.

Administration

The President of the University through the Chancellor administers student discipline and has full power to act. This duty is accomplished through the assistance of the teaching staff, the administrative officers concerned with student welfare, and the Faculty-Administrative Committee on Student Conduct.

Degrees of Discipline

There are six degrees of discipline: warning, probation, official censure, suspension, dismissal, and expulsion. Censure indicates that the student is in danger of exclusion from the University. Suspension is exclusion for a definite period. Dismissal is exclusion for an indefinite period, with the presumption that the student's connection with the University will be ended by it. Expulsion, the most severe academic penalty, is final exclusion from the University.

Student Welfare Council

The Welfare Council of the Associated Students deals with student welfare, student conduct, and student-faculty relations. The Council fosters the Honor System, a code creating favorable attitudes toward education and student life by placing the responsibility for good classroom and campus conduct with the individual student. With the student's accepting this responsibility, a greater respect for knowledge is gained. Recommendations regarding matters of student conduct may be made to the Dean of Students. Appeals of such recommendations are reviewed by the Faculty Administrative Committee on Student Conduct. The Honor Spirit is a cherished tradition on the Davis campus.

LEAVE OF ABSENCE AND HONORABLE DISMISSAL

A student in good standing who needs to withdraw for a short time but wishes to retain his status in classes and resume work before the end of the current semester should apply to the Office of the Dean of Students for a *brief leave of absence*, which expires on a definite date. An excuse for absence will not relieve a student from the need to complete all work in each course to the satisfaction of the instructor.

For any college exercise other than a final examination, leave to be absent or an excuse for absence should be presented to the instructor in charge. Leave to be absent from a final examination should be obtained by written petition to the proper faculty.

If a student must depart suddenly, as in a family emergency, he should write the Office of the Dean of Students as soon as possible, requesting a leave.

An *honorable dismissal* or an *indefinite leave of absence* may, upon petition, be issued to any student in good standing who complies with the instructions on the petition, which may be obtained from the Registrar. Undergraduate students must have the petition approved by the dean of the school or college and the Dean of Students. Graduate students require the approval of the Dean of the Graduate Division. In addition, men who are receiving veterans benefits or who have been deferred by Selective Service because of registration in the University must immediately upon ceasing class attendance report in writing or in person to the Dean of Students.

A student is in good standing if he is entitled to enjoy the normal privileges of the status in which he is officially registered. Students dismissed for scholarship deficiencies, students on scholastic probation, students under censure, and students under suspension are not in good standing.

Discontinuance Without Notice

Students who discontinue their work without formal leave of absence do so at the risk of having their registration privileges curtailed or withdrawn.

STUDENT RESPONSIBILITY FOR MATERIALS SUBMITTED IN SATISFACTION OF COURSE REQUIREMENTS

All material of whatever nature submitted by a student in satisfaction of all or any portion of a course requirement is the property of the University and is not subject to any claim on the part of the student who has submitted it. Further, it is a condition of attendance of any student in any course that any material that he shall produce independently and not as a part of any course requirement must be removed by him from University premises not later than the last day of the semester in which he produced such material and that if he shall fail to remove it, as here provided, there shall be no obligation on the part of the University to hold or safeguard it, and all risks of its destruction, loss, or other dispositions shall rest solely upon the student.

CHANGE OF COLLEGE OR MAJOR

A student may be transferred from one college, major, or department of the University to another upon the approval of the dean or other responsible officer or committee of the college (or department) to which admission is sought. A form of petition for transfer is supplied by the Registrar.

No student may transfer from one major department to another after the opening of the final semester of his senior year.

HONORS

Honor students include those who receive honorable mention as designated by the Deans of the Colleges and Schools. Honors are granted also with the bachelor's degree. Regulations concerning honors are given with explanations of curricula in the various colleges in later pages of this Catalogue.

TRANSCRIPT OF RECORD

Each student will be provided, upon request to the Registrar, with an official transcript (copy) of his University record. A minimum of \$1 is charged for each transcript. Students who plan to seek employment after graduation should obtain one or more transcripts as official evidence of attendance at the University.

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

STUDENT ACTIVITIES

Students participate in various activities on the Davis campus, ranging from events sponsored by the Associated Students to those connected with independent student organizations. Departmental, honor, service, special interest, political, and religious organizations are included, as well as International Club which is for visiting and American students alike.

The entire undergraduate student body has membership in the Associated Students which, through its elected Executive Committee and appointed activities chairmen, is responsible for most student activities on campus. A major effort of all students is Picnic Day, the campus open house welcoming the public each spring. Other special events under the auspices of the Associated Students are Preview Day (tours and discussions for high school and junior college students), Judging Day (competition in agricultural skills and knowledge for high school students), Little International (livestock show for Aggie students), Drives Week (series of fund-raising events to finance a summer camp for youth), Homecoming Weekend, and the all-important Orientation Week for incoming students.

The University band, an orchestra, ensemble groups, chorus, dramatics, a rifle team, and student forums are also supported by the Associated Students in conjunction with various academic departments.

Student publications are the California Aggie, a semi-weekly paper; El Rodeo, the yearbook; and Parados, a literary magazine.

The Memorial Union Student Council, whose chairman is appointed by the Associated Students, 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 Associated Women Students, composed of all undergraduate women students, promulgates social regulations, recommends dress standards, sponsors an orientation program for new women students, and holds social events including the Coed Formal.

Opportunity to participate in many forms of athletics and recreation is presented. The University of California, Davis is a member of the Far Western Intercollegiate Athletic Conference and stresses both intercollegiate and intramural athletics. Sports include football, basketball, boxing, track, baseball, tennis, wrestling, golf, swimming, water polo and rugby. The Women's Athletic Association sponsors women's sports.

Unity of student life on all campuses of the University is emphasized by the California Club, an organization of student leaders which is responsible for a yearly All-University Weekend in the fall. Students from Davis also participate in the All-University Student Art Festival.

THE JUNIOR YEAR ABROAD

Undergraduate students may spend a year of their college career studying outside the United States. The University conducts undergraduate programs in Bordeaux (France), Goettingen (Germany), and Padua (Italy), and also accepts academic credits received in certain other programs abroad.

Because of the time needed to prepare for the study as well as the senior year residence requirement, the junior year is recommended for such foreign study. Thorough preparation in the language of the country selected for study is of great importance; students should have completed at least four semesters of college courses in that language.

Students interested in studying abroad during their junior year are encouraged to consult early in their academic career with the campus Adviser for Undergraduate Study Abroad.

Requirements and Curricula

COLLEGE OF AGRICULTURE

It is the aim of the College of Agriculture to educate able young men and women for leadership in the knowledge and skills of agriculture. The scope of agriculture is broad, offering careers in farming and ranching, business, science, and industry. The principal center of the University's research and teaching activity in agriculture is the Davis campus.

Curricula are based on thorough training in the natural sciences combined with an integrated supporting program in the social sciences and humanities. Upon this foundation specialized study is developed leading to competence in the student's chosen field. Courses are basic in nature, emphasizing principles, and are designed to prepare the student to develop critical faculties in evaluating ideas and in solving problems.

Upon successful completion of the undergraduate requirements, the Bachelor of Science degree is awarded. Further study at the graduate level is offered to those who are qualified to conduct research involving fundamental concepts necessary for the advancement of knowledge. The success of both undergraduate instruction and advanced study is measured by the quality of men and women trained, by their achievements in the sciences of agriculture, and by their contributions to society.

The University of California enjoys world-wide recognition for its achievements in the agricultural sciences, and as a Land-Grant College for the State, functions as the center of research for agriculture and its related industries. The 3300-acre campus provides excellent classroom and laboratory facilities for instruction and research.

The special interests and abilities of the faculty, in combination with the extensive instructional and research facilities available at the University, provide an environment which is particularly conducive to the maximum development of the student's potential. The opportunities provided the students to associate with instructors engaged in the development of entirely new concepts and products, engender in them an appreciation and understanding of how new knowledge is acquired.

Graduates interested in the production phase of agriculture who majored in agricultural production are prepared for employment as farm or ranch operators or managers and engage in the production of agricultural commodities. Since many farm units engage in diversified production activities, graduates are prepared for agricultural operations which may combine livestock and field crops, field crops and vegetable crops, orchards and vineyards, etc.

Curricula in agronomy, animal science, pomology, range management, vegetable crops and viticulture are oriented toward agricultural production, although the education is applicable to all areas of agricultural industry, teaching and research.

Operating in conjunction with and dependent upon the production segment of agriculture are the numerous food processing, marketing, and distribution elements of industry. Positions as food plant operators and managers are available to graduates with a major in food science and technology, foods or nutrition, agricultural economics, or business management.

Career opportunities in those activities encompassing quality control, research, product development, marketing and rendering of special services exist for students majoring in such fields as soils and plant nutrition, entomology, irrigation, forestry, veterinary medicine, plant pathology, agricultural economics, and agricultural engineering.

A large number of professional and technical service opportunities in agriculture exist for students in governmental and private organizations including foreign agriculture. Continued urbanization provides unusual opportunities for graduates trained in landscape horticulture and park administration.

Students interested in the business segment of agriculture, i.e., agricultural business management, agricultural economics or agricultural engineering, will find a wide range of occupations with banks, credit agencies, cooperative organizations and manufacturers and distributors of the agricultural equipment required for food production and processing.

Graduates interested in the professional positions available in teaching or research should allow a minimum of two to three years for completion of the advanced degree requirements.

Regardless of students' special interests, goals or abilities, today's dynamic, scientific agriculture provides an impressive number of challenging and rewarding career opportunities for University graduates trained in the agricultural sciences.

OPPORTUNITIES FOR ACQUIRING AGRICULTURAL SKILLS

Many students interested in careers in agriculture are without previous agricultural experience. The Agricultural Practices program, organized as a result of a grant by the late Fred H. Bixby, provides students an opportunity to supplement their academic training with a program of supervised work experience.

Experience is provided in both agricultural production, i.e., the farming or ranching segment, and in agricultural business, which encompasses the processing and distribution elements of the industry. Laboratory instruction provides students an opportunity to learn the proper operation and care of agricultural equipment and to acquire the basic manipulative skills involved in crop and livestock production.

For the summer periods assistance is given to students in finding employment in agricultural enterprises related to their field of major interest. During the period of employment a representative of the Agricultural Practices Division makes frequent visits to the student and his instructor-employer to develop records and recommendations of value to him when he seeks permanent employment. Students frequently find that these experiences provide contacts that lead to permanent positions upon graduation.

To insure sufficient time for the development of job opportunities that best meet the requirements of training in agriculture, students with limited agricultural experience are encouraged to contact the Agricultural Practices Office soon after registration.

FACULTY ADVISERS AND STUDY-LIST REQUIREMENTS

Freshman and Sophomore Years

Each student designates a major subject upon matriculation and must consult his adviser each semester for guidance in following the requirements of the curriculum that includes the major of his choice. Requirements are listed for each curriculum. It is desirable to plan program schedules so that all lower division requirements are taken during the first two years. Students unable to follow this schedule may take some of the requirements in the junior and senior years. However, any great departure from the suggested schedule may delay graduation beyond the normal four-year period.

Junior and Senior Years

The schedule for the junior and senior years is determined by the major subject requirements, supplemented by optional courses selected by the student with the advice and consent of the major adviser.

Approval of Study List

The study lists of all students must be endorsed by the major-subject adviser before they may be filed with the Registrar. Students will not be permitted to enroll for fewer than 12 or more than 18 units a semester without approval of the Dean of the College of Agriculture. To this maximum there may be added a lower division course in physical education of not more than 1 unit.

HONOR STUDENTS

An honor list is prepared each semester by the Dean of the College and is made public. It includes the names of students who 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.

Honor students have the privilege (subject to the approval of the instructor concerned) of taking each semester one course, not submitted in satisfaction of the requirements of the major program, in which they are marked "passed" or "not passed." In calculating grade point standing, units gained in this way are not counted.

HONORS AT GRADUATION

Honors are granted to the graduating student who is completing his major with distinction and whose academic record is deemed satisfactory. Students who have done work of unusual excellence may be recommended for honors or highest honors. The list of students to whom honors and highest honors have been awarded is published in the commencement programs, and the distinction is noted on the student's transcript and on his diploma.

The minimum grade point averages for students who have earned 90 or more units at the University of California (statewide) shall be 3.15 for honors and 3.50 for highest honors. Students who have taken 60 to 89 units must have maintained an average of 3.35 in order to be considered for honors, and have earned at least a 3.70 average in order to be awarded highest honors. For students who have taken 30 to 59 units the requirements are 3.45 and 3.80 respectively. Students who have earned less than 30 units at the University of California (statewide) are not eligible for consideration for the award of honors.

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

The degree of Bachelor of Science is awarded to those candidates who:

1. Satisfy the general University requirements as follows:
 - a. Subject A. See page 38.
 - b. American History and Institutions. The student may meet this requirement by the passing of an examination in American History and American Institutions or by the completion of courses prescribed by the University.
 - c. Residence in the University during the senior year in the college and completion of at least the final 24 units of credit.
 - d. Attain at least twice as many grade points as units of credit in courses undertaken at this University.
 - e. File notice for candidacy with the Registrar on dates as prescribed by the University Calendar.
2. Satisfy the general requirements of the College of Agriculture as follows:
 - a. At least 124 units of University work. Not more than 4 units may be in lower division physical education courses.
 - b. Thirty-six units of the above total in upper division courses (courses numbered 100-199).
 - c. Nine units of mathematics. Matriculation work may be offered toward this requirement, counting each year of high school work as 3 units.

Trigonometry taken in high school is recommended as partial satisfaction of this requirement.

3. Satisfy the requirements of one of the curricula in the College of Agriculture.

These curricula, except Home Economics (see page 59) are governed by minimum unit requirements in subject matter as follows:

	<i>Units</i>
a. Agriculture and closely related subjects	24
b. Natural Sciences and Physical Sciences	24
c. Social Sciences and Humanities	24
d. Unrestricted electives	16

AGRICULTURAL BUSINESS MANAGEMENT

This curriculum provides training in the management aspects of agricultural businesses. Emphasis is placed on a study of the decision-making function of management, the economic relationships within a firm and among firms within an industry, the use of management controls, the basic principles concerning the procurement of raw materials, personnel policies, and the selection of marketing methods and channels.

Graduate Study—The Department of Agricultural Economics offers programs of study and research leading to the Master of Science degree with emphasis in agricultural business management. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Agricultural Economics.

Curriculum in Agricultural Business Management

(Major: Agricultural Business Management)

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements. (see page 51)	<i>Units</i>
a. Agriculture and closely related subjects..... (29 units)	
Upper division agricultural economics, economics, or business administration	21
Agriculture, other than agricultural economics.....	8
b. Natural Sciences	(24 units)
Analytic geometry, calculus and/or linear algebra	3
Chemistry	5
Physics	3
Statistical methods	6
Restricted electives: Bacteriology, botany, geology, physiology, zoology; or additional chemistry, mathematics and physics (beyond that specified above)	7
c. Social Sciences and Humanities*..... (30 units)	
English and/or Speech	6
Principles of economics	6
Accounting	3
Business law	3
Restricted electives: Anthropology, geography, history, philosophy, political science, psychology, or sociology and social institutions..	12
d. Unrestricted electives	(16 units) 16
4. Additional courses chosen by the student with approval of the major adviser. (These may be used to satisfy the requirements under 1 and 2 above)	25
<hr/>	
Total units required for the Bachelor of Science degree.....	124

* Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

5. Certain courses or their equivalents are required for the major and, where applicable, may be used in partial satisfaction of 3a, 3b, 3c, above:
 Agricultural Economics, 100A, 100B, 106, 110, 111, 115A or 115B.
 Agricultural Economics 106 satisfies, in part, the statistical methods requirement and does not count toward the 21 units of upper division agricultural economics.

To graduate with a major in agricultural business management, a student must have at least a C average in all upper division courses taken in agricultural economics. Students who do not maintain such an average may be required to withdraw from the major at any time.

AGRICULTURAL ECONOMICS

This curriculum is concerned with the economics of the agricultural industry. Its basic goal is to improve the individual's understanding of economic forces and the economic environment in which the agricultural industry plays a prominent role. An equally important goal is to enable an essential specialization in some phase of agriculture, such as farm management, marketing, land economics, agriculture policy, or statistics.

Graduate Study—The Department of Agricultural Economics offers programs of study and research leading to a Master of Science degree in Agricultural Economics. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Agricultural Economics.

Curriculum in Agricultural Economics

(Major: Agricultural Economics)

- | | |
|---|--------------|
| 1. General University requirements. (see page 50) | |
| 2. College of Agriculture requirements. (see page 50) | |
| 3. Curriculum requirements. (see page 51) | <i>Units</i> |
| a. Agriculture and closely related subjects (26 units) | |
| Upper division agricultural economics | 18 |
| Agriculture, other than agricultural economics | 8 |
| b. Natural Sciences (27 units) | |
| Analytical geometry, calculus and/or linear algebra | 6 |
| Chemistry | 5 |
| Physics | 3 |
| Statistical methods | 3 |
| Restricted electives: Bacteriology, botany, geology, physiology, zoology; or additional chemistry, mathematics, and physics (beyond that specified above) | 10 |
| c. Social Sciences and Humanities* (30 units) | |
| English and/or Speech | 6 |
| Economics | 9 |
| Accounting | 3 |
| Restricted electives: Anthropology, geography, history, philosophy, political science, psychology, or sociology and social institutions | 12 |
| d. Unrestricted electives (16 units) | 16 |
| 4. Additional courses chosen by the student, with approval of the major adviser. (These may be used to satisfy the course requirements under 1 and 2 above) | 25 |

Total units required for the Bachelor of Science degree 124

5. Certain courses or their equivalents are required for the major and, where applicable, may be used in partial satisfaction of 3a above:
 Agricultural Economics 100A, 100B, and 106.

* Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

To graduate with a major in agricultural economics, a student must have at least a C average in all upper division courses taken in agricultural economics. Students who do not maintain such an average may be required to withdraw from the major at any time.

AGRICULTURAL EDUCATION

This curriculum provides training for students planning to teach agriculture in the high schools and junior colleges of the State and has also proven to be an excellent preparation for work in agricultural extension, general farming, and for positions with federal and state departments of agriculture.

Graduate Study—The Department of Agricultural Education offers programs of study and research leading to a Master of Education degree. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Agricultural Education.

Curriculum in Agricultural Education

(Major: Agricultural Education)

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements. (see page 51)	<i>Units</i>
a. Agriculture and closely related subjects. (39 units)	
Agricultural Economics	6
Agricultural Engineering	9
Animal Science	12
Plant and Soil Science	12
b. Natural Sciences and Physical Sciences. (33 units)	
Botany and Zoology (laboratory courses)	9
Chemistry (including organic)	8
Entomology	4
Genetics	4
Physics	4
Plant Pathology	4
c. Social Sciences and Humanities* (24 units)	
Economics	3
Education	3
English and/or Speech	6
Psychology	3
Electives	9
d. Unrestricted electives (16 units) . . .	16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or the requirements for the major.)	12

Total units required for the Bachelor of Science degree 124

5. Certain courses are required for the major and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:

Animal Husbandry 103; Chemistry 1A, 8; Education 160 or 187, 320A; Entomology 124; Irrigation 110; Plant Pathology 120; Soil Science 1.

AGRICULTURAL PRODUCTION

This curriculum provides training in more than one field of agriculture, and is designed for students who wish to go into diversified farming or business and services related to agriculture. The student may choose two fields of interest, one primary and one secondary (see below), or he may choose general

* Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

agriculture which provides even less specialization. The requirements are flexible. The student is thus free to choose from numerous agricultural courses—those that will best meet his needs as well as courses in the physical and social sciences.

Curriculum in Agricultural Production

(Major: Agricultural Production)

Primary fields of interest: Agricultural Economics, Agronomy, Animal Husbandry, Dairy Industry, Enology, Food Technology, General Agriculture, Irrigation, Landscape Horticulture, Pest Control, Pomology, Range Management, Soils and Plant Nutrition, Vegetable Crops, Viticulture.

Secondary field of interest: Agricultural Economics, Agricultural Engineering, Agronomy, Animal Husbandry, Enology, Food Technology, Irrigation, Landscape Horticulture, Pomology, Poultry Husbandry, Range Management, Soils and Plant Nutrition, Vegetable Crops, Viticulture.

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements. (see page 51)	<i>Units</i>
a. Agriculture and closely related subjects (35 units)	
Primary field of interest (see above)	12
Secondary field of interest (see above)	9
Electives	14
b. Natural Sciences* (31 units)	
Botany	5
Chemistry	8
Genetics	3
Physics	3
Zoology	3
Electives	9
c. Social Sciences and Humanities** (24 units)	
Economics	3
English and/or Speech	6
Electives	15
d. Unrestricted electives (16 units)	16
4. Additional courses chosen by the student with the aid of the adviser. (These may be used to satisfy course requirements under 1 and 2 above or requirements for the fields of interest)	18

Total units required for the Bachelor of Science degree 124

5. Certain courses are required and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:

Agricultural Economics

Primary Field: Economics 1A, 1B, Agricultural Economics 100A, and 9 additional units of upper division courses in agricultural economics. To graduate with a primary field of interest in agricultural economics, a student must have at least a grade C average in all upper division courses taken in agricultural economics.

Secondary Field: Economics 1A, 1B; Agricultural Economics 1, and 6 additional units of upper division courses in agricultural economics.

Agricultural Engineering

Primary Field: No primary field given.

Secondary Field: Nine units chosen from the following courses: Agricultural Engineering 12, 103, 104, and 105.

* Mathematics beyond trigonometry.

** Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

Agronomy

Primary Field: Botany 111; Chemistry 8; Entomology 124 or Plant Pathology 120; Irrigation 110 or Soil Science 1; Agronomy 1 and 9 additional units of upper division courses in agronomy.

Secondary Field: Botany 111; Chemistry 8; Entomology 124 or Plant Pathology 120; Irrigation 110 or Soil Science 1; Agronomy 1 and 6 additional units of upper division courses in agronomy.

Animal Husbandry

Primary Field: Bacteriology 1; Chemistry 1A, 8; Biochemistry 101; Veterinary Microbiology 111; Zoology 1A, 1B; Animal Husbandry 7, 7L, 103, 110, and 112 or 118.

Secondary Field: Chemistry 1A, 8; Animal Husbandry 7, 7L, 103, and 112 or 118.

Dairy Industry: Dairy Plant Management

Primary Field: Food Science and Technology 1, 118A-118B; 6 additional units from among courses 101, 105, 105L, 107, 108, 130, 132 or 190 in Food Science and Technology; and 3 units of general biochemistry.

Secondary Field: No secondary field given.

Enology

Primary Field: Bacteriology 1; Botany 1; Chemistry 5; Physics 2A, 2B; Viticulture 1, 3 and 9 units selected from Viticulture 124, 125, 140, and Food Science and Technology 107.

Secondary Field: Bacteriology 1; Chemistry 5; Viticulture 1, 3 and 6 units selected from Viticulture 124, 125, 140.

Food Technology

Primary Field: Food Science and Technology 1, 114; 7 additional units from among Food Science and Technology courses 101, 105, 105L, 106, 107, 108 or 190; and 3 units of general biochemistry.

Secondary Field: Food Science and Technology 1 and 7 additional units in upper division courses in Food Science and Technology.

General Agriculture

Primary Field: A total of 21 units of animal and plant science. Twelve units to be chosen from either animal or plant science and 9 units for the secondary field from the other field; 6 units of agricultural economics; and 6 units of agricultural engineering which must include 3 upper division units, Irrigation 110 can substitute for upper division Agricultural Engineering; and completion of 5 of the following courses which may be used in partial fulfillment of the above requirements: Animal Husbandry 103; Botany 107; Entomology 124; Irrigation 10 or 110; General Plant Nematology 100; Plant Pathology 120; Soil Science 1; Veterinary Microbiology 111.

Irrigation

Primary Field: Botany 111; Mathematics 16A; Soil Science 1, 107; and 12 units of irrigation including Irrigation 10 or 110, and 100.

Secondary Field: Botany 111; Soil Science 1, 107; and 9 units of irrigation including Irrigation 10 or 110, and 100.

Landscape Horticulture

Primary Field: Botany 1, 111; Entomology 124 or Plant Pathology 120; Irrigation 10 or Soil Science 1; Pomology 9; Landscape Horticulture 1, 105A, 105B, and 4 additional upper division units in Landscape Horticulture.

Secondary Field: 9 units of upper division courses in landscape horticulture approved by the departmental adviser.

Pest Control

Primary Field: A minimum of 12 units for the primary field in entomology or plant pathology and 9 units as the secondary field in the other of the two

fields. The 12 and the 9 units to be chosen from the following courses: Entomology 1 or 5 and 5L, 124, 128, and 198; Botany 119 and/or Plant Pathology 120, 122, 125, 126, 199. In addition, students must complete 4 of the following courses: Agricultural Engineering 104; Botany 8, 107, 111, 117; Chemistry 8; General Plant Nematology 100; Soil Science 1 or 109; Zoology 116.

Pomology

Primary Field: Botany 1, 111; Chemistry 1A, 1B, 8; Physics 2A; Plant Pathology 120; Irrigation 110; Entomology 124; Soil Science 1; Pomology 2 plus 12 units in pomology, 9 of which must be upper division units.

Secondary Field: Pomology 2 plus 9 other units in pomology, 6 of which must be upper division.

Poultry Husbandry

Primary Field: No primary field given.

Secondary Field: Poultry Husbandry 10, 11, 12, and Avian Medicine 112.

Range Management

Primary Field: Engineering 1A; Botany 111; Range Management 1; 9 units selected from the following list of courses with the approval of the range management adviser: Agronomy 112; Animal Husbandry 7, 7L, 103, 118; Botany 108, 117; Range Management 100, 103, 133; Soil Science 1; and the following courses offered at Berkeley: Forestry 103; Range Management 101, 102, 123, 133.

Secondary Field: Range Management 1; 6 additional units selected from the listing of courses under the primary field above.

Soils and Plant Nutrition

Primary Field: Chemistry 1A, 1B, 8; Geology 1A; Physics 2A, 3A; Soil Science 1, 107, 108 or 109, 118, 124.

Secondary Field: Chemistry 1A, 1B, 8; Geology 1A; Soil Science 1 and 6 additional units selected from the soil science courses listed under the primary requirements above.

Vegetable Crops

Primary Field: Botany 111; Chemistry 8; Entomology 124; Irrigation 110; Plant Pathology 120; Soil Science 1; Vegetable Crops 1, 1L, 101 and 6 additional units in vegetable crops. Recommended: Agricultural Economics 140; Botany 107.

Secondary Field: Vegetable Crops 1, 1L, 101, and 3 additional units in vegetable crops. Recommended: Botany 107; Irrigation 110.

Viticulture

Primary Field: Botany 111; Chemistry 8; Physics 2A; Soil Science 1; Viticulture 1, 3, 105 and 116; and an additional course chosen from the following: Agricultural Engineering 103; Pomology 121; Botany 107.

Secondary Field: Viticulture 1, 3, 105 and 116.

ANIMAL SCIENCE

The animal science curriculum provides education in the fields of nutrition, physiology and genetics with special attention to the application of these disciplines to animal production. The student may specialize in any of the following majors: animal husbandry (including dairy husbandry), animal physiology, genetics, and poultry husbandry.

Graduate Study—The student may pursue graduate work leading to the degree of Master of Science in the following animal science majors and related fields: animal husbandry, animal physiology, genetics, nutrition, and poultry science. Graduate work leading to the doctorate may be undertaken in animal physiology, comparative biochemistry, genetics, and nutrition. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser within the field of interest.

Curriculum in Animal Science

(Majors: Animal Husbandry, Animal Physiology, Genetics, Poultry Husbandry)

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|--|--------------|
| 1. General University requirements. (see page 50) | |
| 2. College of Agriculture requirements. (see page 50) | |
| 3. Curriculum requirements. (see page 51) | <i>Units</i> |
| a. Agriculture and closely related subjects. (27 units) | |
| Animal nutrition | 3 |
| Animal Pathology, parasitology, or additional zoology. | 3 |
| Animal Physiology | 5 |
| Genetics | 4 |
| Upper division courses in major or closely related subjects. | 12 |
| b. Natural Sciences (34 units) | |
| Bacteriology or botany. | 4 |
| Chemistry and/or biochemistry. | 16 |
| Physics | 6 |
| Zoology | 8 |
| c. Social Sciences and Humanities* (24 units) | |
| Economics | 3 |
| English and/or Speech. | 6 |
| Electives | 15 |
| d. Unrestricted electives (16 units) | 16 |
| 4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or the requirements for the major) | 23 |
| <hr/> | |
| Total units required for Bachelor of Science degree. | 124 |
| 5. Certain courses are required for the following majors and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above: | |

Animal Husbandry

Animal Husbandry 7, 7L, 105L, 110; Bacteriology 1; Botany 1; Veterinary Microbiology 111. Animal Husbandry 105 satisfies the animal nutrition requirement and Veterinary Microbiology 111 satisfies the animal pathology requirement under 3a. Genetics 100, and in addition Genetics 100C or Animal Husbandry 107, will satisfy the genetics requirement. Chemistry 1A, 1B, 8 are included in the 16 units of required chemistry.

For students primarily interested in dairy husbandry the following elective courses are highly recommended: Animal Husbandry 107, 111, 114, 121; Food Science and Technology 118A, 130.

Students in this major must spend the last two semesters (before the degree) in residence as bona fide animal husbandry majors.

Animal Physiology

Majors in this subject must take Chemistry 1A, 1B, 5, and 8; Zoology 1A, 1B, and at least one of the following courses: Zoology 100 and 100L, 106, 107 or 112. Animal Husbandry 105 or Poultry Husbandry 105 satisfies the animal nutrition requirement. In addition to animal science curriculum requirements, students must include in their program additional physics (Physics 3A, 3B) and calculus (Mathematics 16A-16B or equivalent). The 12 units of upper division major requirements include biochemistry lecture and laboratory.

Genetics

Chemistry 1A, 1B, 8, 101 or Biochemistry 101; Botany 1; Zoology 1A, 1B, 100, 100L; Physiology 1, 1L; Mathematics 13, 105A-105B. Recommended: Botany 130; Mathematics 16A, 16B, 108; German 1, 2; Zoology 103, 103L, 126.

* Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

Poultry Husbandry

Bacteriology 1; Chemistry 1A, 1B, 8 and Biochemistry 101; Avian Medicine 112 which satisfies the pathology requirement. Poultry Husbandry 105 satisfies the nutrition requirement. Zoology 100 and 100L are additional requirements in the major. Poultry Husbandry 10, 11, and 12 are recommended.

ENTOMOLOGY

The curriculum in this department is designed to furnish basic training in the sciences and to give an introduction to the many branches of entomology.

Graduate Study—The Department of Entomology offers programs of study and research leading to a Master of Science degree and Doctor of Philosophy in Entomology. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Entomology.

Curriculum in Entomology

(Major: Entomology)

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements. (see page 51)	<i>Units</i>
a. Agriculture and closely related subjects (24 units)	
Entomology	15
Electives	9
b. Natural Sciences* (44 units)	
Botany and Zoology.....	15
Chemistry (including organic).....	13
Genetics	3
Microbiology	4
Physics and/or Mathematics.....	6
Plant or Animal Physiology, Nutrition or Biochemistry.....	3
c. Social Sciences and Humanities** (24 units)	
English and/or Speech.....	6
Electives	18
d. Unrestricted electives (16 units).....	16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or the requirements for the major.).....	16
Total units required for Bachelor of Science degree.....	124
5. Certain courses are required for the major and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:	
Entomology 1, 106, 112, 127 and 49 (summer practice course—no credit).	
The microbiology requirement can be satisfied by a basic course in bacteriology or protozoology.	

FOOD SCIENCE

The food science curriculum prepares students to meet the professional opportunities offered by the food and allied industries, careers in plant operation, plant management, quality control, research and teaching. The student may plan a program directed toward one of the following areas of interest: general food technology, preparation for graduate study, brewing technology, dairy products technology, enology, fruit and vegetable products technology, and meat and poultry products technology.

* Mathematics beyond trigonometry.

** Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

Graduate Study—Graduate instruction leading to the Master of Science degree is offered in food science and the Doctor of Philosophy degree in related fields of agricultural chemistry, microbiology, comparative biochemistry, nutrition, engineering, animal physiology and plant physiology.

Curriculum in Food Science

(Major: Food Science)

1. General University requirements. (see page 50)
2. College of Agriculture requirements. (see page 50)
3. Curriculum requirements. (see page 51) Units
 - a. **Agriculture and closely related subjects**..... (24 units)

Food science and technology or closely related courses in the field of food science	20
Electives	4
 - b. **Natural Sciences** (49-51 units)

Bacteriology	4
Biochemistry	6
Botany or zoology.....	5 or 3
Chemistry	19
Mathematics (including calculus)*.....	9
Physics (including laboratory).....	8
 - c. **Social Sciences and Humanities****..... (24 units)

English and/or Speech.....	6
Electives	18
 - d. **Unrestricted electives** (16 units) ... 16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or requirements for the major)..... 9 or 11

Total units required for the Bachelor of Science degree.....	124
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5. Certain courses are required for the major and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:

Chemistry 109, Food Sciences and Technology 1, 103, 105, 105L and 110.	
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HOME ECONOMICS

The curriculum in home economics provides a good general education for all majors and preparation for a variety of professional careers. Considerable latitude in the course of study is encouraged for honor students.

Graduate Study—The Department of Home Economics offers advanced work at the Master of Science level in consumer economics, foods, nutrition, and textile science. Professors of home economics are also in charge of Ph.D. programs in nutrition and various aspects of food quality. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Home Economics.

Curriculum in Home Economics

(Majors: Child Development, Design, Dietetics, Foods, General Home Economics, Nutrition, Textile Science)

1. General University requirements. (see page 50)
2. College of Agriculture requirements. (see page 50)
3. Curriculum requirements. (see page 51)

* Mathematics beyond trigonometry.

** Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

	<i>Units</i>
a. Home Economics and closely related fields	
Lower division	6-12
Upper division	19-27
b. Natural Sciences	18
Chemistry	1 course
Physics	1 course
Statistics or other mathematics.....	1 course*
One course in each of two areas of the biological sciences: Physiology, bacteriology, zoology or botany	
c. Social Sciences	18
One course in two areas of Group I and Group II	
Group I (Psychology, sociology, cultural anthropology)	
Group II (Political science, history, economics)**	
d. Humanities	18
English (6 units)	
One course in Design and Color	
One course in Group I and Group II	
Group I (Literature, foreign language, philosophy)	
Group II (Art, dramatic art, speech, music)	
4. Additional courses chosen by the student with approval of the major adviser, some of which may be required in satisfaction of the major requirements under 5. These may also be used to satisfy the course requirements under 1 and 2.....	45-31
Total units required for the Bachelor of Science degree.....	124
5. Certain courses are required for the following majors and where applicable may be used in partial satisfaction of 3a, 3b, 3c, and 3d above:	

Child Development

Home Economics 112A, 112B, 113A, 113B, 114, 131, 133, 136, 138, 139; Anthropology 1 or 2; Biochemistry 101; Chemistry 1A, 8; Education 110; English 1A-1B; Genetics 100; Mathematics 13; Physiology 1; Psychology 1, 2; Sociology 1, 2, 126.

Design

Art 16, two courses in painting and/or sculpture, two courses in history of art; Design 6A, 6B, 8, 191, 192A-192B, 193 or 195, 196A-196B, 197; English 1A-1B; Philosophy 137 or 145; Psychology 1 or 2, 131. A total of 20 upper division design units or closely related subjects.

Dietetics

Home Economics 100A, 100B, 101A, 101B, 112A, 112B, 113A, 113B, 116, 121, 122, 141 or Agricultural Economics 130; Bacteriology 1; Chemistry 1A, 1B, 8, 101 or Biochemistry 101; Economics 1A, 1B, 11; Education 110; English 1A-1B; Mathematics 13; Physiology 1, 1L; Psychology 1.

Foods

Home Economics 100A, 100B, 101A, 101B, 104A, 104B, 112A, 112B, 113A, 113B; Food Science and Technology 107; Bacteriology 1; Chemistry 1A, 1B, 5, 8; Economics 1A, 1B; English 1A-1B; Mathematics 13; Physics 2A, 2B; Physiology 1; Psychology 1.

General Home Economics†

Design 130, 150; Home Economics 6, 7, 100A, 100B, 112A, 112B, 131, 133,

* Mathematics beyond trigonometry.

** Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c (Group II) above.

† Majors planning to meet the secondary teaching credential requirements or to qualify for agricultural extension positions should complete the laboratory courses: 6L, 7L, 101A, 101B, 113A, 113B, 140L, 175, and Design 130L.

137, 140, 142; Bacteriology 1; Chemistry 1A, 8; Economics 1A, 1B; English 1A-1B; Mathematics 13; Physiology 1; Psychology 1.

Nutrition

Home Economics 100A, 100B, 101A, 101B, 112A, 112B, 113A, 113B, 117, 141; Bacteriology 1; Chemistry 1A, 1B, 5, 8, 101 and 102 or Biochemistry 101 and 101L; Economics 1A, 1B; English 1A-1B; Mathematics 13; Physiology 1, 1L; Psychology 1.

Textile Science

Home Economics 6, 6L, 7, 7L, 141, 142, 160, 162; Bacteriology 1; Chemistry 1A, 1B, 5, 8; Economics 1A, 1B; English 1A-1B; Mathematics 13; Physics 2A, 2B; Psychology 1.

INTERNATIONAL AGRICULTURAL DEVELOPMENT

This curriculum provides coordinated training in Agriculture, the natural and physical sciences, and the social sciences and humanities for students who wish to enter into the field of agricultural development, either at home or abroad, or upon some phase of international agriculture. It represents a sufficiently broad and thorough program in which students will readily be able to prepare for advanced study in two or more phases of agriculture. Those considering foreign service, international trade, technical assistance responsibilities, and other vocational or professional fields involving foreign aspects of agriculture should find this curriculum particularly useful. It also will provide effective training for those students who are interested in developmental activities involving agriculture in the United States. This curriculum also will provide valuable background training for those considering graduate work as a means of preparing for careers in international agriculture.

CURRICULUM IN INTERNATIONAL AGRICULTURAL DEVELOPMENT

(Major: International Agricultural Development)

1. General University requirements. (see page 50)
2. College of Agriculture requirements. (see page 50)
3. Curriculum requirements. (see page 51)

	<i>Units</i>
a. Agriculture and closely related subjects (24 units)	
Primary field of interest: (see curriculum on Agricultural Production, page 54)	12
Secondary field of interest: (see curriculum on Agricultural Production, page 54)	9
Electives	3
b. Natural Sciences (32 units)	
Bacteriology, Plant or Animal Physiology, and/or Zoology	7
Botany	5
Chemistry	8
Genetics	3
Physics	3
Statistics	3
Mathematics and/or additional Sciences*	3
c. Social Sciences and Humanities (42 units)	
Agricultural Economics and/or Economics	9
Anthropology, Geography and/or Sociology	9
English and/or Speech	6
Foreign Language**	12

* Mathematics beyond trigonometry.

** High school languages accepted with one year in high school equivalent to 3 units. The objective in this requirement is to include a minimum of 12 units or their equivalent in a single language. Students meeting this requirement in part with foreign language credits earned in high school, will be required to take a corresponding number of units to meet the requirement of 124 units for the Bachelor of Science degree.

History and/or Political Science***	Units 6
d. Unrestricted electives	(16 units) 16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or the requirements for the major)	10
Total units required for the Bachelor of Science degree.....	
	124

IRRIGATION SCIENCE

The irrigation science curriculum provides instruction in the basic sciences and agriculture with irrigation courses in surface and groundwater supply, hydraulics, wells and pumps, water rights, water quality and salinity, irrigation systems, plant-soil-water relationships and crop water requirements, irrigation management and water conservation, and drainage.

Graduate Study—The Department of Irrigation offers graduate instruction and research in water quality and salinity, physics of soil water, water relations of plants, and engineering problems. Programs of study leading to a Master of Science degree in irrigation are available. Ph.D. programs of study may also be pursued in engineering, soil science, and plant physiology with emphasis in irrigation under the guidance of the Department of Irrigation staff.

Students wishing to emphasize the engineering aspects of irrigation, drainage, and water resources should refer to the College of Engineering section of this catalogue or to the *Announcement of the College of Engineering*.

Curriculum in Irrigation Science

(Major: Irrigation)

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements. (see page 51)	Units
a. Agriculture and closely related subjects (37 units)	
Crops and Soil Science and/or Plant Nutrition.....	14
Engineering and/or Agricultural Engineering.....	8
Irrigation Science	15
b. Natural Sciences*	(40 units)
Botany	9
Chemistry	13
Geology	4
Mathematics	6
Physics	8
c. Social Sciences and Humanities** (24 units)	
Economics	3
English and/or Speech.....	6
Electives	15
d. Unrestricted electives	(16 units) 16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or requirements for the major.).....	7
Total units required for the Bachelor of Science degree.....	
	124

* Mathematics beyond trigonometry.

** Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

*** History and/or Political Science requirement under 3c may be satisfied by completing two of the following courses:

History: 176A, 176B, 178A, 178B, 179, 180

Political Science: 102, 105, 113, 128A, 163, 166

These courses may also be used to satisfy the University requirement of American History and Institutions.

5. Certain courses are required by the major and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:

Irrigation 100, 118, 160; Engineering 1A or 10, and 142; Mathematics 16A-16B; Physics 2A, 2B, 3A, 3B; Soil Science 107. A knowledge of mechanical drawing is required of all students. This requirement may be satisfied by a high school or University Extension course or by demonstrating proficiency.

PLANT SCIENCE

The curriculum in plant science provides opportunity to specialize in fields of specific interest according to the student's objectives. These fields of specialization include agronomy (field crops), vegetable crops, pomology (fruit crops), viticulture, landscape horticulture, park administration, plant pathology, and genetics.

Graduate Study—Programs of study and research leading to a Master of Science degree are offered in the following plant science fields: agronomy, genetics, horticulture (landscape horticulture, pomology and/or viticulture) plant pathology, and vegetable crops. Students may prepare for research and teaching careers in plant science by seeking a doctorate in agricultural chemistry, botany, comparative biochemistry, genetics, plant pathology, plant physiology, or soil science. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser within the field of interest.

Curriculum in Plant Science

(Majors: Agronomy, Genetics, Landscape Horticulture, Park Administration, Plant Pathology, Pomology, Vegetable Crops, Viticulture)

1. General University requirements. (see page 50)
2. College of Agriculture requirements. (see page 50)
3. Curriculum requirements. (see page 51) *Units*
 - a. **Agriculture and closely related subjects.** (24 units)

Entomology	4
Irrigation, Plant Nutrition or Soils.	3
Plant Pathology	4
Courses in the major or closely related field including 12 units of upper division	13
 - b. **Natural Sciences** (29 units)

Botany and Plant Physiology.	9
Chemistry	13
Genetics	4
Physics	3
 - c. **Social Sciences and Humanities***. (24 units)

Economics	3
English and/or Speech.	6
Electives	15
 - d. **Unrestricted electives** (16 units) . . . 16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or the requirements for the major.) 31

Total units required for the Bachelor of Science degree. 124

5. Certain courses are required for the following majors and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:

* Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

Agronomy

Agronomy 1; Botany 1, 111; Chemistry 1A, 1B, 8; Mathematics 13; Soil Science 1; Plant Pathology 120; Irrigation 100 or 110; a course in zoology.

Agronomy

(Science Specialization): In addition to the above: 13 units selected from Biochemistry, Botany, Chemistry, Mathematics, Physics or Bacteriology and 4 units of a foreign language.

Genetics

Chemistry 1A, 1B, 8; Mathematics 13, 105A; Zoology 1A. Recommended: Botany 130; Biochemistry 101 or Chemistry 101; German 1, 2; Mathematics 16A, 16B, 108.

Landscape Horticulture

Botany 1, 111; Chemistry 1A, 1B, 8; Landscape Horticulture 1, 105A, 105B; Pomology 9. Recommended: Agricultural Economics 18; Art 2A; Botany 108 and 117; Economics 11; Engineering 1A; Pomology 1 or 2.

Park Administration

Botany 1, 111; Chemistry 1A, 8; Landscape Horticulture 1, 105A, 105B, 108, 111; Park Administration 110, 134, 140; Engineering 1A; Physical Education 140; Public Administration (6 units). Recommended: Agricultural Economics 18; Architecture 3N; Botany 107; Irrigation 10; Soil Science 1.

Plant Pathology

Bacteriology 1; Botany 119; Chemistry 1A, 1B, 5, 8; Entomology 124; Nematology 100; Plant Pathology 122; Zoology 1A or 10. Recommended: Biochemistry 101 and 101L; Irrigation 100 or 110; Mathematics 13; German 1 and 2.

Pomology

Bacteriology 1; Botany 1, 111 (or 120A-120B, 121A-121B); Chemistry 1A, 1B, 8; Irrigation 110; Physics 2A, 2B; Pomology 2; Soil Science 1. Recommended: Agricultural Engineering 103; Pomology 9, 105, 106A, 106B, 112, 121; Viticulture 116.

Vegetable Crops

Botany 1, 111; Chemistry 1A, 1B, 8; Vegetable Corps 101, 190. Recommended: Agricultural Economics 140; Botany 107; Irrigation 110; Physics 2B.

Viticulture

Botany 1, 111; Chemistry 1A, 1B, 8; Viticulture 1, 3, 105, 116. Recommended: Agricultural Engineering 103; Irrigation 110; Viticulture 124, 125 or Pomology 121.

PREFORESTRY

The preforestry curriculum is designed to offer training that will prepare the candidate for courses in the School of Forestry. For admission to the School of Forestry, which is located on the Berkeley campus, a student must have at least 60 units of credit including essentially the prescribed subjects as listed in the preforestry curriculum and a grade average of C or higher. The summer field program, Forestry 46, 47, 48, is prerequisite to all required forestry courses.

Graduate Study—The Department of Forestry, Berkeley campus, offers programs of study and research leading to the Master of Science, Master of

Forestry, and Doctor of Philosophy degrees. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, School of Forestry, University of California, Berkeley, California.

Curriculum in Preforestry

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements:	<i>Units</i>
a. General	
Botany (general botany).....	5
Chemistry (general inorganic and organic).....	8
Economics (elements of economics).....	6
Engineering (plane surveying).....	3
English and/or Speech.....	6
Geology (structural).....	3
Mathematics (beyond trigonometry).....	3
Physics (general physics).....	6
Statistics.....	3
Zoology (general biology).....	3
b. Forestry	
Summer field program.....	10
4. Additional courses chosen by the student with approval of the major adviser. (These may be used to satisfy the course requirements under 1 and 2 above.).....	14
	<hr/> 70

PREVETERINARY MEDICINE

The preveterinary curriculum is designed to offer the preparation necessary for courses in the School of Veterinary Medicine. At least 60 units of credit including the prescribed subjects listed in the preveterinary curriculum are prerequisite to admission to the School of Veterinary Medicine. Minor shortages may be waived by the Admissions Committee of the School of Veterinary Medicine.

The School of Veterinary Medicine offers instruction leading to the Bachelor of Science and Doctor of Veterinary Medicine degrees. Further information regarding veterinary medicine may be obtained on page 95.

Curriculum in Preveterinary Medicine

1. American History and Institutions; mathematics, 6 units†, and Subject A, as required.	
2. Curriculum requirements:	<i>Units</i>
a. General	
Animal Husbandry*.....	3
Chemistry (general, inorganic, organic, and analytical).....	16
English composition and additional English or speech.....	6
Physics (mechanics, heat, light, electricity).....	6
Social sciences, foreign languages, philosophy, psychology, fine arts, literature, and/or additional English, speech, and mathematics**..	12
Zoology.....	8
3. Additional courses chosen by the student with approval of the major adviser.....	9
	<hr/> 60

* Requirement may be fulfilled after admission to the School of Veterinary Medicine.

** Mathematics beyond trigonometry.

† May be completed in high school. Trigonometry is prerequisite to physics at the University.

RANGE MANAGEMENT

The curriculum in range management is designed to provide training to qualify students as farm advisers, range technicians in state and federal agencies, as managers of commercial operations, and for graduate studies leading to positions in teaching, research, and management. The curriculum is administered by a committee whose membership is drawn from the Departments of Agronomy and Animal Husbandry and the School of Forestry at Berkeley.

Graduate Study—The Range Management Group offers programs of study and research leading to a Master of Science in range management. Students seeking a doctorate should plan to specialize in botany, ecology, plant physiology, soil science or zoology. The dissertation problem is normally drawn from range science. Students interested in advanced work in range economics may seek the doctorate in agricultural economics. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Range Management, in the Department of Agronomy.

Curriculum in Range Management

(Major: Range Management)

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements. (see page 51)	<i>Units</i>
a. Agriculture and closely related subjects (25 units)	
Agronomy and Range Management.....	12
Animal Husbandry	10
Soil Science	3
Summer Field Practice Course.....	0
b. Natural Sciences and Physical Sciences (50 units)	
Botany	15
Chemistry	8
Engineering	3
Geology	4
Physics	6
Zoology	8
Electives (restricted)*	6
c. Social Sciences and Humanities** (24 units)	
Economics	3
English and/or Speech.....	6
Electives	15
d. Unrestricted electives (16 units) ...	16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or requirements for the major).....	9

Total units required for the Bachelor of Science degree..... 124

5. Certain courses are required for the major and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:

Economics 1A; a course in surveying, plant physiology, plant taxonomy, and plant ecology; Agronomy 112; Range Management 100, 103, 133.

SOIL SCIENCE

The soil science curriculum is designed to train students for positions with governmental and private organizations where technical knowledge is required in order to solve problems associated with soils. Special areas of study are soil physics, soil chemistry, soil microbiology, soil fertility, soil management, soil conservation, soil survey and plant nutrition.

* Additional units in botany, chemistry, genetics, geology, statistical methods, and zoology.

** Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.

Graduate Study—The Department of Soils and Plant Nutrition offers programs of study and research leading to the Master of Science and Doctor of Philosophy degrees. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Soils and Plant Nutrition.

Curriculum in Soil Science

(Major: Soil Science)

1. General University requirements. (see page 50)	
2. College of Agriculture requirements. (see page 50)	
3. Curriculum requirements. (see page 51)	<i>Units</i>
a. Agriculture and closely related subjects. (24 units)	
Crop science (agronomy, pomology, vegetable crops, viticulture) or plant ecology	3
Introduction to soil science.	3
Soil science, upper division courses.	12
Electives	6
b. Natural Sciences (31 units)	
Bacteriology	4
Botany and plant physiology.	9
Chemistry	10
Geology	4
Physics	4
c. Social Sciences and Humanities*. (24 units)	
English and/or Speech.	6
Electives	18
d. Unrestricted electives (16 units) . . .	16
4. Additional courses chosen by the student with the approval of the major adviser. (These may be used to satisfy course requirements under 1 and 2 above or requirements for the major)	29

Total units required for the Bachelor of Science degree. 124

5. A minimum of 30 units of technical electives must be devoted to an organized program of study selected by the student with the approval of his adviser. Suggested electives for the area of specialization in addition to the upper division courses offered in soil science are: Agricultural Engineering 12, 106; Agricultural Economics 1, 18, 100A-100B; Agronomy 131; Biochemistry 101-101L; Botany 120A-120B; Chemistry 5, 8, 109, 110A-110B, 112A; Engineering 1A, 10; Entomology 124; Geography 1, 3, 105, 131, 161; Geology 6, 104A-104B, 116, 117; Irrigation 100, 110, 115, 135, 150, 160; Mathematics 9A-9B-9C, 13, 16A-16B, 106, 107; Physics 2B, 3B, 4A-4B-4C, 104, 105A-105B; Plant Nutrition 116; Plant Pathology 120.

* Units received in satisfaction of American History and Institutions requirement may be used to satisfy in part 3c above.



Power laboratory

COLLEGE OF ENGINEERING

The University's programs in engineering education are designed to prepare students for all engineering functions and they place particular emphasis on design, development, and research. Mathematical analysis, the basic sciences, and design are stressed in preparing the student for a professional engineering career.

Engineering offerings on the Davis campus include instruction in the fields of study of agricultural, chemical, civil, electrical and mechanical engineering. The curriculum in engineering is a four-year undergraduate program leading to the degree of Bachelor of Science. Graduate programs leading to the degrees of Master of Engineering, Doctor of Engineering, Master of Science, and Doctor of Philosophy are available.

Admission

As a general rule the Colleges of Engineering in the University will admit students only as beginning freshmen or in advanced standing at the junior or senior level. All applicants must satisfy the general requirements for admission to the University (see pages 17-27) and must take an engineering examination (see page 69). Students who attend a California junior college or other educational institution for one semester to make up high school subject deficiencies or prerequisites for the beginning engineering courses at the University will be considered for admission in freshman standing.

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

<i>Subject</i>	<i>Units</i>
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, the student probably will be delayed in advancement to upper division status and in graduation.

Upper Division

The requirements for admission to the upper division in the College of Engineering shall be as follows:

1. A satisfactory combined average based on the score in the Upper Division Engineering Examination and grades in science, mathematics, and engineering subjects undertaken in college.
2. Completion of at least 60 units, including the following minimum subject requirements, with satisfactory grades:

*Minimum number
of units*

- | | |
|--|----|
| a. Analytic geometry and calculus | 12 |
| b. Chemistry | 8 |
| c. Physics | 10 |
| d. Engineering (Must include some units in each of the following | |

† Or equivalent integrated courses covering the same subject material.

subject areas: graphics, properties of materials, surveying or engineering measurements, and statics)	10
e. Humanistic-social studies (Must be selected from the list of courses approved by the Committee on Undergraduate Study)	6
f. Unspecified subjects (3 units may be humanistic-social; none may be in military science or physical education; the remainder are to be in engineering and scientific subjects, which may include units, in addition to the minimum requirements, in mathematics, chemistry, physics, and engineering)	10
	56

The requirements for admission to the upper division shall be the same for continuing students in the College of Engineering and for students transferring from other colleges in the University or from other educational institutions.

Students in the College of Engineering shall not be permitted to enroll in upper division engineering courses until they have been admitted to the upper division.

Engineering Examinations

Information regarding these examinations may be found on page 25.

Requirements for the Degree of Bachelor of Science

The degree of Bachelor of Science in the College of Engineering is awarded to those candidates who:

1. Satisfy the general University requirements in regard to Subject A, American History and Institutions, and scholarship.
2. Satisfy the senior residence requirement. Students in the College of Engineering are required to take the final 30 units of work in residence in the College of Engineering, rather than the minimum required by the University.
3. Satisfactorily complete the subjects and units prescribed in one of the engineering fields of study.
4. Satisfy the requirement in English (see page 77).
5. Attain a grade C average in all courses of upper division level taken in satisfaction of technical subject requirements and technical electives in the program of study.

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 receive Highest Honors.

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 study programs 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 irregularities should be discussed with the adviser and settled at the earliest possible date.

A student who gives full time to University responsibilities is expected to enroll for the number of units required in his program of study. Students may not enroll for more than 19 units or less than 14 units exclusive of physical education without special approval by the Dean of the College of Engineering.

LOWER DIVISION PROGRAM

The purpose of the lower division program is to provide the beginning student with the fundamentals in science, mathematics, and engineering essential as preparation for the professional studies of the upper division.

Freshman Year			
<i>Fall</i>		<i>Spring</i>	
Chemistry 1A	5	Chemistry 1B ¹	5
Engineering 3	4	Engineering 4	3
Mathematics 9A	4	Mathematics 9B	4
Humanistic-Social Studies	3	Physics 4A	4
	—		—
	16		16
Sophomore Year			
Engineering 45	3	Engineering 35	3
Mathematics 9C	4	Mathematics 109 ²	4
Physics 4B	4	Physics 4C	4
Humanistic-Social Studies	3	Humanistic-Social Studies ³	3
Elective	3	Elective	3
	—		—
	17		17

UPPER DIVISION PROGRAMS

The engineering curriculum consists of a lower division program which provides a common basic preparation and upper division programs in Agricultural, Chemical, Civil, Electrical and Mechanical Engineering. The total undergraduate curriculum normally requires eight semesters of study and leads to the Bachelor of Science degree. Graduate programs leading to the Master of Engineering and Doctor of Engineering degrees, or Master of Science and Doctor of Philosophy degrees are offered.

Agricultural Engineering (132 Units)

The program of study in agricultural engineering prepares the student to apply engineering principles to the problems of agriculture and related industries. Agricultural engineering involves extensive utilization of basic knowledge and techniques from several other fields of engineering; it is unique in that it also requires a general understanding of, and appreciation for, biological and soil-management aspects of agriculture.

The technical electives in the program permit specialization in the areas of farm power and machinery, farm structures, agricultural processing, or some combination of these. Soil and water management is included in the civil engineering program.

The *power and machinery* area involves the design, development, and application of field machines and power units utilized in crop production and

¹ Students in agricultural engineering are encouraged to substitute for Chemistry 1B the following: Chemistry 8 (3 units) and at least 2 additional units of technical electives (Agronomy 1 or Soil Science 1 is suggested).

² Students who have completed Math 4A-4B will continue with the Math 14, 106, 107 sequence.

³ It is recommended that students in irrigation, drainage and water resources take Soil Science 1 or Irrigation 1 in the lower division, deferring 3 units of humanistic-social studies to the upper division. Likewise, students in chemical engineering should take Chemistry 5, deferring 3 units of humanistic-social studies until the upper division.

related activities. Economic aspects and the effects of machines on soils and crops are considered. Procedures for developing machine components and synthesizing them into an engineering system are treated.

Engineering in *farm structures* involves analysis of space and labor utilization of the structure in relation to an over-all enterprise, and determination of the economic value to the enterprise, and consideration of basic design features. The structure is also considered as a device for providing an optimum environment for animal production, product storage and conditioning, or crop production in greenhouses. Thus, the biological aspects and the various meteorological factors are recognized in the basic analysis and design of structures.

Agricultural processing deals with the transformation of raw agricultural products into different, more usable, or more valuable forms, usually at the farm level. The basic aspects of drying, sorting, cleaning, handling, storage, size reduction, and heat and energy transfer, as well as the biological characteristics of the materials, are considered in the design of processing systems.

		Junior Year	
	<i>Fall</i>		<i>Spring</i>
Engineering 100A	3	Engineering 100B	3
Engineering 101	2	Engineering 103	3
Engineering 102	3	Engineering 105B	3
Engineering 104	3	Engineering 118 or	
Engineering 105A	3	Engineering 131	3
Humanistic-Social Studies	3	*Technical Elective	3
	<hr/>		<hr/>
	17		15
		Senior Year	
Engineering 114	3	Engineering 106	3
Engineering 115	3	Engineering 112	3
*Technical Electives	8	Engineering 190	2
Humanistic-Social Studies	3	*Technical Electives	6
		Humanistic-Social Studies	3
	<hr/>		<hr/>
	17		17

Suggested technical electives are:**

Agronomy 1 (or equivalent)	Introduction to Agronomy
Engineering 116	Agricultural Power
Engineering 119	Dynamics of Machines
Engineering 120	Advanced Machine Design
Engineering 121	Manufacturing Processes
Engineering 122	Introduction to Mechanical Vibrations
Engineering 123	Engineering Laboratory
Engineering 124	Engineering Systems Design
Engineering 125	Fluid Mechanics and Machinery
Engineering 132	Structural Mechanics
Engineering 133	Soil Mechanics
Engineering 136	Functional Aspects of Building Design
Engineering 180	Instrumentation
Engineering 184	Experimental Stress Analysis
Engineering 185	Intermediate Fluid Mechanics
Engineering 186	Momentum and Energy Transfer
Soil Science 1	Introduction to Soil Science

* The technical electives must include at least 9 units in engineering courses and 3 units in agricultural science.

** Appropriate courses in other engineering areas or in science or mathematics may be taken in partial satisfaction of the technical electives requirement upon approval of the adviser.

Chemical Engineering (137 Units)

Chemical engineering is concerned with the conversion of raw materials into useful products vital in modern civilization. The products of the chemical and process industries range from antibiotics to zirconium, from petroleum to plutonium, from agricultural chemicals and foods to synthetic plastics. 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 treatment of the engineering and chemical sciences so that he may achieve competence in treating not only current technical problems but those that will arise in the new technologies of the future. In the upper division attention is focused upon 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 and plant design. The program is strengthened and broadened with introductory courses in the electrical and mechanical sciences.

The curriculum includes several technical electives to allow for special training in an area of particular interest. For example, there is a unique opportunity for emphasizing 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.

		Junior Year	
<i>Fall</i>			<i>Spring</i>
Chemistry 110A	..... 3	Chemistry 110B	..... 3
Engineering 100A	..... 3	Chemistry 112A	..... 5
Engineering 101	..... 2	Engineering 103	..... 3
Engineering 102	..... 3	Engineering 152	..... 3
Engineering 105A	..... 3	Technical Elective	..... 3
Humanistic-Social Studies	..... 3		
	17		17
Senior Year			
Chemistry 112C	..... 3	Engineering 106	..... 3
Engineering 104	..... 3	Engineering 154	..... 3
Engineering 155A	..... 1	Engineering 155B	..... 2
Engineering 156	..... 2	Engineering 158	..... 2
Engineering 186	..... 2	Engineering 190	..... 2
Technical Elective	..... 3	Technical Elective	..... 3
Humanistic-Social Studies	..... 3	Humanistic-Social Studies	..... 3
	17		18

Suggested technical electives are:**

Bacteriology 1	Introduction to Microbiology
Bacteriology 105A-B	Food and Industrial Bacteriology
Biochemistry 101	General Biochemistry
Biochemistry 101L	General Biochemistry Laboratory
Food Science and Technology 101	Chemistry and Biochemistry of Food Processing

** Appropriate courses in other engineering areas or in science or mathematics may be taken in partial satisfaction of the technical electives requirement upon approval of the adviser.

Food Science and Technology 103	Physical and Chemical Methods for Food Analysis
Food Science and Technology 105A-B	Food and Industrial Microbiology Laboratory
Engineering 100B	Electronics
Engineering 180	Instrumentation
Engineering 181	Introduction to Field Theory
Mathematics 128A	Numerical Analysis
Mathematics 185	Introduction to Functions of a Complex Variable
Physics 121	Introduction to Atomic Structure

Civil Engineering (134 Units)

The proposed areas of specialization in civil engineering are irrigation, drainage and water resources, and structural engineering and mechanics.

Irrigation, Drainage and Water Resources Engineering concerns hydraulics, surface and ground water hydrology, structures, systems, soils and plants in relation to the development, utilization, and disposition of water resources. Emphasis is placed on principles of planning, design, analysis, construction, and operation of irrigation and drainage and water supply structures and systems and water resources projects. Consideration is also given to water supply, water rights and institutions, water utilization and management, land preparation, water quality and pollution, and plant-soil-water relations.

Structural Engineering and Mechanics is concerned with the design and construction of various kinds of buildings and structures used in industry, commerce, agriculture, and aeronautics; involves use of wood, steel, concrete and other materials. Factors of weight, loading, wind and temperature, blasts and earthquakes are studied and brought into the design of structures and structural component parts. Consideration is also given to the operation and utilization of such structures. Included are studies on economics of construction related to capital cost and amortization, efficiency of labor, and using finished buildings, and environmental control for storage, processing and manufacturing.

Junior Year

<i>Fall</i>		<i>Spring</i>	
Engineering 100A	3	Engineering 103	3
Engineering 101	2	Engineering 131	3
Engineering 102	3	Geological Sciences 150	3
Engineering 104	3	Engineering 132	2
Engineering 105A	3	Engineering 183	3
Humanistic-Social Studies	3	Technical Elective	3
	17		17

Senior Year

<i>Fall</i>		<i>Spring</i>	
Engineering 133	3	Engineering 106	3
Engineering 142	3	Engineering 147	3
Technical Electives	8	Engineering 190	2
Humanistic-Social Studies	3	Technical Elective	3
		Humanistic-Social Studies	6
	17		17

Suggested technical electives are:**

Irrigation, Drainage and Water Resources Engineering

Engineering 125	Fluid Mechanics and Machinery
Engineering 143	Water Resources Engineering
Engineering 144	Drainage Engineering
Engineering 145	Hydraulic System Design
Engineering 146	Irrigation Engineering Laboratory
Engineering 180	Instrumentation
Engineering 185	Intermediate Fluid Mechanics
Irrigation 100	Soil-Water-Plant Relations
Irrigation 160	Farm Irrigation Systems
Irrigation 170	Irrigation and Drainage Laboratory

Structural Engineering and Mechanics

Engineering 115	Farm Structures Design
Engineering 130	Material Mechanics Laboratory
Engineering 134	Analysis and Design of Buildings
Engineering 135	Advanced Structural Mechanics
Engineering 136	Functional Aspects of Building Design
Engineering 137	Construction Principles
Engineering 180	Instrumentation
Engineering 184	Experimental Stress Analysis

Electrical Engineering (134 Units)

The course of study in electrical engineering allows the individual student a maximum of freedom to develop himself in special areas of his choice while ensuring his attainment of a broad background in the engineering sciences. He is required to complete the common engineering core courses to provide a strong foundation for his studies in the electrical field. In addition, a specified group of upper division courses in network theory, field theory, atomic physics, electronic components and circuits, and the elements of design which are basic to any special studies in electronics, is required.

Technical electives are permitted during the senior year. They may be selected from a wide range of courses in electrical engineering, other engineering fields, mathematics, and the sciences. Typical fields of specialization are information and data processing, communications, solid state electronics, instrumentation and automatic control, circuit theory, and microwave devices and radiation.

The variety of course offerings permits the student to prepare himself for graduate study in any of the electronics fields, or to terminate at the bachelor level with a sound background in his chosen specialty.

		Junior Year	
		<i>Fall</i>	<i>Spring</i>
Engineering 100A	.....	3	Engineering 100B 3
Engineering 101	.....	2	Engineering 103 3
Engineering 102	.....	3	Engineering 161 2
Engineering 104	.....	3	Engineering 181 3
Engineering 105A	.....	3	Engineering 182 3
Humanistic-Social Studies	.....	3	Physics 121 3
		17	17

** Appropriate courses in other engineering areas or in science or mathematics may be taken in partial satisfaction of the technical electives requirement upon approval of the adviser.

Senior Year			
Engineering 160	3	Engineering 106	3
Engineering 162	2	Engineering 170	3
Technical Electives	9	Engineering 190	2
Humanistic-Social Studies	3	Technical Electives	6
		Humanistic-Social Studies	3
	—		—
	17		17

Suggested technical electives are:

Engineering 105B	Thermodynamics
Engineering 124	Engineering Systems Design
Engineering 153	Momentum and Energy Transfer
Engineering 163	Information and Data Systems
Engineering 164	Signal Analysis and Information Transmission
Engineering 165A-B	Solid State Materials and Components
Engineering 166	Automatic Feedback Control
Engineering 167	Network Theory
Engineering 168	Electromechanical Devices
Engineering 171A-B	Electromagnetic Fields and Waves
Engineering 180	Instrumentation
Engineering 185	Intermediate Fluid Mechanics
Mathematics 128A-B	Numerical Analysis
Mathematics 131A-B	Statistics
Mathematics 185	Introduction to Functions of a Complex Variable

Mechanical Engineering (133 Units)

Mechanical engineering is concerned with the invention, development, design and manufacture of machines and equipment of many different types. The mechanical engineer must have a thorough understanding of thermodynamics, fluid mechanics, dynamics and mechanics of materials.

The curriculum is aimed at developing the student's ability to synthesize these various basic components into engineering systems. This training should enable the student to handle unforeseen problems in the rapidly expanding engineering field.

The third year is spent in further study of the fundamental courses and in the fourth year, the student has the option of selecting a limited number of courses in the fields of heat-fluid-power or machine design.

Junior Year			
<i>Fall</i>	<i>Spring</i>		
Engineering 100A	3	Engineering 103	3
Engineering 101	2	Engineering 105B	3
Engineering 102	3	Engineering 118	3
Engineering 104	3	Technical Elective	3
Engineering 105A	3	Humanistic-Social Studies	3
Engineering 100B	3		
	—		—
	17		15
Senior Year			
Engineering 123	3	Engineering 106	3
Engineering 186	3	Engineering 190	2
Technical Electives	9	Technical Electives	9
Humanistic-Social Studies	3	Humanistic-Social Studies	3
	—		—
	18		17

Suggested technical electives are:**

Heat-Fluid-Power

Engineering 116
 Engineering 125
 Engineering 154
 Engineering 180
 Engineering 181
 Engineering 182
 Engineering 185

Agricultural Power
 Fluid Mechanics and Machinery
 Transport Processes
 Instrumentation
 Field Theory
 Linear Systems Analysis
 Intermediate Fluid Mechanics

Machine Design

Engineering 119
 Engineering 120
 Engineering 121
 Engineering 122
 Engineering 180
 Engineering 182
 Engineering 183
 Engineering 184

Dynamics of Machines
 Advanced Machine Design
 Manufacturing Processes
 Introduction to Mechanical Vibrations
 Instrumentation
 Linear Systems Analysis
 Intermediate Mechanics of Materials
 Experimental Stress Analysis

Requirement in English

Proficiency in written English is a requirement of the College of Engineering. Any student who does not receive a satisfactory score on the English portion of the Upper Division Engineering Examination—or whose instructors report that his use of English in subsequent course work is unsatisfactory—will be required to take remedial work in English composition. This supplementary course work will be assigned by the Associate Dean of the College of Engineering and will be in addition to the normal program of study.

Humanistic-Social Studies

This curriculum, in conformance with the general policies of the Colleges of Engineering, includes 18 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 the importance of human relations in our society. At least 6 units must be completed while the student is in the lower division and at least 6 units of upper division courses must be completed after the student has been advanced to upper division status in the College of Engineering. The courses must be selected from an approved list that is reviewed annually by the College. The list will include courses from such fields as history, economics, government, literature, sociology, and fine arts; it will not include such courses as accounting, hygiene, industrial management, finance, and personnel administration.

Pass or Fail Grades

Subject to the approval of the Committee on Undergraduate Study and of the instructor concerned, students may choose elective courses from any department of the University. A student who has an average grade of B or better for all work undertaken in the University shall have the privilege of taking each semester one elective course in which he shall be marked "passed" or "not passed." In calculating grade-point standing, units gained in this way shall not be counted.

** Appropriate courses in other engineering areas or in science or mathematics may be taken in partial satisfaction of the technical electives requirement upon approval of the adviser.

The student who wishes to combine two or more areas of interest or include other approved technical electives may arrange a suitable program with the assistance of his adviser. Students who expect to undertake graduate study should elect additional courses in mathematics, the sciences, and basic engineering as early as possible in their undergraduate program. The student's 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 prerequisites can be met.

Graduate Study

Students who are qualified scholastically and who expect to engage in teaching, research, or analytical design during their professional careers are encouraged to undertake graduate work. Programs leading to advanced degrees (M.S., Ph.D., M.Eng., D.Eng.) can be arranged in the following areas of study:

Applied chemical kinetics	Thermodynamics
Bio-engineering	Agricultural processing, structures or power and machinery
Fluid mechanics	Irrigation, drainage, and water re- sources engineering
Heat and mass transfer	Hydraulics
Hydrology	
Solid and structural mechanics	

For admission and program requirements write to the Associate Dean of the College of Engineering or to the Dean of the Graduate Division, University of California, Davis.

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 whereby he becomes aware of man's achievements, responsibilities, and environment. Such a liberal education is not without vocational value, since various worth-while career opportunities are open to letters and science graduates, but the emphasis is more upon the ends of living rather than the means. With a well-balanced cultural education including specialized knowledge in his major field, the graduate is prepared for a satisfying life whatever his chosen career.

To safeguard the liberal character of its instruction, each College of Letters and Science on the several campuses of the University publishes annually a Letters and Science List of Courses based on essentially uniform criteria of acceptability. (See page 93.)

To achieve its educational objectives, the college prescribes a breadth requirement and a major requirement. The breadth requirement is designed to provide a background of general information and culture. The major requirement enables the student to gain further intellectual depth and additional competence in his chosen field. Detailed information regarding these requirements is presented below.

The College offers the undergraduate degrees of Bachelor of Arts and Bachelor of Science. These degrees are conferred upon the completion of the general University and College requirements detailed below. They serve as a foundation for graduate studies leading toward graduate degrees and toward teaching credentials obtainable on this campus or elsewhere.

Faculty Advisers and Study-List Regulations

At registration every undergraduate student will report to a faculty adviser, by whom his study list must be approved. A special adviser is provided for each student planning a major not offered on the Davis campus. The study list may total 12 units or more a semester without special permission in respect to quantity of work, but the maximum is 16 units for a freshman and for a transfer student in his first semester of residence at this University. Any request to take fewer than 12 units must be approved by the Dean of the College.

In addition to these study-list limits, two lower division courses in physical education, with degree credit totaling not more than 1 unit, may be included in a student's program in any semester or session. Not more than 4 units of credit in physical education activity courses (Physical Education 1 and 26) may be counted toward graduation.

A student should designate his major program as early as possible, but not later than the beginning of his junior year. As soon as he has designated it and has been accepted to pursue it, he will be assigned to a major adviser for that program.

The major may be changed only by permission of the Dean of the College and of the department to which the student petitions to transfer. When the change has been authorized, the Registrar will notify the departments concerned.

Candidates for a degree must attain at least a C average in upper division courses required for the major program, together with a C average for all courses completed in the University. Students who fail to attain an average of two grade points for each unit of work undertaken in a department may, at the option of the department, be denied the privilege of pursuing a major program in that department. A similar option may be exercised by committees in charge of interdepartmental and individual group majors.

No student is permitted to transfer from one major program to another *after the start of the senior year* or to elect an individual group major after the third week of the third semester before graduation.

A sophomore student accepted to pursue a major program may, with the approval of his adviser, enroll in upper division courses required for that program if he has completed the prerequisites for such courses.

Students admitted to senior standing in the College of Letters and Science on the basis of credit from other institutions, or other Colleges within the University of California, must complete in residence on this campus, subsequent to such admissions, 24 units of which at least 18 units of work are in upper division courses on the Letters and Science List, including at least 12 units in their major program. Certain exceptions may be made for any student in this category who enters immediately after a period of active service in the armed forces.

Only the following courses may be counted in satisfaction of a major program: 1. Courses in resident instruction at the University of California or at another university (this includes summer session courses). 2. With the written permission of the Dean, courses in University Extension, University of California, with numbers having the prefix X, XB, or XL.

Students who desire to satisfy the specific subject requirements for the degree of Bachelor of Arts or Bachelor of Science in the Summer Sessions or in University Extension, University of California, may use only those courses equivalent in subject matter and unit credit to courses offered in fall and spring sessions and listed as acceptable in meeting requirements for those degrees. No grade points are assigned for courses taken in University Extension.

The Bachelor of Arts Degree

The Bachelor of Arts degree will be granted upon the completion of certain specific requirements. *Each student is responsible for seeing that he meets the University, College, and departmental requirements for graduation.* The specific requirements are as follows:

UNIT REQUIREMENT

The candidate must complete at least 120 units, of which 105 must be in courses chosen from the Letters and Science List of Courses, including 36 units in upper division courses. Not more than 6 units in the 300 and 400 courses or, except for honor students, more than 30 units in the upper division courses of any one department will be counted toward the A.B. degree. Not more than 66 units of transfer credit will be counted toward the degree for students transferring from junior colleges. Credit will not be allowed for work taken at a junior college after the completion of 66 units of credit from any collegiate institution. The final 24 units must be taken in resident courses in the college from which the degree is to be granted. A 2.0 grade-point average is required for all work undertaken.

GENERAL UNIVERSITY REQUIREMENTS

The candidate must satisfy the general University requirements: Subject A; American History and Institutions.

BREADTH REQUIREMENTS

The candidate must satisfy the following breadth requirements and no course offered by him in partial satisfaction of any one of these may be applied toward the satisfaction of any other:

English Reading and Composition

The candidate must complete, normally in his freshman year, English 1A-1B. A student admitted to the College with advanced standing will be

required to complete such a course unless his transcript indicates the previous completion of equivalent college level work.

Foreign Language

The candidate must complete, normally before the beginning of his junior year, the equivalent of 12 units in one foreign language, that is, course 3. A student who can present, by petition to the Dean, a valid reason for fulfilling this requirement in more than one language may be authorized to offer the equivalent of 8 units in each of two languages instead of 12 units in one language. The circumstances under which the Dean will approve this exception are rare. A student should not anticipate approval but should plan his program to include the equivalent of 12 units in one foreign language. A student electing to satisfy this requirement in a language previously studied in high school will be required to take, after his admission to the College, a placement examination, his achievement in which will determine the amount of additional course work, if any, he will be required to take to satisfy this requirement in that language. Retroactive to September 1, 1961, students placed below the course they normally would enter on the basis of their high school preparation will receive the following credit and grade points: course 1, no credit and no grade points; course 2, two units and grade points earned; courses 3 and 4, four units and grade points earned.

Humanities, Social Science, and Natural Science

The candidate must complete 12 units in each of the following fields: humanities, including at least 6 units elected from Group I; social science; and natural science. The requirement in natural science must include at least one course of not fewer than 3 units in a biological science, at least one course of not fewer than 3 units in a physical science, and at least one laboratory science course that either requires more than 1 unit of laboratory or has as its prerequisite a course requiring at least 1 unit of laboratory. The requirement of a laboratory science course will, however, be waived for any student who has had an advanced (eleventh or twelfth grade) high school year course with laboratory in chemistry, physics, or biology; however, this waiver will not reduce the requirement of 12 units of college courses in natural science.

The requirements may be fulfilled by courses chosen from the following list. No courses marked with an H or numbered 198 or 199 may be included. Any combination of courses in history and political science used to satisfy the American History and Institutions requirement shall be counted as 3 units of social science and 3 units of humanities toward the breadth requirement.†

Humanities

Group I (at least 6 units)

Art. All undergraduate courses except 16, 17. Performance courses: 2A*, 2B*, 3A-3B*, 12*, 14A*, 14B*, 101A-101B*, 102A-102B*, 107*, 129*, 141*, 142*.

Classics. All undergraduate courses.

Dramatic Art. All undergraduate courses except 124. Performance course: 190*.

English. All undergraduate courses except 1A, 1B.

French. All undergraduate courses except 1, 2, 3.

German. All undergraduate courses except 1, 2, 3.

Greek. All undergraduate courses except 1 and 2.

Italian. All undergraduate courses except 1, 2, 3.

Latin. All undergraduate courses except 1, 2, 3.

Music. All undergraduate courses. Performance courses: 41*, 42*, 43*, 44*, 46A-46B*, 141*, 142*, 143*, 144*.

Philosophy. All undergraduate courses.

* A total of not more than 4 units in performance courses may be counted.

† American History and Institutions examination for which 3 units of credit is granted will not constitute credit toward the breadth requirements.

Russian. All undergraduate courses except 1, 2, 3.
 Spanish. All undergraduate courses except 1, 2, 3.
 Speech. All undergraduate courses except 25, 26. Performance course: 141*.
 Group II
 History. 4A, 4B, 131, 137A, 137B, 175, 178A, 178B.
 Political Science. 118A, 118B, 119.

Social Sciences

Anthropology. All undergraduate courses except 1, 152, 153, 195, 196.
 Economics. All undergraduate courses except 11.
 Education. 110.
 Geography. All undergraduate courses except 1, 3, 105, 161.
 History. All undergraduate courses except 4A, 4B, 131, 137A, 137B, 175, 178A, 178B.
 Political Science. All undergraduate courses except 118A, 118B, 119.
 Psychology. All undergraduate courses except 108, 150, 165.
 Sociology. All undergraduate courses except 185.

Natural Sciences

The following courses or sequences of courses satisfy the laboratory science requirement: Botany 1, Entomology 1, Physiology 1L, Zoology 1A. Chemistry 1A; sequence Geology 1A, 1B; sequence Physics 3A, 3B; sequence Physics 4A, 4B; sequence Physics 4A, 4C.

Biological Sciences (at least 3 units)

Anthropology. 1, 152, 153.
 Bacteriology. All undergraduate courses except 105A, 105B.
 Botany. All undergraduate courses except 8, 107, 131, 155.
 Entomology. 1.
 Genetics. 100.
 Geology. 111, 112.
 Physiology. 1, 1L.
 Psychology. 108, 150.
 Zoology. All undergraduate courses except 104, 116.

Physical Sciences (at least 3 units)

Chemistry. All undergraduate courses.
 Geography. 1, 3.
 Geology. All undergraduate courses except 102, 111, 112.
 Mathematics. All undergraduate courses except C, D, 129.
 Physics. All undergraduate courses.

MATHEMATICS REQUIREMENT

Elementary algebra and plane geometry. If these courses were not completed in high school, they may be completed in the University of California Extension, but shall not be counted as part of the 120 units.

THE MAJOR REQUIREMENT

The candidate must complete a major program that is a planned effort to explore a subject systematically, to assure that all students pursuing the major program acquire certain knowledge in common, and to encourage the student in independent study. Each major program must include not fewer than 30 or more than 60 units and must include at least 24 units in upper division courses. The types of major programs are the following:

Departmental Major

Departmental major programs consist of not fewer than 24 or more than 30 units of upper division courses together with such lower division courses as the department deems necessary for a coordinated program. A department may prescribe comprehensive examinations for students majoring in

* A total of not more than 4 units of performance courses may be counted.

that department, and unit credit may be given for passing the examination. Such unit credit will not, however, count toward the 24 units required in upper division courses.

Interdepartmental Major

Interdepartmental major programs are programs established by two or more departments. Such programs involving courses in three or more departments may require a maximum of 36 units in upper division courses.

Individual Group Major

Individual group majors may be established on petition of individual students. Such programs require 30 to 36 units in upper division courses.

The Bachelor of Science Degree

The Bachelor of Science degree will be granted upon the completion of certain specific requirements. *Each student is responsible for seeing that he meets the University, College, and departmental requirements for graduation.* The specific requirements are as follows:

UNIT REQUIREMENT

The candidate must complete not fewer than 120 units, of which 105 must be in courses chosen from the College of Letters and Science List of Courses (see page 93), including not fewer than 36 units in upper division courses. The candidate must also complete not fewer than 60 units in natural science and numbered mathematics courses. Not more than 66 units of transfer credit will be counted toward the degree for students transferring from junior colleges. Credit will not be allowed for work taken at a junior college after the completion of 66 units of credit from any collegiate institution. The final 24 units must be taken in resident courses in the college from which the degree is to be granted. A 2.0 grade-point average is required for all work undertaken.

GENERAL UNIVERSITY REQUIREMENTS

The candidate must satisfy the general University requirements: Subject A; American History and Institutions.

BREADTH REQUIREMENTS

The candidate must satisfy the following breadth requirements and no course offered by him in partial satisfaction of any one of these may be applied toward the satisfaction of any other:

English Requirement

The candidate must complete English 1A-1B.

Foreign Language Requirement

The candidate must complete course 3 of a foreign language or 8 units of one foreign language taken in college.

Humanities and Social Science Requirement

The candidate must complete 15 units of work chosen from the courses in these fields listed under the A.B. degree requirements above.

Mathematics Requirement

Elementary algebra and plane geometry. If these courses were not completed in high school, they may be completed in the University of California Extension, but shall not be counted as part of the 120 units.

MAJOR REQUIREMENT

The candidate must complete a departmental, an interdepartmental, or an individual group major program.

Organized Majors and Professional Curricula

To fulfill the major requirement for a degree, a student may select one of the organized programs listed below. However, other suitable programs are possible; a student may present an alternate plan for a major program to the Executive Committee of the College. If the plan is approved, the committee will designate a member of the faculty to take charge of the student's special major and to approve his study lists and the completion of the major.

To facilitate intercampus relations, the Dean of the College is authorized to designate a major, entitled "General Major," for those students enrolled on this campus for one semester only and who are to graduate from another campus of the University. This will enable intercampus transfers to be resident here for one semester and continue with majors not as yet organized on this campus.

Departmental programs are described in detail under "Courses of Instruction" beginning on page 104.

*American Civilization	Economics	Musie
American History and Literature	English	Philosophy
Anthropology	French	Physical Education
Art	Geography	Physical Sciences
Biological Sciences	Geological Sciences	Physics
Botany	German	Political Science
Chemistry	History	Psychology
Dramatic Art	International Relations	Sociology
Dramatic Art and Speech	Latin	Spanish
	Mathematics	Zoology
	Microbiology	

Preprofessional training is offered in Pre dental (2 years), in Pre legal, in Pre medical (3 years), in Pre nursing (2 years), in Pre optometry (2 years), in Pre pharmacy (2 years), in Pre physical Therapy (3 years), and in Pre social Welfare.

Students who are interested in obtaining teaching credentials are referred to pages 100-103 of this bulletin.

AMERICAN HISTORY AND LITERATURE

Major Adviser: Mr. D. L. Jacobson

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. In addition History 4A-4B is required for students electing History in Group 3, and English 45A-45B for students electing literature in Group 3. Recommended: English 46A-46B for those electing History in Group 3. History 4A-4B for those electing literature in Group 3.

The Major Program

A total of 36 units in upper division courses distributed as follows:

* No new student registering during the academic year 1963-1964 may declare American Civilization as a major.

Group 1: Twelve units of history selected from among the following courses:

History 170A-170B
History 172A-172B
History 174A-174B
History 176A-176B
History 178A-178B

Group 2: Twelve units of literature selected from among the following courses:

English 117J (required for those electing literature in Group 3)
English 125E
English 131
English 132
English 133
English 134
English 135
Dramatic Art 150

Group 3: In consultation with his advisor the student must select twelve additional units in *either* English or History. Those students who elect History in this group must take six units of History 101 and European 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.

BIOLOGICAL SCIENCES

Major Advisers: Mr. R. E. Hungate, Mr. T. E. Weier, Mr. E. A. Pessagno, Mr. C. R. Goldman, Mrs. M. Riley.

This program is designed for students desiring a basic understanding of the living world together with some specialized knowledge of both the animal and plant kingdoms. It features a balanced distribution of preparatory and advanced courses in botany, zoology, and related fields and provides a wider coverage of the biological sciences than is possible with a departmental major in any one of them.

A biological sciences major may serve as a basis for graduate study leading to advanced degrees preparatory for academic and professional careers in teaching; research; or practice of medicine, dentistry, and associated fields. It incorporates most of the course requirements of the life science major for the general secondary teaching credential. A choice of two major programs is offered leading either to the A.B. or to the B.S. degree in biological sciences (see below). The latter is suggested for students with professional orientation, whereas the traditional A.B. degree is recommended for the general student.

Bachelor of Arts Major Program

Lower Division Courses

Required: Botany 1; Zoology 1A-1B; Chemistry 1A, and either 1B or 8; and an introductory course in entomology or bacteriology. Recommended: introductory courses in other life sciences; Geography 1; Geology 1A, 1B; Mathematics 13; Physics 2A-2B, 3A-3B.

Upper Division Courses

A total of 24 units of upper division work in botany, zoology, and closely related fields taken in accordance with a plan approved by the major advisers. The program must include a course dealing with invertebrate animals; one with the vertebrates; a course in systematic botany; a course in plant mor-

phology; and one course, either botanical or zoological, in each of the following fields: genetics and/or evolution, and physiology.

Bachelor of Science Major Program

Lower Division Courses

Required: Botany 1; Zoology 1A-1B; Chemistry 1A, and either 1B or 8; Bacteriology 1; Physics 2A-2B, 3A-3B. Recommended: introductory courses in other natural science and mathematics courses, such as Anthropology 1; Entomology 1; Geography 1, 3; Geology 1A, 1B; Mathematics 13; Psychology 1, 2.

Upper Division Courses

A total of 30 units in biological sciences, including at least one course in each of the following four categories:

1. Plant morphology and taxonomy.
2. Animal morphology and taxonomy.
3. Physiology (plant or animal).
4. Genetics and/or evolution.

Not less than two courses in botany and two in zoology will be required. To complete the 30-unit requirement, the student may elect additional upper division courses in the above-mentioned groups and/or in other biological fields, such as microanatomy and cytology, embryology, comparative anatomy, biochemistry, ecology, paleontology, and microtechnique.

The Honors Program

Students on the honor list may enroll in an Honors Program of courses leading to honors with either bachelor's degree (see page 94). The program features two options:

1. 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.
2. A comprehensive examination on completion of a special study course (197H).

For further information see page 94.

INTERNATIONAL RELATIONS

Major Adviser: Mr. V. J. Puryear.

International relations embraces those 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, as well as the main problems and policies of organized states in their relations with one another in the twentieth century. Because these problems and policies must be dealt with and determined by governments, the major is built around courses dealing with inter-governmental diplomatic and economic relations. This major 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

Lower Division Courses

Required: Economics 1A-1B; History 4A-4B, 17A-17B; Political Science 1A-1B, 2, 3; course 4 or the equivalent in a foreign language (French, German, or Spanish).

Upper Division Courses

Additional 3 units in the foreign language offered in preparation for the major; Economics 190A-190B; Political Science 124, 128A-128B; 6 units of

history exclusive of United States history; 6 additional units in related courses selected in consultation with the adviser.

Attention is directed to the following courses as useful in the study of certain aspects of this field: Agricultural Economics 125 (Comparative Agriculture); Anthropology 139 (Peoples of Africa); Economics 116 (Comparative Economic Systems); Geography 123 (Geography of Europe); Geography 143 (Political Geography); History 136 (The Soviet Union in World Affairs); History 146 (Europe since 1870); Political Science 149 (International Communism).

The student should also prepare himself for history of the arts, literature, and philosophy.

PHYSICAL SCIENCES

Chairman and Major Adviser: Mr. M. E. Gardner.

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. The requirements for the Bachelor of Arts or the Bachelor of Science degree may be satisfied.

The Major Program

Lower Division Courses

Required: Chemistry 1A-1B, 5 or 7A-7B; Physics 4A, 4B, 4C; Mathematics 16A-16B.

Upper Division Courses

A total of 24 units of upper division work in chemistry, physics, and allied subjects taken in accordance with a plan approved by the major adviser. These must include Chemistry 8, 9, 109, or their equivalents, and a minimum of 6 upper division units in physics.

All units in chemistry in excess of 13 are counted as upper division units.

INDIVIDUAL GROUP MAJORS

A student desiring to elect other than an established departmental or inter-departmental major or a professional curriculum may petition for an individual group major adapted to his particular interests. The petition must be presented to the Dean for submission to the Executive Committee of the College for approval *not later* than the third week of the third semester before graduation. To insure proper breadth and depth, an individual group major involving two or more departments must consist of not fewer than 30 upper division units or more than 36. This plan should be prepared in consultation with a member of the Department in which the student will do most of his work. It should describe the special educational aims of the major and indicate that it meets the University standards with respect to majors. On approval of the plan, an appropriate adviser will be designated to supervise the major program.

Preprofessional Curricula

SCHOOL OF DENTISTRY

The School of Dentistry in San Francisco offers two curricula leading to the degree of Bachelor of Science and to the degree of Doctor of Dental Surgery. The student has the option, at the close of the second semester in the School of Dentistry, of registering in either one of two major curricula: restorative dentistry or orthodontics. At the end of the sophomore year (fourth semester) a selected small group of students may enter the Honors Curriculum, which is designed to train outstanding students in the fields of dental research and teaching. In addition to these, there is a curriculum for the training of dental hygienists, leading to the degree of Bachelor of Science.

Classes are admitted to the School of Dentistry once a year, in September. Applications for admission in September 1964, may be filed between January 1, 1963, and December 30, 1963. For application for admission write to the Office of Admissions, Room 62, U. C. Hospital, University of California, San Francisco Medical Center, San Francisco 22.

Upon the satisfactory completion of six semesters of work the dental student will be eligible for the Bachelor of Science degree, and for the Doctor of Dental Surgery degree upon the completion of two additional semesters. The Bachelor of Science degree will be granted the student in the dental hygiene curriculum at the end of the fourth semester.

The dental student who wishes to qualify for the degree of Bachelor of Science in addition to the degree of Doctor of Dental Surgery must complete satisfactorily a special project and thesis in the field of his major interest under the supervision of a faculty committee, and receive at least C grades in 4 units of special instruction selected by the committee.

ADMISSION TO DENTAL CURRICULA

All applicants for admission to the dental curricula must have completed at least 60 units of college work with a scholarship average satisfactory to the Admissions Committee, including the requirements 2-5 listed below. Students who have attended the University of California must have a grade C average or better in work undertaken in the University. In addition, all applicants must take a performance test, designed to test manual dexterity. This test is given on the San Francisco campus immediately following the end of the spring semester and during the Christmas recess and during the period between the fall and spring semesters. One test will be given in the Los Angeles area at a time and place to be announced. Provided there is sufficient demand, one test will be given in Boulder, Colorado. The dental aptitude test of the American Dental Association is also a requirement for admission. This test is usually given in October, January, and April. Applicants for admission to the School of Dentistry must take one of the first two tests. For further information regarding this test, write to the Dean's office, Room 630 Medical Sciences Building, University of California, San Francisco Medical Center, San Francisco 22.

The School of Dentistry reserves the right to limit enrollment on the basis of scholarship, results of the performance and aptitude tests, recommendations, and interviews. Until very recently the School of Dentistry limited enrollment to students from California and the far western states. Essentially this policy will be continued except that applications will be accepted from outstanding applicants from other states (B grade average or better) who also make better than average scores on the American Dental Association Aptitude Test and the University of California Performance Test. Students from the far western states without dental schools who are interested in certification for education benefits under the Western Interstate Commission for Higher Education program may write to the Dean of the School of Dentistry for a pamphlet describing the program.

The student will find himself more adequately prepared for the dental curricula if he has taken in high school the following subjects: English, 3 units; history, 1 unit; mathematics, 3 units (algebra, plane geometry, and trigonometry); chemistry, 1 unit; physics, 1 unit; foreign language, 4 units in one language. Students who do not complete trigonometry and 4 units of foreign language in high school may find that they will need more than two years to complete their pre-dental requirements at the college level.

PRE-DENTAL CURRICULUM

Advisers: Mr. C. R. Kovacic, Mr. C. M. Garverick, Mr. C. P. Nash, Mr. W. E. Thiessen.

Requirements for First and Second Years

1. General University requirements.
Subject A (see page 38).
The requirement of American History and Institutions is prerequisite to the bachelor's degree. Although this requirement may be satisfied while enrolled in the School of Dentistry, it is preferable that it be completed in the pre dental program. (See page 38.)
2. English 1A-1B 6 units
3. Science 28-32 units
 - a. Chemistry
 - Inorganic (1A-1B).....10 units
 - Organic lecture (8)..... 3 units
 - Quantitative analysis (5) 3 units
 - b. Physics with laboratory (2A-2B and 3A-3B or 4A-4B)..... 8 units
 - c. Biology, including one full semester of vertebrate zoology, with laboratory (Zoology 1A-1B)..... 8 units
4. Foreign language (in not more than one language)..... 12 units
This may be counted from high school at the rate of 4 units for the first two years and 4 units for each year thereafter. Students enrolled in a college which does not require 12 units of foreign language may petition to substitute 12 units in one subject selected from the fields of social science or humanities (for example, 12 units of history). These courses may not be used to satisfy the social science-humanities requirement.
5. Social science and humanities 12 units

Any accredited college courses in these fields may be counted in satisfaction of this requirement. The following subjects are recommended for the student's consideration: anthropology, economics, history, political science, psychology, sociology, history and appreciation of art or music, English or speech (in addition to the basic requirement), and philosophy.

Whenever scheduling permits, a student should include at least one year sequence in one of the subjects listed above.

If a student wishes to substitute mathematics in partial satisfaction of this requirement, he may include in his program a maximum of 3 units of mathematics.

Applicants for admission to the School of Dentistry in 1964 who started their college work prior to 1958 may qualify for admission on either the above requirements or the requirements in effect in 1959 (see the *Announcement of the School of Dentistry, 1963-1964*).

ADMISSION TO THE DENTAL HYGIENE CURRICULUM

Beginning in 1963, applications for admission to the dental hygiene curriculum will be accepted from both male and female applicants. Applicants for admission to the dental hygiene curriculum must have completed at least 60 units of college work with a scholarship average satisfactory to the Admissions Committee, including the requirements 2-9 listed below. Students who have attended the University of California must have a grade C average or better in work undertaken in the University. The University of California Dental Hygiene Performance Test is required of all applicants who meet the minimum grade point average, which is set each year in relationship to the total number of applicants. The dental hygiene aptitude test of the American Dental Hygienists' Association also is required of all applicants. All applicants are urged to take the test given in the fall of the year preceding admission. The School of Dentistry also has its own Dental Hygiene Performance

Test which is required of all applicants. It is given in the fall and early spring in conjunction with the American Dental Hygiene Association Test and also in December. The student will be more adequately prepared if the following subjects were completed in high school: English, 3 units; history, 1 unit; mathematics, 2 units (algebra, plane geometry); chemistry, 1 unit; physics, 1 unit; foreign language, 4 units in one language.

1. General University requirements.

Subject A (examination in English composition).

American History and Institutions (required for the bachelor's degree). The examination in American History and Institutions may be taken while enrolled in the School of Dentistry, but it is preferable to satisfy the requirement in the pre dental hygiene program. (See page 38.)

- | | |
|--|------------|
| 2. English 1A-1B | 6 units |
| 3. Chemistry (1A, 8) | 8 units |
| 4. Biology (Zoology 1A-1B) | 8 units |
| 5. Psychology | 6 units |
| 6. Social science | 12 units |
| Courses in the fields of anthropology, economics, history, political science, psychology (in addition to the required 6 units), and sociology may be used to satisfy this requirement. | |
| 7. Humanities | 12 units |
| Courses in the field of history and appreciation of art or music, English or speech (in addition to the basic requirement), foreign language (in addition to requirement 8 below), and philosophy may be used to satisfy this requirement. | |
| 8. Foreign language (in not more than one language)* | 12 units |
| This may be counted from high school at the rate of 4 units for the first two years and 4 units for each year thereafter. | |
| 9. Electives to complete a total of 60 units | 10-0 units |

Applicants for admission to the School of Dentistry in 1963 who started their college work prior to 1958 may qualify for admission on *either* the above requirements or the requirements in effect in 1959 (see *Announcement of the School of Dentistry, 1963-1964*).

PRELEGAL

Advisers: Mr. C. E. Jacobs, Mr. M. Zetterbaum, Mr. S. A. Scheingold.

Students interested in entering the profession of law should consult with Mr. Jacobs or Mr. Zetterbaum of the Department of Political Science.

PREMEDICAL CURRICULUM

Advisers: Mr. D. O. Banks, Mr. H. F. Gregor, Mr. E. P. Painter, Mr. W. Lakie, Mr. R. A. Flickinger.

Preliminary Preparation

Completion of ninety semester hours of college work is a minimum requirement for admission to the University of California School of Medicine, San Francisco. This must include the subjects listed below; the corresponding courses offered at the University of California, Davis, are given in parentheses.

One year of English (English 1A-1B).

One year of general chemistry, with laboratory (Chemistry 1A-1B).

Three semester hours of quantitative chemical analysis (Chemistry 5).

Three semester hours of organic chemistry (Chemistry 8).

One year of college physics, with laboratory (Physics 2A-2B, 3A-3B).

* See item 4 under pre dental curriculum for an explanation of substitution for this requirement.

One year of general zoology or biology, with laboratory (Zoology 1A-1B).
Three semester hours of vertebrate embryology (Zoology 100, 100L).
Eight semester hours of one modern foreign language.

Courses beyond the minimum listed above can be selected to fit the interests and needs of the undergraduate student as well as fulfill the requirements of his particular college or university. College mathematics through calculus is practically mandatory for those seeking a career in medical research and, in the opinion of the faculty, is desirable for all medical students. Any course or group of courses in the physical, biological, behavioral, or social sciences or in the humanities is acceptable in the opinion of our admissions committee. Duplication of courses provided by the medical curriculum is not advised. For example, elementary human anatomy, physiology, or bacteriology would be considered undesirable as premedical courses.

The admissions committee encourages premedical students to take a four-year undergraduate curriculum, leading to a baccalaureate degree. Such a course has many advantages. First, it gives the student an opportunity to pursue an integrated program leading to a senior year in which he is able to do independent work. In addition, it offers a wider choice of electives, thus broadening the student's general educational experience. At least half the students entering the University of California School of Medicine, San Francisco, have received a baccalaureate degree. For practical reasons, however, many students must enter medical school at the end of three years of undergraduate work. The faculty of our School of Medicine recognizes this need and does not in any way discriminate against those who may apply for admission after the completion of the third year of undergraduate study. If the student has not received a baccalaureate degree prior to entering the School of Medicine, it is possible for him to receive the Bachelor of Science degree in medical sciences on successful completion of the first year of the School of Medicine curriculum.

All students who are candidates for the bachelor's degree must demonstrate a knowledge of American History and the principles of American Institutions under the Federal and State Constitutions.

For further information concerning the School of Medicine, see the *Announcement of the School of Medicine*, obtainable upon request from the Dean, University of California School of Medicine, San Francisco 22.

PREMEDICAL TECHNOLOGY CURRICULUM

Preparation for post-graduate training in medical technology may be accomplished by completing the regular undergraduate major program in Microbiology.

PRENURSING CURRICULUM

Advisers: A-L, Mr. G. W. Salt; M-Z, Mr. W. G. Kinzey.

The prenursing or preprofessional program consists of two years preprofessional training to be taken at any accredited college or junior college where the appropriate courses are offered. The preprofessional program is followed by six semesters in the basic curriculum of the School of Nursing at the University Medical Center in San Francisco. Students graduate from the basic curriculum with a B.S. degree and are prepared to take the California State Board examination for a license as a registered nurse.

The two years (four semesters) of prenursing training at Davis must consist of a program that contains a minimum of 60 units, satisfies the breadth requirements (see page 84) of the College of Letters and Science, and includes the preparatory courses required by the School of Nursing. These latter are: Chemistry 1A, Bacteriology 1, Physiology 1 and 1L, Zoology 25,

Psychology 1, Sociology 1, English 1A, 1B, and satisfaction of the American History and Institutions requirement.

PREOPTOMETRY CURRICULUM

Adviser: Mr. C. C. Fellage.

The curriculum of the School of Optometry leading to the Bachelor of Science degree and the Certificate of Completion and Master of Optometry degree consists of three years of professional study. To be eligible for admission to the School, two years of preprofessional study, comprising a minimum of 60 units of collegiate work including the subjects listed below, must have been completed with an average grade of C or better.

Required courses:

- Bacteriology. 2 and 4, or 1 and 4.
- Chemistry. 1A, 8
- English. 1A-1B.
- *Foreign Languages.
- Mathematics. 3A or 16A.
- Physics. 2A-2B, 3A-3B.
- †Physiology. 1, 1L.
- Psychology. 1, 33 or 1, 2.

PREPHARMACY CURRICULUM

Adviser: Mr. J. E. Warren

In order to fulfill the requirements for admission to the School of Pharmacy, it is necessary to complete a minimum of sixty semester hours of academic work, including the specific courses listed below. The courses indicated in parentheses are the required courses as offered on the *Berkeley* campus of the University of California. Equivalent courses at any accredited collegiate institution will satisfy the requirements. Courses which are similar in content, but not equivalent to the required courses as offered by the University of California, must be approved by the School of Pharmacy. Questions about the acceptability of specific courses should be directed to the Office of Student Admissions.

Subjects which must be included in the required sixty units:

- | | |
|---|----------|
| (1) One year of English (English 1A-1B) | 6 units |
| (2) One year of general chemistry with laboratory (Chemistry 1A-1B) | 10 units |
| (3) One year of physics with laboratory (Physics 2A-2B, 3A-3B)... | 8 units |
| (4) One year of analytic geometry and calculus (Mathematics 3A-3B or 16A-16B) | 6 units |
| (5) One year of general biology with laboratory (Zoology 1A and Botany 1) | 9 units |
| (6) One semester of vertebrate zoology (Zoology 1B) | 4 units |
| (7) One year of elective course work chosen from one field of study†.. | 6 units |

PREPHYSICAL THERAPY CURRICULUM

Adviser: Mr. W. G. Kinzey.

The physical therapy curriculum consists of three years on the Davis campus and one year at the Medical Center in San Francisco. A B.S. degree is awarded

* Students must meet the breadth requirements of the College of Letters and Science.

† While Physiology 1, 1L constitute the preferable biological science sequence, this requirement may be satisfied for admission purposes by any one of the following, listed in order of preference: Zoology 1A-1B; Zoology 1A-Anatomy 25; Zoology 1A-Comparative Anatomy.

‡ A year course chosen from foreign language, mathematics, social science, philosophy, or the fine arts and selected from the courses offered in satisfaction of the breadth requirements in the College of Letters and Science.

on completion by the Medical School. The program at Davis must satisfy the breadth requirements of the College of Letters and Science, the University requirement in American History and Institutions, and total a minimum of 90 units including the following subjects: Chemistry 1A, Physics 10, Zoology 25, Physiology 1 and 1L, Psychology 1A, 1 or 2, and Psychology 168.

PRESOCIAL WELFARE CURRICULUM

Adviser: Mr. E. M. Lemert.

Students planning to enter the field of social work are referred to Mr. Bolton or Mr. Lemert of the Department of Sociology (see page 306).

Letters and Science List of Courses

Of the 120 units required for the degree of Bachelor of Arts, at least 105 units must be in courses chosen from the Letters and Science List of Courses. Of the 15 units permitted from courses not on the Letters and Science List, not more than 6 units may be counted from courses numbered from 300 through 499, and not more than 4 units in physical education activity courses 1 and 26.

Any course not included in the Letters and Science List of Courses, but required, or accepted, as part of a major program or as a prerequisite therefor, or accepted in partial satisfaction of the breadth requirement, shall for students offering that major at graduation, or for students offering that course in partial satisfaction of the breadth requirement, but for no others, be treated as if it were in the Letters and Science List of Courses.

The following list refers to the courses as given in the departmental offerings for the fall and spring semesters, 1963-1964.

American Civilization. All undergraduate courses.

Anthropology. All undergraduate courses.

Art. All undergraduate courses. Performance courses: 2A*, 2B*, 3A*, 3B*, 12*, 14A*, 14B*, 101A*, 101B*, 102A*, 102B*, 128*, 129*, 141*, 142*, 143*, 160*.

Bacteriology. All undergraduate courses except 106.

Biological Sciences. All undergraduate courses.

Botany. All undergraduate courses except 8, 107, 155.

Chemistry. All undergraduate courses.

Classics. All undergraduate courses.

Dramatic Art. All undergraduate courses. Performance courses: 124*, 190*.

Economics. All undergraduate courses.

Education. 110.

English. All undergraduate courses.

French. All undergraduate courses.

Geography. All undergraduate courses.

Geology. All undergraduate courses.

German. All undergraduate courses.

Greek. All undergraduate courses.

History. All undergraduate courses.

Latin. All undergraduate courses.

Mathematics. All undergraduate courses except 129.

Music. All undergraduate courses. Performance courses: 41*, 42*, 43*, 44*, 46A*, 46B*, 141*, 142*, 143*, 144*.

Philosophy. All undergraduate courses.

Physics. All undergraduate courses.

Physiology. 1, 1L.

Political Science. All undergraduate courses.

Psychology. All undergraduate courses.

Russian. All undergraduate courses.

* A total of not more than 8 units in performance courses may be counted.

Sociology. All undergraduate courses.

Spanish. All undergraduate courses.

Speech. All undergraduate courses. Performance course: 141*.

Zoology. All undergraduate courses except 104.

The Honor List

An honor list is prepared each semester and is made public. It includes the names of students who have completed at least 12 units and have a grade average of at least B for all work undertaken in the College, and additionally, in the case of students transferring to the College from any other unit of the University, an over-all average of B in all work undertaken in the University. Students transferring to the College from other collegiate institutions outside the University shall be eligible for inclusion only upon completion of 12 units in the College with an average grade of B and provided that their over-all average is B in all courses for which University credit is given. To qualify for the honor list, transfer students must have a B average in all work taken in the University as well as an over-all B average. Students on the honor list of the College may take special courses of Honors Programs subject to the approval of the instructor. Other students may take such courses only by special permission of the Dean of the College.

At the discretion of the Dean, a student on the honor list of the College may make study-list changes involving special courses of Honors Programs under suspension of the regulations fixing the time during which such changes are ordinarily permissible and under suspension of the rules requiring fees for such changes. He is expected to report promptly to the Dean concerning proposed changes.

Students on the honor list of the College who have completed at least one year's work in the College shall have the privilege (subject to the approval of the instructor concerned) of taking each semester one course not submitted in satisfaction of the requirement of the major program nor in satisfaction of College breadth requirements in which they shall be marked "passed" or "not passed." In calculating grade-point standing, units gained in this way shall not be counted.

Students on the honor list of the College who have senior standing and have attained at least a B average in the junior year at the University of California shall have the following additional privileges:

1. The study-list total may be less than 12 units.
2. The number of upper division units which may be taken in one department may exceed 30.
3. With the consent of the department or committee supervising the major program, requirements concerning specific courses or sequences in the major program may be set aside.

Honors with the Bachelor's Degree

Students may qualify for Honors, High Honors, or Highest Honors with the bachelor's degree by recommendation of the department or committee supervising the major program, the Committee on Honors, and the Executive Committee of the College of Letters and Science.

A list of students graduating with distinction is published in the annual Commencement Program.

* A total of not more than 8 units in performance courses may be counted.

SCHOOL OF VETERINARY MEDICINE*

The School of Veterinary Medicine offers a two-year curriculum leading to the degree of Bachelor of Science and a two-year graduate curriculum leading to the degree of Doctor of Veterinary Medicine.

Admission to the School of Veterinary Medicine

Candidates for admission to the School of Veterinary Medicine must complete:

1. American History and Institutions; mathematics, 6 units**, and Subject A, as required.
2. Curriculum requirements (General): Units

Animal Husbandry†	3
Chemistry (general, inorganic, organic, and analytical)	16
English composition and additional English or speech	6
Physics (mechanics, heat, light, electricity)	6
Social sciences, foreign languages, philosophy, psychology, fine arts, literature, and/or additional English, speech, and mathematics§	12
Zoology	8
3. Additional courses chosen by the student with approval of the major adviser	9
	60

At least 60 units of credit in one of the colleges of the University of California, or other accredited institution, including the prescribed subjects listed in the preveterinary curriculum above (except that minor shortages may be waived by the admissions committee of the School of Veterinary Medicine).

Students are frequently required to take more than a minimum 60 units to demonstrate scholastic achievement.

The preveterinary curriculum offers a well-balanced basic training in natural science and the humanities that will prepare the candidate not only for the courses in the School of Veterinary Medicine but also to meet the varied problems of his chosen profession. This course of study can be completed on any of the campuses of the University or at any junior college or four-year college offering the prescribed courses.

Enrollment in the School is limited, with the candidates being selected in major part on the basis of scholarship. In addition, applicants must have had sufficient animal experience to serve as a basis for the study of veterinary medicine and to justify their desire to work with animals. Deficiencies in scholastic work and animal experience should not deter the candidate from filing an application, since all factors are reviewed by the Admissions Committee. The student should plan his program in such a way that in the event that he fails to enter the School of Veterinary Medicine, he can complete the requirements for the bachelor's degree in some other curriculum without loss of time.

Students are admitted to the School of Veterinary Medicine in the fall of each year. The necessary application blanks may be obtained from the Registrar and filed with him before March 1. All the requirements need not be completed at that time, but the student must supply a transcript showing work in progress.

* Prospective students should consult the *Announcement of the School of Veterinary Medicine*, obtainable without charge from the Registrar, University of California, Davis.

** May be completed in high school—trigonometry is prerequisite to physics at the University.

† Requirement may be fulfilled after admission to the School of Veterinary Medicine.

§ Mathematics beyond trigonometry.

Students who hold a recognized baccalaureate degree and are admitted to the School of Veterinary Medicine will register as graduate students studying directly for the degree of Doctor of Veterinary Medicine.

Admission in Advanced Standing

An applicant for admission in advanced standing may be accepted under the following conditions:

1. He must furnish evidence that he was eligible for admission to the first semester 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 semester or semesters 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.

Selection of Applicants

Enrollment in the School of Veterinary Medicine is limited. Candidates for admission are selected primarily on scholarship with particular emphasis being placed on the preveterinary requirements. Animal experience and personal qualifications must also be considered satisfactory. A personal interview may be required; if so, the Chairman of the Committee on Admissions will notify those concerned. Eligible applicants will not be considered until after the last date for filing applications.

For the information of those applicants who may be concerned with residence requirements, the following statements relative to residency are offered:

1. Not more than five applicants in each class whose legal residence is other than that of California will be accepted. The Committee on Admissions, however, is not obligated to select any out-of-State applicants.

- a. These five out-of-state applicants will ordinarily be selected from the bordering western states of Arizona, Hawaii, Nevada, and Oregon. To be considered an applicant from one of these places mentioned, the student must be a legal resident of that state.

- b. An exceptional candidate from anywhere in the world will be considered.

2. To be considered a bona fide California applicant, a student must have been a legal resident of California prior to the beginning of his preveterinary work. An exception to this rule may be made in the case of applicants whose legal residence in California has been clearly established on another basis than for the purpose of completing the preveterinary curriculum.

3. The Western Interstate Commission for Higher Education was established to provide a greater measure of educational opportunity in the health science fields for students in the western states. Students from Alaska, Arizona, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming should contact the commission in their state as soon as they consider applying to the School of Veterinary Medicine.

It is necessary to limit enrollment in the School. The basic reason is the supply of clinical material. Registration of students in excess of material and facilities available has been tried at other veterinary schools with the result that so many students were necessarily being assigned to limited numbers of cases that accreditation of the schools became jeopardized.

Minimum requirements for accreditation are outlined by the American Veterinary Medical Association and the Agricultural Research Service, United States Department of Agriculture, the largest employer of veterinarians in this country.

The two final years of the curriculum in Veterinary Medicine are administered by the Graduate Division. Upon completion of the requirements for the degree of Bachelor of Science, application must be filed for admission to the Graduate Division through the Dean of the School of Veterinary Medicine.

Further information is given in the *Announcement of the Graduate Division*, which may be obtained from the Dean of the Graduate Division, Room 6, Freeborn Hall.

Requirements for the Degree of Bachelor of Science

The degree of Bachelor of Science with a major in veterinary science is granted, upon the recommendation of the faculty of the School of Veterinary Medicine, to students who:

1. Satisfy the general University and School of Veterinary Medicine requirements, including:

a. *American History and Institutions.* The student may meet this requirement by the passing of an examination in American History and Institutions or by the completion of courses prescribed by the University.

b. *Subject A.* The Subject A examination in English composition is required of every undergraduate student at the time of his first registration in the University. Students admitted with advanced standing may satisfy this requirement with a grade of C or better in one or more courses in English composition.

c. *Residence in the University during the final undergraduate year* in the School of Veterinary Medicine and completion of at least the final 24 units of credit.

d. *Attain at least twice as many grade points as units of credit* in courses undertaken at this University.

e. *File notice for candidacy* with the Registrar on dates as prescribed by the University Calendar.

f. *Complete at least 124 units of University work at least 36 of which must be in upper division courses* (courses numbered 100-199). Not more than 4 of the 124 units may be in lower division physical education courses.

2. Complete, in the School of Veterinary Medicine, the following 74 units of prescribed courses. This total may be reduced in the case of students with advanced standing.

	Units
a. Botany	2
b. Embryology	2
c. Genetics	3
d. Histology	4
e. Veterinary courses offered by the departments in the School of Veterinary Medicine	63
	74

Requirements for the Degree of Doctor of Veterinary Medicine

1. The candidate for the degree of Doctor of Veterinary Medicine must have completed the requirements for the bachelor's degree in one of the colleges or schools of the University of California or at another college or university of approved standing.

2. He must give satisfactory evidence of possessing good moral character.

3. He must have studied veterinary medicine for the equivalent of eight semesters of sixteen weeks each. The last two years must have been spent in the University of California School of Veterinary Medicine. He must have completed the required work, have fulfilled satisfactorily all special requirements, and have received throughout the entire veterinary course a satisfactory grade as determined by the faculty of the School and by the Graduate Council of the Northern Section.

Graduate Study

For information on work leading to higher degrees other than the D.V.M., see the *Announcement of the Graduate Division*, which may be obtained from the Dean of the Graduate Division, Room 6, Freeborn Hall.

Plan of Study

PREVETERINARY CURRICULUM

The following schedule of study need not be rigidly adhered to but it satisfies the requirements without conflicts. This schedule also satisfies most of the requirements of the first two years of the animal science curriculum. For details of other curricula, including animal science, the student should consult the College of Agriculture section of this bulletin.

FRESHMAN YEAR			SOPHOMORE YEAR		
Course	Fall Units	Spring Units	Course	Fall Units	Spring Units
Animal Husbandry 7	3	..	Chemistry 8, 5	3	3
Chemistry 1A, 1B	5	5	Physics 2A, 2B	3	3
English 1A, 1B	3	3	Zoology 1A, 1B	4	4
Elective	4	7	Elective	5	5
	15	15		15	15

VETERINARY CURRICULUM

The completion of the first two years of the curriculum of the School of Veterinary Medicine satisfies the requirements for the degree of Bachelor of Science. The courses are primarily preclinical sciences but are closely correlated with and are basic to the work in the clinical sciences of the last two years. The graduate curriculum in the School of Veterinary Medicine is given the third and fourth years. The following are the schedules for the four years of study in the School of Veterinary Medicine.

FIRST YEAR			SECOND YEAR		
Course	Fall Units	Spring Units	Course	Fall Units	Spring Units
Anatomy 120	10	..	Botany 8	..	2
Genetics 100	..	3	Veterinary Microbiology 121, 124	10	6
Physiological Sciences 101	..	5	Veterinary Microbiology 125	..	1
Physiological Sciences 101L	..	2	Pathology 122A-122B	5	5
Physiological Sciences 140	..	6	Physiological Sciences 123A-123B	4	4
Physiological Sciences 140L	..	3			
Veterinary Medicine 100	0	..			
Veterinary Medicine 110	1	..			
Zoology 107	4	..			
*Zoology 100	2	..			
	17	19		19	18

THIRD YEAR			FOURTH YEAR		
Course	Fall Units	Spring Units	Course	Fall Units	Spring Units
Anatomy 220	..	4	Avian Medicine 251A-251B	$\frac{1}{2}$	$\frac{1}{2}$
Avian Medicine 208	3	..	Clinical Pathology 251A-251B	$\frac{1}{2}$	$\frac{1}{2}$
Clinical Pathology 201, 202	3	3	Pathology 251A-251B	$\frac{1}{2}$	$\frac{1}{2}$
Veterinary Medicine 203, 205	4	5	Public Health 240	..	5
Veterinary Medicine 206	..	3	Veterinary Medicine 204	..	5
Veterinary Medicine 210, 220	2	4	Veterinary Medicine 207	4	..
Veterinary Medicine 230, 250	4	1	Veterinary Medicine 223	4	..
Veterinary Medicine 254	..	..	Veterinary Medicine 224	2	..
Veterinary Medicine 260	2	..	Veterinary Medicine 225	1	..
			Veterinary Medicine 245	2	..
			Veterinary Medicine 251A-251B	5	5
			Veterinary Medicine 256A-256B	1	1
			Veterinary Medicine 270A-270B	..	..
	18	20		20 $\frac{1}{2}$	17 $\frac{1}{2}$

* Students are encouraged to take the laboratory course in embryology, Zoology 100L.

GRADUATE DIVISION

The University of California offers opportunities for graduate study in academic and professional fields on its campuses at Davis, Berkeley, San Francisco, Los Angeles, La Jolla, Riverside, and Santa Barbara. Graduate study and research is administered by a Graduate Council on each campus and by a statewide Coordinating Committee on Graduate Affairs. The office of the Dean of the Graduate Division is located in Room 6, Freeborn Hall.

The University endeavors to publish full information for the guidance of graduate students. Failure of students to acquaint themselves fully with the organization and regulations of the University may cause complications for which the student is expected to assume the responsibility. For information concerning all matters pertaining to the Graduate Division, including the list of available fellowships and the requirements for higher degrees, see the *Announcement of the Graduate Division, Davis*, which may be obtained from the Dean of the Graduate Division. Special announcements for the information and guidance of graduate students are published from time to time in the *University Calendar* and on the bulletin boards. Students should consult the bulletin boards regularly.

Requests for information affecting the status of graduate students, not contained in the official University bulletins, should be addressed to the Office of the Graduate Division, Room 6, Freeborn Hall.

Organization of Graduate Study and Research

Graduate study and research is offered at Davis in:

Agricultural Chemistry (Ph.D.)	Food Science (M.S.)
Agricultural Economics (M.S.)	French (M.A.)
Agricultural Education (M.Ed.)	Genetics (M.S., Ph.D.)
Agronomy (M.S.)	Geological Sciences (M.S.)
Animal Husbandry (M.S.)	German (M.A.)
Animal Physiology (M.S., Ph.D.)	History (M.A., Ph.D.)
Anthropology (M.A.)	Home Economics (M.S.)
Art (M.A.)	Horticulture (M.S.)
Biophysics (Ph.D.)	Irrigation (M.S., Ph.D.)
Botany (M.A., Ph.D.)	Mathematics (M.A., Ph.D.)
Chemistry (M.S., Ph.D.)	Microbiology (M.A., Ph.D.)
Comparative Biochemistry (M.A., Ph.D.)	Nutrition (M.S., Ph.D.)
Comparative Pathology (M.S., Ph.D.)	Physics (M.A., Ph.D.)
Comparative Pharmacology and Toxicology (M.S., Ph.D.)	Plant Pathology (M.S., Ph.D.)
Dramatic Art (M.A.)	Plant Physiology (M.S., Ph.D.)
Economics (M.A.)	Political Science (M.A.)
Education (Teaching Credential)	Poultry Science (M.S.)
Engineering (M.Eng., D.Eng., M.S., Ph.D.)	Range Management (M.S.)
English (M.A., Ph.D.)	Soil Science (M.S., Ph.D.)
Entomology (M.S., Ph.D.)	Spanish (M.A.)
	Vegetable Crops (M.S.)
	Veterinary Medicine (D.V.M.)
	Zoology (M.A., Ph.D.)

The School of Veterinary Medicine offers a curriculum leading to the degree of Doctor of Veterinary Medicine (see page 97).

For complete information concerning opportunities for graduate study and research, students should confer with the department concerned.

Curricula for Teacher Education

Curricula leading to the credentials listed below are offered. All candidates must present a bachelor's degree from Davis or from another acceptable institution, and must apply to the Graduate Division for admission to graduate standing. Application information, including final filing dates and forms, is available at the Graduate Office. Interested students are advised to consult with members of the Department of Agricultural Education or the Department of Education, as appropriate, as early as possible in their undergraduate careers.

GENERAL REQUIREMENTS

To complete the curriculum leading to a recommendation for a teaching credential the student must have an adequate command of spoken English, obtain a certificate of satisfactory health, be an American citizen or have filed first papers, take the oath of allegiance, and have completed a course in the Constitution of the United States.

SPECIFIC REQUIREMENTS

Special Secondary Credentials

The student who plans to teach agriculture or home economics in the secondary schools may obtain either a special credential or a general secondary credential or both.

The Special Secondary Credential in Vocational Agriculture offered with the cooperation of the Bureau of Agricultural Education of the State Department of Education requires two full semesters of graduate training with one semester devoted exclusively to directed teaching.

The Special Secondary Limited Credential in Agriculture also requires one year of training and the student is authorized to teach the agricultural subjects named in the credential except vocational agriculture in departments organized under the Federal and State Vocational Acts.

The Special Secondary Credential in Home Economics requires only one semester of training beyond the bachelor's degree but it is open only to those who have completed the undergraduate major in Home Economics.

General Credentials

The usual route to a general credential is that of the student-teaching program. But a limited number of students may be admitted to an internship program leading to either the general elementary or general secondary credential. The intern program entails enrollment in a pre-service summer session, a year of full-time teaching under University supervision in an approved school, and in some cases attendance at a post-service summer session. Students interested in either route should consult with members of the Department of Education as early as possible in their senior year to insure completion of the requirements.

Candidates for either the elementary or secondary credential must have a bachelor's degree from an academic college of the University or its equivalent. They must complete, or have completed as an undergraduate, at least forty units of general education with a minimum of 6 units in each of the following areas: (a) science and mathematics, (b) practical and fine arts (art, dramatic art, music, physical education, etc.), (c) social sciences, (d) communicative arts (languages, literature, speech, etc.). Their scholarship record must be 2.5 or better in upper division work and 2.75 or better in all graduate work. During their graduate year they must take at least 6 units of course work in appropriate subject matter fields.

Additional requirements for the elementary and for the secondary credential are outlined below.

Elementary Credential

Elementary credential candidates must complete 24 units of course work in education, including Education 110, 120, 130, appropriate professional courses in the 300 series, 8 units of directed teaching, and 2-5 units of professional methods courses in subject matter departments. They must also complete, preferably as undergraduates, one course in each of the following areas (recommended courses are in parentheses) :

Art (Art 300)

California History (History 189A or 189B, Geography 131, or Political Science 104)

Child Development (Home Economics 131 or Psychology 112)

English (1A or 1B)

Geography (2 or 131)

Mathematics (36)

Music (10)

Physical Education (1 or 26)

Psychology (1 or 2)

Sociology (1) or Anthropology (2)

Secondary Credential

Secondary credential candidates must complete a major and a minor in fields commonly taught in secondary schools (see list below), or a major in a field not commonly taught and two minors in acceptable teaching fields. They must also complete 22 units of course work in education, including Education 110, 115, 120, 163, appropriate professional courses in the 300 series, 6-7 units of directed teaching, and such professional methods courses as may be offered in departments representing their major and minor.

Teaching Majors and Minors for the General Secondary Credential

In many instances the departmental major fulfills subject matter requirements for the teaching major. Prospective teachers are advised to consult counselors in the Department of Education or of Agricultural Education and the authorized subject representatives of the proposed teaching fields as early as possible after undertaking University work. The beginning of the freshman year in undergraduate status is not too early for such consultations.

In the program for the bachelor's degree, the student is permitted a number of electives. A wise selection insures an adequate background of preparation for teaching. Helpful guidance in this choice may be obtained from the subject representatives.

College of Agriculture

Agriculture

Subject Representatives: Sidney S. Sutherland, Elwood M. Juergenson.

Major: See page 53.

Minor: A minimum of 20 units in agricultural subjects. Students should consult with subject representatives.

Homemaking

Subject Representative: Arline Johnson.

Major: See pages 59 and 60.

Minor: A minimum of 20 units in home economics.

College of Letters and Science

Art

Subject Representative: Roland Peterson.

Major: See "Art," page 137.

Minor: 20 units in the field of art. Not less than 9 units in this total in upper division courses (except as recommended by the department of Art).

Dramatic Art and Speech

Subject Representatives: John T. Goldthwait, Alan A. Stambusky.

Major: See page 163. Major in Dramatic Art or in Dramatic Art and Speech.

Minor: 20 units in Dramatic Art and/or Speech. Students must consult with a subject representative.

English

Subject Representative: Gwendolyn B. Needham.

Major: See "English," page 189.

Minor: 20 units including English 1A-1B, 30A or 30B, 45A-45B and at least 6 units of upper division courses including English 106L and one other course chosen from English 117J, 125C-125D. English 300 should be taken in the senior or postgraduate year.

French

Subject Representative: Merle L. Perkins.

Major: See "French," page 204.

Minor: Four semester French courses in the lower division, or their equivalents. Usually these will consist of French 1, 2, 3, 4. At least 12 units of upper division work in French including a full year course in conversation and composition.

German

Subject Representative: Siegfried B. Puknat.

Major: See "German," page 207.

Minor: Four semester German courses in the lower division, or their equivalents. Usually these will consist of German 1, 2, 3, 4. At least 12 units of upper division work in German including a full year course in conversation and composition.

Spanish

Subject Representative: Daniel S. Keller.

Major: See "Spanish," page 212.

Minor: 18 to 22 units in the lower division, or their equivalents. Usually these will consist of Spanish 1, 2, 3, 4, 25A-25B. Spanish 4 may be omitted with a grade of B or better. At least 12 units of upper division work.

Life Sciences

Subject Representatives: Milton A. Miller, T. Elliot Weier.

Major: See "Biological Sciences," page 85.

Minor: Botany 1; Zoology 1A-1B. At least 8 units of advanced work in zoology and botany; a laboratory course in a physical science.

Mathematics

Subject Representative: Albert C. Burdette.

Major: See "Mathematics," page 243.

Minor: 20 units which must include at least 6 units of analytic geometry and calculus (courses 9A-9B or 16A-16B), 6 units of fundamentals of mathematics (courses 7A and 36), and 3 units of probability and statistics (course 13 or 41).

Music

Subject Representative: Jerome W. Rosen.

Major: See "Music," page 260.

Minor: Music 1A-1B or 27A-27B, 4A-4B, 5A, 108, 112A or 112B. Students are advised, in addition, to enroll in at least one performance course.

Physical Education

Subject Representatives: Charles R. Kovacic, Willard S. Lotter, James L. Sells, Marya Welch, E. Dean Ryan, William Lakie.

Major: See "Physical Education," page 274.

Minor: 20 units of physical education. Students should consult with representatives of the department as early as possible in their University programs.

Physical Sciences

Subject Representative: Milton E. Gardner.

Major: See page 87.

Minor: Chemistry 1A-1B and 8; Physics 2A-2B and 3A-3B; Chemistry or Physics—3 upper division units; a laboratory course in botany, zoology, or physiology.

Social Studies

Subject Representatives: Kenneth Thompson, Richard N. Schwab.

Major: A degree in one of the social sciences or an interdepartmental major may be offered (see page 83 and the course section of this Catalogue under the headings of Anthropology and Geography, Economics, History and Political Science, and Sociology). Students should consult with subject representatives in arranging their programs.

Minor: 20 units in the social sciences, of which 9 are in upper division courses.

Courses of Instruction

The course offerings listed in this bulletin are subject to change without notice

EXPLANATORY NOTE

The credit value of each course in semester units is indicated for each semester by a number in parentheses following the title. A semester unit is one hour of the student's time at the University, weekly, during one semester, in lecture or recitation, together with the time necessary in preparation therefor; or a longer time in laboratory or other exercises not requiring preparation. The semester in which the course is given is shown as follows: I, first semester (September to January); II, second semester (February to June); Yr., throughout the first and second semesters. Information concerning class hours will be found in the SCHEDULE AND DIRECTORY.

Year courses.—A course designated by a double number (for example, Home Economics 1A-1B) is continued through two successive semesters, ordinarily from September to June; occasionally, however, the first part of a year course may begin in February. The student should use the first number in registering for the course during its first semester, and the second number during its second semester. The first half of such a course is prerequisite to the second half unless there is an explicit statement to the contrary. The instructor makes a final report on the student's work at the end of each semester. Unless otherwise noted, the student may take the first half only and receive final credit for it.

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 included in the prerequisite listing for the B course.

CLASSIFICATION AND NUMBERING

Courses are classified and numbered as follows:

(1) *Undergraduate courses.* These are of two kinds, lower division and upper division.

(a) *Lower division courses* (numbered 1-49, or sometimes indicated by letters if in subjects usually given in a high school). A lower division course is one normally taken by freshmen and sophomores; such courses do not count as upper division work in any department.

(b) *Upper division courses* (numbered 100-199). An upper division course is one normally taken by juniors and seniors. Students will not be permitted to register in upper division courses unless they have completed the courses named as prerequisites. Accepted professional training, however, will be regarded as sufficient preparation for upper division courses in the field in which the student has been trained.

Special study courses for groups of undergraduates (numbered 198) and for individual undergraduates (numbered 199) should be restricted to senior students having an adequate background in the subject proposed for special study. This would normally require a sound background in upper division courses in the field of 198 or 199 course study.

The maximum number of units per student in any and all 199 courses in any one semester shall be limited to five.

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, or may be independent of such courses.

(2) *Graduate courses* (numbered 200-299). As a condition for enrollment in a graduate course the student must submit to the instructor in charge of the course satisfactory evidence of preparation for the work proposed; adequate preparation normally consists of the completion of at least 12 units of upper division work basic to the subject of the graduate course, irrespective of the department in which such basic work may have been completed.

(3) *Professional teacher-training courses* in the Department of Education and courses in other departments that are specially intended for teachers or prospective teachers (numbered 300-399).

(4) *Certain professional courses* in departments other than the Department of Education (numbered 400-499).

Courses are further classified as follows:

Resident courses.—Courses of resident instruction are given either during regular sessions or summer sessions or (by special arrangement) as 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. All such work is in the form of upper division or graduate extra-session courses, and these courses must be approved in advance by the Committee on Courses of Instruction. Moreover, in pursuance of existing regulations, students must register in advance for all such work, and this registration must be approved by the proper faculty before the work is undertaken.

University Extension courses.—In the curricula leading to the A.B. and B.S. degrees, credit is allowed for courses in University of California Extension that bear numbers prefixed by X, XB, XD, XL, XR, XSB, or XSF. Such courses are rated, with respect to the general and specific requirements for the bachelor's degree, on the same basis as courses taken in residence at collegiate institutions of approved standing.

For information concerning University Extension courses, apply to the Director, University Extension, University of California, Berkeley 4, California.

SYMBOLS

The following symbols and their accompanying footnotes are used throughout the course section:

† Absent on leave, 1963-1964.

‡ Absent on leave, fall semester 1963-1964.

§ Absent on leave, spring semester 1964.

¹ Sabbatical leave in residence, 1963-1964.

² Sabbatical leave in residence, fall semester 1963-1964.

³ Sabbatical leave in residence, spring semester 1964.

* Not to be given, 1963-1964.

⁴ Not to be given, fall semester 1963-1964.

⁵ Not to be given, spring semester 1964.

To be given if a sufficient number of students enroll.

AGRICULTURAL CHEMISTRY

Walter G. Jennings, Ph.D., *Chairman of the Executive Committee.*

Committee Office, 106 Roadhouse Hall

Committee in Charge:

- Maynard A. Amerine, Ph.D., *Professor of Enology.*
Lawrence J. Andrews, Ph.D., *Professor of Chemistry.*
Richard A. Bernhard, Ph.D., *Assistant Professor of Food Science and Technology.*
Clinton O. Chichester, Ph.D., *Professor of Food Science and Technology.*
Edwin B. Collins, Ph.D., *Associate Professor of Food Science and Technology.*
Eric E. Conn, Ph.D., *Professor of Plant Biochemistry.*
Donald G. Crosby, Ph.D., *Lecturer in Food Science and Technology.*
Luther D. Jack, Ph.D., *Professor of Pomology, Emeritus.*
Walter L. Dunkley, Ph.D., *Professor of Food Science and Technology.*
Robert E. Feeney, Ph.D., *Professor of Food Science and Technology.*
Charles R. Grau, Ph.D., *Professor of Poultry Husbandry.*
James F. Guymon, Ph.D., *Professor of Enology.*
Raymond C. Huffaker, Ph.D., *Lecturer in Agronomy.*
John L. Ingraham, Ph.D., *Associate Professor of Bacteriology.*
Lloyd L. Ingraham, Ph.D., *Associate Professor of Enzyme Chemistry.*
Eugene L. Jack, Ph.D., *Professor of Food Science and Technology.*
Walter G. Jennings, Ph.D., *Associate Professor of Food Science and Technology.*
Raymond M. Keefer, Ph.D., *Professor of Chemistry.*
Richard E. Kepner, Ph.D., *Professor of Chemistry.*
Max Kleiber, Sc.D., *Professor of Animal Husbandry, Emeritus.*
George L. Marsh, M.S., *Professor of Food Science and Technology.*
Mendel Mazelis, Ph.D., *Assistant Professor of Food Science and Technology.*
Emil M. Mrak, Ph.D., *Professor of Food Science and Technology.*
Tommy Nakayama, Ph.D., *Lecturer in Food Science and Technology.*
Thomas A. Nickerson, Ph.D., *Associate Professor of Food Science and Technology.*
Edgar P. Painter, Ph.D., *Professor of Chemistry.*
Pauline C. Paul, Ph.D., *Professor of Home Economics.*
Daniel W. Peterson, Ph.D., *Associate Professor of Poultry Husbandry.*
Herman J. Phaff, Ph.D., *Professor of Food Science and Technology.*
Harlan K. Pratt, Ph.D., *Professor of Vegetable Crops.*
Harold G. Reiber, Ph.D., *Professor of Chemistry.*
Lloyd M. Smith, Ph.D., *Associate Professor of Food Science and Technology.*
† Clarence Sterling, Ph.D., *Professor of Food Science and Technology.*
George F. Stewart, Ph.D., *Professor of Food Science and Technology.*
Perry R. Stout, Ph.D., *Professor of Soil Science.*
Paul K. Stumpf, Ph.D., *Professor of Plant Biochemistry.*
Aloys L. Tappel, Ph.D., *Professor of Food Science and Technology.*
Nikita P. Tarassuk, Ph.D., *Professor of Food Science and Technology.*
William E. Theissen, Ph.D., *Assistant Professor of Chemistry.*
David H. Volman, Ph.D., *Professor of Chemistry.*
A. Dinsmoor Webb, Ph.D., *Professor of Enology.*

† Absent on leave, 1963-1964.

†John R. Whitaker, Ph.D., *Associate Professor of Food Science and Technology.*

Masatoshi Yamaguchi, Ph.D., *Lecturer in Vegetable Crops.*

Herbert A. Young, Ph.D., *Professor of Chemistry.*

Frederick P. Zscheile, Jr., Ph.D., *Professor of Agronomy.*

Gunter Zweig, Ph.D., *Lecturer in Entomology.*

GRADUATE COURSES

290. Seminar. (1) II.

Mr. Jennings

One seminar is offered during the semester. One weekly meeting is held.

299. Research. (1-6) I and II.

The Staff

The research work will ordinarily be under the direction of a member of the group who is in the field in which the student's preparation has been found to be adequate.

† Absent on leave, 1963-1964.

AGRICULTURAL ECONOMICS

Loy L. Sammet, Ph.D., *Acting Chairman of the Department, Berkeley-Davis.*
Benjamin C. French, Ph.D., *Vice-Chairman of the Department.*

Department Office, 118 Academic Office Building

Daniel B. DeLoach, Ph.D., *Professor of Agricultural Economics.*
Benjamin C. French, Ph.D., *Professor of Agricultural Economics.*
†Trimble R. Hedges, Ph.D., *Professor of Agricultural Economics.*
Chester O. McCorkle, Jr., Ph.D., *Professor of Agricultural Economics.*
Loy L. Sammet, Ph.D., *Professor of Agricultural Economics.*
James M. Tinley, Ph.D., *Professor of Agricultural Economics.*
Edwin C. Voorhies, B.S., LL.D., *Professor of Agricultural Economics, Emeritus.*
Harold O. Carter, Ph.D., *Associate Professor of Agricultural Economics.*
Gerald W. Dean, Ph.D., *Associate Professor of Agricultural Economics.*
J. Edwin Faris, Jr., *Associate Professor of Agricultural Economics.*
Jerry Foytik, Ph.D., *Associate Professor of Agricultural Economics.*
Gordon A. King, Ph.D., *Associate Professor of Agricultural Economics.*
J. Herbert Snyder, Ph.D., *Associate Professor of Agricultural Economics.*
†Stephen H. Sosniek, Ph.D., *Associate Professor of Agricultural Economics.*
Oscar R. Burt, Ph.D., *Assistant Professor of Agricultural Economics.*
Curtis C. Harris, Jr., Ph.D., *Assistant Professor of Agricultural Economics.*
Samuel H. Logan, Ph.D., *Assistant Professor of Agricultural Economics.*

Stanley S. Johnson, Ph.D., *Lecturer in Agricultural Economics.*
Alice R. Taylor, LL.B., *Lecturer in Business Law.*

Departmental Major Advisers.—Mr. Carter, Mr. Faris, Mr. Harris, Mr. Logan.

Bachelor of Science Major Program and Graduate Study. See page 52.

LOWER DIVISION COURSES

- 1. Agricultural Industry. (3) I.** Mr. Voorhies
Lecture—2 hours; discussion—1 hour.
Comparison of agriculture with other industries: population, production, improvements, trends, etc. Historical sketch of the development of agriculture. Types of farming and their geographical distribution. Movements of agricultural products. Institutional aids to agriculture.
Occasional field trips included.
- 18. Business Law: Introduction. (3) I.** Mrs. Taylor
Lecture—3 hours.
Sophomore standing required. Not open to students with credit for Business Administration 18.
Introduction to law, contracts, sales, and agency.
- 49. Field Practice. (1-6) II.** Mr. Snyder
Field trips to observe economic aspects of production, processing, handling, or marketing of California agricultural products. Various areas and problems—such as management, tenure, financing, taxation, labor practices, market functions, transportation—will be emphasized on the different trips.

UPPER DIVISION COURSES

To graduate with a major in agricultural economics or agricultural business management a student must have at least a C average in all upper division courses taken in the major field.

† Absent on leave, 1963-1964.

100A. Economic Analysis in Agriculture. (3) I. Mr. French

Lecture—3 hours.

Prerequisite: Economics 1A-1B.

The application of economic principles to problems of agriculture: economic structure and aspects of American agriculture; analysis of demand, supply, and production of agricultural products with particular reference to the individual firm.

100B. Economic Analysis in Agriculture. (3) II. Mr. Harris

Lecture—3 hours.

Prerequisite: course 100A or equivalent.

The application of economic principles to the problems of agriculture: economic pricing of agricultural output and productive services, including multiple products, multiple markets and multiple time periods; regional specialization, location and trade; determinants of economic change; effects of economic organization.

106. Analysis of Agricultural Economic Data. (3) II. Mr. Burt

Lecture—2 hours; laboratory—3 hours.

Prerequisite: Mathematics 13 or equivalent, Mathematics 16A or equivalent, or consent of the instructor.

Evaluation and treatment of economic data in agriculture with emphasis on methods of analyzing relations among economic variables.

110. Agricultural Finance. (3) I. Mr. Voorhies

Lecture—2 hours; discussion—1 hour.

Prerequisite: Economics 1A or 1B.

Agricultural credit needs; methods of financing the agricultural industry, and the agencies supplying agricultural credit.

Occasional field trips included.

111. Managerial Accounting. (3) II. Mr. Johnson

Lecture—3 hours.

Prerequisite: Economics 11 or equivalent.

Study of the use of accounting techniques in the management of agricultural businesses. Techniques covered include budgeting, systematic data, processing, normal and standard cost accounting, analysis of financial statements, and quantitative analysis of alternative courses of action.

115A-115B. Agricultural Business Management. (3-3) I and II.

I. Mr. DeLoach; II. Mr. Logan.

Lecture—3 hours.

Prerequisite: Economics 1A or 1B or 11 or equivalent course (economic principles or elementary accounting), or consent of the instructor. Course 115A is not a prerequisite to 115B.

Application of management principles and practices to agricultural business; the economic and institutional aspects of organization and management of business firms; planning and control; industrial regulations; facilities planning; public activity in control and regulation of agricultural processing and marketing.

120. Agricultural Policy. (3) II. Mr. Harris

Lecture—3 hours.

Prerequisite: Economics 1A-1B.

Analytical and historical treatment of economic problems and governmental policies and programs affecting American agriculture.

- 125. Comparative Agriculture.** (3) I. Mr. Tinley
Lecture—3 hours.
Prerequisite: Economics 1A or 1B.
The agriculture of the principal countries of the world, with special reference to the influence of food supply upon the development of man.
- 130. Agricultural Marketing.** (3) I. Mr. Foytik
Lecture—3 hours.
Prerequisite: Economics 1A or 1B.
The nature and function, organizational structure, and operation of agricultural markets; prices, costs, and margins; market information, regulation, and controls; cooperative marketing.
- 135. Cooperation in Agriculture.** (3) II. Mr. Tinley
Lecture—3 hours.
Types of cooperative agencies; scope and objectives of agricultural cooperation, functions, supply, services, insurance, irrigation, production, consumption, marketing; problems of organization, pooling management, member relations, financing, taxation, market control, demand creation, cost control; economic effects; legal, political, social aspects.
- 140. Farm Management.** (4) I and II.
I. Mr. Dean; II. ———.
Lecture—3 hours; laboratory—3 hours.
Prerequisite: junior standing.
Farm organization and resources; applying economic and technological principles in decision-making; analytical techniques and management control; problems in organizing and managing the farm business.
- 145. Land Economics and Farm Appraisal.** (3) II. Mr. McCorkle
Lecture—2 hours; laboratory—3 hours. One field trip is required.
Prerequisite: Economics 1A or 1B.
Appraisal of agricultural land, land utilization in relation to problems of development and valuation, use and appraisal of land and water resources, land and water policies.



Courses 160 to 180 are senior courses designed for those who have completed courses 100A, 100B, 106 and the appropriate survey course in the 120-145 series. A student not having this preparation but who desires a course in the 160-to-180 series may be admitted with the consent of the course instructor.

- 160. Economic Analysis in Agricultural Marketing.** (3) I. Mr. King
Lecture—3 hours.
An analytical treatment of agricultural marketing: the marketing firm in its economic context; location of agricultural production, processing, and trade; demand analysis; economic analysis of market organization; government in marketing; the marketing system and the general economy.
- 165. Economic Analysis in Agricultural Business Management.** (3) II. Mr. Burt
Lecture—3 hours.
An analytical treatment of agricultural business management; procurement; production; processing; costing and pricing; planning and control; business analysis.
- 170. Economic Analysis in Farm Management.** (3) I. Mr. Faris
Lecture—3 hours.
An analytical treatment of farm management: farm organization, administration and management; costs and returns; combination of resources; enterprise combination; problems and principles of size; financial analysis; capital structure; relation of nonfarm influences to farm management.

- 176. Economic Analysis in Resource Development and Use.** (3) II. Mr. Snyder
Lecture—3 hours.
An analytical treatment of resource use problems; economic productivity; rent and distribution theory; land use patterns; determinants of intensities and types of land use; resource conservation; land valuation; land tenure problems and policies.
- *180. Economic Analysis in Agricultural Policy.** (3) II. _____
Lecture—3 hours.
An analytical treatment of agricultural policy: economic appraisal of types of policies and policy problems; production, marketing and price; land; credit; markets, relations to national economic policy.
- 198. Directed Group Study.** (1-5) I and II.
Prerequisite: consent of the instructor. The Staff (Mr. French in charge)
Directed group study of selected topics in agricultural economics for advanced undergraduates.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff (Mr. French in charge)
Prerequisite: senior standing and approval of the department.
Limited to majors in agricultural economics with a B average or higher.

GRADUATE COURSES

- 250. Institutional Setting for Agricultural Business.** (3) I. Mr. Foytik
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.
- 252. Administrative Organization and Behavior.** (3) I. Mr. DeLoach
Lecture—3 hours.
Evaluation of the role of administration in the individual agricultural business firm; nature and theory of administration; contribution of the behavioral sciences; use of administrative tools in the organization and operation of the firm.
- 253. Quantitative Analysis of Operational Problems.** (3) II. Mr. Carter
Lecture—3 hours.
Introduction to quantitative techniques used in analyzing operational problems of the business firm; statistical quality control; inventory control; waiting line problems; programming techniques as applied to transportation, product mix, and related production problems.
- 256. Pricing and Business Forecasting.** (3) I. Mr. King
Lecture—3 hours.
Appraisal of price-forming mechanisms for market structures encountered by agriculture-related industries: price theory for product and factor markets; price policies for the firm; business fluctuations; forecasting prices and sales for the individual firm.
- 257. Production Planning.** (3) II. Mr. Logan
Lecture—3 hours.
Analysis of cost and production relationships; statistical, economic and engineering methods of cost measurement and analysis; problems of investment, location, scale of operations, diversification, and integration.

* Not to be given, 1963-1964.

260. Management Policy Formation. (3) II.

Mr. McCorkle

Lecture—3 hours.

Intensive study of business problems encountered by agricultural business firms and of the formulation of policies by top-management. Actual cases are stressed to illustrate decision-making for particular functions and for enterprises as a whole. Student papers required.

299. Individual Study. (1-4) I and II. The Staff (Mr. Dean in charge)

Any properly qualified graduate student who wishes to pursue a special field of study may do so if his proposed program of study is acceptable to the members of the staff with whom he works.

AGRICULTURAL EDUCATION

Sidney S. Sutherland, M.S., *Chairman of the Department.*

Department Office, 274 Academic Office Building

Sidney S. Sutherland, M.S., *Professor of Agricultural Education, Supervisor of Teacher Training—Vocational.*

Frederick L. Griffin, M.S., *Professor of Agricultural Education, Emeritus.*

Elwood M. Juergenson, Ph.D., *Associate Professor of Agricultural Education.*

Orville E. Thompson, Ph.D., *Associate Professor of Agricultural Education.*

Mary C. Regan, Ph.D., *Assistant Professor of Agricultural Education.*



Arline Johnson, M.S., *Lecturer in Agricultural Education, Supervisor of Teacher Training—Home Economics.*

Departmental Major Advisers.—Mr. Juergenson, Mr. Thompson.

Credentials Counselors:

Special Secondary—Agriculture.—Mr. Juergenson.

Special Secondary—Home Economics.—Miss Johnson.

Bachelor of Science Major Program and Graduate Study. See page 53.

UPPER DIVISION COURSES

160. **Vocational Education.** (2) II. Mr. Thompson

Lecture—2 hours.

Philosophy and organization of vocational education of less than college grade, with particular reference to educational principles for agriculture, commerce, homemaking, and industry.

†161. **Problems in Vocational Education.** (2) I and II. Mr. Juergenson

Lecture—2 hours.

Vocational surveys, junior employments, occupational analysis, trade tests, apprentice training, vocational education for adults, foremanship courses, corporation schools, current legislation, etc.

187. **Extension Education in Agriculture and Home Economics.** (2) II.

Lecture—1 hour; laboratory or field trip—3 hours.

Miss Regan

Prerequisite: junior or senior standing.

A study of the techniques of teaching agriculture and home economics as developed in the United States through the Agricultural Extension Service. Laboratory practice in extension methods such as program planning, demonstrations, discussions, use of bulletins, the press, visual aids. Field study of organization and programs.

188. **Technical Journalism.** (3) I.

Miss Regan

Lecture—2 hours; laboratory—3 hours.

Prerequisite: junior or senior standing.

Principles and techniques of presenting and interpreting technical information in agriculture and home economics to lay groups. Preparation and use of news and feature articles, circulars, radio and television scripts, and feature exhibits.

189. **Adult Education.** (2) I and II.

Mr. Sutherland

Lecture—2 hours.

Prerequisite: Education 110 (may be taken concurrently).

Principles of adult education. Application of the principles of group leadership and group dynamics to the teaching of adults and to extension education in agriculture and home economics.

† Open only to apprentice teachers and graduate students.

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

The Staff (Mr. Sutherland in charge)

199. Special Study for Advanced Undergraduates. (1-5) I and II.

The Staff (Mr. Sutherland in charge)

GRADUATE COURSES

290. Seminar. (1) I and II.

Mr. Thompson

Seminar—1 hour.

Reports and discussions of topics of interest in the fields of agricultural education and agricultural extension.

299. Research. (1-6) I and II.

The Staff

Research in agricultural education, vocational education, or agricultural extension.

SUPERVISED TEACHING COURSES

320A. Introduction to Teaching. (1) I and II.

Mr. Juergenson

Lecture—1 hour.

A limited number of juniors and seniors will be admitted. Lectures, conferences, and field work. Observations and participation in some form of public school work.

320B. Audio-Visual, Radio, and Other Instructional Resources. (2) I and II.

I. Miss Regan; II. Mr. Juergenson.

Lecture—1 hour; laboratory—3 hours.

Lectures, conferences, demonstrations, and school experience. Introduction to the materials and methods of audio-visual-radio education. Preparation of teaching materials; collecting, organizing, processing, and evaluating audio-visual materials.

‡320C. Supervised Teaching. (3) I and II.

Prerequisite: course 320A. Course 320E must be taken concurrently.

Sec. 1. Agriculture.

Mr. Juergenson

Sec. 2. Homemaking.

Miss Johnson

Directed teaching for candidates for the special credentials in agriculture and homemaking and for the general secondary and general elementary credentials.

‡320E. Methods of Teaching. (2) I and II.

Lecture—2 hours and conferences.

All students enrolled in 320E must enroll in 320C concurrently.

Sec. 1. Agriculture.

Mr. Juergenson

The principles and methods of teaching agriculture in the secondary schools of California in accordance with the provisions of the Federal and State Vocational Education Acts.

Sec. 2. Homemaking.

Miss Johnson

Planning for teaching; basis for selection and organization of materials, their use and evaluation; teaching methods and classroom aids. Practices in class and department management. Relation of department programs to school and community.

‡ Open only to apprentice teachers and graduate students. Courses 320C, 320E and 323 are scheduled as extra-session courses, to begin with the opening of the public schools and to end with the closing of the semester in the public schools. Thus teaching assignments in the fall semester, 1963, will begin on or about August 31 and end January 29. For the spring semester, 1964, they will begin on or about February 1 and end June 17. Students should make arrangements accordingly.

‡323. **Practicum in Supervised Teaching.** (4) I and II.

Prerequisite: Concurrent enrollment in course 320E; course 320C (may be taken concurrently) or experience as a teacher and consent of the instructor.

Sec. 1. Agriculture. Mr. Juergenson

Sec. 2. Homemaking. Miss Johnson

Extended and varied teaching experience under supervision.

‡ Open only to apprentice teachers and graduate students. Courses 320C, 320E and 323 are scheduled as extra-session courses, to begin with the opening of the public schools and to end with the closing of the semester in the public schools. Thus teaching assignments in the fall semester, 1963, will begin on or about August 31 and end January 29. For the spring semester, 1964, they will begin on or about February 1 and end June 17. Students should make arrangements accordingly.

AGRICULTURAL ENGINEERING

———, *Chairman of the Department.*

Department Office, 207 Walker Engineering Building

- Norman B. Akesson, M.S., *Professor of Agricultural Engineering.*
Roy Bainer, M.S., *Professor of Agricultural Engineering and Professor of Engineering.*
S. Milton Henderson, M.S., *Professor of Agricultural Engineering and Professor of Engineering.*
Clarence F. Kelly, M.S., *Professor of Agricultural Engineering and Professor of Engineering.*
Robert A. Kepner, B.S., *Professor of Agricultural Engineering and Professor of Engineering.*
Coby Lorenzen, Jr., M.S., *Professor of Agricultural Engineering and Professor of Engineering.*
Loren W. Neubauer, Ph.D., *Professor of Agricultural Engineering and Professor of Engineering.*
Frederick A. Brooks, Sc.D., *Professor of Agricultural Engineering, Emeritus.*
William J. Chancellor, Ph.D., *Associate Professor of Agricultural Engineering.*
John R. Goss, M.S., *Associate Professor of Agricultural Engineering and Associate Professor of Engineering.*
John C. Harper, D.Sc., *Associate Professor of Agricultural Engineering and Associate Professor of Engineering.*
Samuel A. Hart, Ph.D., *Associate Professor of Agricultural Engineering and Associate Professor of Engineering.*
†Lloyd H. Lamouria, M.S., *Associate Professor of Agricultural Engineering.*
Allan A. McKillop, Ph.D., *Associate Professor of Agricultural Engineering and Associate Professor of Engineering.*
Wesley E. Yates, M.S., *Associate Professor of Agricultural Engineering.*
Robert B. Fridley, B.S., *Assistant Professor of Agricultural Engineering and Assistant Professor of Engineering.*
Cletus E. Shertz, Ph.D., *Assistant Professor of Agricultural Engineering.*



- Todd V. Crawford, M.S., *Lecturer in Agricultural Engineering.*
Charles R. Kaupke, M.S., *Lecturer in Agricultural Engineering.*
Michael O'Brien, Ph.D., *Lecturer in Agricultural Engineering.*
Herbert B. Schultz, Ph.D., *Lecturer in Agricultural Engineering and Lecturer in Geography.*

LOWER DIVISION COURSE

12. Survey and Problems in Agricultural Engineering. (2) I.

Lecture—2 hours.

Mr. Bainer, Mr. Kelly

The development and the application and use of farm machinery; the utilization of power on the farm; elements of hydrology in relation to agricultural engineering; the economics of farm buildings; elementary problems in the mechanics of agriculture.

UPPER DIVISION COURSES

Physics 2A–2B or 4A–4B are prerequisite to all upper division courses in agricultural engineering.

† Absent on leave, 1963–1964.

- 103. Agricultural Power.** (3) II. Mr. Kaupke
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Physics 2A-2B or 4A-4B.
Principles of operation, construction, and utilization of internal combustion engines; tractors and electric motors. Open to qualified lower division students by permission.
- 104. Agricultural Machinery.** (3) I. Mr. Yates
Lecture—2 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.** (3) II. Mr. Schertz
Lecture—2 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.
- 106. Micrometeorology in Agriculture.** (2) II. Mr. Crawford
Lecture—2 hours.
Prerequisite: Mathematics 16B or consent of the instructor.
Energy balance at earth's surface; solar and terrestrial radiation; turbulent transfers of momentum, heat, principles and practical applications to agriculture and air pollution.
- 107. Agricultural Meteorology.** (2) I. Mr. Schultz
Lecture—2 hours.
Prerequisite: Recommended: Geography 1 or 3.
Daytime radiation intensities, nocturnal heat losses, climatic elements over different ground covers and terrain. Modification of micro-climate by sheltering, frost-protection devices, and wind-breaks. Probabilities of temperatures, rainfall, and climatic hazards to agriculture (risk figures).
- 198. Directed Group Study.** (1-5) I and II. The Staff
Prerequisite: consent of the instructor.
Group study of selected topics in agricultural engineering.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff
Prerequisite: one upper division course in agricultural engineering with at least a B average.

GRADUATE COURSE

- 299. Research in Agricultural Engineering.** (1-6) I and II. The Staff

PROFESSIONAL COURSES

- 314A. Agricultural Engineering Problems and Techniques for Teachers.**
(2) I. Mr. O'Brien
Laboratory—6 hours.
Prerequisite: agricultural education major or consent of the 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.

314B. Agricultural Engineering Problems and Techniques for Teachers.

(2) I.

Mr. O'Brien

Laboratory—6 hours.

Prerequisite: agricultural education major or consent of the instructor.
Course 314A is not prerequisite to 314B.

A continuation of course 314A. Offered in odd-numbered years.

317. Problems in Teaching Farm Mechanics. (3) II.

Mr. O'Brien

Lecture—1 hour; laboratory—6 hours.

Prerequisite: 8 units in agricultural engineering, including course 314A-314B; Physics 2A-2B or 4A-4B. Limited to graduate students in agricultural education.

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.

AGRICULTURAL PRACTICES

Harry O. Walker, Ed.D., *Chairman of the Department.*
Department Office, 3 TB 6

Harry O. Walker, Ed.D., *Lecturer in Agricultural Practices.*
Departmental Major Adviser.—Mr. Walker.

LOWER DIVISION COURSE

49. Field Practice in Agriculture. (No credit) I and II. Mr. Walker
Laboratory—3 hours.

Practice in basic farm operations. Includes the operation and maintenance of farm machinery, soil tillage, irrigation, cultivation and harvesting operations. Recommended for the student whose experience in agriculture is inadequate for his occupational objectives.

AGRONOMY

R. Merton Love, Ph.D., *Chairman of the Department.*
Department Office, 131 Hunt Hall

Fredrick T. Addicott, Ph.D., *Professor of Agronomy.*
Robert W. Allard, Ph.D., *Professor of Agronomy.*
Paulden F. Knowles, Ph.D., *Professor of Agronomy.*
Horton M. Laude, Ph.D., *Professor of Agronomy.*
R. Merton Love, Ph.D., *Professor of Agronomy.*
Duane S. Mikkelsen, Ph.D., *Professor of Agronomy.*
Maurice L. Peterson, Ph.D., *Professor of Agronomy. (Berkeley campus).*
Charles W. Schaller, Ph.D., *Professor of Agronomy.*
Francis L. Smith, Ph.D., *Professor of Agronomy.*
Ernest H. Stanford, Ph.D., *Professor of Agronomy.*
Frederick P. Zscheile, Jr., Ph.D., *Professor of Agronomy.*
Fred N Briggs, Ph.D., *Professor of Agronomy, Emeritus.*
John P. Conrad, Ph.D., *Professor of Agronomy, Emeritus.*
Ben A. Madson, B.S.A., *Professor of Agronomy, Emeritus.*
William A. Williams, Ph.D., *Associate Professor of Agronomy.*
†Robert S. Loomis, Ph.D., *Assistant Professor of Agronomy.*
Wyman E. Nyquist, Ph.D., *Assistant Professor of Agronomy.*



Beecher Crampton, M.S., *Lecturer in Agronomy.*
Ray C. Huffaker, Ph.D., *Lecturer in Agronomy.*
Dale G. Smeltzer, Ph.D., *Lecturer in Agronomy.*
J. Caswell Williams, Jr., Ph.D., *Lecturer in Agronomy.*

Departmental Major Advisers.—Mr. Laude, Mr. Loomis, Mr. Schaller, Mr. Smeltzer.

Bachelor of Science Major Program and Graduate Study. See page 63.

LOWER DIVISION COURSE

- 1. Introduction to Agronomy. (3) I.** Mr. Smith, Mr. Smeltzer
Lecture—2 hours; laboratory—3 hours.
The principles and practices of field crop production and soil management; a survey of the production and uses of field crops including pastures and other forages, cereals, edible legumes, oil, fiber, sugar, and green manure crops; laboratories and field trips to familiarize the student with production methods, plants and seeds, processing, and quality of field crops.

UPPER DIVISION COURSES

- 111. Small Grains, Corn, Sorghum, and Beans. (3) II.** Mr. Schaller
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1 or consent of the instructor.
Adaptation, distribution, culture, utilization, processing and factors determining quality of wheat, oats, barley, rye, rice, corn, sorghum, and field beans.
- 112. Forage Crops. (3) II.** Mr. W. A. Williams
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1 or consent of the instructor.
Crop-ecological principles in the establishment and management of such forages as irrigated pasture, hay, range, and silage; aspects of forage quality which affect feeding value to livestock. Multiple use capabilities of grasslands are stressed.

† Absent on leave, 1963–1964.

- 113. Cotton, Sugar Beets and Miscellaneous Crops.** (3) I. Mr. Mikkelsen
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1 or consent of the instructor.
Adaptation, distribution, culture, utilization, processing and other factors determining quality of cotton and other fiber crops, sugar crops, oil crops, and miscellaneous crops.
- 121. Principles of Plant Breeding.** (3) II. Mr. Knowles
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Genetics 100.
An introduction to plant breeding with emphasis on the genetic and cytological basis for plant improvement.
- 131. Physiology of Crop Plants.** (3) I. Mr. Laude
Lecture—3 hours.
Prerequisite: course 1 or consent of instructor; Botany 111.
Physiological processes of agronomic plants and their modification by environment. Selected aspects of vegetative and reproductive growth of crop plants and factors affecting the quality of crop products.
- 198. Directed Group Study.** (1-5) I and II. J. C. Williams
Prerequisite: consent of the instructor.
Directed group study of selected topics in agronomy for advanced undergraduates.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff
Prerequisite: 6 upper division units of agronomy.

GRADUATE COURSES

- 205. Design of Field Experiments.** (2) I. Mr. Nyquist
Lecture—1 hour; laboratory—3 hours.
Prerequisite: Mathematics 105A.
The planning and analysis of field and related experiments with emphasis on the biological interpretation of results.
- 206. Chemical and Physical Methods in Biological Research.** (3) I. Mr. Huffaker, Mr. Zscheile
Lecture—1 hour; laboratory—6 hours.
Prerequisite: Chemistry 5 and 9 or their equivalents.
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.
- 221. Advanced Plant Breeding.** (3) II. Mr. Stanford
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 121 or equivalent.
Advanced topics in plant breeding. Genetic diversity and centers of origin of cultivated plants, mating systems in plants, polyploidy, host-pathogen relationships, role of mutagenesis in plant breeding and other topics of current interest.
- 222. Quantitative Genetics and Plant Improvement.** (3) I. Mr. Allard
Lecture—2 hours; laboratory—2 hours.
Prerequisite: course 121 or consent of the instructor; Mathematics 105A.
A survey of the genetic forces affecting populations. Formulation of breeding plans based on principles of population and quantitative genetics.
- 290. Seminar.** (1) I and II. Mr. Huffaker
Seminar—1 hour.
Technical topics of current interest in agronomy will be discussed. Students will prepare and present reports to the seminar.

298. Group Study (1-3) I and II.

The Staff

Directed study in the areas of plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of field crops or range and pasture plants.

299. Research. (1-9) I and II.

The Staff

Original research involving plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of field crops or range and pasture plants.

RELATED COURSES

Weed Control (Botany 107)

Water-Soil-Plant Relationships (Irrigation 100)

Irrigation Principles and Practices (Irrigation 110)

Elementary Statistics (Mathematics 13)

Applied Statistical Methods (Mathematics 105A-105B)

Diseases of Crop Plants (Plant Pathology 125-126)

Range Plants (Range Management 100)

Grassland Ecology (Range Management 133)

Introduction to Soil Science (Soil Science 1)

Soil and Plant Relations (Soil Science 108)

Soil Fertility (Soil Science 109)

Other courses related to agronomy are given in the departments of Agricultural Economics, Agricultural Engineering, Animal Husbandry, Botany, Genetics, and Soils and Plant Nutrition.

AMERICAN HISTORY AND LITERATURE

Robert A. Wiggins, Ph.D., *Chairman of the Committee.*
Committee Office, 222 Sproul Hall.

Committee in Charge:

David L. Jacobson, Ph.D., *Assistant Professor of History.*
C. Bickford O'Brien, Ph.D., *Professor of History.*
John R. Owens, Ph.D., *Assistant Professor of Political Science.*
Alan A. Stambusky, Ph.D., *Assistant Professor of Dramatic Art.*
Wayne Thiebaud, M.A., *Assistant Professor of Art.*
Robert A. Wiggins, Ph.D., *Associate Professor of English.*
Marvin Zetterbaum, Ph.D., *Assistant Professor of Political Science.*

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Group Major Adviser.—Mr. Wiggins.

The Major Program.—See description, page 84.

The Major with Honors.—See description, page 85.

UPPER DIVISION COURSES

194H. Special Study for Honors Students. (3) I and II. The Staff
Lecture and discussion—3 hours.

Prerequisite: enrollment limited to honors students in American History and Literature.

197H. Special Study for the Comprehensive Examination for Honors Students. (3) I and II. The Staff

Prerequisite: completion of all other major requirements for the A.B. degree in American History and Literature.

Study for a written and oral examination given by an interdepartmental committee, the members to be chosen from the student's instructors in American History and Literature.

199. Special Study for Advanced Undergraduates. (1-3) I and II. The Staff

† Absent on leave, 1963-1964.

ANATOMY

Logan M. Julian, D.V.M., Ph.D., *Chairman of the Department.*
Department Office, 1045 Haring Hall

Logan M. Julian, D.V.M., Ph.D., *Professor of Anatomy.*

†Walter S. Tyler, D.V.M., Ph.D., *Associate Professor of Anatomy.*

Larry Z. McFarland, D.V.M., Ph.D., *Assistant Professor of Anatomy.*



Marjan Merala, M.S., *Lecturer in Medical Bibliography.*

UPPER DIVISION COURSES

***100. Systematic Anatomy. (2) II.** The Staff
Lecture—2 hours.

Prerequisite: Zoology 1B and consent of the instructor. Course 100L should be taken concurrently.

Lectures emphasizing the typical structure of the major anatomical systems of the ruminant, carnivore, and fowl.

***100L. Systematic Anatomy Dissection. (2) II.** The Staff
Laboratory—6 hours.

Prerequisite: course 100 (should be taken concurrently).

Dissection and demonstration of the major anatomical systems of the sheep, dog, and chicken with comparisons to related species.

120. Functional Comparative Anatomy of Domestic Animals. (10) I.

Mr. Julian, Mr. McFarland, Mr. Tyler

Lecture—4 hours; laboratory—18 hours.

Prerequisite: first-year standing in the School of Veterinary Medicine.

Systematic presentation of the gross and subgross anatomy of domesticated species.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

Laboratory.

The Staff

Prerequisite: course 120 or consent of the instructor.

GRADUATE COURSES

220. Surgical Anatomy. (4) II. Mr. Julian, Mr. McFarland

Lecture—1 hour; laboratory—9 hours.

Prerequisite: course 120 or equivalent.

Topographical, radiological, and regional anatomy as it applies to the clinical sciences.

290. Seminar. (1) I and II. The Staff

Seminar—1 hour.

299. Research. (1-6) I and II. The Staff

† Absent on leave, 1963-1964.

* Not to be given, 1963-1964.

ANIMAL HUSBANDRY

Hubert Heitman, Jr., Ph.D., *Chairman of the Department.*
Department Office, 126 Animal Science Building

Harold H. Cole, Ph.D., *Professor of Animal Husbandry.*
Perry T. Cupps, Ph.D., *Professor of Animal Husbandry.*
Paul W. Gregory, Sc.D., *Professor of Animal Husbandry.*
Hubert Heitman, Jr., Ph.D., *Professor of Animal Husbandry.*
Glen P. Lofgreen, Ph.D., *Professor of Animal Husbandry.*
James H. Meyer, Ph.D., *Professor of Animal Husbandry.*
William C. Weir, Ph.D., *Professor of Animal Husbandry.*
Harold Goss, Ph.D., *Professor of Animal Husbandry, Emeritus.*
Carroll E. Howell, M.S., *Professor of Animal Husbandry, Emeritus.*
Max Kleiber, Sc.D., *Professor of Animal Husbandry, Emeritus.*
Sylvester W. Mead, M.S., *Professor of Animal Husbandry, Emeritus.*
James F. Wilson, M.A., LL.D., *Professor of Animal Husbandry, Emeritus.*
James M. Boda, Ph.D., *Associate Professor of Animal Husbandry.*
†Floyd D. Carroll, Ph.D., *Associate Professor of Animal Husbandry.*
Moses T. Clegg, Ph.D., *Associate Professor of Animal Husbandry.*
Irving I. Geschwind, Ph.D., *Associate Professor of Animal Husbandry.*
Robert C. Laben, Ph.D., *Associate Professor of Animal Husbandry.*
Wade C. Rollins, Ph.D., *Associate Professor of Animal Husbandry.*
‡Magnar Ronning, Ph.D., *Associate Professor of Animal Husbandry.*
Ransom L. Baldwin, Jr., Ph.D., *Assistant Professor of Animal Husbandry.*
‡G. Eric Bradford, Ph.D., *Assistant Professor of Animal Husbandry.*
Robert G. Loy, Ph.D., *Assistant Professor of Animal Husbandry.*



Jack R. Luick, Ph.D., *Lecturer in Animal Husbandry.*
Glenwood M. Spurlock, Ph.D., *Lecturer in Animal Husbandry.*

Departmental Major Advisers.—Mr. Laben, Mr. Cupps, Mr. Baldwin, Mr. Spurlock, Mr. Loy.

Bachelor of Science Major Program and Graduate Study. See page 57.

LOWER DIVISION COURSES

7. Introduction to Animal Husbandry. (3) I. Mr. Cole
Lecture—3 hours.

A survey of the sources of the world's supply of animal products, the distribution of domestic animals in the United States and factors influencing this; the origin, characteristics, and adaptation of the more important breeds and the influence of environment upon their development.

7L. Introduction to Animal Husbandry Laboratory. (1) I. Mr. Spurlock
Laboratory—3 hours.

Prerequisite: course 7 or consent of the instructor.

Introduction to husbandry of the station flocks and herds. Studies of animal experiments in progress. Live animal and carcass evaluation. Dairy and beef cattle, sheep, swine, and horses.

† Absent on leave, 1963-1964.

‡ Absent on leave, fall semester, 1963-1964.

- 11. Livestock and Dairy Cattle Judging.** (2) II. Mr. Heitman, Mr. Laben
 Laboratory—6 hours.
 Prerequisite: course 7L.
 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.

UPPER DIVISION COURSES

- 102. Animal Biochemistry Laboratory.** (3) I. Mr. Baldwin
 Lecture—1 hour; laboratory—6 hours.
 Prerequisite: Biochemistry 101 (may be taken concurrently).
- 103. Feeds and Feeding.** (3) II. Mr. Weir
 Lecture—3 hours.
 Prerequisite: Chemistry 8.
 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; the balancing of rations. Not open for credit to animal husbandry majors.
- 105. Elements of Animal Nutrition.** (3) II. _____
 Lecture—3 hours.
 Prerequisite: Biochemistry 101.
 A study of the fundamental principles of animal nutrition. Includes a survey of the role of carbohydrates, proteins, lipids, minerals, vitamins and water in nutrition; methods used in evaluation of feeds; nutrient requirements for productive function.
- 105L. Elements of Animal Nutrition Laboratory.** (1) II. _____
 Laboratory—3 hours.
 Prerequisite: course 105 (may be taken concurrently).
 Laboratory studies and demonstrations of nutritional principles and their relation to the evaluation of feeds for productive functions. Nutrient composition of feedstuffs.
- 107. The Genetics of Animal Breeding.** (3) I. Mr. Rollins
 Lecture—2 hours; laboratory—3 hours.
 Prerequisite: Genetics 100.
 The application of modern genetics to livestock improvement; the principles underlying inbreeding, outbreeding, assortative mating, mass selection, progeny testing, and family selection.
- 110. Physiology of Domestic Animals.** (5) I. Mr. Boda
 Lecture—4 hours; laboratory—3 hours.
 Prerequisite: Chemistry 8; Zoology 1A-1B.
 The physiology of the neuromuscular, central nervous, circulatory, respiratory, digestive, endocrine, reproductive, and excretory systems.
- 111. Type Evaluation in Livestock and Dairy Cattle.** (2) I.
 Laboratory—6 hours. Mr. Cupps, Mr. Heitman
 Prerequisite: course 11.
 Studies of recognized type evaluation in livestock and dairy cattle. Critical evaluation of the bases for the criteria used in establishing these standards. Intercollegiate judging teams selected from this course. Given the first six weeks of the semester.
- 112. Milk Production.** (2) II. Mr. Luick
 Lecture—2 hours.
 Prerequisite: course 103 or 105, Genetics 100.
 The basic principles of breeding, feeding, and management of dairy cattle, and a survey of dairying in California. Not open for credit to animal husbandry majors.

- 114. Advanced Dairy Cattle Production. (4) II.** Mr. Laben
Lecture—3 hours; laboratory—3 hours.
Prerequisite: courses 103 or 105, 107 and 110.
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.
- 115. Horse Production. (3) II.** Mr. Loy
Lecture—2 hours; laboratory—3 hours.
Prerequisite: courses 103 or 105, and 110; Genetics 100.
Feeding, breeding, and management of horses; application of the principles of basic animal sciences to problems of production of all classes of horses.
- 116. Meat Animal Production. (4) II.** Mr. Bradford, Mr. Meyer
Lecture—3 hours; laboratory—3 hours.
Prerequisite: courses 103 or 105, 107 and 110.
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.
- 118. Meat Production. (3) II.** Mr. Carroll
Lecture—2 hours; laboratory—3 hours.
Prerequisite: courses 7, 7L, 103 or 105 (may be taken concurrently); Genetics 100.
Improvement of meat type through selection for heritable traits; comparative reproductive and feed efficiency; environmental adaptability and distribution; management for growth and fattening for meat. Not open for credit to animal husbandry majors.
- 120. Metabolism and Food Utilization. (3) I.** Mr. Kleiber
Lecture—3 hours.
Prerequisite: course 105 or equivalent.
Physical, chemical and physiological principles in animal nutrition especially bioenergetics and biokinetics. Energy transformations (chemical energy, work and heat) in animals. Metabolic paths, pools, turnover rates and precursor-product relationships involved in the formation of animal products.
- 121. Physiology of Reproduction. (3) II.** Mr. Cupps
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 110.
The physiological mechanisms related to reproduction, breeding efficiency and fertility with special reference to domestic animals.
- 125. Nutritional Principles of Livestock Feeding. (2) I.** Mr. Lofgreen
Lecture—2 hours.
Prerequisite: third year standing in School of Veterinary Medicine or consent of instructor.
The application of principles of nutrition to the solution of problems in animal feeding. Nutritive requirements for maintenance and productive functions, nutritional disorders, composition and use of feedstuffs.
- 130. Physiology of the Endocrine Glands. (3) II.** Mr. Clegg
Lecture—3 hours.
Prerequisite: course 110 or equivalent.
Control of endocrine secretion and the physiological effects of the hormones with emphasis on endocrine problems relating to domestic animals.

- 190. Proseminar in Animal Husbandry.** (1) II. Mr. Weir, Mr. Rollins
Lecture—1 hour.
Prerequisite: senior standing in Animal Husbandry or consent of the instructor.
Reports and discussions of recent advances in animal husbandry.
- 198. Directed Group Study.** (1-3) I and II.
Laboratory—3 hours per unit. The Staff (Mr. Heitman in charge)
Prerequisite: consent of the instructor.
Group study of selected topics relating to livestock production.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II.
The Staff (Mr. Heitman in charge)

GRADUATE COURSES

- 201. Protein Biochemistry.** (3) I. Mr. Geschwind
Lecture—3 hours.
Prerequisite: Biochemistry 101 and Chemistry 109.
Introduction to the 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.
- *206. Advanced Animal Nutrition Laboratory.** (3) II. Mr. Lofgreen
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 105L or consent of the instructor.
A study of nutrition through laboratory animal experimentation, including studies of deficiency symptoms, nutritional balances and measures of the usefulness of feeds.
- 214. Physiology of Lactation.** (2) II. Mr. Luick
Lecture—2 hours.
Prerequisite: course 110 and Biochemistry 101.
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.
- 230. Biochemical Aspects of Endocrinology.** (2) II. Mr. Geschwind
Lecture—2 hours.
Prerequisite: course 110 or equivalent; Biochemistry 101.
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 even-numbered years.
- 290. Seminar.** (1) I and II. The Staff (Mr. Heitman in charge)
Seminar—1 hour.
Reports and discussions of topics of interest in the fields of animal husbandry, animal nutrition, animal physiology or animal genetics.
- 299. Research.** (1-9) I and II. The Staff
Research may be undertaken in the fields of animal husbandry, animal nutrition, animal physiology, or animal genetics.

RELATED COURSE

Animal Hygiene (Veterinary Microbiology 111)

* Not to be given, 1963-1964.

ANIMAL PHYSIOLOGY

Frederick W. Lorenz, Ph.D., *Chairman of the Group.*

Chairman's Office, 130 Poultry Husbandry Building

Members of the Animal Physiology Group:

- Ursula H. Abbott, Ph.D., *Associate Professor of Poultry Husbandry.*
Norman F. Baker, D.V.M., Ph.D., *Associate Professor of Parasitology.*
Arthur L. Black, Ph.D., *Professor of Physiological Chemistry.*
James M. Boda, Ph.D., *Associate Professor of Animal Husbandry.*
Floyd D. Carroll, Ph.D., *Associate Professor of Animal Husbandry.*
Moses T. Clegg, Ph.D., *Associate Professor of Animal Husbandry.*
Harold H. Cole, Ph.D., *Professor of Animal Husbandry.*
Charles E. Cornelius, D.V.M., Ph.D., *Associate Professor of Clinical Pathology.*
Perry T. Cupps, Ph.D., *Professor of Animal Husbandry.*
Irving I. Geschwind, Ph.D., *Associate Professor of Animal Husbandry.*
Frederic W. Hill, Ph.D., *Professor of Poultry Husbandry.*
Louis W. Holm, Ph.D., *Professor of Physiology.*
Jurgen H. H. Jacobs, Ph.D., *Assistant Professor of Zoology.*
Logan M. Julian, D.V.M., Ph.D., *Professor of Anatomy.*
Jiro J. Kaneko, D.V.M., Ph.D., *Assistant Professor of Clinical Pathology.*
Clarence F. Kelly, M.S., *Professor of Agricultural Engineering.*
Max Kleiber, Sc.D., *Professor of Animal Husbandry, Emeritus.*
Charles R. Kovacic, Ed.D., *Professor of Physical Education.*
Frederick W. Lorenz, Ph.D., *Professor of Poultry Husbandry.*
Robert G. Loy, Ph.D., *Assistant Professor of Animal Husbandry.*
Frank X. Ogasawara, Ph.D., *Assistant Professor of Poultry Husbandry.*
Stuart A. Peoples, M.D., *Professor of Comparative Pharmacology.*
Edward A. Rhode, Jr., D.V.M., *Associate Professor of Veterinary Medicine.*
George W. Salt, Ph.D., *Associate Professor of Zoology.*
Arthur H. Smith, Ph.D., *Professor of Poultry Husbandry.*
Wilbor O. Wilson, Ph.D., *Professor of Poultry Husbandry.*



- Emanuel Epstein, Ph.D., *Lecturer in Plant Nutrition.*
Chester L. Foy, Ph.D., *Lecturer in Agricultural Botany.*
Edward C. Maxie, Ph.D., *Lecturer in Pomology.*
Prau Vohra, Ph.D., *Lecturer in Animal Physiology.*

Instruction in Animal Physiology is not organized as a single administrative unit in the University, but the relevant courses are offered by a number of departments, and are coordinated by the Group in Animal Physiology. An undergraduate major is offered within the animal science curriculum.

Group Major Adviser.—Mr. Lorenz.

Bachelor of Science Major Program and Graduate Study. See page 57.

UPPER DIVISION COURSES

100. General Physiology. (3) I.

Mr. Smith

Lecture—3 hours.

Prerequisite: Chemistry 1B, 8; Physics 2B; Physiology 1, 1L, or Zoology 1B, or Botany 1. Recommended: biochemistry; mammalian physiology; Mathematics 16A–16B.

The physical and chemical processes of cells and tissues.

- 100L. General Physiology Laboratory.** (1) I. Mr. Smith
 Laboratory—3 hours.
 Prerequisite: course 100 (may be taken concurrently).
 Laboratory in the physical and chemical processes of cells and tissues.
 Offered in odd-numbered years.
- 102. Physiology of Growth.** (2) II. Mr. Smith
 Lecture—2 hours.
 Prerequisite: Animal Husbandry 110. Recommended: course 100; Biochemistry 101; Mathematics 13.
 Biological, physical, and chemical aspects of the growth of organisms.
 Offered in even-numbered years.
- 120A. Comparative Physiology.** (3) I. The Staff (Mr. Clegg in charge)
 Lecture—3 hours.
 Prerequisite: systemic physiology (Animal Husbandry 110 or Physiological Sciences 140) which may be taken concurrently. Recommended: Zoology 106.
 A description and comparison of the diverse ways in which a wide variety of animals perform physiological functions with special reference to integrative mechanisms and reproduction.
 Offered in odd-numbered years.
- 120B. Comparative Physiology.** (3) II. The Staff (Mr. Boda in charge)
 Lecture—3 hours.
 Prerequisite: systemic physiology (Animal Husbandry 110 or Physiological Sciences 140) which may be taken concurrently. Recommended: Zoology 106.
 Course 120A is not prerequisite to 120B.
 A description and comparison of the diverse ways in which a wide variety of animals perform physiological functions with special reference to respiration, circulation, digestion, and excretion.
 Offered in even-numbered years.
- 198. Directed Group Study.** (1-3) I and II. The Staff
 Prerequisite: Consent of the instructor.
 Lectures and group discussions of special topics in physiology.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II.
 Mr. Lorenz

GRADUATE COURSES

- 243. Use of Isotopes as Tracers in Biological Research.** (2) I.
 Lecture—2 hours. Mr. Black, Mr. Epstein, Mr. Foy, Mr. Kleiber
 Discussion of the use of isotopes as tracers in biological systems.
- 243L. Laboratory in Use of Isotopes as Tracers in Biological Research.**
 (2) I. Mr. Black, Mr. Vohra, Mr. Foy
 Laboratory—6 hours.
 Laboratory practice in handling radioisotopes and their application in biological research.
- 290. Seminar.** (1) I and II. The Staff (Mr. Lorenz in charge)
 Seminar—1 hour.
 Discussion and critical evaluation of advanced topics and current trends in research.
- 291. Seminar in General Physiology.** (1) II.
 Seminar—1 hour. Mr. Clegg, Mr. Epstein, Mr. Maxie, Mr. Smith
 Discussion of selected topics concerning the physical and chemical processes of cells and tissues.

298. **Group Study** (1-3) I and II.

The Staff

Lectures and group discussions of advanced physiological subjects.

RELATED COURSES

Mammalian Physiology (Animal Husbandry 110, Physiological Sciences 140, 140L)

Metabolism and Food Utilization (Animal Husbandry 120, Nutrition 250)

Physiology of Reproduction (Animal Husbandry 121)

Physiology of the Endocrine Glands (Animal Husbandry 130)

Biochemical Aspects of Endocrinology (Animal Husbandry 230)

Kinesiology (Physical Education 103A-103B)

Physiological Chemistry (Physiological Sciences 101, 101L)

Intermediary Metabolism of Animals (Physiological Sciences 205, Biochemistry 150A, 150B, Clinical Pathology 203)

Experimental Physiology (Physiological Sciences 265)

Introductory Physiology (Physiology 1, 1L, see Zoology)

Avian Physiology (Poultry Husbandry 107, 108)

Environmental Physiology of Domestic Animals (Poultry Husbandry 149)

Invertebrate Physiology (Zoology 142 and 142L)

ANTHROPOLOGY AND GEOGRAPHY

David L. Olmsted, Ph.D., *Chairman of the Department.*
Department Office, 324 Academic Office Building

David L. Olmsted, Ph.D., *Professor of Anthropology.*
Martin A. Baumhoff, Ph.D., *Associate Professor of Anthropology.*
Daniel J. Crowley, Ph.D., *Associate Professor of Anthropology and Associate Professor of Art.*
Kenneth Thompson, Ph.D., *Associate Professor of Geography.*
Philip L. Wagner, Ph.D., *Associate Professor of Geography.*
Alan D. Coult, Ph.D., *Assistant Professor of Anthropology.*
Howard F. Gregor, Ph.D., *Assistant Professor of Geography.*
Warren G. Kinzey, Ph.D., *Assistant Professor of Anthropology and Assistant Professor of Zoology.*

Thomas S. Chambers, A.B., *Lecturer in Anthropology.*
Thomas H. Pagenhart, A.B., *Acting Assistant Professor of Geography.*
Herbert B. Schultz, Ph.D., *Lecturer in Geography and Lecturer in Agricultural Engineering.*
William C. Smith, A.B., *Acting Assistant Professor of Anthropology.*
Jack Whitehead, M.A., *Lecturer in Anthropology.*

ANTHROPOLOGY

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Departmental Major Advisers.—Mr. Crowley, Mr. Olmsted.

The Major Program

(A) Lower Division Courses.—Required: Anthropology 1, 2, Geography 1, Psychology 1, and either Mathematics 13 or Sociology 18. Recommended: Geology 1A, 1B, Zoology 1A.

(B) Upper Division Courses.—Required: courses 102, 103A–103B, 110A–110B, 128, 195 and 7 units drawn from other upper division courses in anthropology or from Art 150, 154A, 154B; Sociology 126; Genetics 100; Geology 111.

Graduate Study.—The department offers a program of study and research leading to the M.A. degree in anthropology. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser for Anthropology, Department of Anthropology and Geography.

LOWER DIVISION COURSES

1. **Physical Anthropology.** (3) I and II. Mr. Kinzey, Mr. Whitehead
Lecture—2 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.

2. **Cultural Anthropology.** (3) I and II. Mr. Smith
Lecture—3 hours.

Prehistory and growth of culture; diversity of cultures considered from the aspects of language, economics, kinship, art, magic, and religion.

UPPER DIVISION COURSES

- 102. Ethnology. (3) I.** Mr. Coult
Lecture—3 hours.
Prerequisite: course 2 or consent of the instructor.
Major theories of culture; survey of principal culture types and their distribution; discussion of ethnological problems.
- 103A. Culture Growth. (3) I.** Mr. Baumhoff
Lecture—3 hours.
Prerequisite: consent of the instructor.
Comparative prehistory and archaeology. Old World.
- 103B. Culture Growth. (3) II.** Mr. Baumhoff
Lecture—3 hours.
Prerequisite: consent of the instructor.
Comparative prehistory and archaeology. New World.
- 105. The American Indian. (3) II.** Mr. Coult
Lecture—3 hours.
Prerequisite: course 2 or consent of the instructor.
An introductory survey of the Indians of North and South America; origins, languages, civilizations, and history.
- 110A. Elementary Linguistic Analysis. (3) I.** Mr. Olmsted
Lecture—3 hours.
Phonetics, phonemics, morphophonemics, morphemics, tactics.
- 110B. Language and Culture. (3) II.** Mr. Olmsted
Lecture—3 hours.
Prerequisite: course 110A.
Linguistic prehistory, historical linguistics and reconstruction. Dialect geography. The relations of language and other cultural systems.
- 119. Culture and Personality. (3) I.** Mr. Coult
Lecture—3 hours.
Prerequisite: course 2 or consent of the instructor.
Interrelationships of culture, society, and personality; personality in various societies; techniques of culture and personality studies.
- 121. Folklore. (3) II.** Mr. Crowley
Lecture—3 hours.
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.
- 124. Comparative Religion. (3) II.** Mr. Chambers
Lecture—3 hours.
Prerequisite: course 2 or consent of the instructor.
An anthropological analysis of the origins, elements, forms, and symbolism of religion; functional interpretation with stress on ethnographic materials.
- 128. Kinship and Social Organization. (3) II.** Mr. Coult
Lecture—3 hours.
Prerequisite: course 2.
Kinship systems and their significance in the organization of social life. Theories of kinship, marriage regulations, and kinship role patterns.
- 139. Peoples of Africa. (3) I.** Mr. Crowley
Lecture—3 hours.
Prerequisite: course 2 or consent of the instructor.
Peoples and cultures of Africa: survey and comparative analysis of representative societies and cultures in the area.

- *140. Peoples of Afroamerica.** (3) II. Mr. Crowley
Lecture—3 hours.
A study of the cultural implications of slavery and the contribution of Africans to the national cultures of the Americas.
- *147. Peoples of the Pacific.** (3) I. Mr. Coult
Lecture—3 hours.
The aboriginal civilizations of Australia, Malaysia, Melanesia, Micronesia, and Polynesia in prehistoric and modern times; changes arising from European contact and colonization.
- 152. Human Evolution and Fossil Man.** (3) II. Mr. Whitehead
Lecture—3 hours.
Prerequisite: course 1 or equivalent.
Nature and results of the evolutionary processes involved in the formation and differentiation of mankind.
Offered in odd-numbered years.
- *153. Living Races of Man.** (3) I. Mr. Kinzey
Lecture—3 hours.
Prerequisite: course 1 or equivalent.
Physical characters, distribution, and relationships.
Offered in even-numbered years.
- 195. Field Course in Archaeological Method.** (2) I and II. Mr. Chambers
Laboratory—8 hours.
Prerequisite: consent of the instructor.
Lectures, museum preparation, and week-end excavations. Enrollment limited to twenty students. With consent of the instructor, may be repeated without duplication of credit.
- 196. Archaeological Method.** (2) II. Mr. Baumhoff
Laboratory—4 hours.
Prerequisite: course 195 and consent of the instructor.
Museum preparation, advanced field investigation, and guidance in preparation of museum material for publication. Enrollment limited to eighteen students. With consent of the instructor, may be repeated without duplication of credit.
- 199. Special Study for Advanced Undergraduates.** (1-3) I and II.
Investigation of special problems. The Staff (Mr. Olmsted in charge)

GRADUATE COURSES

- 210. Aspects of Culture Structure.** (2) I. Mr. Coult
Lecture—2 hours.
Prerequisite: consent of the instructor.
Analysis of various phases of culture, such as religion, economics, law, and folklore.
- 216. Problems in Archaeological Method.** (2) II. Mr. Baumhoff
Lecture—2 hours.
Prerequisite: consent of the instructor.
Techniques for analyzing archaeological data; application to various prehistoric cultures.
- *239. Problems in African Society and Culture.** (2) I. Mr. Crowley
Lecture—2 hours.
Prerequisite: consent of the instructor.
Diachronic analyses of traditional institutions in sub-Saharan Africa.

* Not to be given, 1963-1964.

250. **Theory and Method of Anthropology.** (2) I. Mr. Baumhoff
Seminar—2 hours.
253. **Concepts and Problems in Physical Anthropology.** (2) I. Mr. Kinzey
Lecture—2 hours.
Prerequisite: consent of the instructor.
Concepts in historical perspective; continuing and new problems in human biology as it concerns physical anthropology.
292. **Seminar in Anthropological Linguistics.** (2) I. Mr. Olmsted
Seminar—2 hours.
299. **Research.** (2-6) I and II. Mr. Olmsted

GEOGRAPHY

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Departmental Major Adviser.—Mr. Thompson.

The Major Program

(A) Lower Division Courses.—Required: Geography 1, 2, 3; Anthropology 2; Economics 1A; Geology 1A.

(B) Upper Division Courses.—Required: 24 upper division units in Geography. Each program should normally include Geography 101 (Methods of Geographic Research), 105 (Cartography), and 151 (History of Geographic Thought).

It is recommended that selected courses be taken in agricultural economics, anthropology, botany, economics, geology, history, political science, sociology, statistics, and other fields. Course selection, as appropriate to the individual student's program, should be made in consultation with the adviser.

LOWER DIVISION COURSES

1. **Introduction to Physical Geography.** (3) I and II.
Lecture—3 hours. Mr. Pagenhart, Mr. Thompson
A study of the basic physical elements of geography (especially climate, landforms, soils, and natural vegetation) and their integrated patterns of world distribution.
2. **Introduction to Cultural Geography.** (3) I. Mr. Wagner
Lecture—3 hours.
A study of the basic cultural elements of geography (especially population distribution, general settlement and land-use patterns, and economics) and their correlation with the physical elements. Delimitation of the major geographic regions of the world.
3. **Introduction to Climate and Weather.** (2) I. Mr. Schultz
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.

UPPER DIVISION COURSES

101. **Methods of Geographic Research.** (3) II. Mr. Pagenhart
Lecture—1 hour; laboratory—4 hours.
Prerequisite: courses 1 and 2 and consent of the instructor.

Research methodology; field study of a unit area, with systematic mapping of the elements that constitute the natural region and of the forms of its utilization; field trips.

Offered in even-numbered years.

- 105. Cartography. (3) I.** Mr. Gregor
Lecture—1 hour; laboratory—4 hours.
Prerequisite: consent of the 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.
- *119. Geography of the Arid Lands. (3) I.** Mr. Gregor
Lecture—3 hours.
A study of the physical and cultural characteristics of the arid and semi-arid regions of the world.
- 121. The Geography of Anglo-America. (3) II.** Mr. Gregor
Lecture—3 hours.
Prerequisite: courses 1 and 2 or consent of the instructor.
A geographical survey of the major natural and economic regions of the United States, Canada, and Alaska.
- 122. The Geography of Latin America. (3) II.** Mr. Wagner
Lecture—3 hours.
Prerequisite: courses 1 and 2 or consent of the instructor.
A study of the physical and cultural characteristics of Latin America's geographical regions.
- 123. The Geography of Europe. (3) I.** Mr. Thompson
Lecture—3 hours.
Prerequisite: courses 1 and 2 or consent of the instructor.
A study of the geographic conditions and their relation to the economic, social, and political problems of Europe, excluding the USSR.
- *124. The Geography of the Soviet Union. (3) II.** Mr. Wagner
Lecture—3 hours.
Prerequisite: courses 1 and 2 or consent of the instructor.
A study of the geographic conditions and their relation to the economic, social, and political problems of the USSR.
- 131. Geography of California. (3) I.** Mr. Gregor
Lecture—3 hours.
A study of the geographical regions of California: landforms, climate, and other physical characteristics; agricultural, mineral, and other resources; and patterns of settlement, population, transportation, and economy.
- 141. Economic Geography. (3) II.** Mr. Gregor
Lecture—3 hours.
A geographical analysis of the distribution and production of the world's major agricultural and mineral raw materials.
- 143. Political Geography. (3) II.** Mr. Thompson
Lecture—3 hours.
Areal differentiation of the natural and cultural phenomena that affect the world's political organization.

- 151. History of Geographic Thought. (3) II.** Mr. Wagner
 Lecture—3 hours.
 Prerequisite: three upper division courses in geography.
 Objectives, subdivisions, and development of geography.
 Offered in even-numbered years.
- 155. Urban Geography. (3) I.** Mr. Wagner
 Lecture—3 hours.
 The origin, development, distribution, and regional variation of the world's cities, with emphasis on an analysis of the functions and patterns of American cities.
- 161. The Conservation of Natural Resources. (3) II.** Mr. Pagenhart
 Lecture—3 hours.
 The general principles of conservation and their application, especially in the United States.
- 162. Geography of Water Resources. (3) I.** Mr. Pagenhart
 Lecture—3 hours.
 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.
- 199. Special Study for Advanced Undergraduates. (1-3) I and II.**
 Investigation of special problems. The Staff (Mr. Thompson in charge)

PROFESSIONAL COURSE

- 300. Problems in Teaching Geography. (1) I.** Mr. Thompson
 Lecture—1 hour.
 Prerequisite: course 1 or 2.
 Problems in establishing, organizing, and conducting courses in geography and regional study. Designed primarily for prospective elementary and secondary school teachers of the social sciences.

ART

Richard L. Nelson, M.A., *Chairman of the Department.*

Department Office, 103 East Hall

Richard L. Nelson, M.A., *Professor of Art.*

Daniel J. Crowley, Ph.D., *Associate Professor of Art and Associate Professor of Anthropology.*

†Roland C. Petersen, M.A., *Associate Professor of Art.*

Daniel Shapiro, *Associate Professor of Art and Associate Professor of Design.*

Wayne Thiebaud, M.A., *Associate Professor of Art.*

Robert C. Arneson, M.F.A., *Assistant Professor of Art and Assistant Professor of Design.*

Tio L. Giambruni, M.A., *Assistant Professor of Art.*

Ruth J. Horsting, M.A., *Assistant Professor of Art and Assistant Professor of Design.*

Seymour Howard, Ph.D., *Assistant Professor of Art.*

†Ralph M. Johnson, M.A., *Assistant Professor of Art.*



Joseph A. Baird, Jr., Ph.D., *Lecturer in Art.*

Richard D. Cramer, M.F.A. (Architecture), *Associate Professor of Design.*

Charles M. Muskavitch, H.D., F.I.I.C., *Lecturer in Art.*

William T. Wiley, M.F.A., *Acting Assistant Professor of Art.*

———, *Lecturer in Art.*

———, *Lecturer in Art.*

Letters and Science List.—All undergraduate courses except 16 and 17 are included in the Letters and Science List of Courses (see page 93).

Departmental Major Advisers.—Mr. Giambruni, Mr. Howard, Mr. Nelson, Mr. Thiebaud, Mr. Wiley.

Preparation for the Art Major.—Courses 2A–2B, 3A–3B, and 6 units chosen from courses 1A, 1B, 1C, and 1D.

The Major.—A student may elect a major emphasizing Appreciation and Practice of Art or History of Art.

I. Appreciation and Practice of Art. Twelve units of Group A courses under two different artists, 2 units of Group B, 4 units of Group C, and 6 units chosen from Group A, B, or C.

II. History of Art. Required: 12 units of Group C of which 6 units must be in an historical sequence such as 154A–154B; Art 189; and 9 additional units of any courses in Group A, B, or C. Students planning to do advanced work in History of Art are urged to develop their knowledge of foreign languages (especially French and German) as early as possible.

Transfer Students.—Transfer students who have fulfilled unit requirements elsewhere are: (a) required to take an examination in order to qualify for Group A courses, and (b) are requested to present examples of their work done in other institutions before being admitted to classes and before credit can be given toward the major for work done elsewhere.

Students who qualify will be advised to take course 195 in order to acquaint themselves with the methods expected for this department's advanced courses. The department will recommend for graduation only students with at least a grade C average in the major.

† Absent on leave, 1963–1964.

Graduate Study.—The Department of Art offers a program of study and research leading to the M.A. degree in art practice. Detailed information regarding graduate study may be obtained from the bulletin of the Graduate Division, or write to the Graduate Adviser, Department of Art.

LOWER DIVISION COURSES

- 1A. History of Ancient Mediterranean Art. (3) I.** Mr. Howard
Lecture—3 hours.
From the Stone Age to the end of the Roman Empire.
Field trips are included.
- 1B. History of Medieval, Renaissance, and Modern Art. (3) II.** Mr. Nelson
Lecture—3 hours.
Emphasis on Painting.
Field trips are included.
- 1C. History of Medieval, Renaissance, and Modern Art. (3) II.** Mr. Howard
Lecture—3 hours.
Emphasis on Architecture and Sculpture.
Field trips are included.
- 1D. History of Oriental Art. (3) I.** Mr. Crowley
Lecture—3 hours.
The art of India, China, and Japan.
Field trips are included.
- 2A. Elementary Form and Color. (2) I and II.**
Laboratory—6 hours. Mr. Thiebaud, Mr. Wiley, Mr. Giambruni
Form in composition using black and white media.
Field trips are included.
- 2B. Elementary Form and Color. (2) I and II.** Mr. Wiley, Mr. Thiebaud
Laboratory—6 hours.
Introduction to color in composition.
Field trips are included.
- 3A. Intermediate Form and Color. (2) I and II.** Mr. Wiley, Mr. Thiebaud
Laboratory—6 hours.
Prerequisite: course 2A-2B.
Color and form in composition.
Field trips are included.
- 3B. Intermediate Form and Color. (2) I and II.** _____
Laboratory—6 hours.
Prerequisite: course 2A-2B.
Form in composition using the human figure as subject.
Field trips are included.
- 10. Introduction to Art. (2) I and II.** Mr. Nelson
Lecture—2 hours.
Open to nonmajors.
The understanding and appreciation of painting, sculpture, architecture, and industrial art. Consists of illustrated lectures.
- 12. Ceramics. (2) I and II.** Mr. Arneson
Laboratory—6 hours.
An introduction to ceramic forms and ceramic sculpture.

- 14A. Sculpture. (2) I.** Mr. Giambruni, Mrs. Horsting
 Laboratory—6 hours.
 Introduction to basic elements of three-dimensional construction and relief in clay and plaster.
- 14B. Sculpture. (2) II.** Mr. Giambruni
 Laboratory—6 hours.
 Prerequisite: course 14A.
 Introduction to space design, using the human figure as a motif, with construction in clay, plaster, wood and stone.
- 16. Descriptive Drawing and Rendering. (2) I.** Mr. Nelson
 Lecture—1 hour; laboratory—3 hours.
 Methods of objective drawing and of space description; rendering in various media.
 Field trips are included.

UPPER DIVISION COURSES

Group A: Appreciation and Practice

Prerequisite: courses 2A-2B, 3A-3B.

The various courses in Group A differ in content, use of materials, type of subject matter, etc., depending upon the individual aims of the artists in charge. All courses in this group may be repeated indefinitely without duplication of credit, and part A is not prerequisite to part B.

The subject matter will range from still-life and landscape to life classes, figure and mural compositions.

The materials used will range from charcoal and *sumi* to water color, gouache, egg tempera, oil, mixed technique, and fresco painting.

- 101A. Advanced Drawing and Painting. (2) I.** Mr. Thiebaud, Mr. Wiley
 Laboratory—6 hours.
 Prerequisite: courses 2A-2B, 3A-3B.
 Representational composition based upon out-of-door subjects in any medium. Composition with the human figure as a basic motif. Painting in various media including oil, tempera, gouache, and wax. May be repeated for credit.
 Field trips are included.
- 101B. Advanced Drawing and Painting. (2) II.** Mr. Thiebaud, Mr. Wiley
 Laboratory—6 hours.
 Prerequisite: courses 2A-2B, 3A-3B.
 Representational composition based upon out-of-door subjects in any medium. Composition with the human figure as a basic motif. Painting in various media including oil, tempera, gouache, and wax. May be repeated for credit.
 Field trips are included.
- 121. Architectural Design. (2) II.** Mr. Cramer
 Laboratory—6 hours.
 Prerequisite: 2 semesters in art practice or design.
 Studio projects in architectural design.
- 128A-128B. Graphic Arts. (2-2) Yr.** Mr. Shapiro
 Laboratory—6 hours.
 Prerequisite: two semesters of art practice or design.
 Experimental methods in relief and intaglio printmaking; etching, engraving, aquatint, woodcut, and related media.

- 141. Sculpture: Methods and Materials. (2) I.** Mr. Giambruni
 Laboratory—6 hours.
 Prerequisite: course 14B or consent of the instructor.
 Advanced three-dimensional design featuring the use of stone, wood, metal, and plaster.
- 142. The Human Figure in Sculpture. (2) II.** Mrs. Horsting
 Laboratory—6 hours.
 Prerequisite: courses 3B, 14B; or consent of the instructor. Recommended: course 141.
 Design exercises in three dimensions and relief, featuring the human figure as subject matter.
- 143. Casting Techniques and Theory of Cast Sculpture. (2) II.**
 Laboratory—6 hours. Mr. Giambruni
 Prerequisite: course 14B or consent of the instructor. Recommended: courses 141, 142.
 Advanced sculpture projects in varied casting techniques and media. Emphasis on bronze and "lost wax" technique.

Group B: Theory and Criticism

- 148. Art Theory and Criticism. (2) II.** Mr. Nelson
 Lecture—2 hours.
 Prerequisite: course 2A or 14A and one art lecture course.
 Study of forms and symbols in historic and contemporary works of art.

Group C: History of Art

Open to nonmajors. General prerequisite: upper division standing and consent of the instructor.

- 150. The Art of Primitive Peoples. (3) II.** Mr. Crowley
 Lecture—3 hours.
 The arts of prehistoric peoples, and of the peoples of Africa, Oceania, Australia, and the Indians of the Americas.
- 154A. History of Greek Art. (3) I.** Mr. Howard
 Lecture—3 hours.
 Prerequisite: course 1A or consent of the instructor.
 From the Archaic period to the late Hellenistic period.
 Offered in odd-numbered years.
- 154B. History of Roman Art. (3) II.** Mr. Howard
 Lecture—3 hours.
 Prerequisite: course 1A or consent of the instructor.
 Course 154A is not prerequisite to 154B.
 From the Republic through the beginning of the Christian Era.
 Offered in even-numbered years.
- 168. Golden Ages of Great Cities. (3) II.** Mr. Baird
 Lecture—3 hours.
 An historical investigation of town planning as a guide to modern urban development. Analysis of key cities, from ancient Rome to New York City, and the creative personalities which shaped them.
- 177. Medieval Art. (3) I.** Mr. Baird
 Lecture—3 hours.
 The visual arts in European civilization circa 300 to 1400. The classical heritages, Christianity, and the contribution of the Northern peoples.

- 178A. **Renaissance Art.** (3) I. Mr. Baird
Lecture—3 hours.
European art of the fourteenth and fifteenth centuries.
Field trips are included.
- 178B. **Renaissance Art.** (3) II. Mr. Baird
Lecture—3 hours.
European art of the sixteenth century.
Field trips are included.
179. **Baroque Art.** (3) I. _____
Lecture—3 hours.
Painting, sculpture, architecture, and the art of the garden from the formative stages of the Baroque style to the Rococo.
Field trips are included.
- 183A. **European Painting in the Nineteenth Century.** (3) I. Mr. Howard
Lecture—3 hours.
Field trips are included.
- 183B. **European Painting in the Twentieth Century.** (3) II. Mr. Howard
Lecture—3 hours.
Field trips are included.
- *188A. **The Art of Latin America.** (3) I. _____
Lecture—3 hours.
Emphasis on the architecture, sculpture, and painting of Mexico from pre-conquest to contemporary times. The arts of the American southwest, Inca and colonial architecture of Peru, and the modern architecture of Brazil.
- 188B. **The Art of the United States.** (3) I. _____
Lecture—3 hours.
A survey of three centuries of American art, with emphasis on colonial, nineteenth-century, and modern architecture, and on painting and sculpture from 1850 to the present in the United States.
Field trips are included.
189. **Museum Methods and Connoisseurship.** (3) II.
Lecture—2 hours; laboratory—3 hours. Mr. Baird, Mr. Muskavitch
Prerequisite: one semester art history or consent of the instructor.
An introduction to problems of media and connoisseurship; methods of preservation and authentication in the graphic arts (drawing, etching, engraving and lithography); museum trips; visiting lecturers.

Special Study Courses

195. **Special Study in Appreciation and Practice of Art.** (2) I and II.
Laboratory—6 hours. The Staff
Prerequisite: 8 units of appreciation and practice work, or the equivalent; consent of the instructor. May not be repeated for credit.
198. **Directed Group Study.** (1-5) I and II.
Mr. Thiebaud, Mr. Wiley, Mr. Nelson
199. **Special Study for Advanced Undergraduates.** (1-5) I and II.
The Staff, Mr. Nelson in charge

* Not to be given, 1963-1964.

GRADUATE COURSES

- 201. Advanced Practice in Selected Painting and Drawing Techniques.**
(3) I and II. The Staff
Lecture—3 hours.
Original works produced for group discussion and criticism. May be repeated for credit.
- 290. Seminar.** (3) I and II. The Staff
Seminar—3 hours.
The practice of painting and drawing; original works produced for group discussion and criticism; topics of a contemporary and historical nature. May be repeated for credit.
- 299. Individual Study.** (1-6) I and II. The Staff

PROFESSIONAL COURSE

- 300. Practice and Principles of Art Education.** (2) I. Mr. Giambruni
Lecture—2 hours.
Prerequisite: senior or graduate standing, or consent of the instructor.
Art education and practice of techniques used in elementary and secondary schools.

AVIAN MEDICINE

Livio G. Raggi, D.V.M., Ph.D., *Chairman of the Department.*
Department Office, 2080 Haring Hall

Henry E. Adler, D.V.M., Ph.D., *Professor of Veterinary Medicine.*
Raymond A. Bankowski, D.V.M., Ph.D., *Professor of Veterinary Medicine.*
Livio G. Raggi, D.V.M., Ph.D., *Associate Professor of Veterinary Medicine.*

◇
Moshe Shifrine, Ph.D., *Lecturer in Avian Medicine.*

UPPER DIVISION COURSES

112. **Principles of Poultry Diseases.** (3) II. Mr. Adler
Lecture—3 hours.
Prerequisite: Zoology 1A; Bacteriology 1; junior standing or consent of the instructor.
Principles in the control of poultry diseases.
199. **Special Study for Advanced Undergraduates.** (1-5) I and II.
The Staff (Mr. Raggi in charge)

GRADUATE COURSES

208. **Poultry Diseases.** (3) I. Mr. Adler, Mr. Bankowski, Mr. Raggi
Lecture—3 hours.
Prerequisite: third-year standing in the School of Veterinary Medicine.
Other qualified students admitted with consent of the instructor.
The etiology, diagnosis, and control of the diseases of poultry.
- 251A. **Avian Medicine Laboratory.** (½) I. The Staff
Lecture—5 hours; laboratory—15 hours. (Hours per semester)
Prerequisite: fourth-year standing in the School of Veterinary Medicine.
Application of avian medicine knowledge to diagnosis of poultry diseases.
- 251B. **Avian Medicine Laboratory.** (½) II. The Staff
Lecture—5 hours; laboratory—15 hours. (Hours per semester)
Prerequisite: fourth-year standing in the School of Veterinary Medicine.
Application of avian medicine knowledge to diagnosis of poultry diseases.
290. **Seminar in Avian Medicine.** (1) I and II. Mr. Raggi
Seminar—1 hour.
299. **Research in Avian Medicine.** (1-6) I and II. The Staff

BACTERIOLOGY

John L. Ingraham, Ph.D., *Chairman of the Department.*
Department Office, 156 Biological Sciences Building

Robert E. Hungate, Ph.D., *Professor of Bacteriology.*
Allen G. Marr, Ph.D., *Professor of Bacteriology.*
Mortimer P. Starr, Ph.D., *Professor of Bacteriology.*
Courtland S. Mudge, Ph.D., *Professor of Bacteriology, Emeritus.*
John L. Ingraham, Ph.D., *Associate Professor of Bacteriology.*
Donald M. Reynolds, Ph.D., *Associate Professor of Bacteriology.*
Monica Riley, Ph.D., *Assistant Professor of Bacteriology.*



Ralph Kunkee, Ph.D., *Assistant Professor of Viticulture and Enology.*
Herman J. Phaff, Ph.D., *Professor of Food Science and Technology.*

Letters and Science List.—All undergraduate courses in bacteriology except course 106 are included in the Letters and Science List of Courses (see page 93).

The Major in Microbiology.—The undergraduate major program is designed to provide a proper balance of studies in microbiology and the auxiliary chemical and biological sciences, with considerable latitude in the selection of individual courses.

A major in microbiology is appropriate for students contemplating a career in medical technology.

Major Advisers.—Mr. Reynolds, Mr. Starr.

The Major Program

(A) Lower Division Courses.—Required: Bacteriology 1; Botany 1; Chemistry 1A–1B, and 8; Physics 2A–2B; Zoology 1A. Chemistry 112A–112B may be substituted for Chemistry 8. Recommended: Chemistry 9; Mathematics 16A–16B; elementary courses in German and French.

(B) Upper Division Courses.—Required: Bacteriology 100, 104; Chemistry 5, Biochemistry 101, 101L; Genetics 100. In addition, at least 5 units from the following list with the approval of the major adviser (in special cases, substitutions may be permitted): Bacteriology 103, 106, 199; Botany 114, 119; Chemistry 109; Veterinary Microbiology 127, Veterinary Parasitology 124; Zoology 110.

All units in chemistry in excess of 13 are counted as upper division units.

All students majoring in microbiology are required to take a comprehensive final examination during the final semester of the senior year. The examination carries no credit value.

All courses required for the major must be completed with at least a grade of C.

Honors and Honors Program (see page 94).—The honors program comprises course 194H, an acceptable thesis, and superior performance on the regular departmental comprehensive examination.

Graduate Study.—The 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 personnel of the departments of Biochemistry, Botany, Food Science and Technology, and Chemistry, the Enology Laboratory, and the School of Veterinary Medicine. For detailed information regarding graduate study in microbiology, address the Graduate Adviser in Microbiology, Department of Bacteriology.

LOWER DIVISION COURSE

- 1. Introduction to Microbiology.** (4) I and II. Mr. Ingraham, Mr. Reynolds
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Chemistry 1A; one course in botany, zoology, or physiology
(Botany 1, Zoology 1A or 10, Physiology 1, or equivalent).
A general introduction to microbiology.

UPPER DIVISION COURSES

A grade of C or higher in introductory bacteriology is required for admission to upper division courses.

- 100. The Physiology of Bacteria.** (5) I. Mr. Marr
Lecture—3 hours; laboratory—6 hours.
Prerequisite: course 1; Chemistry 8; Physics 2B.
Microscopy, cytology, and growth of microorganisms; effects of the physico-chemical environment; microbial genetics.
- 103. Microbial Metabolism.** (2) II. Mr. Hungate
Lecture—2 hours.
Prerequisite: course 1; Biochemistry 101.
A survey of the metabolic activities of microbes.
- 103L. Microbial Metabolism Laboratory.** (2) II. Mr. Hungate
Laboratory—6 hours.
Prerequisite: course 103 (may be taken concurrently); a course in quantitative chemical analysis.
Quantitative experiments in microbial metabolism, using selected methods of microchemical analysis, manometry, liquid and gas phase chromatography, spectrophotometry, and isotopic tracers.
- 104. Bacterial Ecology and Diversity.** (4) II. Mr. Starr
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1; Chemistry 8.
Principles of bacterial ecology and bacterial diversity. Survey of the major systematic groups of bacteria, with intensive study of selected microorganisms and habitats.
- 106. Industrial Fermentations.** (2) II. Mr. Kunkee, Mr. Phaff, Mr. Reynolds
Lecture—2 hours.
Prerequisite: course 1, Chemistry 1A-1B, 8.
Microorganisms and their activity in relation to industrial processes such as baking, brewing, and the production of industrial solvents, vitamins, enzymes, and drugs. For laboratory experience in this field, students may register in Food Science and Technology 106.
- 194H. Special Study for Honors Students.** (1-3) I and II. The Staff
Laboratory.
Prerequisite: course 100 and at least one additional upper division course in microbiology; consent of instructor.
Open to honors students. Designed to provide experience in preparation of an honors thesis.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff
Prerequisite: consent of the instructor based on adequate preparation of the student in allied fields.
Investigation of special problems.

GRADUATE COURSES

- 203. Microbial Biochemistry.** (3) II. Mr. Ingraham, Mr. Marr, Mrs. Riley
Lecture—3 hours.
Prerequisite: Biochemistry 150A and 150B, Chemistry 110B or 109.
Protein synthesis; control mechanisms; biochemical genetics; metabolic pathways.
- 205. Bacterial Taxonomy.** (2) II. Mr. Starr
Lecture—2 hours.
Principles of classification; nomenclatural systems and codes; evolution and phylogeny of bacteria and other microorganisms; determinative and taxonomic methods, manuals and schemes.
- 207. Bacterial Genetics.** (3) II. Mrs. Riley
Lecture—3 hours.
Prerequisite: course 1; Biochemistry 101. Recommended: Genetics 100.
The mechanisms for transmission of hereditary traits, with emphasis on bacteria and bacteriophage.
- *207L. Laboratory in Bacterial Genetics.** (2) II. Mrs. Riley
Laboratory—6 hours.
Prerequisite: course 207 (may be taken concurrently).
Genetic analyses of bacteria and bacteriophage.
- 290. Seminar.** (1) I and II. The Staff
Seminar—1 hour.
- 299. Research.** (1-6) I and II. The Staff

RELATED COURSES

- Intermediary Metabolism** (Biochemistry 150A-150B)
Enzymology (Biochemistry 210)
Biochemical Mechanisms (Biochemistry 205)
Comparative Morphology of Nonvascular Plants (Botany 114)
Mycology (Botany 119)
Food and Industrial Microbiology Laboratory (Food Science and Technology 106)
Microbiology of Milk and Dairy Products (Food Science and Technology 132)
Yeasts and Related Organisms (Food Science and Technology 216)
Medical Microbiology (Veterinary Microbiology 127)
Advanced Immunology (Veterinary Microbiology 270)
Soil Microbiology and Soil Biochemistry (Soils and Plant Nutrition 111)
Protozoology (Zoology 110)

* Not to be given, 1963-1964.

BIOCHEMISTRY AND BIOPHYSICS

Eric E. Conn, Ph.D., *Chairman of the Department*
Department Office, 554 Biological Sciences Building

Eric E. Conn, Ph.D., *Professor of Biochemistry.*
Paul K. Stumpf, Ph.D., *Professor of Biochemistry.*
Lloyd L. Ingraham, Ph.D., *Associate Professor of Biophysics.*
Sterling Chaykin, Ph.D., *Assistant Professor of Biochemistry.*
Richard S. Criddle, Ph.D., *Assistant Professor of Biophysics.*
Jack Preiss, Ph.D., *Assistant Professor of Biochemistry.*

Departmental Major Adviser.—Mr. Conn.

The department does not offer an undergraduate major in these subjects. For graduate study the Department of Biochemistry and Biophysics cooperates with the Group in Comparative Biochemistry for work leading to the M.S. degree and Ph.D. degree in comparative biochemistry. The department cooperates with the Group in Biophysics for work leading to the Ph.D. degree in biophysics.

UPPER DIVISION COURSES

- 101. General Biochemistry. (3) I.** Mr. Conn
Lecture—3 hours.
Prerequisite: Chemistry 1B; 8 or 112A. Recommended: an 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.
- 101L. General Biochemistry Laboratory. (3) I and II.**
Lecture—1 hour; laboratory—6 hours. Mr. Criddle, Mr. Preiss
Prerequisite: course 101 (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.
- 150A. Intermediary Metabolism. (3) I.** Mr. Chaykin, Mr. Conn, Mr. Stumpf
Lecture—3 hours.
Prerequisite: course 101 or equivalent. Recommended: Chemistry 150A.
Comparative biochemistry of respiration, oxidative phosphorylation and metabolism of carbohydrates and lipids.
- 150B. Intermediary Metabolism. (3) II.** Mr. Conn, Mr. Preiss
Lecture—3 hours.
Prerequisite: course 101 or equivalent. Recommended: Chemistry 150B.
Comparative metabolism of amino acids, proteins, porphyrins, and nucleic acids.

GRADUATE COURSES

- 201L. General Biochemistry Laboratory. (5) I.** Mr. Chaykin
Lecture—1 hour; laboratory—12 hours.
Prerequisite: course 101 (may be taken concurrently); Chemistry 5.
Laboratory methods and procedures in biochemistry. Designed for graduate students who desire an intensive and comprehensive training in modern biochemical techniques.

- 205. Biochemical Mechanisms.** (2) I. Mr. Ingraham
Lecture—2 hours.
Prerequisite: course 101; Chemistry 109 or 110A–110B or equivalent, 131.
Bond structures of biochemical interests. Application of modern organic and inorganic chemical principles to a study of the mechanisms of biochemical reactions.
- 206. Physical Biochemistry of Macromolecules.** (2) I. Mr. Criddle
Lecture—2 hours.
Prerequisite: course 101; Chemistry 110A–110B.
Application of modern physical concepts and experimental methods to the problems of large molecules of biological interest.
- 210. Enzyme Chemistry.** (3) II. Mr. Ingraham, Mr. Stumpf
Lecture—3 hours.
Prerequisite: course 101 or equivalent; Chemistry 109 or 110A–110B.
Recommended: Chemistry 112A–112B.
Chemical and physical-chemical properties of coenzymes and enzymes; their role in biochemical processes.
- 210L. Enzyme Chemistry Laboratory.** (3) II. Mr. Ingraham
Lecture—1 hour; laboratory—6 hours.
Prerequisite: courses 101L and 210 (210 may be taken concurrently); or consent of instructor.
Experimental methods of enzyme chemistry.
Offered in summer.
- 222. Plant Biochemistry.** (2) II. Mr. Conn, Mr. Stumpf
Lecture—2 hours.
Prerequisite: course 101 or equivalent.
The chemistry of important plant constituents, and processes such as photosynthesis and respiration; carbohydrate, fat, and nitrogen metabolism.
- 290. Seminar.** (1) I and II. The Staff
Seminar—1 hour.
- 299. Research.** (1–6) I and II. The Staff

RELATED COURSES

- Metabolism and Food Utilization** (Animal Husbandry 120)
Protein Biochemistry (Animal Husbandry 201)
Biochemical Aspects of Endocrinology (Animal Husbandry 230)
Use of Isotopes as Tracers in Biological Research (Animal Physiology 243)
Microbial Metabolism (Bacteriology 103)
Selected Topics in Microbial Metabolism (Bacteriology 203)
Bacterial Genetics (Bacteriology 207)
General Cytology (Botany 130)
Plant Cell Metabolism (Botany 211)
Proteins—Their Functional Activities and Interactions (Food Science and Technology 210)
Intermediary Metabolism of Animals (Physiological Sciences 205)

BIOLOGICAL SCIENCES

Robert E. Hungate, Ph.D., *Chairman of the Committee.*

Committee Office, 282 Biological Sciences Building

Committee in Charge:

Herbert B. Currier, Ph.D., *Professor of Botany.*

Charles R. Goldman, Ph.D., *Associate Professor of Zoology.*

Robert E. Hungate, Ph.D., *Professor of Bacteriology.*

Monica Riley, Ph.D., *Assistant Professor of Bacteriology.*

T. Elliot Weier, Ph.D., *Professor of Botany.*

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Major Advisers.—Mr. Hungate, Mr. Goldman, Mrs. Riley, Mr. Pessagno, Mr. Weier.

The Major Program.—See description, page 85.

Honors and Honors Program (see page 94).—The Honors Program comprises courses 194H, 195H. These courses are in addition to the 24-unit requirement in upper division courses.

UPPER DIVISION COURSES

194H. Special Study for Honors Students. (2-4) I and II.

The Staff (Mr. Hungate in charge)

Prerequisite: enrollment limited to honors students.

Independent research and/or reading on selected topics.

195H. Honors Thesis. (1) I and II. The Staff (Mr. Hungate in charge)

Prerequisite: course 194H.

Preparation of comprehensive thesis incorporating studies undertaken in course 194H.

BOTANY

Ernest M. Gifford, Jr., *Chairman of the Department.*
Department Office, 141 Robbins Hall

Alden S. Crafts, Ph.D., *Professor of Botany.*
Herbert B. Currier, Ph.D., *Professor of Botany.*
Ernest M. Gifford, Jr., Ph.D., *Professor of Botany.*
†C. Ralph Stocking, Ph.D., *Professor of Botany.*
†John M. Tucker, Ph.D., *Professor of Botany.*
T. Elliot Weier, Ph.D., *Professor of Botany.*
Rolf Y. Berg, Ph.D., *Assistant Professor of Botany.*
Norma J. Lang, Ph.D., *Assistant Professor of Botany.*
Jack Major, Ph.D., *Assistant Professor of Botany.*
Bruce A. Bonner, Ph.D., *Assistant Professor of Botany.*
†Kenneth Wells, Ph.D., *Assistant Professor of Botany.*



Floyd M. Ashton, Ph.D., *Lecturer in Botany and Assistant Professor of Agricultural Botany.*
Paul A. Castelfranco, Ph.D., *Lecturer in Botany.*
Chester L. Foy, Ph.D., *Assistant Professor of Agricultural Botany.*
Hendrik J. Ketellapper, Ph.D., *Lecturer in Botany.*
Don C. Prusso, M.S., *Lecturer in Botany.*

Letters and Science List.—All undergraduate courses except Botany 8, 107, and 155 are included in the Letters and Science List of Courses (see page 93).

Departmental Major Adviser.—Miss Lang, Mr. Weier.

The Major Program

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, e.g., seed analysts. Students who wish a less intensive program in botany, but one which acquaints the student with plant life and its importance, should elect the Bachelor of Arts major program.

Bachelor of Science Major Program

(A) Lower Division Courses.—Botany 1; Chemistry 1A, 8; Physics 2A-2B; plus 13 units in related natural science subjects; German or French is the required language; Bacteriology 1, Chemistry 1B, Zoology 10 or 1A-1B are recommended.

(B) Upper Division Courses.—Botany 108, 111, 114, 116; Genetics 100; 6 additional units in botany, plus 7 units in related natural science courses.

Bachelor of Arts Major Program

(A) Lower Division Courses.—Botany 1; Zoology 10; Chemistry 1A. Chemistry 8 is recommended.

(B) Upper Division Courses.—Twenty-four units in botany and allied areas; 9 upper division units from the humanities or the social sciences, in addition to the college breadth requirements, are also required.

Honors and Honors Program (see page 94).—The Honors Program comprises 8 units of the following: courses 105, 117, 119, 120A, 120B, 121A, 121B, or 130; course 194H, to be taken during the senior year.

† Absent on leave, 1963-1964.

Graduate Study.—Graduate programs leading to M.A., M.S., and Ph.D. degrees are offered in cytology, plant physiology, anatomy, morphology, taxonomy, ecology, mycology, and allied areas. The resources of the department are augmented by appropriate courses in related departments.

LOWER DIVISION COURSES

1. **General Botany.** (5) I and II. Mr. Weier, Miss Lang, Mr. Bonner
Lecture—3 hours; laboratory—6 hours.
An introduction to the morphology, physiology, and genetics of flowering plants; brief survey of the plant kingdom including fungi causing plant diseases.
8. **Poisonous Plants.** (2) II. Mr. Berg
Lecture—1 hour; laboratory—3 hours.
Identification, distribution, toxic principles, nature of injury and animals affected, and plant control measures.

UPPER DIVISION COURSES

In addition to requirements specifically noted, the prerequisite for all upper division courses is Botany 1.

105. **Plant Anatomy.** (4) II. _____
Lecture—2 hours; laboratory—6 hours.
Structure and growth of meristems; development and structure of cells, tissues, and tissue systems; comparative anatomy of stem, root, and leaf.
107. **Weed Control.** (4) II. Mr. Foy
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Chemistry 1B or 8.
Introduction to the physiological and chemical principles underlying control of weeds; principles of preventive, cultural, and biological weed control; identification of common weeds.
108. **Systematic Botany of Flowering Plants.** (3) II. Mr. Berg
Lecture—1 hour; laboratory—6 hours.
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.
111. **Introduction to Plant Physiology.** (4) II. Mr. Ketellaper
Lecture—4 hours.
Prerequisite: course 1; Chemistry 8 (may be taken concurrently).
The fundamental activities of plants, such as absorption, transpiration, synthesis of foods, respiration, growth, and reproduction.
- *114. **Comparative Morphology of Nonvascular Plants.** (4) II.
Lecture—2 hours; laboratory—6 hours. Miss Lang, Mr. Wells
Prerequisite: course 1, Bacteriology 1, or equivalent.
Introduction to structure and reproduction of the algae and fungi with special emphasis on distribution and ecology; field trips.
116. **Comparative Morphology of Vascular Plants.** (4) I. Mr. Gifford
Lecture—2 hours; laboratory—6 hours.
Introduction to structure, reproduction, and evolution of the major groups of living and extinct vascular plants; special emphasis given to seed plants.

* Not to be given, 1963-1964.

- 117. Plant Ecology. (3) II.** Mr. Major
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 111. Recommended: course 108 and a course in soil science.
Study of individual plants, species, and vegetation in relation to environment, and of modification of the environment by vegetation.
- 119. Mycology. (4) I.** Mr. Prusso
Lecture—2 hours; laboratory—6 hours.
Introduction to structure, relationships, life cycles, and genetics of selected species of fungi.

RELATED COURSES

Pathogenic Fungi (Plant Pathology 224)

Fruit Morphology (Pomology 110)

- 120A. Plant Physiology. (3) I.** Mr. Currier
Lecture—3 hours.
Prerequisite: course 111 or consent of the instructor; Chemistry 8. Recommended: Biochemistry 101 or Chemistry 101.
The cell as a physicochemical system; water relations; translocation; mineral nutrition.

- 120B. Plant Physiology. (3) II.** Mr. Bonner
Lecture—3 hours.
Prerequisite: course 111 or consent of the instructor; Biochemistry 101 or Chemistry 101. Recommended: course 120A.
Plant metabolism, including photosynthesis and respiration; various aspects of growth.

- 121A. Plant Physiology Laboratory. (2) I.** Mr. Currier
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.** Mr. Currier
Laboratory—6 hours.
Prerequisite: course 120B (may be taken concurrently).
Laboratory procedure in plant physiology. Experiments selected to follow subject-matter sequence of course 120B.

- 130. General Cytology. (4) I.** Mr. Weier
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Genetics 100.
Structure and function of the plant and animal cell as a unit: cytoplasm and cytoplasmic inclusions, the somatic nucleus, chromosome structure and activity during mitosis and meiosis, development of gametes and their activity during fertilization.

RELATED COURSES

Cytogenetics (Genetics 101)

Cytogenetics Laboratory (Genetics 101L).

- 155. Plant Microtechnique. (3) I.** Mr. Gifford, Mr. Weier, Miss Lang
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 116 or 105, or equivalent.
Introduction to theory and 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.

194H. Special Study for Honors Students. (3) I and II. The Staff
Laboratory—9 hours.

Prerequisite: open only to majors of senior standing in the honors program.

Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a thesis.

199. Special Study for Advanced Undergraduates. (1-5) I and II. The Staff

GRADUATE COURSES

210. Cell Physiology-Protoplasmatics. (3) II. Mr. Currier
Lecture—2 hours; laboratory—3 hours.

Prerequisite: courses 120A-120B, 121A-121B. Recommended: course 105 and/or course 130.

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.

***211. Plant Cell Metabolism.** (3) I. Mr. Stocking
Lecture—1 hour; laboratory—6 hours.

Prerequisite: consent of the 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.

212. Physiology of Herbicidal Action. (3) I. Mr. Ashton
Lecture—2 hours; laboratory—3 hours.

Prerequisite: courses 107, 120A-120B, 121A-121B.

Lectures and laboratory exercises on the fundamental processes of absorption, translocation, and physiological action of herbicides. Greenhouse studies on toxicants applied through the soil and applied to foliage. Greenhouse culture, toxicity rating, autoradiography, and chromatography.

214. Mechanisms of Toxic Action. (2) I. Mr. Castelfranco
Lecture—2 hours.

Prerequisite: courses 107, 120B; Biochemistry 101, or consent of the instructor.

Physiological and biochemical mechanisms underlying toxicity and detoxification reactions.

Offered in odd-numbered years.

***216A. Advanced Morphology of Vascular Plants.** (3) II. ———
Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 116 or the equivalent.

Evolution of form, structure, and reproduction of fossil and extant types through Cycadophytes.

* Not to be given, 1963-1964.

231. Advanced Microtechnique. (3) II.

Mr. Weier

Lecture—1 hour; laboratory—6 hours.

Prerequisite: one of the following: course 105, 116, 130; 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.

291. Seminar in Plant Morphology. (1) I and II.

Mr. Gifford, Mr. Weier, Mr. Tucker, Mr. Berg, Miss Lang

Seminar—1 hour.

Survey and discussion of recent developments in the field of plant morphology.

292. Seminar in Plant Physiology. (1) I and II. Mr. Ashton, Mr. Bonner

Seminar—1 hour.

Survey and discussion of recent developments in the field of plant physiology at the graduate level.

297. Problems in Plant Ecology. (1) I.

Mr. Major

Seminar—1 hour.

Prerequisite: courses 108 and 117, or the equivalent. Recommended: courses in soils and mathematical statistics.

Orientation lectures by the instructor; reports and discussions by the students on limited subjects of current interest.

299. Research in Botany. (1-6) I and II.

The Staff

RELATED COURSES

Use of Isotopes as Tracers in Biological Research (Animal Physiology 243-243L).

CHEMISTRY

Raymond M. Keefer, Ph.D., *Chairman of the Department.*
Department Office, 139 Physical Science Building

Thomas L. Allen, Ph.D., *Professor of Chemistry.*
Lawrence J. Andrews, Ph.D., *Professor of Chemistry.*
Robert K. Brinton, Ph.D., *Professor of Chemistry.*
Raymond M. Keefer, Ph.D., *Professor of Chemistry.*
Richard E. Kepner, Ph.D., *Professor of Chemistry.*
Edgar P. Painter, Ph.D., *Professor of Chemistry.*
Harold G. Reiber, Ph.D., *Professor of Chemistry.*
David H. Volman, Ph.D., *Professor of Chemistry.*
Herbert A. Young, Ph.D., *Professor of Chemistry.*
Albert T. Bottini, Ph.D., *Assistant Professor of Chemistry.*
Gary E. Maciel, Ph.D., *Assistant Professor of Chemistry.*
W. Kenneth Musker, Ph.D., *Assistant Professor of Chemistry.*
Charles P. Nash, Ph.D., *Assistant Professor of Chemistry.*
George B. Savitsky, Ph.D., *Assistant Professor of Chemistry.*
James H. Swinehart, Ph.D., *Assistant Professor of Chemistry.*
William E. Thiessen, Ph.D., *Assistant Professor of Chemistry.*
John E. Warren, Ph.D., *Assistant Professor of Chemistry.*
George S. Zweifel, Sc.D., *Assistant Professor of Chemistry.*



Letters and Science List.—All undergraduate courses in chemistry are included in the Letters and Science List of Courses (see page 93).

Major Subject Advisers.—Mr. Bottini, Mr. Kepner, Mr. Maciel, Mr. Savitsky.

CHEMISTRY 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. Those 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 simplified if their high school programs include chemistry and four years of mathematics.

Candidates for the bachelor's 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

(A) Lower Division Courses.—Chemistry 1A–1B, 5 or 7A, 7B; Physics 4A, 4B, 4C; Mathematics 9A, 9B, 9C; and a reading knowledge of German.

(B) Upper Division Courses.—Chemistry 105, 110A–110B, 111, 112A–112B and 6 units of any additional courses in chemistry (one of which must include laboratory work) except Chemistry 101 and 109.

Bachelor of Arts Major Program

(A) Lower Division Courses.—Chemistry 1A–1B, 5 or 7A, 7B; Physics 2A, 2B, 3A, 3B; Mathematics 16A–16B.

(B) Upper Division Courses.—Twenty-four units in chemistry, biochemistry, or physics, including Chemistry 110A–110B, 112A, and 112B or 112C.

Honors and Honors Program (see page 94).—The honors program comprises 4 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.

LOWER DIVISION COURSES

1A. General Chemistry. (5) I and II.

The Staff (I. Mr. Keefer and Mr. Allen in charge; II. Mr. Maciel in charge)

Lecture—3 hours; laboratory—6 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-semester standing. Admission will be determined (when necessary) on the basis of the student's high school grades and his proficiency in arithmetic and first-year algebra.

1B. General Chemistry (Qualitative Analysis). (5) I and II.

The Staff (I. Mr. Brinton in charge; II. Mr. Volman and Mr. Musker in charge)

Lecture—3 hours; laboratory—6 hours.

Prerequisite: course 1A.

5. Quantitative Analysis. (3) I and II.

I. Mr. Savitsky; II. Mr. Nash

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 1B with grade of C or higher. Not open to students who have credit for Chemistry 7B.

A short course dealing with the principles and methods of quantitative analysis.

7A. General Chemistry. (5) I.

Mr. Nash

Lecture—3 hours; laboratory—6 hours.

Prerequisite: high school chemistry, Mathematics 9A or 16A (may be taken concurrently), and superior performance on an examination to be given during the week of registration. Enrollment to be limited.

The fundamental principles of chemistry with emphasis in the laboratory on quantitative work. Courses 7A and 7B are equivalent to the sequence Chemistry 1A–1B–5 as a prerequisite for further courses in chemistry.

7B. General Chemistry. (5) II.

Mr. Savitsky

Lecture—3 hours; laboratory—6 hours.

Prerequisite: course 7A.

Continuation of course 7A.

8. Short Survey of Organic Chemistry. (3) I and II.

Lecture—3 hours.

I. Mr. Reiber; II. Mr. Andrews

Prerequisite: course 1A or 1B with a grade of C or higher.

An introductory study of the compounds of carbon.

9. Methods of Organic Chemistry. (3) I and II.

Lecture—1 hour; laboratory—6 hours.

I. Mr. Zwiefel; II. Mr. Thiessen

Prerequisite: course 1B with a grade of C or higher and course 8, which should be taken concurrently.

An experimental study of the physical properties and chemical reactions of the common classes of organic substances.

UPPER DIVISION COURSES

101. General Biochemistry. (3) II.

Mr. Painter

Lecture—3 hours.

Prerequisite: course 8 or 112A with a grade of C or higher, or consent of the instructor.

The chemistry of carbohydrates, fats, proteins, amino acids, nucleic acids, and related compounds in plant and animal tissues. The role of these compounds in life processes.

105. Advanced Quantitative Analysis. (3) II. Mr. Brinton

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 109 or 110B (may be taken concurrently).

Advanced theory and practice of modern analytical chemistry. Instrumental methods emphasizing electrochemical techniques are applied to analytical procedures.

109. Physical Chemistry, Brief Course. (3) II. Mr. Young

Lecture—3 hours.

Prerequisite: course 5 or 7B; one year of college physics; Mathematics 16B or equivalent.

Graduate students of high standing may, under exceptional circumstances, be admitted without the prerequisite in chemistry.

Special topics in physical chemistry.

110A. Physical Chemistry. (3) I. Mr. Savitsky

Lecture—3 hours.

Prerequisite: course 5 or 7B; Mathematics 9A or 16B; one year of college physics.

The general principles of physical chemistry and elementary thermodynamics.

110B. Physical Chemistry. (3) II. Mr. Allen

Lecture—3 hours.

Prerequisite: course 110A.

A continuation of course 110A.

111. Physical Chemistry. (3) I and II. I. Mr. Warren; II. Mr. Swinehart

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 110B (may be taken concurrently) or course 109; Mathematics 16B.

Physicochemical measurements and laboratory experiments illustrating some of the important principles of physical chemistry.

112A. General Organic Chemistry. (5) I and II.

Lecture—3 hours; laboratory—6 hours. I. Mr. Thiessen; II. Mr. Reiber

Prerequisite: course 1B with a grade of C or higher.

A course with some emphasis on modern theoretical concepts designed primarily for majors in chemistry. With course 112B, a broader coverage of organic chemistry than courses 8 and 9.

112B. General Organic Chemistry. (5) I and II.

Lecture—3 hours; laboratory—6 hours. I. Mr. Kepner; II. Mr. Zweifel

Prerequisite: course 112A or 8 and 9.

A continuation of course 112A.

112C. General Organic Chemistry. (3) I and II.

Lecture—3 hours.

I. Mr. Kepner; II. Mr. Zweifel

Prerequisite: course 112A or 8 and 9; and consent of instructor.

Equivalent to the lecture part of 112B. Intended primarily for graduate students in fields other than chemistry. Except in very unusual circumstances undergraduates will enroll in 112B rather than 112C.

121. Introduction to Molecular Structure and Spectra. (3) I.

Lecture—3 hours.

Mr. Maciel, ———

Prerequisite: course 110B.

Modern theoretical and experimental methods used to study problems of molecular structure and binding; emphasis on spectroscopic techniques.

124. Advanced Inorganic Chemistry. (3) I. Mr. Musker

Lecture—3 hours.

Prerequisite: course 109 or 110B; 112B or 112C.

Modern interpretations of bonding, structure, and reactivity of inorganic compounds; emphasis on the chemistry of the first- and second-row elements, organometallic compounds, and transition metals.

124L. Advanced Inorganic Chemistry Laboratory. (2) I. Mr. Musker

Laboratory—6 hours.

Prerequisite: course 124 (may be taken concurrently).

Synthesis and characterization of inorganic compounds.

126. Nuclear Chemistry. (3) II. Mr. Warren

Lecture—3 hours.

Prerequisite: course 110B.

Natural and artificial radioactivity; nuclear structure and transformations; interaction of nuclear radiations with matter; distribution of nuclei in nature.

126L. Nuclear Chemistry Laboratory. (1) II. Mr. Warren

Laboratory—3 hours.

Prerequisite: course 126 (may be taken concurrently).

Application of chemical techniques in the study of nuclear reactions.

130. Qualitative Organic Analysis. (3) II. Mr. Kepner

Lecture—1 hour; laboratory—6 hours.

Prerequisite: courses 5 or 7B and 112B or 112C.

The application of physical and chemical techniques to the qualitative identification of organic compounds.

131. Advanced Organic Chemistry. (3) I. Mr. Bottini

Lecture—3 hours.

Prerequisite: course 109 or 110A; 112B or 112C.

Selected topics of preparative organic chemistry including enolate condensations and reactions of organometallic compounds. Application of current knowledge of reaction mechanisms, bond energies and molecular structure to problems of organic synthesis.

150A. Chemistry of Natural Products. (2) I. Mr. Painter

Lecture—2 hours.

Prerequisite: courses 109 and 112B or consent of the instructor.

Structure, reactions, and physical properties of carbohydrates, lipids and related compounds. Mechanisms of type reactions involving the major functional groups.

150B. Chemistry of Natural Products. (2) II. Mr. Painter

Lecture—2 hours.

Prerequisite: courses 109 and 112B or consent of the instructor. Course 150A is not a prerequisite to 150B.

Structure, reactions, and physical properties of proteins, amino acids, nucleic acids, and related nitrogen compounds.

194H. Undergraduate Research. (2-5) I and II. The Staff

Prerequisite: course 110B (may be taken concurrently).

Original research and a written report of the investigation. Unit value to be determined by instructor supervising the research.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

The Staff

Prerequisite: consent of the instructor based upon adequate preparation in chemistry, mathematics, and physics.

Investigation of special problems to be selected according to the preparation and needs of the individual.

GRADUATE COURSES

- 204. Chemical Kinetics. (3) I.** Mr. Swinehart
Lecture—3 hours.
A consideration of important classes of chemical reactions in gaseous and condensed phases. Experimental methods, and application of theory.
Offered in odd-numbered years.
- *205. Quantum Chemistry. (3) I.** Mr. Allen
Lecture—3 hours.
The quantum theory and its chemical applications.
Offered in even-numbered years.
- 214. Physical Chemistry—Thermodynamics. (3) I.** Mr. Volman
Lecture—3 hours.
Prerequisite: open to graduate students who have satisfactory foundation in physical chemistry, physics, and mathematics.
The principles of thermodynamics, with examples of their application to chemistry.
- *215. Statistical Thermodynamics. (3) II.** Mr. Nash
Lecture—3 hours.
Prerequisite: course 214.
A development of statistical thermodynamics with applications to selected topics of chemical interest.
Offered in odd-numbered years.
- *220A. Organic Chemistry. (3) II.** Mr. Thiessen
Lecture—3 hours.
Selected topics of current interest concerning the structure and synthesis of the more complex organic compounds with emphasis on heterocyclic systems.
Offered in odd-numbered years.
- 220B. Organic Chemistry. (3) II.** Mr. Bottini
Lecture—3 hours.
Selected topics of current interest concerning the structure and synthesis of the more complex organic compounds with emphasis on acyclic and homocyclic systems.
Offered in even-numbered years.
- 233. Physical Organic Chemistry. (3) I.** Mr. Andrews
Lecture—3 hours.
Modern concepts of substitution, elimination, and addition reactions, rearrangements and stereochemistry.
- 290. Seminar. (1) I and II.** Mr. Thiessen
Seminar—1 hour.
Prerequisite: consent of instructor.
The subjects covered will vary from year to year and will be announced at the beginning of each semester.
- 299. Research. (2-9) I and II.** The Staff
The laboratory is open to qualified graduate students who wish to pursue original investigation. Students desiring to enroll in this course should communicate with the department well in advance of the opening of the semester in which the work is to be undertaken. Such work will be under the direction of some member of the instructing staff, who will determine the credit value.

* Not to be given, 1963-1964.

CLINICAL PATHOLOGY

Oscar W. Schalm, D.V.M., Ph.D., *Chairman of the Department.*

Department Office, 1163 Haring Hall

Donald E. Jasper, D.V.M., Ph.D., *Professor of Clinical Pathology.*

Oscar W. Schalm, D.V.M., Ph.D., *Professor of Clinical Pathology.*

Charles E. Cornelius, D.V.M., Ph.D., *Associate Professor of Clinical Pathology.*

Jiro J. Kaneko, D.V.M., Ph.D., *Assistant Professor of Clinical Pathology.*



Robert Schneider, D.V.M., *Lecturer in Clinical Pathology.*

UPPER DIVISION COURSES

198. **Directed Group Study.** (1-3) I and II. The Staff

Prerequisite: consent of the instructor.

Directed group study of selected topics in clinical pathology.

199. **Special Study for Advanced Undergraduates.** (1-4) I and II. The Staff

GRADUATE COURSES

201. **Clinical Hematology and Bacteriology.** (3) I. Mr. Kaneko, Mr. Schalm
Laboratory—9 hours.

Prerequisite: third-year standing in the School of Veterinary Medicine or consent of the instructor.

Hematologic techniques and interpretation as applied to the study of disease in animals; morphologic and chemical characteristics of milk and bacteriologic techniques as applied to mastitis diagnosis.

202. **Clinical Biochemistry.** (3) II. Mr. Cornelius, Mr. Jasper, Mr. Kaneko
Lecture—1 hour; laboratory—6 hours.

Prerequisite: third-year standing in the School of Veterinary Medicine or consent of the 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.

203. **Biochemistry of Metabolic Diseases.** (3) I. Mr. Cornelius, Mr. Kaneko
Lecture—3 hours.

Prerequisite: biochemistry and physiology or consent of the instructor.

The biochemistry of inborn and acquired errors of metabolism in animals and man.

Offered in even-numbered years.

204. **Advanced Clinical Pathology.** (3) II. Mr. Kaneko, Mr. Schalm

Lecture—2 hours; laboratory—3 hours.

Prerequisite: consent of the instructor.

Selected topics in advanced clinical pathology with special emphasis on comparative hematology and clinical biochemistry.

251A. **Clinical Pathology Laboratory.** (½) I. The Staff

Discussion—10 hours; laboratory—13 hours. (Hours per semester)

Prerequisite: fourth-year standing in the School of Veterinary Medicine.

Application of laboratory methods to the diagnosis of animal disease.

- 251B. Clinical Pathology Laboratory.** ($\frac{1}{2}$) II. The Staff
Discussion—10 hours; laboratory—13 hours. (Hours per semester)
Prerequisite: fourth-year standing in the School of Veterinary Medicine.
Application of laboratory methods to the diagnosis of animal disease.
- 290. Seminar.** (1) I and II. The Staff (Mr. Cornelius in charge)
Seminar—1 hour.
- 299. Research.** (1-6) I and II. The Staff

DESIGN

For courses in design, see "Home Economics" on page 230.

DRAMATIC ART AND SPEECH

Alan A. Stambusky, Ph.D., *Acting Chairman of the Department.*

Department Office, 127C South Hall

†Theodore J. Shank, Ph.D., *Associate Professor of Dramatic Art.*
Benne B. Alder, Ph.D., *Assistant Professor of Speech.*
Everard D'Harnoncourt, Ph.D., *Assistant Professor of Dramatic Art.*
Clifford C. Fellage, M.A., *Assistant Professor of Dramatic Art.*
John T. Goldthwait, Ph.D., *Assistant Professor of Speech.*
Ralph S. Pomeroy, Ph.D., *Assistant Professor of Speech.*
Alan A. Stambusky, Ph.D., *Assistant Professor of Dramatic Art.*



Leonard G. Homann, A.B., *Lecturer in Speech.*
Douglas McDermott, M.A., *Acting Assistant Professor of Dramatic Art.*
Gerald P. Mohrmann, M.A., *Acting Assistant Professor of Speech.*
Robert K. Sarlos, M.A., *Lecturer in Dramatic Art.*

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

The Major Program.—Two majors are offered: Dramatic Art and a major combining Dramatic Art and Speech.

DRAMATIC ART MAJOR

Major Adviser.—Mr. Stambusky.

(A) Lower Division Courses.—Two courses selected from Dramatic Art 10A, 10B, Speech 2A; and Dramatic Art 20.

(B) Upper Division Courses.—Twenty-four units in Dramatic Art including the following: 124 (Visual Aspects of Dramatic Presentation) or 125 (Principles of Scene Design), 127 (Principles of Directing), 158A–158B (World Drama), 159 (Contemporary Drama), 160 (Principles of Playwriting), 165 (Dramatic Theory and Criticism), and 190 (Proseminar in Dramatic Art).

Except for course 190, with the adviser's consent, 6 units from other Dramatic Art courses or from related courses in other departments may be substituted for two of the above courses.

In addition each major student is expected to participate in departmental dramatic productions.

The department will certify to the completion of a major program for graduation only on the basis of at least a C average in the upper division courses taken in the department. Students who do not maintain such an average will be required to withdraw from the major in Dramatic Art.

Honors and Honors Program.—The honors program comprises at least 3 units of Dramatic Art 194H (Special Study for Honors Students) in addition to the regular major.

DRAMATIC ART AND SPEECH MAJOR

Major Advisers.—Mr. Pomeroy, Mr. Stambusky.

(A) Lower Division Courses.—Speech 1A or 40, 2A; Dramatic Art 10A or 10B, 20 are required; Speech 1B and an additional lower division course in dramatic art are recommended.

† Absent on leave, 1963–1964.

(B) Upper Division Courses.—Twenty-four units in dramatic art and speech, including a minimum of 6 units each selected from Groups A, B, and C:

Group A: Dramatic Art 158A, 158B, 159, 165.

Group B: Speech 101, 102, Dramatic Art 125, 127, 160.

Group C: Speech 117, 130, 140.

In addition each major student is expected to participate in departmental dramatic productions or forensic activities, and each senior will be required to enroll in course 195.

The remainder of the 24 units may be satisfied by upper division courses in dramatic art and speech or by related courses in other departments.

Dramatic Art 124 or 127 is required of teaching majors.

The Department will certify to the completion of a major program for graduation only on the basis of at least a grade C average in the upper division courses taken in the department. Students who do not maintain such an average will be required to withdraw from the major in dramatic art and speech.

Honors and Honor's Program (see page 94).—The honors program comprises at least 3 units of course 194H (Special Study for Honors Students) in addition to the regular major.

MASTER OF ARTS DEGREE IN DRAMATIC ART

Graduate Adviser.—Mr. D'Harnoncourt.

Candidates who meet the requirements of the Graduate Division and the Department of Dramatic Art and Speech will be admitted to graduate studies in Dramatic Art. After admission students will be required to complete a diagnostic examination in dramatic art.

Candidates for the degree must complete the following requirements:

(A) At least one graduate course in dramatic theory or dramatic literature and history and at least three units in course 280 or 299.

(B) Students are expected to participate in some phase of departmental dramatic productions.

(C) A reading knowledge of French or German (or another language approved by the Department). Competence in the language should be demonstrated to the Department during the first semester of residence and not later than the seventh week of the semester in which the candidate expects to complete all requirements for the degree.

(D) The requirements of one of the following plans must be fulfilled:

Plan I. Candidates must complete a minimum of 20 units in Dramatic Art and allied fields of which at least 8 are in graduate courses, must take an oral comprehensive examination approximately one hour in length, and must submit a thesis which has been approved by the faculty committee in charge. The thesis may be of either type described below:

The creative thesis records a significant artistic accomplishment involving research and public performance in one of the following areas: Acting, Design, Directing, or Playwriting.

The historical-critical thesis presents the results of an original investigation in the literature, history, or theory of dramatic art.

Plan II. Candidates must complete a minimum of 24 units in Dramatic Art and allied fields of which at least 12 are in graduate courses and must take a written comprehensive examination.

THE UNIVERSITY THEATRE

Each year the Department of Dramatic Art and Speech 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.

DRAMATIC ART**LOWER DIVISION COURSES**

- 10A. Fundamentals of Acting. (3) I.** Mr. McDermott
Lecture—2 hours; laboratory—2 hours.
Reading and analysis of contemporary plays; theory and practice of acting with emphasis on character analysis and interpretation.
Field trips included.
- 10B. Fundamentals of Acting. (3) II.** Mr. Stambusky
Lecture—2 hours; laboratory—2 hours.
Reading and analysis of plays of different types and forms selected from various periods; theory and practice of acting with emphasis on style.
Field trips included.
- 15. The Art of the Cinema. (3) I and II.** Mr. D'Harnoncourt
Lecture—2 hours; laboratory—2 hours.
The cinema as an art form; its relation to other arts; its evolution, with emphasis on the significant modern contributions.
- 20. Introduction to Dramatic Art. (3) I and II.**
Lecture—3 hours. Mr. D'Harnoncourt, Mr. Sarlos
Understanding and appreciation of the arts and literature of the theatre.
Field trips included.

UPPER DIVISION COURSES

English 1A is prerequisite to all upper division courses.

- 124. Visual Aspects of Dramatic Presentation. (3) I.** Mr. Fellage
Lecture—2 hours; laboratory—3 hours.
Dramatic emphasis as affected by theatre design, stage decor and lighting, make-up, and costuming.
- 125. Principles of Scene Design. (3) II.** Mr. Fellage
Lecture—3 hours.
Principles of design as applied to stage settings. Study of various styles and periods of stage design. Execution of scene designs for modern and period dramas.
- 127. Principles of Directing. (3) I.** Mr. Sarlos
Lecture—3 hours.
Theory of directing and directorial analysis of dramas from various periods.
- 150. American Drama. (3) II.** Mr. McDermott
Lecture—3 hours.
Selected plays and the history of the theatre from Colonial times to the present.
- 158A. World Drama. (3) I.** Mr. Sarlos
Lecture—3 hours.
Selected plays and the history of the theatre from ancient Greece to the Renaissance.

- 158B. World Drama.** (3) II. Mr. Sarlos
Lecture—3 hours.
Selected plays and the history of the theatre from the Renaissance to the present time.
- 159. Contemporary Drama.** (3) I. Mr. McDermott
Lecture—3 hours.
Twentieth-century European, British, and American plays.
- 160. Principles of Playwriting.** (3) I. Mr. D'Harnoncourt
Lecture-seminar—3 hours.
Prerequisite: consent of the instructor or at least one of the following: courses 20, 150, 158A, 158B, 159, 165.
Analysis of dramatic structure and the composition of original plays.
Offered in alternate years.
- 165. Dramatic Theory and Criticism.** (3) II. Mr. McDermott
Lecture-seminar—3 hours.
Changing concepts of drama from Aristotle to the present.
- 180. Theater Laboratory.** (1-3) I and II.
Laboratory. The Staff (Mr. Stambusky in charge)
Prerequisite: consent of the instructor.
Projects in acting, production, scene design, directing, and playwriting.
Participation in departmental productions. May be repeated for credit up to a total of 8 units.
- 190. Proseminar in Dramatic Art.** (3) I and II.
Lecture-recitation—3 hours. The Staff (Mr. Stambusky in charge)
Selected aspects of Dramatic Art. Emphasis on individual study and research. Comprehensive examination covering the entire major field. Students may, with instructor's consent, substitute a thesis for the comprehensive examination.
- 194H. Special Study for Honors Students.** (3) I and II. The Staff
Prerequisite: majors with honors standing.
May be repeated once for credit.
- 195. Proseminar in Dramatic Art and Speech.** (3) I and II.
Lecture-seminar—3 hours. The Staff (Mr. Stambusky in charge)
Prerequisite: majors with senior standing. Not open to students who have received credit for Speech 195.
Extensive resurvey of the fields of dramatic art and speech, with emphasis upon individual study and research. Comprehensive examination covering the entire major field. Students may, with the instructor's consent, substitute a thesis for the comprehensive examination.
- 199. Special Study for Advanced Undergraduates.** (1-3) I and II. The Staff
Prerequisite: consent of the instructor.
Advanced study of dramatic literature, acting, or play production.

GRADUATE COURSES

- 210. Advanced Acting.** (3) I. Mr. Stambusky
Lecture—2 hours; laboratory—2 hours.
Theory and practice in advanced styles of acting, with emphasis on special problems; detailed study of the Stanislavski system of acting and other acting theories.
- 224. Visual Theater.** (3) II. Mr. Fellage
Seminar—2 hours.
Selected theoretical and practical problems of the visual theater.

225. **Design for the Theater.** (3) I. Mr. Fellage
Seminar—2 hours.
Advanced study of selected problems in the design of settings, costumes and lighting; practice in design.
227. **Advanced Directing.** (3) II. Mr. Stambusky
Lecture—2 hours; laboratory—2 hours.
Study of advanced directing techniques; specialized procedures in styles of drama. Projects in directing scenes from dramas of different types and periods.
230. **Greek and Roman Theater.** (3) I. Mr. Sarlos
Seminar—2 hours.
Classical theatre and drama.
235. **Elizabethan Theater.** (3) II. Mr. Sarlos
Seminar—2 hours.
240. **Seventeenth-century Theater.** (3) II. Mr. D'Harnoncourt
Seminar—2 hours.
The theater and drama of Restoration England and seventeenth-century France.
- *250. **Realism in the Theater.** (3) I. Mr. Shank
Seminar—2 hours.
The realistic drama of the nineteenth and twentieth centuries. The development of realism in the theater. Consideration of such dramatists as Ibsen, Strindberg, Chekhov, and O'Neill.
- *259. **Contemporary Trends in the Theater.** (3) II. Mr. D'Harnoncourt
Seminar—2 hours.
The major dramatists since Brecht. The development of the significant contemporary drama.
- *260. **Advanced Playwriting.** (3) I. Mr. Shank
Seminar—2 hours.
Dramatic structure, character, and dialogue. Advanced projects in playwriting.
265. **Theory of Dramatic Art.** (3) I. Mr. McDermott
Seminar—2 hours.
Theory and aesthetic principles of dramatic art as a fine art, including a consideration of traditional dramatic genres.
280. **Theater Laboratory.** (1-6) I and II. The Staff (Mr. Stambusky in charge)
Advanced practice in acting, design, directing, playwriting, and technical theatre.
299. **Individual Study.** (1-6) I and II. The Staff (Mr. Stambusky in charge)

SPEECH

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

LOWER DIVISION COURSES

Students must have passed Subject A before taking courses 1A or 2A.

- 1A. **Elements of Speech.** (3) I and II. The Staff
Lecture-recitation—3 hours.

* Not to be given, 1963-1964.

The principles and practice of effective speech composition and delivery, with emphasis upon the logical organization and presentation of ideas.

1B. Elements of Speech. (3) I and II. The Staff

Lecture-recitation—3 hours.

Prerequisite: course 1A.

Application of the principles of effective speech composition and delivery to group discussion and public address.

2A. Fundamentals of Oral Interpretation of Literature. (3) I and II.

Lecture-recitation—3 hours.

Mrs. Alder

Introduction to the oral reading of prose and poetry; practice in speaking and reading, with training in the principles of effective delivery.

25. Oral English for Foreign Students. (4) I and II.

Mr. Homann

Lecture-recitation—4 hours.

For foreign students only. Pronunciation, speaking, grammar, reading, and writing of English. Required of those who do not pass the examination in English and who are not qualified to take course 26.

26. Oral English for Foreign Students. (4) I and II.

Mr. Homann

Lecture-recitation—4 hours.

Continuation of course 25; required of those who have taken course 25.

40. Fundamentals of Debate. (3) I and II.

Mr. Mohrmann

Lecture-recitation—3 hours.

Principles and practice of formal and informal debate. Emphasis on identification and analysis of issues and logical presentation of evidence.

UPPER DIVISION COURSES

Prerequisite to all upper division courses are upper division standing or two of the following courses: English 1A, 1B, Speech 1A, 1B, 40.

***101. Oral Interpretation of Poetry.** (3) II.

Mrs. Alder

Lecture-recitation—3 hours.

Prerequisite: course 2A.

Thorough application of the principles of oral interpretation to poetic literature.

Offered in odd-numbered years.

102. Oral Interpretation of Selected Fields of Literature. (3) II.

Lecture-recitation—3 hours.

Mr. Goldthwait

Prerequisite: course 2A.

Application of the principles of oral interpretation to selected types, periods, or authors. An opportunity for the student to choose an area of specialization for intensive study.

Offered in even-numbered years.

117. Theories of Rhetoric and Criticism. (3) I.

Mr. Goldthwait

Lecture—3 hours.

A study of the underlying nature of linguistic expression and communication as given in major theories, and comparison of their criteria of effectiveness. Attention to both artistic and instrumental functions of language.

Offered in odd-numbered years.

130. History of Public Address. (3) I.

Mr. Pomeroy

Lecture—3 hours.

A survey of public address in its major periods of influence in Western civilization.

Offered in odd-numbered years.

* Not to be given, 1963-1964.

- 140. Argumentation and Debate.** (3) I. Mr. Pomeroy
Lecture-recitation—3 hours.
Forms and techniques of argumentation and debate, with attention to the logical and rhetorical aspects. Materials taken largely from current events.
- 141. Debate Laboratory.** (2) I and II. Mr. Mohrmann
Laboratory—4 hours.
Prerequisite: consent of the instructor.
Practice in the principles of argumentation and debate. Intercollegiate and tournament debating. May be repeated for credit up to a total of 6 units.
- 194H. Special Study for Honors Students.** (3) I and II. The Staff
Prerequisite: majors with honors standing.
May be repeated once for credit.
- 195. Proseminar in Dramatic Art and Speech.** (3) I and II. The Staff
Lecture-seminar—3 hours.
Prerequisite: majors with senior standing.
Extensive resurvey of the fields of dramatic art and speech, with emphasis upon individual study and research. Comprehensive examination covering the entire major field.
- 199. Special Study for Advanced Undergraduates.** (1-3) I and II.
Prerequisite: consent of the instructor. The Staff
Advanced study of one phase of speech, such as public speaking, discussion, debate, oral interpretation.

GRADUATE COURSE

- 299. Individual Study.** (1-6) I and II. The Staff (Mr. Pomeroy in charge)

ECONOMICS

Frank C. Child, Ph.D., *Chairman of the Department.*
Department Office, 378 Academic Office Building

Thomas Mayer, Ph.D., *Professor of Economics.*
Frank C. Child, Ph.D., *Professor of Economics.*
Bruce Glassburner, Ph.D., *Associate Professor of Economics.*
Ralph C. James, Ph.D., *Associate Professor of Economics.*
———, *Associate Professor of Economics.*
Martin P. Oettinger, Ph.D., *Assistant Professor of Economics.*



Andrzej Brzeski, M.A., *Acting Assistant Professor of Economics.*
———, *Lecturer in Economics.*

Letters and Science List.—All undergraduate courses in economics are included in the Letters and Science List of Courses (see page 93).

Departmental Major Advisers.—Mr. Glassburner, Mr. Mayer, Mr. Oettinger.
Graduate Adviser.—Mr. Child.

The Major Program

(A) Lower Division Courses.—Required: Economics 1A–1B and 6 additional units in social science; Mathematics 13 or a course in statistics approved by the department; and at least an average grade of C in these courses. Students planning to major in economics should complete these courses by the end of the sophomore year.

(B) Upper Division Courses.—A total of 24 units of upper division courses in economics is required, including Economics 100A–100B, and either 110A or 110B. It is recommended that these required courses be taken in the junior year. Except under extraordinary circumstances, no more than 9 units of economics may be taken in any one semester.

The department will certify to the completion of the major program for graduation only on the basis of at least a C average in the upper division courses taken in the department in satisfaction of major requirements. Students who do not maintain such an average may be required at any time to withdraw from the major in economics.

LOWER DIVISION COURSES

1A. Principles of Economics. (3) I and II. Mr. Glassburner
Lecture—2 hours; discussion—1 hour.

Analysis of the allocation of resources and distribution of income through the price system; competition and monopoly; comparative economic systems.

1B. Principles of Economics. (3) I and II. Mr. Brzeski
Lecture—2 hours; discussion—1 hour.

Prerequisite: course 1A is not a prerequisite to 1B, but it is recommended that the courses be taken in sequence.

Analysis of the economy as a whole: determinants of national income; the level of employment; related topics including monetary policy, the business cycle, international trade and economic development.

11. Elementary Accounting. (4) I and II. Mr. Oettinger
Lecture—3 hours; laboratory—2 hours.

The basic concepts of accounting; the history of accounting; the ledger, journals, income statement, and balance sheet; inventory valuation; de-

preciation; introduction to cost accounting; analysis of financial statements; social accounting.

UPPER DIVISION COURSES

Upper Division Prerequisites.—For students with a major in economics, course 1A–1B is prerequisite to all upper division work in the department. For students not majoring in economics, junior standing and consent of the instructor are required for admission to all upper division courses in the department.

100A. Economic Theory. (3) I. Mr. Child

Lecture—3 hours.

Price and distribution theory.

100B. Economic Theory. (3) II. Mr. Child

Lecture—3 hours.

Scope and method of economic science; theory of income and employment.

***101A. History of Economic Thought. (3) I.** _____

Lecture—3 hours.

Historical survey of economic doctrines, with emphasis on the classical school and its antecedents.

101B. History of Economic Thought. (3) II. Mr. Glassburner

Lecture—3 hours.

Historical survey of economic doctrines, with emphasis on the classical school and neoclassical theory; their critics; current developments in economic thought.

***102. Advanced Economic Theory. (3) I.** _____

Lecture—3 hours.

Prerequisite: courses 100A and 100B.

Mathematical analysis in economic theory. Analysis of the determinants of the aggregate level of output and employment, and of the allocation of resources. Includes advanced value and distribution theory, and a brief review of modern monetary theory.

***105. The Economics of Social Legislation. (3) I.** Mr. Oettinger

Lecture—3 hours.

Prerequisite: courses 1A and 1B.

Theory of welfare economics. The economic impact of social legislation. Analysis of such current issues as health insurance and aid to education. The impact of economic growth, technological change, and inflation on existing programs.

110A. Economic History. (3) I. _____

Lecture—3 hours.

Analysis of economic problems in their historical setting. Emphasis on development of economic institutions in Europe; implications for contemporary world economic relationships.

110B. Economic History. (3) II. Mr. James

Lecture—3 hours.

Analysis of economic problems in their historical setting. Examination of the evolution of economic institutions in the United States; their significance in the contemporary world economy.

115. Economic Development. (3) I. Mr. Glassburner

Lecture—3 hours.

Prerequisite: course 1A–1B or consent of the instructor. Theories of economic development and underdevelopment; economic policy for growth and development.

* Not to be given, 1963–1964.

116. Comparative Economic Systems. (3) I.

Mr. Brzeski

Lecture—3 hours.

Critical examination of major economic systems, emphasizing their economic goals and institutions; achievements and problems of capitalism; fascism; Marxian thought and socialist economics; problems of economic planning in USSR, India, China, and other industrializing societies.

121. Industrial Organization. (3) I.

Mr. James

Lecture—3 hours.

The organization and structure of industries and their markets in the American economy, competitive behavior, price policy, and market performance in such industries; public policy in the regulation of industry.

130. Public Finance and Taxation. (3) I.

Mr. Mayer

Lecture—3 hours.

Examination of the growth and economic effects of public expenditures; taxation and borrowing; analysis of income, property, excise and other major taxes; fiscal policy and economic stability.

131. The Economics of Corporation Finance. (3) I.

Mr. James

Lecture—3 hours.

The corporation as a form of business organization; financial aspects of promotion and organization, operation, expansion and consolidation, failure, and reorganization; the capital market, financial instruments and institutions; public regulation of security issues and security exchanges.

133. Dynamic Economics and Business Fluctuations. (3) II.

Mr. Mayer

Lecture—3 hours.

Prerequisite: Mathematics 13 and consent of the instructor.

An analysis of the general features and chief causes of economic change, with special emphasis on the cyclical instability of economic activity. It is recommended that this course be taken in the senior year.

135A-135B. Money, Banking, and Monetary Policy. (3-3) Yr.

Mr. Mayer

Lecture—3 hours.

The monetary economy: commercial and central banking; monetary and income theory; monetary policy.

150A. Labor Economics. (3) I.

Mr. Oettinger

Lecture—3 hours.

Historical analysis of worker organization and of trade union philosophy and practice; theoretical exploration of basic influences affecting real wages and employment; examination of relevant statistical records; wage structure and wage level problems; union-management relations and the national economy.

150B. Labor Economics. (3) II.

Mr. Oettinger

Lecture—3 hours.

Labor law and legislation and their economic impact; collective bargaining and economic conflict; economic impact of laws regulating minimum wages, hours of work, and other labor standards; government intervention in collective bargaining and dispute settlement.

160A. International Economic Relations. (3) I.

Lecture—3 hours.

International trade theory; analysis of selected international and economic problems.

160B. International Economic Relations. (3) II.

Lecture—3 hours.

International finance; U. S. foreign trade policies and their impact on the world economy.

199. **Special Study for Advanced Undergraduates.** (1-5) I and II.
The Staff (Mr. Glassburner in charge)

GRADUATE COURSES

- 200A. **Economic Theory.** (3) I. Mr. Child
Lecture and discussion—3 hours.
Microstatic and microdynamic theoretical issues; theory of production, theory of the firm, and general theory of choice.
- 200B. **Economic Theory.** (3) II. Mr. Child
Lecture and discussion—3 hours.
Macrostatic and macrodynamic theoretical issues; theory of income and employment and theory of economic growth.
201. **History of Economic Thought.** (3) II. Mr. Glassburner
Lecture—3 hours.
Analysis of the relationships between historical conditions, economic theory, and economic policy from the Greeks to modern times.
210. **Economic History.** (3) I. _____
Lecture—3 hours.
American and European economic history. Emphasis upon development of economic institutions.
215. **Economics of Underdeveloped Countries.** (3) I. Mr. Glassburner
Lecture—3 hours.
The theories of economic stagnation, of development and of growth; specific problems of development policy in Latin America, Africa, the Near East, and Asia.
216. **Comparative Economic Systems.** (3) I. Mr. Brzeski
Lecture—3 hours.
Comparative study of economic systems with reference to their organization and institutions, their prevailing values and goals, and various aspects of their economic performance.
233. **Dynamic Economics and Business Fluctuations.** (3) II. Mr. Mayer
Lecture—3 hours.
Macro- and micro-dynamic economic models; review of business cycle theory; economic policy for growth and stability.
235. **Money and Banking.** (3) I. Mr. Mayer
Lecture—3 hours.
Monetary theory; monetary and banking policy.
250. **Labor Economics.** (3) II. Mr. Oettinger
Seminar—3 hours.
Theory of the labor market; trade union movements.
260. **International Economic Relations.** (3) II. _____
Seminar—3 hours.
Theory of international trade, policy problems in international relations.
299. **Individual Study.** (1-5) I and II. The Staff (Mr. Mayer in charge)

EDUCATION

Hugh C. Black, Ph.D., *Chairman of the Department.*
Department Office, 244 Academic Office Building

Hugh C. Black, Ph.D., *Associate Professor of Education.*
Jack Otis, Ph.D., *Associate Professor of Education.*
Robert A. Braund, Ed.D., *Assistant Professor of Education.*
Charles M. Garverick, Ph.D., *Assistant Professor of Education.*
———, *Assistant Professor of Education.*
———, *Assistant Professor of Education.*



J. Richard Blanchard, M.S., *Lecturer in Education.*
Dorcey F. Davy, M.A., *Lecturer in Education, Supervisor of Teacher Education.*
Douglas L. Minnis, M.A., *Lecturer in Education, Supervisor of Teacher Education.*
Lawrence P. Newberry, Ed.D., *Lecturer in Education, Supervisor of Teacher Education.*
Shirley J. Skinner, B.A., *Lecturer in Education, Supervisor of Teacher Education.*
Margaret R. Sutherland, Ph.D., *Lecturer in Education, Supervisor of Teacher Education.*

Letters and Science List.—Education 110.

Credentials Counselors:

General.—Miss Sutherland.

Secondary.—Mr. Davy, Mr. Newberry.

Elementary.—Mrs. Skinner, Mr. Minnis.

Curricula for Teacher Education.—See pp. 100–103.

UPPER DIVISION COURSES

110. Introduction to Educational Psychology. (3) I and II. Miss Sutherland
Lecture—3 hours.

Prerequisite: Psychology 1 or 2.

The learning process; physical, mental, and social development; individual differences and their measurement; mental hygiene; the role of the teacher in guidance and counseling.

115. Tests and Measurements. (3) I and II.

Mr. Garverick

Lecture—3 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.

120. Educational Sociology. (3) I and II.

Mr. Black

Lecture—3 hours.

Prerequisite: course 110 (may be taken concurrently).

The school as a social institution; historical development of purposes and programs of education; the role of the teacher.

130. Elementary School Curriculum. (2) I.

Mr. Minnis

Lecture—2 hours.

Selection and placement of content; organization of elementary school programs; analysis of instructional materials; evaluation of student achievement.

- 150. Bibliographic Methods.** (1) I. Mr. Blanchard
Lecture—1 hour.
Prerequisite: junior standing.
Techniques of literature searching and the location of information. Use of bibliographies, abstract journals, card catalogs, reference works and other source materials. Preparation of scientific bibliographies. Designed to assist upper division and graduate students in preparation of research papers and dissertations.
- 163. Guidance and Counseling.** (3) I and II. Mr. Garverick
Lecture—3 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 particular emphasis on educational and vocational adjustment.
- 198. Directed Group Study.** (1-5) I and II. The Staff
Prerequisite: consent of the instructor.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSE

- 290. Seminar.** (2) I and II.

PROFESSIONAL COURSES

- 300. Language Arts in the Elementary Schools.** (2) I and II. _____
Lecture—2 hours.
Prerequisite: consent of the instructor.
Principles, procedures, and curricular materials for developing oral and written language skills.
- 320A. Introduction to Teaching in Secondary Schools.** (1) I and II.
Lecture—1 hour; laboratory—2 hours.
Sec. 1. Mr. Braund.
Sec. 2. Mr. Davy.
Sec. 3. Mr. Newberry.
Lectures, conferences, and field work in secondary teaching. Observations and participation in some form of public school work.
- ‡**320C. Supervised Teaching in Secondary Schools.** (3-8) I and II.
Prerequisite: course 320E (must be taken concurrently).
Sec. 1. Mr. Davy.
Sec. 2. Mr. Braund.
Sec. 3. Mr. Newberry.
Sec. 4. _____.
Directed teaching for candidates for the general secondary credential.
May be repeated for credit up to a total of 8 units.
- ‡**320E. Methods of Teaching in Secondary Schools.** (2) I and II.
Lecture—2 hours.
Prerequisite: course 320C (must be taken concurrently).

‡ Open only to apprentice teachers and graduate students. All 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 semester in the public schools. Thus teaching assignments in the fall semester, 1963, will begin on or about September 3 and end January 31. For the spring semester, 1964, they will begin on or about February 3 and end June 12. Students should make arrangements accordingly.

Sec. 1. Mr. Davy.

Sec. 2. Mr. Braund.

Sec. 3. Mr. Newberry.

Sec. 4. ———.

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.

330A. Introduction to Teaching in Elementary Schools. (2) I and II.

Lecture—1 hour; laboratory—3 hours.

Mrs. Skinner, Mr. Minnis

Sec. 1. For student teachers.

Sec. 2. For intern teachers.

Lectures, conferences, and field work; observation of and participation in classroom activities in the public elementary schools.

‡330C. Supervised Teaching in Elementary Schools. (4-8) I and II.

Mrs. Skinner, Mr. Minnis

Prerequisite: course 330E (must be taken concurrently).

Sec. 1. For student teachers.

Sec. 2. For intern teachers.

Directed teaching for candidates for the general elementary credential.

‡330E. Methods of Teaching in Elementary Schools. (2) I and II.

Lecture—2 hours.

Mrs. Skinner, Mr. Minnis

Prerequisite: course 330C (must be taken concurrently).

Sec. 1. For student teachers.

Sec. 2. For intern teachers.

Selection, organization, and evaluation of teaching materials, including the use of audio-visual aids.

‡ Open only to apprentice teachers and graduate students. All 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 semester in the public schools. Thus teaching assignments in the fall semester, 1963, will begin on or about September 3 and end January 31. For the spring semester, 1964, they will begin on or about February 3 and end June 12. Students should make arrangements accordingly.

ENGINEERING

Roy Bainer, M.S., *Chairman of the Department*
Department Office, 205 Walker Engineering Building

- Roy Bainer, M.S., *Professor of Engineering and Professor of Agricultural Engineering.*
- Clyne F. Garland, M.S., *Professor of Engineering.*
- Robert M. Hagan, Ph.D., *Professor of Engineering and Professor of Irrigation.*
- S. Milton Henderson, M.S., *Professor of Engineering and Professor of Agricultural Engineering.*
- Clarence F. Kelly, M.S., *Professor of Engineering and Professor of Agricultural Engineering.*
- Robert A. Kepner, B.S., *Professor of Engineering and Professor of Agricultural Engineering.*
- Coby Lorenzen, Jr., M.S., *Professor of Engineering and Professor of Agricultural Engineering.*
- James N. Luthin, Ph.D., *Professor of Engineering and Professor of Irrigation.*
- Loren W. Neubauer, Ph.D., *Professor of Engineering and Professor of Agricultural Engineering.*
- John B. Powers, Ph.D., *Professor of Engineering.*
- Verne H. Scott, Ph.D., *Professor of Engineering and Professor of Irrigation.*
- Joseph M. Smith, Sc.D., *Professor of Engineering and Professor of Food Science and Technology.*
- George F. Stewart, Ph.D., *Professor of Engineering and Professor of Food Science and Technology.*
- Jaime Amorocho, Ph.D., *Associate Professor of Engineering and Associate Professor of Irrigation.*
- Robert H. Burgy, M.S., *Associate Professor of Engineering and Associate Professor of Irrigation.*
- John R. Goss, M.S., *Associate Professor of Engineering and Associate Professor of Agricultural Engineering.*
- John C. Harper, Ph.D., *Associate Professor of Engineering and Associate Professor of Agricultural Engineering.*
- Samuel A. Hart, Ph.D., *Associate Professor of Engineering and Associate Professor of Agricultural Engineering.*
- John D. Kemper, M.S., *Associate Professor of Engineering.*
- Allan A. McKillop, Ph.D., *Associate Professor of Engineering and Associate Professor of Agricultural Engineering.*
- Charles W. Beadle, Ph.D., *Assistant Professor of Engineering.*
- Bruce Caswell, Ph.D., *Assistant Professor of Engineering.*
- James A. Cheney, Ph.D., *Assistant Professor of Engineering.*
- Robert B. Fridley, M.S., *Assistant Professor of Engineering and Assistant Professor of Agricultural Engineering.*
- S. Russell Keim, Ph.D., *Assistant Professor of Engineering.*
- Herschel H. Loomis, Ph.D., *Assistant Professor of Engineering.*
- † Peter T. Lyman, D.Eng., *Assistant Professor of Engineering.*
- Paul Van Shaw, Ph.D., *Assistant Professor of Engineering.*
- Theodor S. Strelkoff, Ph.D., *Assistant Professor of Engineering and Assistant Professor of Irrigation.*



† Absent on leave, 1963-1964.

J. Robert Freeman, E.E., *Lecturer in Engineering.*

Jerald M. Henderson, M.S., *Associate in Engineering.*

Arthur S. Leonard, M.S., *Lecturer in Engineering.*

William O. Pruitt, Jr., M.S., *Lecturer in Engineering and Lecturer in Irrigation.*

LOWER DIVISION COURSES

1A. Plane Surveying. (3) I.

Lecture—2 hours; laboratory—3 hours.

Prerequisite: plane trigonometry.

Principles; field practice; calculations and mapping with special reference to irrigation, drainage, and agricultural engineering problems.

3. Engineering Methods. (4) I and II.

Mr. Goss

Lecture—2 hours; laboratory—6 hours.

Prerequisite: Mathematics 9A (may be taken concurrently).

Elementary problems in engineering measurement, instrumentation, and data analysis applied to plane surveying, temperature fluid flow, electrical and other physical quantities. Introduction to electronic analog and digital computers, with actual elementary programming applications.

4. Engineering Geometry. (3) I and II.

Mr. J. M. Henderson

Lecture—2 hours; laboratory—3 hours.

Prerequisite: Mathematics 9A.

The principles and application of descriptive geometry and mechanical and freehand drawing to the representation, visualization, and solution of engineering problems.

35. Statics. (3) I and II.

Mr. Fridley, Mr. Garland

Lecture—3 hours.

Prerequisite: Physics 4A; Mathematics 9C or 14.

Force systems and equilibrium conditions with emphasis on engineering problems covering structures, distributed forces, beams, cables, and friction. Includes graphical solutions and an introduction to the method of virtual work.

45. Properties of Materials. (3) I and II.

Mr. Leonard

Lecture—2 hours; laboratory—3 hours.

Prerequisite: sophomore standing in engineering.

An introductory course on the properties of engineering materials. Applications of basic principles to the selection and use of engineering materials.

UPPER DIVISION COURSES

100A. Electronics. (3) I and II.

Mr. Loomis

Lecture—3 hours.

Prerequisite: Mathematics 106 and 107, or the equivalent; Physics 4B.

The development of transistor and vacuum-tube equivalent circuits, based on physical considerations of electronic conduction in vacuo, gases, and solids; fundamentals of circuit analysis; analysis of linear amplifiers.

100B. Electronics. (3) I and II.

Lecture—3 hours.

Prerequisite: course 100A.

Feedback amplifiers; resonance and coupled circuits; tuned amplifiers and sinusoidal oscillators; amplitude and frequency modulation and demodulation; magnetic materials and circuits; permanent magnets; magnetic devices.

101. Electrical Laboratory. (2) I and II.

Mr. Jacob

Laboratory—6 hours.

Prerequisite: course 100A (should be taken concurrently).

Instruction and practice in the use of basic electronic devices and measuring instruments; properties of transducers for mechanical, thermal and optical

measurements; use of transducers with electronic laboratory instruments for the measurement of non-electrical quantities.

102. Dynamics. (3) I and II. Mr. Beadle
Lecture—3 hours.

Prerequisite: course 35; Mathematics 14 or 106, 107.

Kinematics and kinetics of a particle and of rigid bodies as applied to engineering problems. Force, energy, and momentum methods of solution. Introduction to mechanical vibrations.

103. Elementary Fluid Mechanics. (3) I and II. Mr. Keim
Lecture—3 hours.

Prerequisite: course 102.

The principles of mechanics applied to the statics and to the flow of incompressible and compressible fluids.

104. Mechanics of Materials. (3) I and II. Mr. Beadle
Lecture—3 hours.

Prerequisite: course 35.

Elastic and ultimate resistance of materials; stress and deformation analysis of bars, shafts, and beams; combined stresses; columns; elements of design for wood and metal members.

105A. Thermodynamics. (3) I and II. Mr. Shaw
Lecture—3 hours.

Prerequisite: course 102 (may be taken concurrently); Chemistry 1B or 8; Physics 4C.

Energy transformations, reversibility, availability; thermal properties of gases and vapors; theoretical cycles and practical engine forms, mechanisms and performance.

105B. Thermodynamics. (3) I and II. Mr. Leonard
Lecture—3 hours.

Prerequisite: course 105A.

Heat transmission and equipment, fuels, combustion, and analysis of products of combustion. Heat power engines using nozzles. Reheating and regenerative cycles and equipment. Plant performance.

106. Engineering Economics. (3) II. Mr. Kemper
Lecture—3 hours.

Prerequisite: senior standing in engineering.

The analysis, synthesis and evaluation of problems in engineering economics; operations research techniques; relevant differences between alternatives; discounted cash flow concept; income tax considerations; recovery of proposed investment plus return commensurate with the risk.

112. Unit Operations in Agricultural Processing. (3) II. Mr. S. M. Henderson
Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 105B.

Thermodynamic and mass transfer procedures applied to such processes as drying, dehydration, refrigeration, size reduction, separation, and materials handling.

114. Principles of Farm Machinery. (3) I. Mr. Kepner
Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 102.

Functional requirements, basic principles, and performance characteristics of field machines. General design considerations, cost analysis, testing methods, and laboratory studies of specific machines.

- 115. Farm Structures Design. (3) I.** Mr. Neubauer
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 102.
The design of farm buildings including houses, storage buildings, and production structures, with emphasis on functional requirements and characteristics of materials. Study of the principles of lighting, heating, insulating, water supply, and sanitation.
- 116. Agricultural Power. (3) II.** Mr. Lorenzen
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 105B.
Principles of internal combustion engines and accessories for stationary and mobile power. Design criteria for agriculture.
- 118. Machine Design. (3) II.** Mr. Garland
Lecture—2 hours; laboratory—3 hours.
Prerequisites: courses 102 and 104.
Application of the principles of engineering mechanics, physical properties of materials, and manufacturing processes in the design of machine parts.
- 119. Dynamics of Machines. (3) I.** Mr. Kemper
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 102.
Advanced kinematic analysis and synthesis of typical elements of mechanism; velocity and acceleration analysis of linkages, gearing and cams; inertia forces and balancing problems in machinery.
- 120. Advanced Machine Design. (3) II.** Mr. Kemper
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 118.
Engineering properties of specific arrangements and materials for refinement of machines and their components; vibration isolation; balancing; stress concentration; residual stresses; curved beam analysis; bearing lubrication; design of castings, weldments, and forgings.
- 121. Manufacturing Processes. (2) I.** Mr. Kemper
Lecture—1 hour; laboratory—3 hours.
Prerequisite: courses 45 and 104, or the equivalent.
Casting processes; hot and cold working; machining; measuring and gaging; welding; surface finishing; tooling; jigs and fixtures; introduction to the theoretical basis of metal forming; forces and energy in metal working; interrelation of design and production.
- 122. Introduction to Mechanical Vibrations. (3) I.** Mr. Garland
Lecture—3 hours.
Prerequisite: course 102; Mathematics 106 and 107.
Free and forced vibrations in simple lumped-parameter systems with and without damping; vibrations in coupled systems; equivalent electrical networks; use of energy conservation principle and Lagrange's equations.
- 123. Engineering Laboratory. (3) I.** The Staff (Mr. McKillop in charge)
Laboratory—9 hours.
Prerequisite: courses 100B, 103, 105B.
Special projects designed to acquaint students with techniques of experimental analysis of engineering systems.
- 124. Engineering Systems Design. (3) II.** Mr. Kemper
Lecture—3 hours.
Prerequisite: senior standing in engineering.

The design of engineering systems based on the synthesis of components from the several engineering fields.

125. Compressible Fluid Mechanics. (3) II. Mr. Keim
Lecture—3 hours.

Prerequisite: courses 103 and 105A.

The theory of one-dimensional, compressible flow with related phenomena; unsteady flow in conduits; application to fluid machinery.

130. Material Mechanics Laboratory. (2) I. _____

Laboratory—6 hours.

Prerequisite: courses 45, 104, 132, 133 (133 may be taken concurrently).

A generalized approach to the characterization of the properties of materials with regard to their selection and use. Tests of metals, wood, soil, concrete, aggregate, and asphalts are included.

131. Structural Analysis. (3) II. Mr. Cheney
Lecture—3 hours.

Prerequisite: course 104.

Analysis of determinate structures, including beams, frames, and roof and bridge trusses by algebraic and graphical methods. Introduction to indeterminate structural analysis.

132. Structural Mechanics. (2) II. Mr. Keim

Lecture—2 hours.

Prerequisite: course 183 (may be taken concurrently).

The analysis and design of structural components; special topics in mechanics of materials (torsion, stability); basic design considerations using structural materials (concrete, wood, metals); review of the principal design codes.

133. Soil Mechanics. (3) I. Mr. Cheney

Lecture—3 hours.

Prerequisite: course 104; Geology 150.

Soil as foundation and construction material; origin; classification; physical and mechanical properties; stress; deformation; failure theories; stability; fluid flow (seepage, consolidation); cementive additives and compaction; consideration of design for static and dynamic loads on soil masses (embankments, walls, piles, footings).

134. Analysis and Design of Buildings. (3) I. Mr. Hart

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 132. Recommended: course 133 (may be taken concurrently).

Analysis and design of building structures under the action of vertical dead and live loads, and of wind and earthquake forces. Building code and structural requirements in connection with the use of timber, steel frame, reinforced concrete, and brick.

135. Advanced Structural Mechanics. (3) II. _____

Lecture—3 hours.

Prerequisite: courses 104, 134.

Shear flow analysis of full and semi-monocoque sections; elastic and plastic design of rigid frames, two- and three-hinged arches, and other indeterminate structures; introduction to matrix analysis of space frames; bulkhead and bin design.

136. Functional Aspects of Buildings Design. (3) II. Mr. Hart

Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 104.

The design of structures for industry, public works, and agriculture, with emphasis on costs and functional requirements in regard to labor efficiency, environmental control, and aesthetics.

137. Construction Principles. (3) I. Mr. Cheney

Lecture—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.

142. Water Supply. (3) I. Mr. Burgy

Lecture—3 hours.

Prerequisite: course 103 or Irrigation 118 (may be taken concurrently).

Origin, occurrence, and utilization of surface and ground water supplies; hydrologic analysis and methods of predicting surface and ground water yields; irrigation and urban water requirements; water supply systems including dams and reservoirs, wells, pumping plants, and introduction to water treatment processes.

143. Water Resources Engineering. (3) II. _____

Lecture—3 hours.

Prerequisite: course 142.

Basic concepts of water resources planning; water inventories, use, and control; regional economy and economic potential; water conservation measures and legislation; multiple-purpose project planning, domestic and foreign water development projects.

144. Principles of Drainage Engineering. (2) II. Mr. Luthin

Lecture—2 hours.

Prerequisite: course 103; Irrigation 100 or Soil Science 107.

Elements of seepage through porous media; theory of drainage; depth and spacing of drains; methods of drainage investigation; project planning for drainage; loads on buried pipe; design of gravel filters; strength of tile; engineering analysis of surface drainage.

145. Hydraulic System Design. (3) II. Mr. Amorocho

Lecture—3 hours.

Prerequisite: course 185.

Hydraulic and structural design of impounding structures, diversion works, closed conduit systems, open channel systems, and energy dissipators; engineering analysis of systems for hydro-power generation, irrigation and drainage and flood control projects.

146. Irrigation Engineering Laboratory. (2) II. Mr. Scott

Lecture—1 hour; laboratory—3 hours.

Prerequisite: courses 145, 185 (145 may be taken concurrently).

Experimental analysis and design of water supply systems including related storage and conveyance structures, and of irrigation and drainage systems; measurements and instrumentation.

147. Air and Water Pollution Control. (3) II. Mr. Hart

Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 142.

Engineering and biological principles of waste-handling and treating systems; nature of air pollutants; method of appraising and ameliorating atmospheric pollution; radiological wastes as air and water pollutants.

- 152. Chemical Engineering Thermodynamics.** (3) II. Mr. Shaw
Lecture—3 hours.
Prerequisite: course 105A, Chemistry 110A.
Application of the laws of thermodynamics with particular emphasis on the behavior of fluids, phase equilibria, and chemical reaction equilibrium.
- 154. Chemical Engineering Transport Processes.** (3) II. _____
Lecture—3 hours.
Prerequisite: course 186, Chemistry 110A.
Fundamental concepts of mass transfer in fluids; their applications to absorption, extraction, distillation, and other separation processes.
- 155A. Chemical Engineering Laboratory.** (1) I. Mr. Caswell
Laboratory—3 hours.
Prerequisite: course 186 (should be taken concurrently).
Laboratory experiments and analysis emphasizing fundamentals of momentum and energy transfer.
- 155B. Chemical Engineering Laboratory.** (2) II. Mr. Caswell
Laboratory—6 hours.
Prerequisite: courses 154, 155A (154 should be taken concurrently).
Laboratory experiments and analysis emphasizing fundamentals of mass transfer. Applications to absorption, extraction, distillation and other separation processes.
- 156. Chemical Engineering Kinetics.** (2) I. Mr. Smith
Lecture—2 hours.
Prerequisite: course 152, Chemistry 110A and 112A.
Chemical kinetics and introduction to homogeneous and heterogeneous reactor design.
- 158. Chemical Engineering Process Design.** (2) II. _____
Lecture—2 hours.
Prerequisite: courses 156, 186.
Integration and application of momentum, energy and mass transfer, thermodynamics, and kinetics to design of processes.
- 160. Advanced Electronics.** (3) I and II. _____
Lecture—3 hours.
Prerequisite: courses 100B and 182.
An advanced study of electronic circuits; nonlinear electronic circuits including multivibrators, gates, pulse amplifiers, and blocking oscillators; distributed parameter systems and their lumped-parameter approximations—transmission lines, relay circuits, and distributed amplifiers.
- 161. Electronics Laboratory.** (2) I and II. Mr. Powers
Laboratory—6 hours.
Prerequisite: course 101.
Design of small-signal amplifiers, feedback amplifiers, and tuned amplifiers; observation of the properties of resonant circuits, oscillators, and large signal amplifiers.
- 162. Electronics Laboratory.** (2) I. Mr. Loomis
Laboratory—6 hours.
Prerequisite: courses 160 (may be taken concurrently) and 161.
Laboratory experiments with electronic components and circuits used in pulse, digital, and switching systems.

- 163. Data Systems. (3) I.** Mr. Loomis
Lecture—3 hours.
Prerequisite: course 100A or the equivalent.
A study of the theoretical aspects of data systems; Boolean algebra and its application to discrete signal systems; switching circuits; automata theory; computer systems organization.
- 164. Signal Analysis and Information Transmission. (3) II.** _____
Lecture—3 hours.
Prerequisite: courses 100B and 182.
Discrete and continuous signal systems used in the transmission of information; frequency spectra; modulation and demodulation; probability; random noise; correlation functions; information theory and coding.
- 165A. Solid State Materials and Components. (3) I.** Mr. Freeman
Lecture—3 hours.
Prerequisite: courses 100B and 181; Physics 121.
A study of the electrical characteristics of semiconductor, magnetic, and dielectric materials and solid-state electronic devices, e.g., rectifiers, transistors, magnetic cores, tunnel diodes, multijunction switches, parametric amplifiers, and integrated microelectronic circuits.
- 165B. Solid State Materials and Components. (3) II.** Mr. Freeman
Lecture—3 hours.
Prerequisite: courses 100B and 181; Physics 121.
A study of the electrical characteristics of semiconductors, magnetic, and dielectric materials and solid-state electronic devices, e.g., rectifiers, transistors, magnetic cores, tunnel diodes, multijunction switches, parametric amplifiers, and integrated microelectronic circuits.
- 166. Automatic Feedback Control. (3) II.** _____
Lecture—3 hours.
Prerequisite: courses 100B and 182.
The design and analysis of closed-loop automatic control systems and electronic circuits; signal flow graphs; stability criteria; the use of log-modulus and root-locus methods; phase-plane analysis of nonlinear systems.
- 167. Network Theory. (3) II.** Mr. Freeman
Lecture—3 hours.
Prerequisite: courses 100B and 182.
The theory of network synthesis applied to the design and analysis of one- and two-part networks, including ladder-type filters.
- 170. Electronic Systems Design. (3) II.** Mr. Powers
Lecture—3 hours.
Prerequisite: courses 160 and 162 (may be taken concurrently).
Design factors governing the selection and combination of electronic circuits and devices to produce useful systems for measurement, communication, computation, and control; impedance matching; energy conversion; frequency transformation; analog-digital transformation.
- 171A. Electromagnetic Fields and Waves. (3) I.** Mr. Powers
Lecture—3 hours.
Prerequisite: course 181.
Maxwell's equations applied to static field problems. The diffusion and wave equations; retarded potentials; high frequency resistance; transmission lines; lumped parameters. Wave guides, cavity resonators, and microwave technique. Simple antennas and arrays.

- 171B. Electromagnetic Fields and Waves. (3) II.** Mr. Powers
Lecture—3 hours.
Prerequisite: course 181 (not open to students taking Physics 110A–110B).
Maxwell's equations applied to static field problems. The diffusion and wave equations; retarded potentials; high frequency resistance; transmission lines; lumped parameters. Wave guides, cavity resonators, and microwave technique. Simple antennas and arrays.
- 180. Instrumentation. (3) I.** Mr. Freeman
Lecture—2 hours; laboratory—3 hours.
Prerequisite: senior standing in engineering.
Description and analytical study of instruments used in engineering data observations, in research, and as basic components for controls.
- 181. Introduction to Field Theory. (3) I and II.** Mr. Powers
Lecture—3 hours.
Prerequisite: Mathematics 106 and 107.
Use of vector calculus in the description of steady potential and solenoidal fields with illustrations in gravitational, electrostatic, magnetostatic, thermal, thermodynamic, elastic and fluid domains. Potential and stream functions. Precise and approximate methods of solution of Laplace's equation.
- 182. Linear Systems Analysis. (3) I and II.** Mr. Keim
Lecture—3 hours.
Prerequisite: courses 100A and 102.
The use of operational mathematics in the analysis of lumped-parameter systems and engineering processes characterized by sets of linear differential equations; translational and rotational mechanical systems; hydraulic and pneumatic systems; thermal and chemical processes; electromechanical systems; electronic circuits.
- 183. Intermediate Mechanics of Materials. (3) II.** Mr. Beadle
Lecture—3 hours.
Prerequisite: course 104.
Failure theories; elastic and inelastic behavior; strain energy methods; bending theory, including curved beams; unsymmetrical loading; beams on elastic foundations; torsion of noncircular elements; thin plates; stability; stress concentrations; creep; fatigue.
- 184. Experimental Stress Analysis. (3) II.** Mr. Beadle
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 104.
Experimental methods used for the analysis of stress and strain, including photoelasticity, brittle lacquers, mechanical and electrical strain gages and instrumentation; analogy methods and principles of similitude for loaded structural models.
- 185. Intermediate Fluid Mechanics. (3) I.** Mr. Strelkoff
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 103.
An extension of the principles of solid dynamics, treating the effects of each major fluid property; flows in conduits and around bodies; unsteady flows; boundary layers; turbulence; applications to hydraulics. Laboratory experiments illustrating flow principles and design problems.
- 186. Momentum and Energy Transfer. (3) I.** Mr. Shaw
Lecture—3 hours.
Prerequisite: course 103.
Fundamental concepts of momentum and energy transfer in fluids; their application to heat transfer and flow processes.

- 190. Professional Responsibilities of Engineers.** (2) II. Mr. Kemper
Lecture—2 hours.
Prerequisite: senior standing in Engineering.
Professional ethics and social responsibilities of engineers; introduction to contracts and elements of business law; engineering organization; engineering specifications; written and oral presentation of short technical reports.
- 198. Directed Group Study.** (1-5) I and II. The Staff
Prerequisite: senior standing in engineering with at least a B average.
Group study of selected topics. Student groups may be organized in instrumentation and design problems. Students may enroll in one or more separate subjects.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSES

- 203. Heat and Mass Transfer.** (3) II. Mr. McKillop
Lecture—3 hours.
Prerequisite: course 186; Mathematics 106 and 107, or the equivalent.
Development of equations describing heat, mass, and momentum transfer by convection; analogies among transport systems; applications to systems important in agricultural and food processing and in agricultural climatology.
- 204. Heat Conduction.** (2) I. Mr. McKillop
Lecture—2 hours.
Prerequisite: courses 186, 230 or the equivalent (may be taken concurrently).
Steady-state and transient problems of heat conduction, using both mathematical and numerical methods of solution.
- 205. Thermal Radiation.** (2) I. Mr. McKillop
Lecture—2 hours.
Prerequisite: course 186.
The transfer of radiant energy, gaseous radiation, geometrical and spectral characteristics of systems involving thermal radiation.
- 210. Field Theory.** (3) I. Mr. Powers
Lecture—3 hours.
Prerequisite: course 181.
Energy relationships in fields; interaction of fields and matter; time-variant fields in acoustic, electromagnetic, and fluid domains; diffusion and radiation equations; the Navier-Stokes equation and some of its special integrals; introduction to tensor methods.
- 220. Mechanical Vibrations.** (3) II. Mr. Garland
Lecture—3 hours.
Prerequisite: course 122.
Systems with many degrees of freedom. Newton's and Lagrange's methods and Rayleigh-Ritz approximation. Vibration of beams, shafts, and machine elements. Non-harmonic vibrations. Solution by precise, graphical, and numerical techniques. Vibration of diaphragms. Autoexcitation. Vibration measurement.
- 225. Theory of Elasticity.** (3) I. Mr. Keim
Lecture—3 hours.
Prerequisite: Mathematics 106 and 107.
Tensor formulation of the stress-strain field. Plane stress and strain in rectangular and cylindrical coordinates. Solution by complex variable method.

Introduction to three-dimensional problems. Bending and torsion of prismatical bars and plates. Display and measurement of strain.

230. Engineering Analysis. (3) II.

Mr. McKillop

Lecture—3 hours.

Prerequisite: Mathematics 106 and 107, or the equivalent.

Methods of theoretical analysis of typical engineering problems in heat transfer, fluid mechanics, electrical network, mechanical vibrations, and elasticity.

252. Advanced Engineering Thermodynamics. (3) I.

Mr. Smith

Lecture—3 hours.

Prerequisite: course 105B or 152, or the equivalent.

General treatment of the first and second laws; applications of thermodynamic relationships to chemical and nonchemical systems and to phase and chemical reaction equilibrium; introduction to irreversible processes and to statistical thermodynamics.

255. Equilibrium Stage Processing. (3) I.

Mr. Caswell

Lecture—3 hours.

Prerequisite: courses 154 and 252 (may be taken concurrently).

The concept of equilibrium stage processing; application to the design of distillation, absorption, and extraction processes.

256. Applied Kinetics and Reactor Design. (3) II.

Lecture—3 hours.

Prerequisite: courses 156 and 252 or the equivalent.

Application of kinetics and transport rates to the design of chemical reactors; emphasis on heterogenous catalytic systems.

271. Advanced Hydrology. (2) I.

Mr. Burgy

Lecture—2 hours.

Prerequisite: course 142 and consent of the instructor.

Advanced study and analysis of hydrologic processes including the theoretical considerations in investigation and analysis of water development for power, irrigation, municipal, industrial, and other uses. Hydrometeorology, including analysis of precipitation and runoff, unit graphs, and flood forecasting, routing, and control.

272. Advanced Ground Water Problems. (2) II.

Mr. Scott

Lecture—2 hours.

Prerequisite: course 142 and consent of the instructor.

Analyses and methods of groundwater development; fluid mechanics of porous solids; geophysical exploration and analysis; artificial recharge concepts; hydraulics of wells, including analytical treatment of transient flow problems; and problems of well design.

275. Flow in Porous Media. (2) II.

Mr. Luthin

Lecture—2 hours.

Prerequisite: Mathematics 106 and 107, or the equivalent, and consent of the instructor.

Elements of potential theory, methods of solving flow equations, numerical analysis, and solutions to specific seepage problems involving dams and other hydraulic structures.

276. Hydrologic and Hydraulic System Analysis. (3) II.

Mr. Amorocho

Lecture—3 hours.

Prerequisite: courses 142 and 145; Mathematics 106 and 107.

Theory and application of the methods of techniques of modern system analysis to hydrologic and hydraulic systems; emphasis on flood prediction studies and on planning, development, and operation of irrigation and power projects.

- 277. Mechanics of Open-Channel Flow.** (3) II. Mr. Strelkoff
Lecture—3 hours.
Prerequisite: course 185; Mathematics 106. Recommended: a short course in Fortran programming (may be taken concurrently).
Principles of fluid mechanics adapted to flow with free surface. Resistance in uniform flows; gradually and rapidly varied flows; critical depth; unsteady flows, graphic and numerical solutions; supercritical flows; shock waves; hydraulic jump. Solutions by digital computer.
Offered in even-numbered years.
- 278A. Advanced Fluid Mechanics.** (3) I. Mr. Strelkoff
Lecture—3 hours.
Prerequisite: Mathematics 106, 107, and 185. Recommended: course 185.
Dimensional analysis; general equations of motion, momentum, and energy; stream function; classical hydrodynamics; velocity potential; conformal mapping.
- 278B. Advanced Fluid Mechanics.** (3) II. Mr. Strelkoff
Lecture—3 hours.
Prerequisite: course 278A.
Viscous flow; the Navier-Stokes equations and solutions for laminar flow; turbulent flow and Reynolds equations; diffusion; the boundary layer approximation; free turbulent shear flows.
- 290. Seminar.** (1) II. The Staff
Lecture—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.
- 298. Group Study.** (1-5) I and II. The Staff (Mr. S. M. Henderson in charge)
Engineering topics important to agriculture such as: vibration, indeterminate structures, mass transfer, control systems, electronics, micrometeorology, fluid mechanics of porous systems, instrumentation, food processing unit operations. The topics treated are dependent upon the availability of staff and student interest.
- 299. Research.** (1-6) I and II. The Staff

ENGLISH

William V. O'Connor, Ph.D., *Chairman of the Department.*
Robert A. Wiggins, Ph.D., *Vice-chairman of the Department.*
Department Office, 224 Sproul Hall

Everett Carter, Ph.D., *Professor of English.*
Solomon Fishman, Ph.D., *Professor of English.*
Gwendolyn B. Needham, Ph.D., *Professor of English.*
William V. O'Connor, Ph.D., *Professor of English.*
Linda Van Norden, Ph.D., *Professor of English.*
Brom Weber, Ph.D., *Professor of English.*
Celeste T. Wright, Ph.D., *Professor of English.*
Jay L. Halio, Ph.D., *Associate Professor of English.*
Thomas A. Hanzo, Ph.D., *Associate Professor of English.*
Elizabeth R. Homann, Ph.D., *Associate Professor of English.*
Hugh B. Staples, Ph.D., *Associate Professor of English.*
Robert A. Wiggins, Ph.D., *Associate Professor of English.*
*Alexander B. Chambers, Ph.D., *Assistant Professor of English.*
Hilton J. Landry, Ph.D., *Assistant Professor of English.*
Ralph A. Randal, Ph.D., *Assistant Professor of English.*
Daniel S. Silvia, Jr., Ph.D., *Assistant Professor of English.*



Howard Baker, Ph.D., *Lecturer in English.*

ENGLISH MAJOR

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Departmental Major Advisers.—Mr. Chambers, Mr. Fishman, Mr. Halio, Mrs. Homann, Mr. Landry, Mr. Silvia, Mr. Staples, Miss Van Norden, Mr. Wiggins, Mrs. Wright.

The Major Program

(A) Lower Division Courses.—First year, course 1A-1B required. Second year, course 45A-45B. Recommended: philosophy.

(B) Upper Division Courses.—Twenty-four units of upper division courses in literature with specific requirements: third year, course 117J; fourth year, course 145A-145B. Recommended: a course in English history.

Courses 106L and 110 and Speech 1A or 2A are required of candidates for the Certificate of Completion of the teacher-training curriculum whose teaching major is English.

The department will certify to the completion of a major program for graduation only on the basis of at least a grade C average in the upper division courses taken in the department. Students who do not maintain such an average will be required to withdraw from the major in English.

Attention is called to the requirements in foreign languages for higher degrees in English—a reading knowledge of French or German for the M.A. degree; of French, German, and Latin for the Ph.D. degree. Undergraduates contemplating advanced study in English should prepare to satisfy these requirements as they proceed to the bachelor's degree.

Honors and Honors Program (see page 94).—The honors program consists of course 194H in the senior year in addition to the regular major.

* Sabbatical leave in residence, fall semester 1963-1964.

Graduate Study.—The Department of English offers programs of study and research leading to the M.A. and Ph.D. degrees.

LOWER DIVISION COURSES

Students must have passed Subject A before taking any course in English.

1A. First-Year Reading and Composition. (3) I and II.

Mr. Fishman, Mr. Hadio, Mr. Landry, Mr. Wiggins, Mr. O'Connor
Lecture—1 hour; discussion—2 hours.

1B. First-Year Reading and Composition. (3) I and II.

Mrs. Wright, Mr. Chambers, Mr. Hanzo, Mrs. Homann
Lecture—1 hour; discussion—2 hours.

Prerequisite: course 1A.

Continuation of course 1A. For maximum benefit, the student is advised to complete both courses.

30A. Survey of American Literature to the Civil War. (3) I. Mr. Wiggins

Lecture—3 hours.

Prerequisite: course 1A.

30B. Survey of American Literature after the Civil War. (3) II.

Lecture—3 hours.

Prerequisite: course 1A. Course 30A is not prerequisite to 30B.

Mr. Wiggins

31. Intermediate Composition. (3) II.

Lecture—3 hours.

Prerequisite: course 1B.

Designed primarily for non-majors who wish to improve their skills in expository writing.

Mr. Staples

45A. Critical Reading of Poetry. (3) I and II.

Lecture—3 hours.

Prerequisite: course 1B.

Analysis and evaluation of works representing main types of English and American poetry.

Mr. Landry, Mr. Staples, Mrs. Wright

45B. Critical Reading of Prose. (3) I and II

Lecture—3 hours.

Prerequisite: course 45A.

Analysis and evaluation of works representing main types of English and American prose.

Mr. Ranald, Mr. Silvia

46A. Masterpieces of English Literature. (3) I.

Lecture—3 hours.

Prerequisite: course 1A. Recommended: course 1B.

Selected works of principal writers before the eighteenth century; lectures and discussion. Designed for majors and nonmajors.

Mrs. Wright

46B. Masterpieces of English Literature. (3) II.

Lecture—3 hours.

Prerequisite: course 1A. Recommended: course 1B.

Selected works of principal writers after 1700; lectures and discussion. Designed for majors and nonmajors.

Mr. Chambers

47. Introduction to Modern Literature. (3) I and II. Mr. Weber, Mr. Staples

Lecture—3 hours.

Prerequisite: course 1B.

Chief twentieth-century writers of England and America.

UPPER DIVISION COURSES

English 1A is prerequisite to all upper division courses.

- 106G. Creative Writing.** (3) I. Mr. Baker
Lecture—3 hours.
Prerequisite: course 1B. Sophomore students may enroll in this course with the consent of the instructor.
- 106L. Advanced Composition.** (3) I and II. Mr. Halio, Miss Van Norden, Mr. Silva
Lecture—3 hours.
Prerequisite: course 1B.
Designed to develop a clear, accurate, interesting style. Required of prospective high school English teachers.
- 110. Language.** (3) I. Mrs. Homann
Lecture—3 hours.
Origins, materials, growth, and function of language, with emphasis on English.
- 114A. The English Drama to 1620.** (3) I. Mr. Halio
Lecture—3 hours.
Medieval, Tudor, and early Stuart plays.
- 114B. The English Drama from 1620 to 1800.** (3) II. Mrs. Wright
Lecture—3 hours.
Later Stuart, Restoration, and Eighteenth Century plays.
- *114C. The English Drama from 1800 to the Present.** (3) I. Mr. Landry
Lecture—3 hours.
- 116. The English Bible as Literature.** (3) II. Miss Van Norden
Lecture—3 hours.
- 117J. Shakespeare.** (3) I and II. Mr. Chambers, Mrs. Wright, Mr. Halio, Mr. Landry
Lecture—3 hours.
Study of twelve to fifteen of Shakespeare's principal plays.
- 119. The Age of Johnson.** (3) II. Mrs. Needham
Lecture—3 hours.
- 125C. The English Novel.** (3) I. Mrs. Needham
Lecture—3 hours.
From the beginnings to Dickens.
- 125D. The English Novel.** (3) II. Mrs. Needham
Lecture—3 hours.
From Dickens to Hardy.
- 125E. The American Novel.** (3) I. Mr. Ranald
Lecture—3 hours.
Reading and discussion of selected American novels.
- 125F. The English Novel.** (3) II. Mr. Fishman
Lecture—3 hours.
From Hardy to the present.
- 131. Colonial and Neo-Classical American Literature.** (3) I. Mr. Weber
Lecture—3 hours.
Literature in America to 1800.

* Not to be given, 1963-1964.

132. **Romanticism in American Literature.** (3) II. Mr. Weber
Lecture—3 hours.
Irving, Cooper, Emerson, Thoreau, and other early nineteenth-century writers.
133. **Hawthorne and Melville.** (3) II. Mr. Weber
Lecture—3 hours.
134. **American Literature from 1865 to 1914.** (3) I. Mr. Carter
Lecture—3 hours.
135. **Modern American Literature.** (3) II. Mr. Baker
Lecture—3 hours.
Twentieth-century prose, poetry, and drama.
- 144A. **Masterpieces of World Literature: The Epic.** (3) I. Miss Van Norden
Lecture—3 hours.
Iliad; Odyssey; Aeneid; Beowulf; Divine Comedy; Paradise Lost.
- *144B. **Masterpieces of World Literature: The European Novel.** (3) II. _____
Lecture—3 hours.
Representative European novelists of the nineteenth and twentieth centuries.
- 145A. **History of English Literature.** (3) I. Mrs. Homann
Lecture—3 hours.
Prerequisite: course 45A–45B or consent of the instructor.
A study of English literature and its backgrounds.
- 145B. **History of English Literature.** (3) II. Mr. Ranald
Lecture—3 hours.
Prerequisite: course 45A–45B or consent of the instructor.
A study of English literature and its backgrounds.
147. **Introduction to Principles of Criticism.** (3) II. Mr. Ranald
Lecture—3 hours.
Examination of the principal theories of literary criticism and their application to literature, with emphasis on modern criticism.
149. **The English Lyric.** (3) I. Mr. Landry
Lecture—3 hours.
Reading and discussion of representative lyric poems, English and American.
151. **Study of a Major Writer.** (3) I and II. Mr. Hanzo, Mr. Wiggins
Lecture—3 hours.
With the consent of the instructor, this course may be repeated for credit.
154. **Chaucer.** (3) II. Mrs. Homann
Lecture—3 hours.
155. **Medieval Literature.** (3) I. Mr. Silvia
Lecture—3 hours.
Chief writers of the Middle Ages other than Chaucer.
- 158A. **The Age of Elizabeth.** (3) I. Mr. Baker
Lecture—3 hours.
Beginnings of the English Renaissance, and literature of the sixteenth century.

* Not to be given, 1963–1964.

- 158B. **Literature of the Seventeenth Century.** (3) II. Mr. Chambers
Lecture—3 hours.
159. **Milton.** (3) I. Miss Van Norden
Lecture—3 hours.
165. **The Age of Dryden.** (3) II. Miss Van Norden
Lecture—3 hours.
English literature of the Restoration.
166. **The Age of Swift and Pope.** (3) I. Mr. Ranald
Lecture—3 hours.
177. **The Romantic Period.** (3) I. Mr. Fishman
Lecture—3 hours.
Wordsworth, Coleridge, Byron, Shelley, Keats, and their eighteenth-century precursors.
187. **Prose and Poetry of the Victorian Period.** (3) I. Mr. Staples
Lecture—3 hours.
Major poets and nonfiction prose writers of the period 1832–1901, including Tennyson, Browning, and Arnold; Carlyle, Ruskin, and Newman.
191. **British Literature from 1880 to 1918.** (3) I. Mr. O'Connor
Lecture—3 hours.
Wells, Shaw, Conrad, Hardy, Housman, and other representative writers.
192. **British Literature from 1918 to the Present.** (3) II. Mr. Hanzo
Lecture—3 hours.
Lawrence, Joyce, Yeats, Eliot, and other representative writers.
- 194H. **Special Study for Honors Students.** (2) I and II. The Staff
Conference—1 hour.
Prerequisite: honors status.
Individual directed study leading to preparation of a long paper. May be repeated once for credit.
198. **Directed Group Study.** (3) I and II. The Staff
Lecture—3 hours.
199. **Special Study for Advanced Undergraduates.** (1–3) I and II.
The Staff (Mr. O'Connor in charge)
Limited to seniors who have completed at least 9 units of upper division English and who have the consent of the instructor.

GRADUATE COURSES

200. **Techniques of Literary Scholarship.** (3) I. Mr. O'Connor
Lecture—3 hours.
211. **Introduction to Old English.** (3) II. Mr. Silvia
Lecture—3 hours.
Anglo-Saxon language and literature.
- *212. **Middle English and Early Modern English Philology.** (3) II.
Lecture—3 hours. Mrs. Homann, Mr. Silvia
From early Middle English dialects to the language of Dryden and Pope.
213. **Readings in Middle English.** (3) II. Mrs. Homann
Seminar—3 hours.
Rapid reading of selections in Middle English from the twelfth to the fifteenth century.

- *214. **Arthurian Romance.** (3) I. Mrs. Homann
Seminar—3 hours.
The Arthurian tradition in the Middle Ages.
217. **Shakespeare.** (3) II. Mr. Halio
Seminar—3 hours.
Problems in Shakespearean criticism and interpretation.
- *231. **American-European Literary Relations.** (3) II. Mr. Carter
Seminar—3 hours.
The interchange of ideas between Europe and America in the nineteenth and twentieth centuries.
232. **Topics on American Writers.** (3) II. Mr. Weber
Lecture—3 hours.
Examination of selected major figures.
- *254. **Elizabethan and Jacobean Drama.** (3) II. Mrs. Wright
Seminar—3 hours.
Kyd, Marlowe, Beaumont and Fletcher, Jonson, Ford, Webster, Massinger, Shirley.
255. **Sense and Sensibility in the Eighteenth Century.** (3) I. Mrs. Needham
Seminar—3 hours.
Rationalism and sentimentalism in eighteenth-century thought and literature.
- *256. **The Irish Literary Renaissance.** (3) II. Mr. Hanzo
Seminar—3 hours.
Twentieth-century Anglo-Irish literature.
- *260. **Medieval Literature.** (3) I. Mrs. Homann
Seminar—3 hours.
Selected topics in the literature of the period.
262. **Sixteenth-Century Literature.** (3) I. Mr. Landry
Seminar—3 hours.
263. **Seventeenth-Century Literature.** (3) I. Mr. Hanzo
Seminar—3 hours.
- *264. **Eighteenth-Century Literature.** (3) II. Mrs. Needham
Seminar—3 hours.
265. **Nineteenth-Century Literature.** (3) I. Mr. Staples
Seminar—3 hours.
266. **Twentieth-Century Literature.** (3) II. Mr. O'Connor
Seminar—3 hours.
270. **American Literature.** (3) II. Mr. Carter
Seminar—3 hours.
- *271. **Dramatic Literature.** (3) II. _____
Seminar—3 hours.
Problems in dramatic theory, criticism, and interpretation.
272. **Fiction.** (3) II. Mr. Baker
Seminar—3 hours.
Problems in the theory and practice of the novel.

* Not to be given, 1963-1964.

- 273. Literary Criticism. (3) II.** Mr. Fishman
Seminar—3 hours.
A survey of literary criticism from Aristotle to the present.
- *280. Ideas of the Self in Contemporary Literature. (3) I.** Mr. Hanzo
Seminar—3 hours.
Definitions of selfhood in the works of major twentieth-century writers in England.
- 299. Individual Study. (1-3) I and II.** The Staff
This course is for students investigating a restricted field; it involves research and the writing of a report. It is not a substitute for available seminars.
- 299D. Special Study for the Doctoral Dissertation. (1-6) I and II.** The Staff

PROFESSIONAL COURSE

- 300. Problems in Teaching English Literature and Composition in Secondary Schools. (2) I.** Mrs. Needham
Prerequisite: senior or graduate standing; an English teaching major or minor.
This course, designed for seniors and graduate students undertaking an English teaching major or minor, should be completed before practice teaching. The course is accepted in partial satisfaction of the 22-unit requirement in education for the general secondary credential.

ENOLOGY

For courses in enology see "Viticulture and Enology," page 317.

* Not to be given, 1963-1964.

ENTOMOLOGY

Richard M. Bohart, Ph.D., *Chairman of the Department.*
Department Office, 124 Robbins Hall

Oscar G. Bacon, Ph.D., *Professor of Entomology.*
Stanley F. Bailey, Ph.D., *Professor of Entomology.*
Richard M. Bohart, Ph.D., *Professor of Entomology.*
Harry H. Laidlaw, Jr., Ph.D., *Professor of Entomology.*
William H. Lange, Jr., Ph.D., *Professor of Entomology.*
Eugene M. Stafford, Ph.D., *Professor of Entomology.*
Francis M. Summers, Ph.D., *Professor of Entomology.*
John E. Eckert, Ph.D., *Professor of Entomology, Emeritus.*
Leslie M. Smith, Ph.D., *Professor of Entomology, Emeritus.*
Norman E. Gary, Ph.D., *Assistant Professor of Entomology.*
Charles L. Judson, Ph.D., *Assistant Professor of Entomology.*
‡Frank E. Strong, Ph.D., *Assistant Professor of Entomology.*



James R. Douglas, Ph.D., *Professor of Parasitology.*
Albert A. Grigarick, Jr., Ph.D., *Lecturer in Entomology.*
Paul D. Hurd, Jr., Ph.D., *Lecturer in Entomology (Berkeley campus).*
Dewey J. Raski, Ph.D., *Professor of Nematology.*
Gunter Zweig, Ph.D., *Lecturer in Entomology.*

ENTOMOLOGY

Departmental Major Advisers.—Mr. Bacon, Mr. Grigarick.

Bachelor of Science Major Program and Graduate Study. See page 58.

LOWER DIVISION COURSES

1. **An Introduction to Entomology.** (4) II. Mr. Strong
Lecture—2 hours; laboratory—6 hours.
A basic study of insects: their biology, anatomy, classification, and relation to human welfare.
10. **Natural History of the Insects.** (3) I. Mr. Bacon
Lecture—3 hours.
Prerequisite: designed for students not specializing in zoological sciences. Not open for credit to students who have had course 1.
Principles of biology as illustrated by the taxonomy, morphology, and behavior of insects.
49. **Summer Field Course.** (No credit). Mr. Bohart, Mr. Hurd, Mr. MacSwain
Five weeks, daily.
Prerequisite: one course in entomology or consent of the instructor.
The study and collection of insects in their natural habitats, with special emphasis on ecology, life histories, and field recognition.

UPPER DIVISION COURSES

105. **An Introduction to Apiculture.** (2) II. Mr. Gary
Lecture—2 hours.
Prerequisite: Zoology 1A or 10, Botany 1, or consent of the instructor.
Biology and behavior of honeybees; communication, orientation, social organization, foraging activities, honey production, pollination activities.

‡ Absent on leave, fall semester, 1963–1964.

- 105L. Apiculture Laboratory.** (2) II. Mr. Gary
Laboratory—6 hours.
Prerequisite: course 105 (may be taken concurrently).
Biology and behavior of honeybees (especially communicative behavior); fundamentals of colony management necessary for efficient agricultural use; utilization of bees in research and teaching.
- 106. Introduction to Structure and Function in Insects.** (4) I. Mr. Summers
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1 or equivalent.
General principles of insect morphology with emphasis on the functional approach. Comparative anatomy of selected insect types.
- 107. Advanced Apiculture.** (4) II. Mr. Laidlaw
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 105 or consent of the instructor.
Principles of modern queen bee rearing; function of the queens; anatomy of reproductive system, formation of germ cells; genetic considerations; artificial insemination.
- 110. Insect Physiology.** (3) I. Mr. Judson
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1 or the equivalent, Chemistry 8. Recommended: course 106.
Vital functions of insects and related organisms.
- 112. Systematic Entomology.** (4) I. Mr. Bohart
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1 or equivalent.
The classification of insects, taxonomic categories and procedures; bibliographical methods; nomenclature; museum practices.
- 119. Acarology.** (3) II. Mr. Summers
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 112 or 124.
The taxonomy, morphology, and ecology of mites, with special emphasis on plant-feeding and predaceous species.
Offered in odd-numbered years.
- 124. Economic Entomology.** (4) I and II.
I. Mr. Grigarick; II. Mr. Lange.
Lecture—2 hours; laboratory—6 hours.
Life histories, habits, and principles underlying control of insects attacking fruit trees, field and vegetable crops.
- 127. Insect Ecology.** (3) II. Mr. Bailey
Lecture—3 hours.
Prerequisite: upper division standing in one of the biological sciences.
Principles of ecology with examples from the insects; insect behavior; analysis of the insect environment; population dynamics.
- 128. Chemistry of Insecticides and Fungicides.** (4) II. Mr. Stafford
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Chemistry 8, or consent of the instructor.
Chemical composition and reactions of insecticides and fungicides, and their physiological effects on plant and animal tissues.
- 130A. Agricultural Entomology.** (3) I. Mr. Bacon, Mr. Lange
Lecture—3 hours.
Prerequisite: course 124.

Bionomics and principles involved in control of insects and mites; side effects on vertebrates and invertebrates following insecticide usage. Primary emphasis on field and vegetable crops.

Offered in even-numbered years.

130B. Agricultural Entomology. (3) II. Mr. Bailey, Mr. Stafford

Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 124.

Complementary to 130A but emphasizing plot design, sampling techniques, control programs, and equipment. Examples primarily from deciduous fruit and nut pests.

Offered in odd-numbered years.

198. Directed Group Study. (1-5) I and II. The Staff (Mr. Bohart in charge)

Prerequisite: consent of the instructor.

Group study of selected topics in acarology, coccidology, immature insects, and other problems for which student groups may be organized.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

The Staff (Mr. Bohart in charge)

GRADUATE COURSES

250. Principles and Methods of Entomological Research. (3) II.

Lecture—2 hours; laboratory—3 hours.

Mr. Lange, Mr. Strong

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.

290. Seminar. (2) I and II.

The Staff

Seminar—2 hours.

Advanced study in various fields of entomology and parasitology. Topics will vary from year to year.

299. Research. (1-6) I and II.

The Staff

FOOD SCIENCE AND TECHNOLOGY

Reese H. Vaughn, Ph.D., *Acting Chairman of the Department.*
Department Office, 126A Cruess Hall

- Clinton O. Chichester, Ph.D., *Professor of Food Science and Technology.*
†Walter L. Dunkley, Ph.D., *Professor of Food Science and Technology.*
Robert E. Feeney, Ph.D., *Professor of Food Science and Technology.*
Eugene L. Jack, Ph.D., *Professor of Food Science and Technology.*
George L. Marsh, M.S., *Professor of Food Science and Technology.*
Emil M. Mrak, Ph.D., *Professor of Food Science and Technology.*
Herman J. Phaff, Ph.D., *Professor of Food Science and Technology.*
Joseph M. Smith, Sc.D., *Professor of Food Science and Technology and Professor of Engineering.*
†Clarence Sterling, Ph.D., *Professor of Food Science and Technology.*
George F. Stewart, Ph.D., *Professor of Food Science and Technology.*
Aloys L. Tappel, Ph.D., *Professor of Food Science and Technology.*
Nikita P. Tarassuk, Ph.D., *Professor of Food Science and Technology.*
Reese H. Vaughn, Ph.D., *Professor of Food Science and Technology.*
Chester L. Roadhouse, D.V.M., *Professor of Dairy Industry, Emeritus.*
Edwin B. Collins, Ph.D., *Associate Professor of Food Science and Technology.*
Walter G. Jennings, Ph.D., *Associate Professor of Food Science and Technology.*
Thomas A. Nickerson, Ph.D., *Associate Professor of Food Science and Technology.*
Lloyd M. Smith, Ph.D., *Associate Professor of Food Science and Technology.*
†John B. Whitaker, Ph.D., *Associate Professor of Food Science and Technology.*
Richard A. Bernhard, Ph.D., *Assistant Professor of Food Science and Technology.*
Mendel Mazelis, Ph.D., *Assistant Professor of Food Science and Technology.*
Martin W. Miller, Ph.D., *Assistant Professor of Food Science and Technology.*
George K. York, II, Ph.D., *Assistant Professor of Food Science and Technology.*



- Maynard A. Amerine, Ph.D., *Professor of Enology.*
Harold W. Berg, M.S., *Professor of Enology.*
A. Wade Brant, Ph.D., *Lecturer in Food Science and Technology.*
Donald G. Crosby, Ph.D., *Lecturer in Food Science and Technology.*
James F. Guymon, Ph.D., *Professor of Enology.*
John C. Harper, D.Sc., *Associate Professor of Agricultural Engineering.*
Wendell W. Kilgore, Ph.D., *Lecturer in Food Science and Technology.*
Samuel Lepkovsky, Ph.D., *Professor of Poultry Husbandry (Berkeley Campus)*
Tommy Nakayama, Ph.D., *Lecturer in Food Science and Technology.*
Daniel W. Peterson, Ph.D., *Associate Professor of Poultry Husbandry.*
Edward B. Roessler, Ph.D., *Professor of Mathematics.*

Departmental Major Advisers. Mr. Marsh, Mr. Miller, Mr. Nickerson.
Bachelor of Science Major Program and Graduate Study. See page 58.

† Absent on leave, 1963-1964.

LOWER DIVISION COURSES

1. Introduction to Food Science. (2) I.

Lecture—2 hours.

Mr. Amerine, Mr. Stewart, Mr. Vaughn

Historical and philosophical aspects of food processing and its relationships to man's health and well-being. World's food supply and its use by human populations. Trends in the processing, preservation, and utilization of food.

UPPER DIVISION COURSES

101. Chemistry and Biochemistry of Food Processing. (2) II.

Lecture—2 hours.

Mr. Sterling, Mr. Tappel

Prerequisite: Biochemistry 101 or equivalent.

Chemical and biochemical principles in relation to food processing problems: hydrophilic polymers, enzymes, lipids, proteins, and vitamins.

103. Physical and Chemical Methods for Food Analysis. (4) II.

Lecture—2 hours; laboratory—6 hours.

Mr. Bernhard

Prerequisite: Chemistry 5 and Biochemistry 101L or their equivalents.

Theory and application of physical and chemical methods for analyzing foods.

105. Food and Industrial Microbiology. (3) I.

Mr. Collins, Mr. York

Lecture—3 hours.

Prerequisite: Bacteriology 1; Chemistry 1B, and 8.

Microbiology of food fermentations (including vinous fermentation, but not brewing), food processing, food spoilage, and the disposal of wastes.

105L. Food and Industrial Microbiology Laboratory. (2) I.

Laboratory—6 hours.

Mr. Collins, Mr. York

Prerequisite: course 105 (should be taken concurrently); Bacteriology 1; Chemistry 8.

Microbiology of food fermentations (including vinous fermentation, but not brewing), food processing, food spoilage and the disposal of wastes.

106. Food and Industrial Microbiology Summer Laboratory. (2)

Laboratory—90 hours total.

Mr. Nakayama, Mr. Phaff

Prerequisite: Bacteriology 106.

Microorganisms and their activities in relation to industrial processes such as baking; brewing; production of industrial alcohol, yeasts, solvents, vitamins, enzymes, antibiotics, and other drugs.

107. Analysis of Foods by Sensory Methods. (3) II.

Lecture—2 hours; laboratory—3 hours.

Mr. Amerine, Mr. Roessler

Prerequisite: Mathematics 13.

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.

108. Food Industry Sanitation. (3) II.

Mr. Jennings

Lecture—2 hours; laboratory—3 hours.

Prerequisite: Bacteriology 1; Chemistry 8.

Principles and practices of food industry sanitation, laws and regulations; inspection techniques; significance of microorganisms; control of animal and insect pests; detergents and chemical sanitizers; water supplies and waste disposal; plant and equipment problems; and sanitation of selected food industries.

109. Quality Control for Food Processing Operations. (3) I.

Lecture—2 hours; laboratory—3 hours.

Mr. Bernhard, Mr. Smith

Prerequisite: courses 103 and 105L; Mathematics 13 or equivalent.

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. Offered in even-numbered years.

110. Engineering Principles of Food Processing. (5) I.

Lecture—3 hours; laboratory—6 hours.

Mr. Harper, Mr. Smith

Prerequisites: Mathematics 16B; Physics 2B, 3B; Chemistry 109.

Application of the conservation of mass and energy to food processing. Introduction to process principles, including counter-current operation and equilibrium stage processing. Elements of fluid mechanics and heat transfer with illustrations in the food industry.

114. Principles of Processing Fruit and Vegetable Products. (3) II.

Lecture—2 hours; laboratory—3 hours.

Mr. Marsh

Prerequisite: Chemistry 8; Bacteriology 1.

Technical principles relating to processing operations used in the commercial preservation of fruit and vegetable products; theory and practical applications; field trips.

***118A. Principles of Dairy Processing. (3) I.**

Lecture—3 hours.

Prerequisite: Biochemistry 101 or the equivalent; Bacteriology 1.

Principles and technological processes involved in the processing of dairy foods.

118B. Principles of Dairy Processing. (3) II.

Mr. Nickerson

Lecture—3 hours.

Prerequisite: Biochemistry 101 or the equivalent; Bacteriology 1.

Principles and technological processes involved in the processing of dairy foods.

122. Enzyme Technology. (3) II.

Mr. Nokayama

Lecture—2 hours; laboratory—3 hours.

Prerequisite: Biochemistry 101.

Special emphasis on enzymes involved in food and beverage production. The characteristics of these enzymes, methods of production, measurement of activity, control and utilization in the preparation and preservation of specific foods and food products.

130. Chemistry of Milk and Dairy Products. (2) II.

Mr. Tarassuk

Lecture—2 hours.

Prerequisite: Biochemistry 101 or the equivalent.

The physical and chemical properties of milk and milk products and their relationship to the manufacture and quality of dairy products.

132. Microbiology of Milk and Dairy Products. (2) II.

Mr. Collins

Lecture—1 hour; laboratory—3 hours.

Prerequisite: course 105.

Significance, control, and detection of bacteria and other microorganisms used in manufacturing and/or ripening dairy products; bacteriophage action and control; defects produced by microorganisms; destruction of microorganisms; protection of public health.

190. Recent Advances in Food Technology. (1) I.

Mr. Chichester

Lecture—1 hour.

Prerequisite: two courses in food science and technology or equivalent.

Assigned topics, reports, and discussions concerning recent advances in food technology.

* Not to be given, 1963-1964.

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

Prerequisite: consent of the instructor. The Staff (Mr. Vaughn in charge)
Directed group study of selected topics in food science and technology for advanced undergraduates.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

The Staff (Mr. Vaughn in charge)

GRADUATE COURSES

210. Proteins—Their Functional Activities and Interactions. (3) II.

Lecture—3 hours.

Mr. Feeny

Prerequisite: Biochemistry 101; Chemistry 109 or 110A-110B; or consent of the instructor. Recommended: Chemistry 112A-112B.

The relationships of structure of proteins to their biological functions. Structural proteins, complexing proteins, and catalytic proteins in plant and animal materials and products.

211. Chemistry of the Food Lipids. (2) I.

Mr. Jack, Mr. Smith

Lecture—2 hours.

Prerequisite: Biochemistry 101 or equivalent.

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.

***216. Yeasts and Related Organisms.** (4) II.

Mr. Miller, Mr. Phaff

Lecture—2 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, including certain industrial aspects.

220. The Natural Coloring Matters. (2) I.

Mr. Chichester

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.

290. Seminar. (1) I and II.

Mr. Mazelis

299. Research. (1-9) I and II.

The Staff (Mr. Vaughn in charge)

Prerequisite: graduate standing.

RELATED COURSES

Agricultural Business Management (Agricultural Economics 115A-115B)

Handling, Storage, and Transit of Fruits (Pomology 112)

Technology of Handling Poultry Products (Poultry Husbandry 121)

Concepts of Animal Nutrition (Nutrition 250)

Handling, Storage, and Transit of Vegetables (Vegetable Crops 112)

Enology: Wine Processing and Analyses (Viticulture 124)

Enology: Wine Preparation (Viticulture 125)

* Not to be given, 1963-1964.

FOREIGN LANGUAGES

Merle L. Perkins, Ph.D., *Chairman of the Department.*

Department Office, 524 Sproul Hall

- Merle L. Perkins, Ph.D., *Professor of French.*
Siegfried B. Puknat, Ph.D., *Professor of German.*
Maria C. Zardoya, Ph.D., *Professor of Spanish.*
Iver N. Nelson, Ph.D., *Professor of Spanish, Emeritus.*
Max Bach, Ph.D., *Associate Professor of French.*
Donald G. Castanien, Ph.D., *Associate Professor of Spanish.*
Roland W. Hoermann, Ph.D., *Associate Professor of German.*
Daniel S. Keller, Ph.D., *Associate Professor of Spanish.*
Keith V. Sinclair, Docteur de l'Université de Paris, Ph.D., *Associate Professor of French.*
Wayne S. Bowen, Ph.D., *Assistant Professor of Spanish.*
Ulrich Gaier, Dr.Phil., *Assistant Professor of German.*
Richard E. Grimm, Ph.D., *Assistant Professor of Classics.*
Martin Kanes, Docteur de l'Université de Paris, Ph.D., *Assistant Professor of French.*
Marshall Lindsay, Ph.D., *Assistant Professor of French.*
Oliver T. Myers, Ph.D., *Assistant Professor of Spanish.*
Guenther H. Nerjes, Ph.D., *Assistant Professor of German.*
Wesley E. Thompson, Ph.D., *Assistant Professor of Classics.*
Pierre L. Ullman, Ph.D., *Assistant Professor of Spanish.*



- William P. Galvin, M.A., *Associate in Foreign Languages.*
Sonia F. Harrison, M.A., *Associate in Spanish.*
Margaret B. Jackson, Ph.D., *Lecturer in German.*
Anthony S. Kawczynski, Mag. Phil., *Lecturer in Foreign Languages.*
Henry F. Loyzelle, A.B., *Associate in Italian.*
Russell L. Pfohl, M.A., *Acting Instructor in French.*
Raul Pimentel, M.A., *Acting Instructor in German.*
Madeleine M. Rumeau, D.E.S., *Associate in French.*
Alex M. Shane, Jr., M.A., *Acting Assistant Professor of Russian.*
Leonilla F. Strelkoff, M.A., *Associate in French and Russian.*

CLASSICS

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

LOWER DIVISION COURSES

- 39A. Greek Literature in Translation. (3) I.** Mr. Grimm
Lecture—3 hours.
Prerequisite: English 1A.
The Homeric epic and fifth-century drama. Reading of the Iliad, Odyssey, and selected plays of Aeschylus, Sophocles, Euripides, and Aristophanes. Lectures on early Greek epic and classical Athenian drama.

39B. Greek Literature in Translation. (3) II. Mr. Thompson

Lecture—3 hours.

Prerequisite: English 1A or consent of the instructor.

Readings in Pindar, Herodotus, Thucydides, Plato, Menander, and the Hellenistic writers. Lectures on literary trends from the fifth century to the end of the Hellenistic period.

Offered in even-numbered years.

40. Roman Literature in Translation. (3) II. Mr. Grimm

Lecture—3 hours.

Prerequisite: English 1A or consent of the instructor.

Readings in Plautus, Terence, 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.

FOREIGN LANGUAGES**PROFESSIONAL COURSE****300. The Teaching of a Modern Foreign Language. (2) II.** The Staff

Prerequisite: senior or graduate standing; a major or minor in a modern foreign language.

Analysis and discussion of a variety of teaching techniques by representatives of modern foreign languages and linguistics; orientation in language laboratory operation; practice in evaluating oral and written performance in language classes.

FRENCH

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

Departmental Major Advisers.—Mr. Bach, Mr. Lindsay, Mr. Perkins.

Graduate Adviser—Mr. Perkins.

The Major Program

(A) Lower Division Courses.—French 1, 2, 3, and 4, or their equivalents. Recommended: one year of college Latin or the equivalent; classics 39A and 39B.

(B) Upper Division Courses.—Required: 24 units of upper division courses, including 101A–101B, 109A, a separate course in each of the following periods: seventeenth century, eighteenth century, nineteenth century. With the permission of the staff, three of the 24 units may be related work in other fields. Students who major in French must maintain at least an average of C in upper division French courses.

Course 134 and either course 130A or 130B are required for the General Secondary Teaching Credential in French.

Honors and Honors Program (see page 94).—The honors program comprises two semesters of study under course 194H, which will include a research paper and a comprehensive examination.

The Master of Arts Degree in French

The Department offers courses leading to the Master of Arts degree in French to students who have completed with distinction the A.B. degree in French, or its equivalent. Candidates will be recommended for admission to graduate studies in French provided they meet the requirements of the Graduate Division and the Department of Foreign Languages. Detailed information may be obtained by writing to the Graduate Adviser, Department of Foreign Languages.

LOWER DIVISION COURSES

A course may not ordinarily be taken for credit if it is a prerequisite to a course already completed. Students offering high school language preparation as a prerequisite must take a placement test.

1. **Elementary French—Beginning.** (4) I and II. The Staff
Recitation—3 hours; laboratory—2 hours.
This course corresponds to the first two years of high school French.
2. **Elementary French—Continued.** (4) I and II. The Staff
Recitation—3 hours; laboratory—2 hours.
Prerequisite: course 1 or two years of high school French.
3. **Intermediate French.** (4) I and II. The Staff
Recitation—4 hours.
Prerequisite: course 2 or three years of high school French.
4. **Intermediate French. Conversation and Reading.** (4) I and II. The Staff
Recitation—4 hours.
Prerequisite: course 3 or four years of high school French.
Spoken French stressed through class discussion of a variety of selected readings.
5. **Intermediate French. Conversation and Reading.** (3) II. The Staff
Lecture—3 hours.
Prerequisite: course 4 or the equivalent. Open only to freshmen.
Introduction to the study of French literature. Spoken French stressed through class discussion and oral reports.

UPPER DIVISION COURSES

Prerequisite for all courses except 150, 160: course 4 or its equivalent.

- 101A. **Advanced Grammar, Composition, and Conversation.** (3) I. Miss Rumeau
Lecture—3 hours.
- 101B. **Advanced Grammar, Composition, and Conversation.** (3) II. Miss Rumeau
Lecture—3 hours.
- 109A. **Survey of French Literature to 1715.** (3) I. Mr. Kanes
Lecture—3 hours.
Readings from major works; discussion of literary history; introduction to bibliography.
- 109B. **Survey of French Literature from 1715 to Present.** (3) II. Mr. Kanes
Lecture—3 hours.
Readings from major works; discussion of literary history; elementary bibliography and research techniques.
Offered in odd-numbered years.
116. **Literature of the Sixteenth Century.** (3) II. Mr. Sinclair
Lecture—3 hours.
Readings in Rabelais and Montaigne.
Offered in even-numbered years.
- 117A. **The Theater of the Seventeenth Century.** (3) I. Mr. Pfohl
Lecture—3 hours.
Offered in even-numbered years.
- 117B. **Novelists and Moralists of the Seventeenth Century.** (3) II. Mr. Pfohl
Lecture—3 hours.
Offered in odd-numbered years.

- 118A. The Age of Voltaire and Rousseau.** (3) I. Mr. Perkins
Lecture—3 hours.
A study of writings which helped mold the intellectual environment of the American and French Revolutions.
Offered in odd-numbered years.
- 118B. Drama and Novel in the Eighteenth Century.** (3) II. Mr. Perkins
Lecture—3 hours.
Plays of Marivaux and Beaumarchais; novels of Lesage, Prevost, Diderot, Voltaire, Rousseau.
Offered in odd-numbered years.
- 119A. The Nineteenth Century.** (3) I. Mr. Bach
Lecture—3 hours.
Romanticism in drama and poetry: Hugo, Musset, Vigny; novels of Balzac and Stendhal.
Offered in even-numbered years.
- 119B. The Nineteenth Century.** (3) II. Mr. Kanes
Lecture—3 hours.
Realism and naturalism (Flaubert, Zola, Maupassant); criticism (Sainte-Beuve, Renan, Taine); symbolism (Baudelaire, Verlaine, Rimbaud, Mallarmé).
Offered in even-numbered years.
- 124. French Lyric Poetry.** (3) I. Mr. Lindsay
Lecture—3 hours.
Prerequisite: one upper division course in French or consent of the instructor.
Study of French versification and poetic conventions; intensive analysis of the works of major poets.
Offered in odd-numbered years.
- 130A. Advanced Grammar and Composition.** (3) II. Mr. Bach
Lecture—3 hours.
Prerequisite: courses 101A–101B or either course with grade B or better.
Offered in odd-numbered years.
- 130B. Advanced Grammar and Composition.** (3) I. Mr. Bach
Lecture—3 hours.
Prerequisite: courses 101A–101B or either course with grade B or better.
Offered in odd-numbered years.
- 134. Survey of French Culture and Institutions.** (3) I. Mr. Bach
Lecture—3 hours.
Offered in even-numbered years.
- 140. Study of a Major Writer.** (3) I. The Staff
Lecture—3 hours.
With the consent of the instructor, this course may be repeated for credit.
Offered in even-numbered years.
- 150. Masterpieces of French Literature.** (3) II. Mr. Pfohl
Lecture—3 hours.
Prerequisite: English 1B.
Reading, lectures, and discussion in English. May not be counted as part of the major in French.
Offered in even-numbered years.

160. **French Literature of the Twentieth Century.** (3) II. Mr. Lindsay
Lecture—3 hours.
Representative readings from Proust, Gide, Valery, Sartre and others.
Lectures in English; readings in English or French. Knowledge of French not required.
Offered in odd-numbered years.
- 194H. **Special Study for Honors Students.** (3) I and II. The Staff
Prerequisite: open only to honors students.
Guided research leading to an honors thesis.
199. **Special Study for Advanced Undergraduates.** (1-4) I and II. The Staff

GRADUATE COURSES

201. **History of the French Language.** (3) I. Mr. Sinclair
Lecture—3 hours.
Offered in odd-numbered years.
202. **Medieval French Literature.** (3) II. Mr. Sinclair
Lecture—3 hours.
Offered in even-numbered years.
217. **Seventeenth-Century French Literature.** (3) II. Mr. Pfohl
Lecture—3 hours.
Offered in odd-numbered years.
218. **Eighteenth-Century French Literature.** (3) I. Mr. Perkins
Lecture—3 hours.
Offered in even-numbered years.
219. **Nineteenth-Century French Literature.** (3) II. Mr. Bach, Mr. Kanen
Lecture—3 hours.
Offered in odd-numbered years.
220. **Twentieth-Century French Literature.** (3) II. Mr. Lindsay
Lecture—3 hours.
Offered in even-numbered years.
299. **Research.** (1-4) I and II. The Staff

GERMAN

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

Departmental Major Advisers.—Mr. Hoermann, Mr. Puknat.
Graduate Adviser.—Mr. Puknat

The Major Program

(A) Lower Division Courses.—German 1, 2, 3, 4, or their equivalents.
(B) Upper Division Courses.—Twenty-four units in upper division courses, including one full year's course in composition. Six of the 24 units may be related work in other departments. Students who fail to maintain an average of C or better in upper division courses in German will be excluded from the major.

Honors and Honors Program (see page 94).—The honors program comprises two semesters of study under course 194H, which will include a research paper and a comprehensive examination.

The Master of Arts Degree in German

The Department offers courses leading to the Master of Arts degree in German to students who have completed with distinction the A.B. degree in German, or its equivalent. Candidates will be recommended for admission to graduate studies in German provided they meet the requirements of the Graduate Division and the Department of Foreign Languages. Detailed information may be obtained by writing to the Graduate Adviser, Department of Foreign Languages.

LOWER DIVISION COURSES

A course may not ordinarily be taken for credit if it is a prerequisite to a course already completed. Students offering high school language preparation as a prerequisite must take a placement test.

1. **Elementary German—Beginning.** (4) I and II. The Staff
 Recitation—3 hours; laboratory—2 hours.
 This course corresponds to the first two years of high school German.
2. **Elementary German—Continued.** (4) I and II. The Staff
 Recitation—3 hours; laboratory—2 hours.
 Prerequisite: course 1 or two years of high school German.
3. **Intermediate German.** (4) I and II. The Staff
 Recitation—4 hours.
 Prerequisite: course 2 or three years of high school German.
4. **Intermediate German. Conversation and Reading.** (4) I and II. The Staff
 Recitation—4 hours.
 Prerequisite: course 3 or four years of high school German.
 Spoken German stressed through class discussion of a variety of selected readings.
- 1G. **German for Graduate Students.** (No credit) I and II. Mr. Kawczynski
 Lecture—3 hours.
 A course designed to prepare students for the graduate reading examination.

UPPER DIVISION COURSES

Prerequisite for all courses except 150, 160: course 4 or its equivalent.

- 101A. **Advanced Grammar, Composition, and Conversation.** (3) I. Mr. Pimentel
 Lecture—3 hours.
- 101B. **Advanced Grammar, Composition, and Conversation.** (3) II. Mr. Pimentel
 Lecture—3 hours.
102. **German Poetry.** (3) I. Mr. Hoermann
 Lecture—3 hours.
 Literary, folk, and church forms in German lyric and narrative verse from the Middle Ages to the present.
 Offered in even-numbered years.
- 103A. **The Classical Period: Lessing and Schiller.** (3) I. Mr. Nerjes
 Lecture—3 hours.
 The major dramas and aesthetic principles of Lessing and Schiller.
 Offered in odd-numbered years.
- 103B. **The Classical Period: Goethe.** (3) II. Mr. Puknat
 Lecture—3 hours.
 A study of *Iphigenie*; *Tasso*; and *Faust*, Parts I and II.
 Offered in odd-numbered years.

- 109. The "Sturm und Drang" Period and Romanticism. (3) II.**
 Lecture—3 hours. Mr. Hoermann
 The liberation of feeling in the imaginative literature of the Storm and Stress and Romantic periods.
 Offered in odd-numbered years.
- 114. Nineteenth-Century German Prose. (3) I.** ———
 Lecture—3 hours.
 Readings from representative German prose writers of the nineteenth century from the end of Romanticism to Naturalism.
 Offered in even-numbered years.
- 116. Nineteenth-Century German Drama. (3) II.** Mr. Hoermann
 Lecture—3 hours.
 The development of the German drama during the nineteenth century.
 Readings of representative plays by Kleist, Büchner, Grillparzer, and Hebbel.
 Offered in even-numbered years.
- 118. Twentieth-Century German Drama. (3) II.** Mr. Puknat
 Lecture—3 hours.
 Development of the German drama from naturalism to the present.
 Offered in even-numbered years.
- 121. History of German Literature. (3) II.** Mr. Pimentel
 Lecture—3 hours.
 A survey of German literature in the Middle Ages.
 Offered in odd-numbered years.
- 122. History of German Literature. (3) II.** Mr. Gaier
 Lecture—3 hours.
 A survey of German literature from the Reformation to the end of the nineteenth century.
 Offered in even-numbered years.
- 125. Middle High German. (3) I.** Mrs. Jackson
 Lecture—3 hours.
 Outline of grammar; selections from Middle High German poetry.
 Offered in odd-numbered years.
- 130A. Advanced Grammar and Composition. (3) I.** The Staff
 Lecture—3 hours.
 Prerequisite: courses 101A–101B or either course with grade of B or better.
 Offered in even-numbered years.
- 130B. Advanced Grammar and Composition. (3) II.** The Staff
 Lecture—3 hours.
 Prerequisite: courses 101A–101B or either course with grade B or better.
 Offered in odd-numbered years.
- 150. Masterpieces of German Literature. (3) I.** Mr. Puknat
 Lecture—3 hours.
 Prerequisite: English 1B.
 Reading, lectures, and discussion in English. May not be counted as part of the major in German.
 Offered in odd-numbered years.

160. **German Literature of the Twentieth Century.** (3) I. Mr. Puknat
Lecture—3 hours.
Representative readings from Rilke, Kafka, Hesse, Brecht, Thomas Mann, and others. Lectures in English; readings in English or German. Knowledge of German not required.
Offered in even-numbered years.
- 194H. **Special Study for Honors Students.** (3) I and II. The Staff
Prerequisite: open only to honors students.
Guided research leading to an honors thesis.
199. **Special Study for Advanced Undergraduates.** (1-3) I and II. The Staff

GRADUATE COURSES

201. **History of the German Language.** (3) II. _____
Lecture—3 hours.
205. **Sixteenth- and Seventeenth-Century German Literature.** (3) I. Mr. Gaier
Lecture—3 hours.
208. **Eighteenth-Century German Literature.** (3) II. Mr. Nerjes
Lecture—3 hours.
- *211. **Nineteenth-Century German Literature.** (3) II. Mr. Hoermann
Lecture—3 hours.
- *217. **Twentieth-Century German Literature.** (3) I. Mr. Puknat
Lecture—3 hours.
299. **Research.** (1-4) I and II. The Staff

GREEK

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

LOWER DIVISION COURSES

1. **Elementary Greek—Beginning.** (4) I. Mr. Thompson
Recitation—4 hours.
2. **Elementary Greek—Continued.** (4) II. Mr. Thompson
Recitation—4 hours.
Prerequisite: course 1 or the equivalent.

UPPER DIVISION COURSES

Prerequisite for all courses: course 2 or its equivalent.

101. **Plato.** (3) I. Mr. Grimm
Lecture—3 hours.
Prerequisite: course 2 or the equivalent.
Reading of Plato's *Apology* and *Crito*, and of selected passages from the *Phaedo*.
102. **Homer.** (3) II. Mr. Grimm
Lecture—3 hours.
Prerequisite: course 2 or the equivalent.
Reading from selected books of Homer's *Iliad*.

ITALIAN

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

* Not to be given, 1963-1964.

LOWER DIVISION COURSES

1. **Elementary Italian—Beginning.** (4) I. Mr. Loyzelle
 Recitation—3 hours; laboratory—2 hours.
 Prerequisite: this course corresponds to the first two years of high school Italian.
2. **Elementary Italian—Continued.** (4) II. Mr. Loyzelle
 Recitation—3 hours; laboratory—2 hours.
 Prerequisite: course 1 or two years of high school Italian.
3. **Intermediate Italian.** (4) I. Mr. Loyzelle
 Recitation—4 hours.
 Prerequisite: course 2 or three years of high school Italian.
4. **Intermediate Italian.** (4) II. Mr. Loyzelle
 Recitation—4 hours.
 Prerequisite: course 3 or four years of high school Italian.

LATIN

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

LOWER DIVISION COURSES

1. **Elementary Latin—Beginning.** (4) I. Mr. Grimm
 Recitation—4 hours.
2. **Elementary Latin—Continued.** (4) II. Mr. Grimm
 Recitation—4 hours.
 Prerequisite: two years of high school Latin or course 1 or consent of the instructor.
3. **Intermediate Latin.** (4) I. Mr. Thompson
 Recitation—4 hours.
 Prerequisite: course 2 or the equivalent.

UPPER DIVISION COURSES

Prerequisite for all courses: course 3 or its equivalent.

101. **Vergil: Aeneid.** (3) II. Mr. Thompson
 Lecture—3 hours.
 Prerequisite: course 3 or the equivalent.
 Reading of selected books of the *Aeneid*.
102. **Livy.** (3) I. Mr. Thompson
 Lecture—3 hours.
 Prerequisite: course 3 or the equivalent.
 Book 1 and other selections from the history; study of Livy's prose style and narrative technique.
 Offered in odd-numbered years.
103. **Catullus and Horace.** (3) II. Mr. Grimm
 Lecture—3 hours.
 Prerequisite: course 3 or the equivalent.
 Selected personal and Alexandrian lyrics of Catullus; selected odes of Horace.
 Offered in even-numbered years.

RUSSIAN

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

LOWER DIVISION COURSES

1. **Elementary Russian—Beginning.** (4) I. Mr. Shane
Recitation—3 hours; laboratory—2 hours.
2. **Elementary Russian—Continued.** (4) II. Mr. Shane
Recitation—3 hours; laboratory—2 hours.
Prerequisite: course 1.
3. **Intermediate Russian.** (4) I. Mr. Shane
Recitation—4 hours.
Prerequisite: course 2.
4. **Intermediate Russian.** (4) II. Mr. Shane
Recitation—4 hours.
Prerequisite: course 3.
16. **Russian for Graduate Students.** (No credit) I. Mrs. Strelkoff
Lecture—3 hours.
A course designed to prepare students for the graduate reading examination.

UPPER DIVISION COURSES

- 101A. **Advanced Grammar, Composition and Conversation.** (3) I. Mr. Shane
Lecture—3 hours.
Prerequisite: course 4 or the equivalent.
131. **The Russian Novel of the Nineteenth Century.** (3) II. Mr. Shane
Lecture—3 hours.
Prerequisite: English 1B.
The evolution of Russian fiction; readings in Pushkin, Lermontov, Gogol, Goncharov, Turgenev, Tolstoy, and Dostoyevsky. Lectures, readings, and discussions in English. Knowledge of Russian not required.
Offered in even-numbered years.
132. **Russian Literature since 1917.** (3) II. Mr. Shane
Lecture—3 hours.
Prerequisite: English 1B.
Representative readings from Gorky, Blok, Mayakovsky, Zamyatin, Pilnyak, Fedin, A. Tolstoy, Ehrenburg, Leonov, Fadeyev, Olesha, Katayev, Sholokhov, Pasternak, and others. Lectures, readings, and discussions in English. Knowledge of Russian not required.
Offered in odd-numbered years.

SPANISH

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses. For regulations governing this list, see page 93.

Departmental Major Advisers.—Mr. Bowen, Mr. Castanien, Mr. Keller, Mr. Myers.

Graduate Adviser.—Mr. Keller

The Major Program

(A) Lower Division Courses.—Four years of high school Spanish, or courses 1, 2, and 3, and also 4 unless 3 has been passed with a grade of A or B; course 25A–25B. Recommended: one year of college Latin or the equivalent.

(B) Upper Division Courses.—Required: 24 units of upper division courses including 106A–106B (6 units). The remaining units may be from any of the upper division courses. Students who fail to maintain an average grade of at least C in the Spanish courses taken in the upper division will be excluded from the major.

Honors and Honors Program (see page 94).—The honors program comprises two semesters of study under course 194H, which will include a research paper and a comprehensive examination.

The Master of Arts Degree in Spanish

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 Foreign Languages. Detailed information may be obtained by writing to the Graduate Adviser, Department of Foreign Languages.

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. Students whose native tongue is Spanish will not normally be admitted to any lower division course.

1. **Elementary Spanish—Beginning.** (4) I and II. The Staff
Recitation—3 hours; laboratory—2 hours.
This course corresponds to the first two years of high school Spanish.
2. **Elementary Spanish—Continued.** (4) I and II. The Staff
Recitation—3 hours; laboratory—2 hours.
Prerequisite: course 1 or two years of high school Spanish.
3. **Intermediate Spanish.** (4) I and II. The Staff
Recitation—4 hours.
Prerequisite: course 2 or three years of high school Spanish, or the equivalent.
4. **Intermediate Spanish Conversation and Reading.** (4) I and II. The Staff
Recitation—4 hours.
Prerequisite: course 3 or four years of high school Spanish.
Spoken Spanish stressed through class discussion of a variety of selected readings.
- 25A. **Advanced Spanish.** (3) I. The Staff
Lecture—3 hours.
Required as preparation for the major.
Prerequisite: four years of high school Spanish, or course 3 (with a grade of at least B), or course 4, or the equivalent.
- 25B. **Advanced Spanish.** (3) II. The Staff
Lecture—3 hours.
Required as preparation for the major.
Prerequisite: four years of high school Spanish, or course 3 (with a grade of at least B), or course 4, or the equivalent.

UPPER DIVISION COURSES

Prerequisite for all courses except 150: course 4 or its equivalent.

- 104A. **History of Spanish-American Literature: Colonial Period to Modernismo.** (3) I. Mr. Keller
Lecture—3 hours.
Offered in even-numbered years.

- 104B. **History of Spanish-American Literature: *Modernismo* to the Present.** (3) II. Mr. Keller
Lecture—3 hours.
Offered in odd-numbered years.
105. **Peninsular Drama from the Romantic Movement to the Present.** (3) I. ———
Lecture—3 hours.
Offered in even-numbered years.
- 106A. **History of Spanish Literature to 1680.** (3) I. Mr. Castanien
Lecture—3 hours.
- 106B. **History of Spanish Literature from 1680 to the Present.** (3) II. Mr. Bowen
Lecture—3 hours.
109. **Spanish Drama of the Golden Age.** (3) II. Mr. Castanien
Lecture—3 hours.
Offered in even-numbered years.
111. **Cervantes.** (3) I. Mr. Castanien
Lecture—3 hours.
Offered in odd-numbered years.
115. **Lyric Poetry.** (3) II. Mr. Bowen
Lecture—3 hours.
A survey of Spain's principal lyric poets from the Middle Ages to the present.
Offered in odd-numbered years.
- 120A. **Twentieth-Century Spanish Literature to 1936.** (3) I. Miss Zardoya
Lecture—3 hours.
Offered in odd-numbered years.
- 120B. **Twentieth-Century Spanish Literature from 1936.** (3) II. Miss Zardoya
Lecture—3 hours.
Offered in even-numbered years.
121. **Spanish Literature of the Renaissance.** (3) II. Miss Zardoya
Lecture—3 hours.
Offered in even-numbered years.
122. **Spanish-American Fiction of the Twentieth Century.** (3) I. Mr. Keller
Lecture—3 hours.
Offered in odd-numbered years.
- 130A. **Advanced Grammar and Composition.** (3) I. Mr. Myers
Lecture—3 hours.
Prerequisite: courses 25A–25B.
Offered in even-numbered years.
- 130B. **Advanced Grammar and Composition.** (3) I. Mr. Myers
Lecture—3 hours.
Prerequisite: courses 25A–25B. Course 130A is not prerequisite to 130B.
Offered in odd-numbered years.
140. **Medieval Language and Literature.** (3) II. Mr. Myers
Lecture—3 hours.
Prerequisite: one semester of upper division Spanish or consent of the instructor.
Reading, analysis and discussion of representative works in Old Spanish.
Offered in even-numbered years.

150. **Masterpieces of Spanish Literature.** (3) I. Mr. Bowen
Lecture—3 hours.
Prerequisite: English 1B.
Reading, lectures, and discussion in English. May not be counted as part
of the major in Spanish.
Offered in even-numbered years.
- 194H. **Special Study for Honors Students.** (3) I and II. The Staff
Prerequisite: open only to honors students.
Guided research leading to an honors thesis.
199. **Special Study for Advanced Undergraduates.** (1-3) I and II. The Staff

GRADUATE COURSES

- *230. **History of the Spanish Language.** (3) I. Mr. Myers
Lecture—3 hours.
- *231. **Spanish Literature of the Golden Age.** (3) II. Mr. Castanien
Lecture—3 hours.
232. **Spanish-American Literature of the National Period.** (3) II. Mr. Keller
Lecture—3 hours.
233. **Spanish Literature of the Twentieth Century.** (3) I. Miss Zardoya
Lecture—3 hours.
299. **Research.** (1-4) I and II. The Staff

* Not to be given, 1963-1964.

FRENCH

For courses in French see "Foreign Languages" on page 203.

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

39A-39B. Greek Literature in Translation.

40. Roman Literature in Translation.

DRAMATIC ART

158A-158B. The World Drama.

159. Contemporary Drama.

ENGLISH

116. The English Bible as Literature.

144A. Masterpieces of World Literature: The Epic.

144B. Masterpieces of World Literature: The European Novel.

FRENCH

150. Masterpieces of French Literature.

160. French Literature of the Twentieth Century.

GERMAN

150. Masterpieces of German Literature.

160. German Literature of the Twentieth Century.

RUSSIAN

131. The Russian Novel of the Nineteenth Century.

SPANISH

150. Masterpieces of Spanish Literature.

GENETICS

Alexander S. Fraser, Ph.D., *Chairman of the Department.*
Department Office, 201B Biological Sciences Building

Alexander S. Fraser, Ph.D., *Professor of Genetics.*
†Melvin M. Green, Ph.D., *Professor of Genetics.*
G. Ledyard Stebbins, Ph.D., *Professor of Genetics.*
Harris Bernstein, Ph.D., *Assistant Professor of Genetics.*
Sidney R. Snow, Ph.D., *Assistant Professor of Genetics.*

Members of the Genetics Group:

Ursula H. Abbott, Ph.D., *Associate Professor of Poultry Husbandry.*
Hans Abplanalp, Ph.D., *Associate Professor of Poultry Husbandry.*
Robert W. Allard, Ph.D., *Professor of Agronomy.*
Vigfus S. Asmundson, Ph.D., *Professor of Poultry Husbandry, Emeritus.*
‡G. Eric Bradford, Ph.D., *Assistant Professor of Animal Husbandry.*
Fred N. Briggs, Ph.D., *Professor of Agronomy, Emeritus.*
Royce S. Bringhurst, Ph.D., *Associate Professor of Pomology.*
Glen N. Davis, Ph.D., *Professor of Vegetable Crops.*
Robert E. Feeney, Ph.D., *Professor of Food Science and Technology.*
Alexander S. Fraser, Ph.D., *Professor of Genetics.*
†Melvin M. Green, Ph.D., *Professor of Genetics.*
Paul W. Gregory, Sc.D., *Professor of Animal Husbandry.*
Claron O. Hesse, Ph.D., *Professor of Pomology.*
Paulden F. Knowles, Ph.D., *Professor of Agronomy.*
Robert C. Laben, Ph.D., *Associate Professor of Animal Husbandry.*
Harry H. Laidlaw, Jr., Ph.D., *Professor of Entomology.*
Lloyd A. Lider, Ph.D., *Associate Professor of Viticulture.*
R. Merton Love, Ph.D., *Professor of Agronomy.*
Wyman E. Nyquist, Ph.D., *Assistant Professor of Agronomy.*
Harold P. Olmo, Ph.D., *Professor of Viticulture.*
Charles M. Rick, Jr., Ph.D., *Professor of Vegetable Crops.*
Monica Riley, Ph.D., *Assistant Professor of Bacteriology.*
Wade C. Rollins, Ph.D., *Associate Professor of Animal Husbandry.*
Charles W. Schaller, Ph.D., *Professor of Agronomy.*
Dale G. Smeltzer, Ph.D., *Assistant Professor of Agronomy.*
Francis L. Smith, Ph.D., *Professor of Agronomy.*
Sidney R. Snow, Ph.D., *Assistant Professor of Genetics.*
Ernest H. Stanford, Ph.D., *Professor of Agronomy.*
G. Ledyard Stebbins, Ph.D., *Professor of Genetics.*
Clyde Stormont, Ph.D., *Professor of Immunogenetics.*
J. Caswell Williams, Jr., Ph.D., *Lecturer in Agronomy.*

Departmental Major Adviser.—Mr. Snow.

Bachelor of Science Major Program and Graduate Study (Animal Science).
See page 57.

Bachelor of Science Major Program and Graduate Study (Plant Science).
See page 63.

UPPER DIVISION COURSES

100. Principles of Genetics. (3) I and II.

I. Mr. Snow; II. Mr. Fraser.

Lecture—3 hours; conference—1 hour.

Prerequisite: general botany or general zoology.

† Absent on leave, 1963–1964.

‡ Absent on leave, fall semester, 1963–1964.

Introduction to genetics with some consideration of its applications in agriculture and biology.

Students taking course 100C concurrently will include their conference hour within the laboratory period of that course.

100L. Principles of Genetics Laboratory. (1) I and II.

I. Mr. Snow; II. Mr. Bernstein.

Laboratory—3 hours.

Must be taken concurrently with course 100.

Laboratory work in elementary genetics to supplement course 100.

101. Cytogenetics. (3) II.

Mr. Snow

Lecture—3 hours.

Prerequisite: course 100; general cytology (Botany 130 or its equivalent).

Genetics as related to cytological conditions.

101L. Cytogenetics Laboratory. (2) II.

Mr. Snow

Laboratory—6 hours.

Prerequisite: course 101 (may be taken concurrently).

Laboratory study of chromosome morphology and behavior as related to problems in genetics.

103. Organic Evolution. (3) II.

Mr. Stebbins

Lecture—3 hours.

Prerequisite: course 100.

The principles of evolution, with particular reference to the evolutionary processes in plants.

***106. Advanced Genetics.** (3) I.

Lecture—3 hours.

Prerequisite: course 100; Botany 130; Chemistry 8.

An introduction into the nature and properties of the gene; gene mutation, the mechanism of gene action and related topics.

Offered in odd-numbered years.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

Mr. Fraser

GRADUATE COURSES

206. Current Problems in Genetics. (3) I and II.

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 100, 100C or the equivalent; consent of the instructor.

Selected topics in advanced genetics. May be repeated for credit.

291. Seminar in the History of Genetics. (1-3) I.

Mr. Stebbins

Lecture—1 hour; individual conferences.

The development of modern genetic theories, beginning with Mendel.

292. Seminar in Gene Structure and Action. (1-3) II.

Mr. Bernstein

Lecture—1 hour; individual conferences.

Prerequisite: Genetics 291.

Topics of current interest related to the structure of genes, mutation, and the mechanism of gene action.

293. Seminar in Cytogenetics and Evolution. (1-3) I.

Lecture—1 hour; individual conferences.

Prerequisite: Genetics 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 problems of organic evolution.

* Not to be given, 1963-1964.

- 294. Seminar in Breeding Systems.** (1-3) II. Mr. Nyquist
Lecture—1 hour; individual conferences.
Prerequisite: Genetics 291.
Topics of current interest relating genetics to problems of animal and plant breeding.
- 297. Graduate Seminar in Genetics.** (1-4) I and II. The Genetics Group (———)
Prerequisite: graduate standing in genetics.
Intensive study of special topics, under supervision of some member of the staff.
- 299. Research.** (1-6) I and II. The Staff
- Staff Seminar in Genetics.** (No credit) I and II.
Prerequisite: course 100. The Genetics Group (Mr. Stebbins in charge)
Weekly meetings for presentation of topics by members of the staff, visiting investigators, and graduate students.

RELATED COURSES

- Principles of Plant Breeding** (Agronomy 121)
Advanced Plant Breeding (Agronomy 221)
Quantitative Genetics and Plant Improvement (Agronomy 222)
The Genetics of Animal Breeding (Animal Husbandry 107)
Bacterial Genetics (Bacteriology 207)
Plant Cytology (Botany 130)
Applied Statistical Methods (Mathematics 105A-105B)
Fruit Breeding (Pomology 114)
Vegetable Breeding (Vegetable Crops 120)

GEOGRAPHY

For courses in geography see "Anthropology and Geography" on page 131.

GEOLOGICAL SCIENCES

Cordell Durrell, Ph.D., *Chairman of the Department.*
Department Office, 306A Physical Sciences Building.

Cordell Durrell, Ph.D., *Professor of Geology.*
Charles G. Higgins, Ph.D., *Associate Professor of Geology.*
Donald O. Emerson, Ph.D., *Assistant Professor of Geology.*
Charles V. Guidotti, Ph.D., *Assistant Professor of Geology.*
Emile A. Pessagno, Jr., Ph.D., *Assistant Professor of Geology.*
Thomas W. Todd, Ph.D., *Assistant Professor of Geology.*



Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Departmental Major Adviser.—Mr. Todd.

GEOLOGICAL SCIENCES MAJOR PROGRAMS

Students who are 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

The major program consists of 60 units of numbered mathematics and/or natural science courses including:

(A) Lower Division Courses.—Chemistry 1A or 7A; Geology 1A-1B, 6; Mathematics 9A-9B, or 16A and 16B or 13; Physics 2A-2B, or 4A and 4B or 4C.

(B) Upper Division Courses.—24 units of upper division courses in geology. With the approval of the major adviser, 6 units of the 24 may be satisfied by upper division courses in other sciences related to the student's program.

Bachelor of Arts Major Program

(A) Lower Division Courses.—Chemistry 1A; Geology 1A-1B, 6; Physics 2A-2B.

(B) Upper Division Courses.—24 units of upper division courses in geology. With the approval of the major adviser, 6 units of the 24 may be satisfied by upper division courses in other fields related to the student's program.

Honors and Honors Program (see page 94).—The honors program in geological sciences consists of course 194H and an honors thesis incorporating studies undertaken in course 194H.

Graduate Study.—The Department of Geological Sciences offers a program of study and research leading to the M.S. degree. For information regarding graduate study in geology, address the Graduate Adviser, Department of Geological Sciences.

LOWER DIVISION COURSES

- 1A. General Geology: Physical.** (4) I. Mr. Higgins
Lecture—3 hours; laboratory—3 hours.
An introduction to the earth's physical features and the changes they undergo through dynamic processes.
- 1B. General Geology: Historical.** (4) II. Mr. Pessagno
Lecture—3 hours; laboratory—3 hours.
Prerequisite: course 1A.
Origin and geological history of the earth and the evolution of its plant and animal inhabitants. Several of the lecture periods will be combined in all-day field trips.
- 6. Mineralogy and Petrology.** (4) I. Mr. Emerson
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Chemistry 1A or 7A.
Properties, origins, and associations of important rock-forming and economic minerals and of the rocks in which they occur.

UPPER DIVISION COURSES

- 102. Field Geology.** (3) II. Mr. Todd
Lecture—1 hour; laboratory—6 hours.
Prerequisite: courses 6 and 116.
Principles and methods of making topographic and geologic field observations, measurements, and maps. Several all-day periods in the field.
- 104A. Crystallography and Optical Mineralogy.** (4) II. Mr. Emerson
Lecture—2 hours; laboratory—6 hours.
Principles of structural, morphological and optical crystallography; microscopic study of mineral fragments and thin sections.
- 104B. Optical Petrology.** (4) I. Mr. Durrell
Lecture—2 hours; laboratory—6 hours.
Prerequisite: courses 6 and 104A.
Origin, occurrence, and classification of rocks, and their description and interpretation by megascopic and microscopic means.
- *107. Evolution of North America.** (2) I. Mr. Todd
Lecture—2 hours.
Prerequisite: course 116.
Origin of continents and their tectonic elements, applied to a study of North America.
- 111. Invertebrate Paleontology.** (4) I. Mr. Pessagno
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1B or Zoology 1A or 10.
Morphology, systematics, paleoecology, and evolution of invertebrates common in the fossil record.
- 112. Stratigraphy.** (3) II. Mr. Todd
Lecture—3 hours.
Prerequisite: course 1B.
The principles of stratigraphy, sedimentation, and sedimentary tectonics.
- 116. Structural Geology.** (3) I. Mr. Guidotti
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1A.
Deformation of the earth; causes, mechanics, and effects of crustal deformation; laboratory practice in three-dimensional geology problems.

* Not to be given, 1963-1964.

- 117. Geomorphology.** (2) II. Mr. Higgins
Lecture—2 hours.
Prerequisite: course 1A.
Sculpture of the earth's surface by natural processes.
- 150. Engineering Geology.** (3) II. Mr. Guidotti
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Chemistry 1A; Mathematics 9A or 16A; Physics 2A or 4A.
Geologic processes; properties of geologic materials; the interpretation of field and laboratory data important to engineering problems.
- 194H. Special Study for Honors Students.** (3) I and II. The Staff
Prerequisite: open only to majors of senior standing who qualify for the honors program.
Independent study of selected topics under direction of the staff. Completion will involve the writing of an honors thesis.
- 198. Directed Group Study.** (2) I and II. The Staff
Prerequisite: senior standing in geology.
- 199. Special Study for Advanced Undergraduates.** (1-3) I and II. The Staff

GRADUATE COURSES

- 213. Geomorphology.** (2) II. Mr. Higgins
Lecture—2 hours.
Prerequisite: course 117 or the equivalent.
Surficial processes and evolution of land forms.
- 255. Metamorphic Petrology.** (3) II. Mr. Guidotti
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 104B.
Physiochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks.
- 257. Sedimentary Petrology.** (3) I. Mr. Todd
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 104B.
Examination and interpretation of sedimentary rocks using the petrographic microscope.
- 260. Paleontology.** (3) I. Mr. Pessagno
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 111.
Morphological and biostratigraphic studies of Mesozoic and Cenozoic invertebrates important as index fossils.
- 280. Igneous Petrology.** (3) II. Mr. Emerson
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 104A.
Origin and classification of the igneous rocks.
- 298. Group Study.** (2) I and II. The Staff
- 299. Research.** (1-6) I and II. The Staff

GERMAN

For courses in German see "Foreign Languages" on page 203.

GREEK

For courses in Greek see "Foreign Languages" on page 203.

HISTORY

Walter L. Woodfill, Ph.D., *Chairman of the Department.*
Department Office, 169 Academic Office Building

W. Turrentine Jackson, Ph.D., *Professor of History.*
C. Bickford O'Brien, Ph.D., *Professor of History.*
¹James H. Shideler, Ph.D., *Professor of History.*
Walter L. Woodfill, Ph.D., *Professor of History.*
Kwang-Ching Liu, Ph.D., *Associate Professor of History.*
†Peter Paret, Ph.D., *Associate Professor of History.*
Richard N. Schwab, Ph.D., *Associate Professor of History.*
§Craig B. Fisher, Ph.D., *Assistant Professor of History.*
David L. Jacobson, Ph.D., *Assistant Professor of History.*
Rollie E. Poppino, Ph.D., *Assistant Professor of History.*
Philip J. Staudenraus, Ph.D., *Assistant Professor of History.*
Donald C. Swain, Ph.D., *Assistant Professor of History.*
Irwin Unger, Ph.D., *Assistant Professor of History.*



William H. Cunliffe, M.A., *Associate in History.*
John R. Fleckles, B.A., *Associate in History.*
Paul J. Hauben, B.A., *Lecturer in History.*
Peter H. Shattuck, M.A., *Associate in History.*

HISTORY

Letters and Science List.—All undergraduate courses in history are included in the Letters and Science List of Courses (see page 93).

Departmental Advisers.—Mr. Fisher, Mr. Jacobson, Mr. Paret, Mr. Poppino, Mr. O'Brien, Mr. Schwab, Mr. Staudenraus, Mr. Unger.

Graduate Adviser.—Mr. Woodfill.

Introductory Courses.—Courses 4A-4B and 17A-17B are open to all students.

The American History and Institutions Requirement may be satisfied by any two of the following courses: course 17A, 17B, 170A, 170B, 171, 172A, 172B, 174A, 174B, 176A, 176B, 178A, 178B, 179A-179B, 180, 183. See also page 38.

The Major Program

(A) Lower Division Courses.—Required: courses 4A-4B, 17A-17B, Political Science 1A and 1B or 2, and one of the following courses: Economics 1B or Geography 2 or Philosophy 6A or 20A.

(B) Upper Division Courses.—Required: (1) Students majoring in history must complete 24 upper division units in history, including:

(a) Course 101.

(b) A minimum of 6 units each in European and United States history.

(c) Two sequence courses of two semesters each.

(2) History students must maintain at least a grade C average in the major.

Honors and Honors Program (see page 94).—A student may become eligible for graduation with honors in history by enrolling in the department's Honors Program. This comprises course 101, completed with a grade of B or better, and three units of course 199 to be taken preferably during the second

¹ Sabbatical leave in residence, 1963-1964.

† Absent on leave, fall semester, 1963-1964.

§ Absent on leave, spring semester, 1963-1964.

senior semester in relation to an upper division course chosen in consultation with the student's academic adviser and with the permission of the course instructor. Before being admitted to the honors program, a student must complete 12 units of history, including both United States and European history (normally courses 4 and 17) with an average grade of B.

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.

LOWER DIVISION COURSES

- 4A. History of Western Civilization.** (3) I and II. The Staff
Lecture—2 hours; discussion—1 hour.
The growth of western civilization from ancient times through the seventeenth century.
- 4B. History of Western Civilization.** (3) I and II. The Staff
Lecture—2 hours; discussion—1 hour.
The development of western civilization in the eighteenth, nineteenth, and twentieth centuries.
- 17A. History of the United States.** (3) I and II. The Staff
Lecture—2 hours; discussion—1 hour.
American national beginnings from colonial times through 1865.
- 17B. History of the United States.** (3) I and II. The Staff
Lecture—2 hours; discussion—1 hour.
The American nation from the Civil War to the present.

UPPER DIVISION COURSES

- 101. Introduction to Historical Method and Historiography.** (3) II. Mr. O'Brien
Lecture—3 hours.
- 111A. Ancient History.** (3) I. Mr. Fisher
Lecture—3 hours.
A survey of the history of the Near East and Mediterranean area from the beginning of recorded history to the reign of Alexander the Great.
- *111B. Ancient History.** (3) II. Mr. Fisher
Lecture—3 hours.
The history of the Near East and Mediterranean area from the reign of Alexander the Great to the time of Constantine.
- 121A. Medieval History.** (3) I. Mr. Fisher
Lecture—3 hours.
A survey of European history from the reign of Constantine to the tenth century, with readings from the literary sources.
- 121B. Medieval History.** (3) II. Mr. Hauben
Lecture—3 hours.
European history from the tenth century to the Renaissance, with readings from the literary sources.
- 131. The Renaissance and Reformation.** (3) I. Mr. Hauben
Lecture—3 hours.
A study of the period 1300–1600, with primary attention to the leading figures and with readings from their major works.

* Not to be given, 1963–1964

- 132. Europe in the Seventeenth and Eighteenth Centuries. (3) I.**
Lecture—3 hours. Mr. Hauben
A survey of the period 1600–1789 with emphasis on the growth of the modern state, the new interest in science, and the growth of critical thought leading to revolutionary sentiment.
Offered in odd-numbered years.
- *133. The Age of Reason. (3) I.** Mr. Schwab
Lecture—3 hours.
Relationship of ideas to European society in the seventeenth and eighteenth centuries; the intellectual background of the French Revolution. Extensive source readings.
- *134A. Age of Revolution. (3) II.** Mr. Schwab
Lecture—3 hours.
Intellectual and social history of Europe from the French Revolution to the late nineteenth century. Extensive source readings.
- *134B. Age of Revolution. (3) I.** Mr. Schwab
Lecture—3 hours.
The intellectual and social history of Europe since the late nineteenth century. Extensive source readings.
- *136. The Soviet Union in World Affairs. (3) II.** Mr. O'Brien
Lecture—3 hours.
Primarily a history of Russia in world politics and economics since 1917. The long-range nature and problems of Russian foreign policy will be investigated.
- 137A. History of Russian Civilization. (3) I.** Mr. O'Brien
Lecture—3 hours.
An outline of Russian social, political and economic institutions and intellectual development from earliest times to the end of the nineteenth century.
- 137B. History of Russian Civilization. (3) II.** Mr. O'Brien
Lecture—3 hours.
An outline of Russian social, political and economic institutions and intellectual development in the twentieth century.
- *144A. History of Germany to 1815. (3) I.** Mr. Paret
Lecture—3 hours.
A history of the Germanics through the Congress of Vienna.
- 144B. History of Germany since 1815. (3) II.** Mr. Paret
Lecture—3 hours.
The German national unification, the age of Bismarck and William II, and the wars and revolutions of the twentieth century.
- 145. Europe from 1789 to 1871. (3) I.** Mr. Schwab
Lecture—3 hours.
A survey of the history of Western Europe from the French Revolution to the Franco-Prussian War.
- 146. Europe Since 1870. (3) II.** Mr. Schwab
Lecture—3 hours.
The political, social, and economic development of Europe from the Franco-Prussian War to the present.

* Not to be given, 1963–1964.

147. **Ideas and Politics in 20th-Century Europe.** (3) II. Mr. Paret
Lecture—2 hours; discussion—1 hour.
Prerequisite: courses 4A and 4B, or consent of the instructor.
Political, military, and intellectual history of Europe from the turn of the century to the present. Extensive source readings.
- *149. **History of Military Thought and Policy from Machievelli to the Present.** (3) I. Mr. Paret
Lecture—3 hours.
- 151A. **History of England to 1603.** (3) I. Mr. Woodfill
Lecture—3 hours.
- 151B. **History of England from 1603.** (3) II. Mr. Woodfill
Lecture—3 hours.
152. **English Constitutional History.** (3) I. Mr. Woodfill
Lecture and discussion—3 hours.
Prerequisite: course 151A–151B or the equivalent, or consent of the instructor.
From Anglo-Saxon times to the eighteenth century.
153. **English Society in the Early Modern Period.** (3) II. Mr. Woodfill
Discussion—3 hours.
Prerequisite: course 151A–151B or the equivalent, or consent of the instructor.
Reading in sources and monographs, sixteenth and seventeenth centuries; discussion and reports.
- 161A. **Latin-American History.** (3) I. Mr. Poppino
Lecture—3 hours.
Colonial history of Latin America.
- 161B. **Latin-American History.** (3) II. Mr. Poppino
Lecture—3 hours.
The National Period of Latin-American history.
163. **History of Brazil.** (3) II. Mr. Poppino
Lecture—3 hours.
The history of Brazil since 1500, dealing with colonial origins and subsequent development of political, economic, and social institutions. Emphasis on the period since independence.
Offered in even-numbered years.
- *165. **Twentieth Century Latin-American Social Revolutions.** (3) I. Mr. Poppino
Lecture—2 hours; discussion—1 hour.
Major social upheavals in Mexico, Argentina, Brazil, Bolivia, Guatemala, and Cuba, examined as to similarities and differences in causes, course, and consequences. Reading knowledge of Spanish helpful but not required.
Offered in even-numbered years.
- *166. **History of Mexico.** (3) II. Mr. Poppino
Lecture—3 hours.
The colonial origins and development of the Mexican nation; its political, economic, and social institutions. Emphasis on the period since 1910.
Offered in odd-numbered years.

* Not to be given, 1963–1964.

- 167. Proseminar in Latin American History.** (3) I. Mr. Poppino
 Discussion—3 hours.
 Prerequisite: course 161A-161B or the equivalent, and consent of the instructor. Reading knowledge of Spanish or Portuguese recommended.
 Research and writing on selected topics in Latin American history.
- 168. History of Inter-American Relations.** (3) I. Mr. Poppino
 Lecture—3 hours.
 Diplomatic history of Latin-America since independence, intra-Latin American relations, relations with the U. S., participation in international organizations, and communism in Latin-America. Reading knowledge of Spanish or Portuguese helpful but not required.
 Offered in odd-numbered years.
- 170A. Colonial America.** (3) I. Mr. Jacobson
 Lecture—3 hours.
 A survey of 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.
- 170B. The American Revolution.** (3) II. Mr. Jacobson
 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.
- *171. The Early National Period, 1789-1815.** (3) I. Mr. Jacobson
 Lecture—3 hours.
 The political and social history of the American republic from the adoption of the Constitution through the War of 1812.
- 172A. The Jacksonian Era.** (3) I. Mr. Staudenraus
 Lecture—3 hours.
 Prerequisite: courses 17A and 17B.
 The political and social history of the American republic from the War of 1812 to the Compromise of 1850, with special emphasis on intersectional rivalry.
- 172B. American Civil War.** (3) II. Mr. Staudenraus
 Lecture—3 hours.
 Prerequisite: course 172A.
 Major aspects of the 1850's and the Civil War era; factors leading to the sectional crisis and war; problems relating to Negro freedom; constitutional adjustments; economic and political changes; military and diplomatic policies of Union and Confederacy.
- 173. The Emergence of Modern America.** (3) I. Mr. Unger
 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.
- 174A. Recent History of the United States.** (3) I. Mr. Swain
 Lecture—3 hours.
 A study of political, economic, and cultural aspects of American democracy in recent years. From 1896 to 1928.

* Not to be given, 1963-1964.

- 174B. Recent History of the United States.** (3) II. Mr. Swain
Lecture—3 hours.
A study of political, economic, and cultural aspects of American democracy of recent years. From 1928 to the present.
- *175. Proseminar in American Intellectual History.** (3) II. Mr. Jacobson
Discussion—3 hours.
Intellectual history of the American people, with emphasis on social and political thought.
- *176A. Social and Cultural History of the United States.** (3) I. Mr. Shideler
Lecture—3 hours.
To 1865.
Offered in even-numbered years.
- *176B. Social and Cultural History of the United States.** (3) II. Mr. Shideler
Lecture—3 hours.
1865 to the present.
Offered in odd-numbered years.
- 178A. Great Issues in United States History: Ideas and Interpretations.** (3) I. Mr. Jackson
Lecture—3 hours.
Selected topics in the political, economic, social, and intellectual history of the United States. A study of historical thought and interpretation concerning the main currents of national development. To 1876.
- 178B. Great Issues in United States History: Ideas and Interpretations.** (3) II. Mr. Jackson
Lecture—3 hours.
Selected topics in the political, economic, social, and intellectual history of the United States. A study of historical thought and interpretation concerning the main currents of national development. 1876 to the present.
- 179A. Economic Growth of the United States.** (3) I. Mr. Unger
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.** (3) II. Mr. Unger
Lecture—3 hours.
The changing nature of industrial capitalism and its effects on agriculture, labor, business, and government in the late 19th century and 20th century.
- *180. The Westward Movement to 1850.** (3) I. Mr. Jacobson
Lecture—3 hours.
The political, economic, and social significance of the westward movement from colonial times to 1850.
Offered in even-numbered years.
- 181. Representative Americans.** (3) I. Mr. Staudenraus
Lecture—3 hours.
Prerequisite: course 17A-17B.
A biographical analysis of significant and representative men and women who shaped American history.
- 183. The Trans-Mississippi Frontier.** (3) I. Mr. Jackson
Lecture—3 hours.
The fur trade, western exploration and transportation, the mining kingdom, range cattle industry, and settlement of the West.
Offered in odd-numbered years.

* Not to be given, 1963-1964.

- *188A. **History of Agriculture in the United States.** (3) I. Mr. Shideler
Lecture—2 hours; discussion—1 hour.
History of agricultural development to 1900 with emphasis on social and economic institutions.
- *188B. **History of Agriculture in the United States.** (3) II. Mr. Shideler
Lecture—2 hours; discussion—1 hour.
History of agricultural changes from 1900 to the present with emphasis on the background and evolution of government policy.
- *189A. **History of the Pacific Coast and California.** (3) I. Mr. Jackson
Lecture—3 hours.
History of the Pacific Coast and California to 1850.
Offered in even-numbered years.
- 189B. **History of the Pacific Coast and California.** (3) II. Mr. Jackson
Lecture—3 hours.
History of California since 1850.
- 190A. **Far Eastern Civilization.** (3) I. Mr. Liu
Lecture—3 hours.
The culture and history of the Far East to about 1800. Emphasis on China and Japan, attention also to Korea and Southeast Asia.
- 190B. **Far Eastern Civilization.** (3) II. Mr. Liu
Lecture—3 hours.
Course 190A is not prerequisite to 190B, but taking the sequence is advised.
The culture, history, and problems of the Far East since about 1800. Emphasis on China and Japan, attention also to Korea and Southeast Asia.
- 191A. **China.** (3) I. Mr. Liu
Lecture—3 hours.
The development, to about 1800, of Chinese society and institutions in relation to cultural and political history. Readings include translations from Chinese literature.
- 191B. **China.** (3) II. Mr. Liu
Lecture—3 hours.
Course 191A is not prerequisite to 191B, but taking the sequence is advised.
The forces precipitating cultural and institutional change in China since about 1800; emphasis on 20th-century political history.
199. **Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSES

201. **Sources and General Literature of History.** (3) I and II. The Staff
Seminar—3 hours.
Advanced studies in bibliography and historiography in the several fields of history, for students preparing for higher degrees in history.
May be repeated for credit.
237. **Russian History.** (3) I and II. Mr. O'Brien
Seminar—3 hours.
Prerequisite: course 137A-137B or equivalent.
Topics relating to the political and cultural history of Russia in the seventeenth, eighteenth, and nineteenth centuries.

* Not to be given, 1963-1964.

242. **History of the Enlightenment.** (3) I and II. Mr. Schwab
Seminar—3 hours.
Prerequisite: a reading knowledge of French.
Intellectual and social history of Europe during the Enlightenment.
May be repeated for credit.
251. **English History.** (3) I and II. Mr. Woodfill
Seminar—3 hours.
261. **Latin American History.** (3) I and II. Mr. Poppino
Seminar—3 hours.
Prerequisite: two semesters of Latin American history; consent of the instructor; reading knowledge of Spanish or Portuguese.
- *270. **Early American History.** (3) I and II. Mr. Jacobson
Seminar—3 hours.
271. **History of the American West.** (3) I and II. Mr. Jackson
Seminar—3 hours.
272. **History of the United States, 1815–1865.** (3) I and II. Mr. Staudenraus
Seminar—3 hours.
273. **History of the United States, 1865–1900.** (3) I and II. Mr. Unger
Seminar—3 hours.
Prerequisite: consent of the instructor.
Selected topics in American history from the Civil War to the Progressive Movement.
288. **Agricultural History of the United States.** (3) I and II. Mr. Shideler
Seminar—3 hours.
291. **Chinese History.** (3) I and II. Mr. Liu
Seminar—3 hours.
299. **Research.** (1–4) I and II. The Staff

PROFESSIONAL COURSE

- *300. **The Teaching of History in the Secondary School and the Junior College.** (2) I. The Staff
Prerequisite: upper division standing; a teaching major or minor in social studies.
Methods for the presentation of history at the secondary and junior college level.

⁴ Not to be given, fall semester, 1963–1964.

* Not to be given, 1963–1964.

HOME ECONOMICS

Lucille S. Hurley, Ph.D., *Chairman of the Department.*
Department Office, 152 Home Economics Building

- †Gladys J. Everson, Ph.D., *Professor of Home Economics.*
Pauline C. Paul, Ph.D., *Professor of Home Economics.*
Flora M. Hanning, Ph.D., *Visiting Professor of Home Economics.*
Richard D. Cramer, M.F.A., (Architecture), *Associate Professor of Design.*
Lucille S. Hurley, Ph.D., *Associate Professor of Nutrition.*
Mary Ann Morris, Ph.D., *Associate Professor of Home Economics.*
Daniel Shapiro, *Associate Professor of Design.*
———, *Associate Professor of Nutrition.*
Robert C. Arneson, M.F.A., *Assistant Professor of Design.*
Roberta R. Collard, Ph.D., *Assistant Professor of Child Development.*
Elizabeth M. Elbert, Ph.D., *Assistant Professor of Home Economics.*
Ruth J. Horsting, M.A., *Assistant Professor of Design.*
Emmy E. Werner, Ph.D., *Assistant Professor of Child Development.*
———, *Assistant Professor of Home Economics.*
———, *Assistant Professor of Home Economics.*
———, *Assistant Professor of Home Economics.*



- R. Lorene Dryden, M.A., *Lecturer in Home Economics.*
Helen G. Giambruni, B.A., *Lecturer in Design.*
Doris F. Heineman, B.A.E., *Lecturer in Design.*
Robert O. Herrmann, M.S., *Acting Assistant Professor of Consumption Economics.*
Arline Johnson, M.S., *Lecturer in Education.*
Agnes McClelland, M.A., *Lecturer in Home Economics.*

Departmental Major Advisers.—Mr. Arneson, Miss Collard, Mr. Cramer, Miss Dryden, Miss Elbert, Miss Hanning, Mrs. Heineman, Mrs. Horsting, Mrs. Hurley, Miss McClelland, Miss Morris, Miss Paul, Mr. Shapiro, Miss Werner.

Graduate Adviser.—Miss Paul.

Bachelor of Science Major Program and Graduate Study. See page 59.

DESIGN

LOWER DIVISION COURSES

- 6A. Theory of Design.** (2) I and II. The Staff
Laboratory—6 hours.
Basic elements of form, texture, and color in two and three dimensions; studio exercises.
- 6B. Theory of Design.** (2) I and II. The Staff
Laboratory—6 hours.
Prerequisite: course 6A.
Basic elements of form, texture, and color in two and three dimensions; studio exercises.
- 8. Principles of Typographic Design.** (2) II. Mr. Shapiro
Laboratory—6 hours.
Prerequisite: course 6B or consent of the instructor.
Letter and type forms as elements of design.

† Absent on leave, 1963–1964.

UPPER DIVISION COURSES

- 130. Interior Design.** (2) II. Mrs. Heineman
Lecture—2 hours.
Prerequisite: course 6A.
Introduction to the principles of design. Analysis, organization, and solution of problems in interior design in reference to functional and aesthetic aspects.
- 130L. Interior Design.** (1) II. Mrs. Heineman
Laboratory—3 hours.
Prerequisite: course 130 should be taken concurrently.
Introduction to the principles of design. Analysis, organization, and solution of problems in interior design in reference to functional and aesthetic aspects.
- 150. The House.** (3) II. Mr. Cramer
Lecture—3 hours.
Prerequisite: course 6A or consent of the instructor.
The tenets of modern architecture as illustrated in the contemporary house.
- 160. Textile Design.** (2) I. Mrs. Heineman
Laboratory—6 hours.
Prerequisite: course 6B or consent of the instructor.
Studio projects in textile printing.
- 191. History of Design.** (3) I. Mrs. Giambruni
Lecture—3 hours.
Prerequisite: one semester of history of art.
From ancient to modern times.
- 192A-192B. Costume Design.** (2-2) Yr. _____
Laboratory—6 hours.
Prerequisite: course 6B and Art 16 or consent of the instructor.
Studio projects in contemporary costume design.
- 193. History of Costume.** (3) II. _____
Lecture—3 hours.
Prerequisite: one semester of history of art.
From ancient to modern times.
- 195. History of Interior Design.** (3) II. _____
Lecture—3 hours.
Prerequisite: one semester of history of art.
From ancient to modern times.
- 196A-196B. Advanced Interior Design.** (2-2) Yr. Mrs. Heineman
Laboratory—6 hours.
Prerequisite: courses 6B, 130L (may be taken concurrently) and Art 16 or consent of the instructor.
Studio projects in interior design.
- 197. Individual Problems in Design.** (2) I and II. The Staff
Laboratory—6 hours.
Prerequisite: one year upper division work in design, or consent of the instructor.
Senior thesis; a comprehensive design problem independently pursued under the direction of a member of the faculty.
- 198. Directed Group Study.** (1-3) I and II. The Staff
Prerequisite: upper division standing and consent of the instructor.
Group study of selected problems in design.
- 199. Special Study for Advanced Undergraduates.** (1-3) I and II. The Staff

HOME ECONOMICS

LOWER DIVISION COURSES

- 6. Introduction to Textiles.** (2) II. Miss Morris
Lecture—2 hours.
Prerequisite: Chemistry 8.
Study of plant, animal, and synthetic fibers used in textiles and of the finished textile fabrics.
Field trips are included.
- 6L. Introduction to Textiles Laboratory.** (1) II. Miss Dryden
Laboratory—3 hours.
Prerequisite: course 6 (should be taken concurrently).
Study of plant, animal, and synthetic fibers used in textiles and of the finished textile fabrics.
Field trips are included.
- 7. Clothing Study.** (2) I and II. Miss Dryden
Lecture—2 hours.
Prerequisite: Design 6A.
Social, psychological, and economic aspects of clothing as related to selection, design, and construction.
- 7L. Clothing Study Laboratory.** (1) I and II. Miss Dryden, Miss McClelland
Laboratory—3 hours.
Prerequisite: course 7 (should be taken concurrently).
Social, psychological, and economic aspects of clothing as related to selection, design, and construction.

- 12. Euthenics.** (2) I. The Staff
Lecture—2 hours.
A study of the function of the family and the homemaker in modern society, and of the contributions of the basic sciences and the arts to the solution of present-day social and economic problems of the individual and the family.

UPPER DIVISION COURSES

- 100A-100B. Experimental Food Study.** (2-2) Yr. Miss Elbert
Lecture—2 hours.
Prerequisite: Chemistry 8. Recommended: Bacteriology 1.
Composition of food; principles involved in food preservation, meal preparation, and management.
- 101A-101B. Experimental Food Study Laboratory.** (1-1) Yr. Miss Elbert
Laboratory—3 hours.
Prerequisite: course 100A-100B (should be taken concurrently).
Composition of food; principles involved in food preservation, meal preparation, and management.
- 104A-104B. Advanced Food Study.** (4-4) Yr. Miss Paul
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 100B or consent of the instructor.
Application of principles of chemistry to food preparation. Development of experimental attitudes and techniques.
- 112A-112B. Nutrition and Dietetics.** (2-2) Yr. Miss Hanning
Lecture—2 hours.
Prerequisite: course 100A-100B (may be taken concurrently); Chemistry 8; Physiology 1.
An introduction to the principles of nutrition. Study of the nutrients and

their chemical and physiological roles in metabolism. Nutrient requirements of man at various phases of the life cycle.

113A-113B. Nutrition and Dietetics Laboratory. (1-1) Yr. Miss Hanning
Laboratory—3 hours.

Prerequisite: course 112B (should be taken concurrently).

An introduction to the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism; nutrient requirements of man at various phases of the life cycle.

***114. Physiological Processes in Child Development.** (3) I. Mrs. Hurley
Lecture—3 hours.

Prerequisite: course 112A-112B.

Physical development, physiological changes, and nutritional needs during the embryological period, infancy, childhood and youth.

116. Nutrition and Diet Therapy. (3) I. _____

Lecture—3 hours.

Prerequisite: course 112B or equivalent.

Physiological basis for the use of special diets. Problems in the planning and computation of dietaries for normal and pathological conditions.

117. Problems in Human Nutrition. (4) II. Mrs. Hurley

Lecture—2 hours; laboratory—6 hours.

Prerequisite: course 112A-112B; Biochemistry 101; Chemistry 5.

Second-year study of nutrition dealing primarily with aspects of human nutrition, e.g., evaluation of nutritional status, factors influencing nutrient requirements of man, deficiencies versus excesses, world nutrition problems.

121. Institution Food Study. (4) I. Mrs. Pirkey

Lecture—2 hours; laboratory—6 hours.

Prerequisite: course 100B.

The principles and problems involved in the preparation and service of food in institutions.

122. Institution Organization and Management. (4) II. Mrs. Pirkey

Lecture—2 hours; laboratory—6 hours.

Prerequisite: course 121 or permission of instructor.

The principles and problems involved in the organization and management of institution households, such as residence halls, hospitals, and hotels.

131. Development in Infancy and Early Childhood. (3) I. Miss Collard

Lecture—3 hours.

Prerequisite: Psychology 1 or 2.

Psychological and cultural factors in the development of infants and pre-school children.

133. Laboratory in Child Development. (1) I. Miss Collard

Lecture—1 hour; laboratory—2 hours for six-week period.

Course 133 must be taken concurrently with course 131.

Laboratory conducted at the nursery school.

136. Development in Middle Childhood and Adolescence. (3) II. _____

Lecture—3 hours.

Miss Werner

Prerequisite: Psychology 1 and 2, or course 131.

Psychological and cultural factors in the development of school-age children and adolescents.

137. The Contemporary American Family. (3) II. _____

Lecture—3 hours.

Sociological and psychological factors influencing marriage and the family in present-day society.

* Not to be given, 1963-1964.

- 138. Exceptional Children.** (3) II. Miss Collard, Miss Werner
Lecture—3 hours.
Prerequisite: courses 131, 136, or Psychology 112.
General consideration of emotionally disturbed, handicapped and gifted children. Introduction to research findings and to special diagnostic and training facilities available.
- 139. Diagnostic Techniques with Children.** (3) I. Miss Werner
Lecture—3 hours.
Prerequisite: courses 131 and 136, or Psychology 112.
Evaluation of intelligence, personality, and special abilities of children. Class demonstrations of individual tests for infants, preschool, and school-age children. Concepts of measurement and empirical research.
- 140. Home Management.** (3) I. _____
Lecture—2 hours; discussion—1 hour.
Prerequisite: Psychology 1 or 2.
Management principles in relation to home and family resources.
- 140L. Laboratory in Home Management.** (2) I and II. _____
Prerequisite: course 140 (may be taken concurrently) and senior or graduate standing.
Integrated experiences in the various phases of home management, as provided by five weeks' residence in the home management house. A fee is required.
- 141. Consumers and the Market.** (3) I. Mr. Herrmann
Lecture—3 hours.
Prerequisite: Economics 1A-1B; a course in statistics.
Study of the functions and structure of the market from the standpoint of consumers; evaluation of the guides available for consumers in buying; agencies aiding and protecting consumers.
- 142. Social and Economic Problems of Families.** (3) II. Mr. Herrmann
Lecture—3 hours.
Prerequisite: Economics 1A-1B; a course in statistics.
Present-day problems of families as they are related to economic and social conditions.
- 151A-151B. Housing.** (3-3) Yr. Mr. Cramer
Lecture—3 hours.
Prerequisite: Design 150.
Housing problems as they have developed in Europe and in America; social, economic, technical, and aesthetic aspects; activities of private agencies and programs of government; the current scene as indicative of problems ahead.
- 160. Textiles.** (3) I. Miss Morris
Lecture—2 hours; laboratory—3 hours.
Prerequisite: courses 6 and 6L.
The chemical and physical structure of textile fibers, and its relations to fiber and fabric properties.
- 162. The Textile Economy.** (3) I. Miss Morris
Lecture—2 hours; laboratory—3 hours.
Prerequisite: courses 6, 6L; Economics 1A-1B.
Organization of the textile industry; production and consumption of textile products; principles involved in the maintenance of textile products.
- 175. Clothing Design and Construction.** (3) I and II. Miss McClelland
Lecture—1 hour; laboratory—6 hours.
Prerequisite: courses 6, 7.
Wardrobe planning and problems in advanced clothing construction.

198. **Directed Group Study.** (1-3) I and II. The Staff

Prerequisite: consent of the instructor.

Directed group study of selected topics in home economics for advanced undergraduates.

199. **Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSES

247. **Consumption and Standards of Living.** (3) I. Mr. Herrmann

Lecture—3 hours.

Prerequisite: courses 141 and 142 or equivalent.

The effects of family income, size, residence, and occupation on consumption; the relation of standards of living to levels of consumption. Appraisal of methodology of collecting data and analysis.

290. **Seminar in Home Economics.** (1) I and II. The Staff

Seminar—1 hour.

Prerequisite: consent of the instructor.

Selected topics in the fields of food, nutrition, or consumer economics.

292. **Seminar in Textiles.** (2) II. Miss Morris

299. **Research in Home Economics.** (2-6) I and II. The Staff

Research in foods, nutrition, consumer economics, or textiles.

PROFESSIONAL COURSE

300. **Teaching Home Economics in Secondary Schools.** (2) I and II.

Lecture—2 hours.

Miss Johnson

Prerequisite: senior or graduate standing; major or minor in home economics.

Philosophy of homemaking education; organization of the curriculum; methods and techniques of teaching homemaking; selection and use of materials of instruction; evaluation procedures.

RELATED COURSE

Extension Education in Agriculture and Home Economics (Agricultural Education 187)

INTERNATIONAL AGRICULTURAL DEVELOPMENT

James M. Tinley, Ph.D., *Acting Chairman of the Committee.*

Committee Office, 214 Academic Office Building

Committee in Charge:

Norman B. Akesson, M.S., *Professor of Agricultural Engineering.*

J. Richard Blanchard, M.S., *University Librarian.*

Daniel J. Crowley, Ph.D., *Associate Professor of Anthropology and Art.*

Bruce Glassburner, Ph.D., *Associate Professor of Economics.*

Trimble R. Hedges, Ph.D., *Professor of Agricultural Economics.*

William M. Herms, M.S., *Extension Information Specialist.*

Donald E. Jasper, D.V.M., Ph.D., *Professor of Clinical Pathology.*

Duane S. Mikkelsen, Ph.D., *Professor of Agronomy.*

Maurice L. Peterson, Ph.D., *Professor of Agronomy (Berkeley campus).*

Maynard Skinner, Ph.D., *Foreign Student Adviser.*

James M. Tinley, Ph.D., *Professor of Agricultural Economics.*

Lynn D. Whittig, Ph.D., *Associate Professor of Soil Science.*

Major Advisers.—Mr. Mikkelsen, Mr. Tinley.

Instruction in International Agricultural Development is not organized as a single administrative unit in the University, but the relevant courses are offered by a number of departments, and are coordinated by the Committee in charge. An undergraduate major is offered in the College of Agriculture.

IRRIGATION

Verne H. Scott, Ph.D., *Chairman of the Department.*

Department Office, 121 Veihmeyer Hall

Lloyd D. Doneen, Ph.D., *Professor of Irrigation.*

Robert M. Hagan, Ph.D., *Professor of Irrigation and Professor of Engineering.*

James N. Luthin, Ph.D., *Professor of Irrigation and Professor of Engineering.*

Verne H. Scott, Ph.D., *Professor of Irrigation and Professor of Engineering.*

Frank Adams, M.A., L.L.D. (hon.c.), *Professor of Irrigation, Emeritus.*

Frank J. Veihmeyer, C.E., Ph.D., *Professor of Irrigation, Emeritus.*

Jaime Amorocho, Ph.D., *Associate Professor of Irrigation and Associate Professor of Engineering.*

Robert H. Burgy, M.S., *Associate Professor of Irrigation and Associate Professor of Engineering.*

Delbert W. Henderson, Ph.D., *Associate Professor of Irrigation.*

Donald R. Nielsen, Ph.D., *Assistant Professor of Irrigation.*

Theodor S. Strelkoff, Ph.D., *Assistant Professor of Irrigation and Assistant Professor of Engineering.*

James W. Biggar, Ph.D., *Lecturer in Irrigation.*

William O. Pruitt, Jr., M.S., *Lecturer in Irrigation and Lecturer in Engineering.*

Departmental Major Advisers.—Mr. Henderson, Mr. Nielsen, Mr. Biggar, Mr. Burgy.

Bachelor of Science Major Program and Graduate Study. See page 62.

LOWER DIVISION COURSE

1. Introduction to Irrigation. (3) II.

Lecture—3 hours.

Prerequisite: sophomore standing or consent of the instructor. Not open to students who have received credit for course 110.

An introductory course in irrigation principles including soil characteristics related to irrigation; water supply, conveyance and distribution; land preparation and irrigation methods; irrigation requirements of crops; drainage of irrigated land; problems of irrigation management.

UPPER DIVISION COURSES

100. Water-Soil-Plant Relationships. (3) I.

Mr. Hagan, Mr. Nielsen

Lecture—3 hours.

Prerequisite: consent of the instructor.

Basic principles underlying irrigation in its soil and plant relationships. Movement of irrigation water in soil, soil-moisture availability, soil moisture measurement, relation of soil moisture to plant growth, irrigation requirements for principal crops, and scheduling irrigations for maximum efficiency.

- 110. Irrigation Principles and Practices.** (4) I. Mr. Henderson
Lecture—3 hours; laboratory—3 hours.
Prerequisite: Physics 2A or 10; consent of the instructor if the student has received credit in course 1.
A general course for students not majoring in irrigation. Irrigation as a factor in agriculture, principles of irrigation practice, development of the farm irrigation water supply, preparation of land for irrigation, design of farm irrigation systems, and water requirements of crops.
- 115. Water Quality and Salinity as Factors in Irrigation.** (3) I. Mr. Doneen
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Chemistry 1A–1B. Recommended: Chemistry 5; Soil Science 1.
Water quality, water analysis, salinity, soil reclamation, infiltration problems, and soil amendments.
- 118. Irrigation Hydraulics.** (4) I. Mr. Amorcho
Lecture—3 hours; laboratory—3 hours.
Prerequisite: Physics 2A–2B; Mathematics 16A–16B.
Basic principles of hydraulics including flow in pipelines and open channels. Use, operation and design of water-measuring devices and water control structures used on irrigated farms.
- 135. Irrigation Management and Water Conservation.** (2) II. Mr. Henderson
Lecture—2 hours.
Prerequisite: senior standing in irrigation science or soil science and concurrent enrollment in Soil Science 135.
Irrigation practices as affected by soil properties and topography, irrigation-tillage interrelationships, irrigation-fertility interrelationships, irrigation in relation to fertilizer applications, moisture control during germination and harvest, irrigation practices for water conservation, and influences of salinity and drainage on irrigation management.
- 140. Drainage of Agricultural Lands.** (2) II. Mr. Luthin
Lecture—2 hours.
Prerequisite: course 100 and 118.
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.
- 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. Farm Irrigation Systems.** (3) I. _____
Lecture—3 hours.
Prerequisite: senior standing in irrigation science or engineering.
Design, construction, operation and maintenance of farm irrigation systems including appurtenant structures. Preparation of land for irrigation. Analysis of irrigation systems and water application practices.
- 170. Irrigation and Drainage Laboratory.** (2) II. _____
Lecture—1 hour; laboratory—3 hours.
Prerequisite: senior standing in irrigation science or engineering.
Laboratory and field exercises on ground water, wells, and pumping plants; soil-moisture characteristics and water-soil-plant relationships; farm irrigation system design and operation; evaluation of water application methods; drainage investigation techniques; and layout of farm drainage systems. Occasional field trips may be scheduled.

190. **Irrigation Proseminar.** (1) II. Mr. Nielsen
Lecture—1 hour.
Prerequisite: consent of instructor.
Current problems in irrigation.
198. **Directed Group Study.** (1-5) I and II. The Staff
Group study of selected problems in irrigation.
199. **Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff
Prerequisite: senior standing.

GRADUATE COURSES

200. **Advanced Water-Soil-Plant Relationships.** (2) II. Mr. Hagan
Lecture—2 hours.
Prerequisite: consent of instructor.
Selected topics in water relations including the availability of soil moisture for plant growth; influence of water potential on plant metabolism; water uptake, movement, and distribution in plants; transpiration and water use; nutrient uptake.
215. **Advanced Topics in Water Quality.** (2) II. Mr. Biggar
Lecture—2 hours.
Prerequisite: consent of instructor.
An advanced course on irrigation water quality emphasizing physiochemical principles governing interactions of ionic constituents in water with soils and plants. Topics include hydro-dynamic dispersion phenomena during leaching, percolating waters and ground-water quality, and irrigation disposal of waste waters.
250. **Physics of Soil Water.** (2) I. Mr. Nielsen
Lecture—2 hours.
Prerequisite: Mathematics 114 or 119 and consent of instructor.
An advanced course on physics of soil water with emphasis on unsaturated flow problems in soils including hydro-dynamics of viscous fluids, miscible and immiscible displacement theories, and methods for solving differential forms of flow equations.
290. **Seminar.** (1) I and II. Mr. Nielsen
Seminar—1 hour.
Required of all graduate students in irrigation science. Discussions of advanced problems in irrigation.
298. **Group Study.** (1-6) I and II. The Staff
Group study on advanced topics in irrigation.
299. **Research in Irrigation.** (1-6) I and II. The Staff
Individual research in irrigation science. May be repeated for credit.



For additional courses in irrigation, drainage, and water resources engineering, see the Engineering course section, pages 177-188.

ITALIAN

For courses in Italian see "Foreign Languages," page 203.

LANDSCAPE HORTICULTURE

Richard W. Harris, Ph.D., *Chairman of the Department.*
Department Office, 106 Landscape Horticulture Building

Richard W. Harris, Ph.D., *Associate Professor of Landscape Horticulture.*
John H. Madison, Ph.D., *Associate Professor of Landscape Horticulture.*
Roy Sachs, Ph.D., *Assistant Professor of Landscape Horticulture.*



Philip A. Barker, M.S., *Lecturer in Landscape Horticulture.*
Robert D. Danielson, M.S., *Lecturer in Landscape Architecture.*

Departmental Major Advisers.—Landscape Horticulture, Mr. Danielson,
Mr. Madison; Park Administration, Mr. Harris.

Bachelor of Science Major Program and Graduate Study. See page 63.

LANDSCAPE HORTICULTURE

LOWER DIVISION COURSES

1. **Introduction to Landscape Design.** (3) I. Mr. Danielson
Lecture—2 hours; laboratory—3 hours.
Design principles; practice in analysis and design with reference to landscape problems.
2. **Elements of Landscape Design.** (3) II. Mr. Danielson
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 1.
Analysis and solution by design of typical site problems.
4. **Introduction to Landscape Horticulture.** (3) II. Mr. Harris
Lecture—2 hours; laboratory—3 hours.
Principles and practices of growing turf, flowers and herbaceous and woody plants in the landscape.
- *49. **Orientation in Landscape Horticulture.** (No credit) II. Mr. Madison
Prerequisite: consent of the instructor.
Field trips to observe and study the opportunities for careers in the management of parks, golf courses, and public grounds; arboriculture; landscape construction and contracting; nursery production and management; commercial floriculture; and teaching, research, and extension.
To be given during the spring recess of odd-numbered years.

UPPER DIVISION COURSES

- *104. **Principles of Landscape Construction.** (3) I. Mr. Danielson
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1, Engineering 1A (may be taken concurrently).
The analysis and solution of construction problems as they relate to design and site development. Emphasis on physical structures rather than plant materials.
Offered in even-numbered years.
- 105A. **Taxonomy of Landscape Trees.** (3) I. Mr. Barker
Lecture—1 hour; laboratory—6 hours.
Prerequisite: Botany 1. Recommended: Botany 108.
Morphological comparison, identification, adaptation, and evaluation of landscape trees of Western and Southern United States.

* Not to be given, 1963-1964.

105B. Taxonomy of Landscape Shrubs. (3) II. Mr. Barker

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 105A or consent of the instructor.

Morphological comparison, identification, adaptation, and evaluation of landscape shrubs, vines, and groundcovers of Western and Southern United States.

105C. Spring Field Course. (1) II. Mr. Barker

Prerequisite: course 105B or consent of the instructor.

Morphological comparison, identification, adaptation, and evaluation of desert, tropical, and subtropical landscape plants. Field study of landscape plantings, plant survey practices, and preparation of field reports.

Offered during the spring recess of even-numbered years.

108. Turf. (2) I. Mr. Madison

Lecture—1 hour; laboratory—3 hours.

Prerequisite: Botany 1. Recommended: Botany 111.

The basic practices and ecological and physiological principles involved in the selection of turf grasses, turf establishment and maintenance.

Offered in odd-numbered years.

***109. Principles of Growing Plants in Nurseries. (2) I.** Mr. Sachs

Lecture—1 hour; laboratory—3 hours.

Prerequisite: Pomology 9. Recommended: Botany 111.

The basic practices and physiological principles involved in the growing of woody plants in nurseries.

Offered in even-numbered years.

***110. Floriculture. (2) II.** Mr. Sachs

Lecture—1 hour; laboratory—3 hours.

Prerequisite: Botany 1. Recommended: Botany 111, Pomology 9.

The basic practices and physiological principles involved in the growing of economic flowering plants, emphasizing the modification of the environment for flower induction and growth.

Offered in odd-numbered years.

111. Arboriculture. (2) II. Mr. Harris

Lecture—1 hour; laboratory—3 hours.

Prerequisite: Botany 1. Recommended: Botany 111.

The physiological principles and practices involved in the culture of trees and shrubs in the landscape.

Offered in even-numbered years.

198. Directed Group Study. (1-5) I and II. The Staff

Prerequisite: 3 units of upper division work in landscape horticulture; consent of the instructor.

Selected problems in landscape horticulture.

199. Special Study for Advanced Undergraduates. (1-5) I and II.
The Staff (Mr. Harris in charge)

Prerequisite: consent of the instructor.

GRADUATE COURSES

290. Seminar. (1) I and II. Mr. Barker, Mr. Madison
Seminar—1 hour.**299. Research. (1-6) I and II.** Mr. Sachs

RELATED COURSES

Business Law: Introduction (Agricultural Economics 18)
Managerial Accounting (Agricultural Economics 111)

Agricultural Business Management (Agricultural Economics 115A-115B)
Weed Control (Botany 107)
Economic Entomology (Entomology 124)
Water-Soil-Plant Relationships (Irrigation 100)
Plant Diseases (Plant Pathology 120)
Principles of Plant Propagation (Pomology 9)
Introduction to Soil Science (Soil Science 1)

PARK ADMINISTRATION

- 110. Introduction to City Planning.** (3) II. _____
 Lecture—3 hours.
 Survey of city planning as it has evolved in the United States since 1800 in response to physical, social, and economic problems; major concepts and procedures used by city planners and local governments to improve the urban environment.
- 134. Park and Recreation Area Planning.** (3) II. Mr. Danielson
 Lecture—1 hour; laboratory—6 hours.
 Principles, standards, and procedures in planning and design of areas for park recreation use.
- 140. Park Administration.** (3) I. _____
 Lecture—3 hours.
 Prerequisite: consent of the instructor.
 The acquisition, development, and management of parks, street tree plantings, and other landscaped areas.
- 198. Directed Group Study.** (1-5) I and II. Mr. Danielson
 Prerequisite: consent of the instructor.
 Selected problems in park administration.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff
 Prerequisite: consent of the instructor.

RELATED COURSES

Recreation in the Community (Physical Education 140)
California State and Local Government (Political Science 104)
Elements of Public Administration (Political Science 181)
Problems of Public Administration (Political Science 183)

LATIN

For courses in Latin see "Foreign Languages" on page 203.

MATHEMATICS

Charles A. Hayes, Jr., Ph.D., *Chairman of the Department.*
Department Office, 824 Sproul Hall

———, *Professor of Mathematics.*

George A. Baker, Ph.D., *Professor of Mathematics.*

Curtis M. Fulton, Ph.D., *Professor of Mathematics.*

Charles A. Hayes, Jr., Ph.D., *Professor of Mathematics.*

Edward B. Roessler, Ph.D., *Professor of Mathematics.*

Henry L. Alder, Ph.D., *Associate Professor of Mathematics.*

Hubert A. Arnold, Ph.D., *Associate Professor of Mathematics.*

Donald C. Benson, Ph.D., *Associate Professor of Mathematics.*

Albert C. Burdette, Ph.D., *Associate Professor of Mathematics.*

Peter W. M. John, Ph.D., *Associate Professor of Mathematics.*

Donald A. Norton, Ph.D., *Associate Professor of Mathematics.*

Sherman K. Stein, Ph.D., *Associate Professor of Mathematics.*

Eugene Albert, Ph.D., *Assistant Professor of Mathematics.*

Dallas O. Banks, Ph.D., *Assistant Professor of Mathematics.*

Leon E. Borgman, Ph.D., *Assistant Professor of Mathematics.*

Gertrude I. Heller, Ph.D., *Assistant Professor of Mathematics.*

†Fred Krakowski, Ph.D., *Assistant Professor of Mathematics.*

†Kurt Kreith, Ph.D., *Assistant Professor of Mathematics.*

Melven R. Krom, Ph.D., *Assistant Professor of Mathematics.*

Gary J. Kurowski, Ph.D., *Assistant Professor of Mathematics.*

Fawzi M. Yaqub, Ph.D., *Assistant Professor of Mathematics.*



Gulbank D. Chakerian, Ph.D., *Lecturer in Mathematics.*

Shirley A. Goldman, M.A., *Associate in Mathematics.*

Fred J. Lorenzen, Jr., M.S., *Associate in Mathematics.*

Takayuki Tamura, Ph.D., *Visiting Associate Professor of Mathematics.*

Edward J. Tully, Jr., Ph.D., *Lecturer in Mathematics.*

Letters and Science List.—All undergraduate courses in mathematics except 129 are included in the Letters and Science List of Courses. (See page 93.)

Major Subject Advisers.—Mr. Borgman, Miss Heller, Mr. Krom, Mr. Roessler, Mr. Stein and Mr. Yaqub.

Bachelor of Arts Major Program

(A) Lower Division Courses.—Required: courses 7A, 7B, 9A, 9B, 9C. Total: 18 units.

(B) Upper Division Courses.—In the 24 units of upper division work required for the major in mathematics, the student is to acquire competence in algebra, analysis, and geometry. For this purpose he must elect, subject to the approval of the adviser, at least 3 units of upper division work in each of these fields, including courses 108 and 127A.

The department will certify to the completion of the major program for graduation only on the basis of at least a C average in the upper division courses which could be taken in the department in satisfaction of major requirements. Students who fail to maintain such an average may be excluded from the major in mathematics.

Bachelor of Science Major Program

The major program consists of 60 units of numbered mathematics and/or natural sciences courses including:

† Absent on leave, 1963–1964.

(A) Lower Division Courses.—Required: courses 7A, 7B, 9A, 9B, 9C. Total: 18 units.

(B) Upper Division Courses.—The student must pass successfully courses 106, 107, 108, 111A, 127A, one course in geometry, and at least 11 additional units in upper division or graduate mathematics courses. Total: 27 units. Students specializing in statistics may substitute course 132 or 133 for the geometry course.

The department will certify to the completion of the major program for graduation only on the basis of at least a C average in the upper division courses which could be taken in the department in satisfaction of major requirements. Students who fail to maintain such an average may be excluded from the major in mathematics.

A numbered course in mathematics is not acceptable as a prerequisite for another course in mathematics unless a grade of C or higher has been attained in the prerequisite course.

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.

LOWER DIVISION COURSES

4A. Analytic Geometry and Calculus, Third Course. (3) I and II. The Staff

Lecture—3 hours.

Prerequisite: course 3B. Not open to students who have completed course 14 with a grade of C or better.

Continuation of course 3B.

4B. Analytic Geometry and Calculus, Fourth Course. (3) II. The Staff

Lecture—3 hours.

Prerequisite: course 4A.

Continuation of course 4A.

7A. Introduction to Mathematical Structures. (3) I and II. The Staff

Lecture—3 hours.

Prerequisite: two years of high school algebra or the equivalent; trigonometry. Credit will not be allowed in course 7A if student has received credit in course 1.

Topics selected from advanced algebra; determinants and matrices; theory of sets.

7B. Introduction to Mathematical Structures. (3) I and II. The Staff

Lecture—3 hours.

Prerequisite: course 7A. Credit will not be allowed in course 7B if the student has received credit in course 7.

Topics selected from theory of sets, functions, and axiomatic systems.

9A. Analytic Geometry and Calculus, First Course. (4) I and II.

Lecture—4 hours.

The Staff

Prerequisite: two years of high school algebra or the equivalent; plane geometry; plane trigonometry. Only 2 units of credit will be allowed students who have received credit for course 16A or 3A.

Introduction to analytic geometry and calculus. The sequence 9A, 9B, 9C includes plane and solid analytic geometry, differentiation and integration of elementary functions, infinite series, functions of several variables, partial differentiation, multiple integration, and elementary differential equations.

9B. Analytic Geometry and Calculus, Second Course. (4) I and II.

Lecture—4 hours. The Staff

Prerequisite: course 9A or 16B. Only two units of credit will be allowed students who have received credit for course 16B or 3B.

Continuation of course 9A.

9C. Analytic Geometry and Calculus, Third Course. (4) II. The Staff

Lecture—4 hours.

Prerequisite: course 9B. Only three units of credit will be allowed students who have received credit for course 4A.

Continuation of course 9B.

13. Elementary Statistics. (3) I and II. The Staff

Lecture—3 hours.

Prerequisite: two years of high school algebra or the equivalent.

Arrays of experimental measurements, measures of central tendency, variation and correlation, significance of measures; elementary reliability and validity of tests.

14. Analytic Geometry and Calculus. (5) I. The Staff

Lecture—3 hours. Section meeting—2 hours.

Prerequisite: course 3B. Not open to students who have completed course 4A with a grade of C or better.

Continuation of course 3B.

16A. Analytic Geometry and Calculus. (3) I and II. The Staff

Lecture—3 hours.

Prerequisite: one and one-half years of high school algebra or the equivalent, plane geometry, plane trigonometry. Not open for credit to students who have received credit in course 9A.

A short course in analytic geometry and in differential and integral calculus. Primarily for students in the biological sciences.

16B. Analytic Geometry and Calculus. (3) I and II. The Staff

Lecture—3 hours.

Prerequisite: course 16A. Not open for credit to students who have received credit in course 9B. Only 2 units of credit will be allowed if the student has received credit in course 9A.

Continuation of course 16A.

36. Fundamentals of Mathematics. (3) I and II. Mr. Stein

Lecture—3 hours.

Introduction to fundamental mathematical ideas selected from the principal areas of modern mathematics.

41. Discrete Probability. (3) II. Mr. Borgman

Lecture—3 hours.

Prerequisite: course 7A.

Introduction to probability theory in the discrete case, using set theory but not calculus.

UPPER DIVISION COURSES

Students who major in mathematics must maintain at least a grade C average in upper division courses in mathematics.

- 105A. Applied Statistical Methods: Analysis of Variance and Related Topics.** (3) I and II. Mr. John
Lecture—3 hours.
Prerequisite: course 13.
Applications of student's t-distribution; chi-square distribution; F-distribution; the sign test. Analysis of variance; Duncan's multiple range test. Design of experiments including randomized complete-block designs, Latin squares, split-plot designs, factorial designs, and incomplete block designs.
- 105B. Applied Statistical Methods: Matrix Algebra and Regression and Correlation Theory.** (3) II. Mr. Alder
Lecture—3 hours.
Prerequisite: course 105A or Agricultural Economics 106.
Matrix algebra including addition, multiplication and inversion of matrices. Linear regression and correlation theory. Multiple regression. The use of Gauss multipliers. Nonlinear regression. Analysis of covariance with one and two criteria of classification.
- 106. Differential Equations.** (2) I and II. _____
Lecture—2 hours.
Prerequisite: course 4B or 14.
An introduction to differential equations designed especially for students in engineering and related fields.
- 107. Advanced Calculus.** (3) I and II. _____
Lecture—3 hours.
Prerequisite: course 4B or 14.
Vector analysis, series, functions of several variables.
- 108. Linear Algebra.** (3) I. Mr. Norton
Lecture—3 hours.
Prerequisite: courses 7B and 9B.
Vector spaces, linear transformations and matrices, characteristic values, quadratic forms.
- 111A. Introduction to Higher Algebra.** (3) II. Mr. Yaquib
Lecture—3 hours.
Prerequisite: course 108.
Introduction to the formal systems of modern algebra, including groups, rings, and fields.
- 111B. Introduction to Higher Algebra.** (3) I. Mr. Tully
Lecture—3 hours.
Prerequisite: course 111A.
Continuation of course 111A.
- *112. Higher Geometry.** (3) I. Mr. Fulton
Lecture—3 hours.
Prerequisite: course 7B, or consent of the instructor.
Homogeneous point and line coordinates; cross ratio; one- and two-dimensional projective geometry; point and line conics.
Offered in even-numbered years.
- 113. Synthetic Projective Geometry.** (3) II. Mr. Fulton
Lecture—3 hours.
Prerequisite: course 7B, or consent of the instructor.
Duality; perspectivity; harmonic sets; projectivity; definition of conics; theorems on conics; pole and polar.
Offered in even-numbered years.

* Not to be given, 1963-1964.

- 115A. The Theory of Numbers.** (3) I. Mr. Alder
Lecture—3 hours.
Prerequisite: course 7A.
Divisibility; congruences; diophantine equations; selected topics from the theory of prime numbers; partitions; continued fractions.
Offered in odd-numbered years.
- 115B. The Theory of Numbers.** (3) II. Mr. Alder
Lecture—3 hours.
Prerequisite: course 7A.
Divisibility, congruences, diophantine equations; selected topics from the theory of prime numbers; partitions; continued fractions.
Offered in even-numbered years.
- *116. Metric Differential Geometry.** (3) II. Mr. Fulton
Lecture—3 hours.
Prerequisite: course 9C.
Vector analysis; curves and surfaces in three dimensions.
Offered in odd-numbered years.
- 119. Theory of Differential Equations.** (3) II. _____
Lecture—3 hours.
Prerequisite: courses 106, 107.
Elementary theory of ordinary differential equations with special attention to linear equations, Sturm-Liouville systems, Laplace transforms, introduction to partial differential equations.
- 125. Introduction to Mathematical Logic.** (3) I. Mr. Krom
Lecture—3 hours
Prerequisite: one year of calculus.
Propositional and predicate calculi. Normal forms, completeness, decision procedures, and topics from the theory of models.
- 127A. Advanced Calculus.** (3) I. The Staff
Lecture—3 hours.
Prerequisite: courses 106, 107.
The real number system; continuity; differentiation and integration on the real line; vector calculus and functions of several variables; theory of convergence.
- 127B. Advanced Calculus.** (3) II. The Staff
Lecture—3 hours.
Prerequisite: course 127A.
Continuation of course 127A.
- 128A. Numerical Analysis.** (3) I. Mr. Karowski
Lecture—3 hours.
Prerequisite: course 9C.
Finite differences; interpolation; polynomial approximations; non-linear equations; integration of differential equations; partial differential and difference equations; large systems of linear equations; linear programming; programming for analog and digital calculators; large-scale methods.
Offered in odd-numbered years.
- 128B. Numerical Analysis.** (3) II. _____
Lecture—3 hours.
Prerequisite: course 128A.
Continuation of course 128A.
Offered in even-numbered years.

* Not to be given, 1963-1964.

- 129. Theory of Automatic Digital Computers.** (3) II. _____
 Lecture—2 hours; laboratory—3 hours.
 Prerequisite: course 9C.
 Organization of a digital computer; instruction code for the University computer; elementary machine language coding; subroutines and assembly programs; code checking. Laboratory work on the University computer.
- 131A. Introduction to Mathematical Statistics.** (3) I. Mr. Albert
 Lecture—3 hours.
 Prerequisite: course 9C.
 A basic, introductory course in mathematical statistics.
- 131B. Introduction to Mathematical Statistics.** (3) II. Mr. Albert
 Lecture—3 hours.
 Prerequisite: course 131A.
 Continuation of course 131A.
- 132. Introduction to Stochastic Processes.** (3) II. Mr. Albert
 Lecture—3 hours.
 Prerequisite: course 131A.
 Random walks; recurrent events; Markov chains; birth and death processes.
- 168. Linear Programming and Game Theory.** (3) I. Mr. Benson
 Lecture—3 hours.
 Prerequisite: courses 7A and 9A or 16B.
 Introduction to zero-sum, two-person games; the fundamental theory for matrix games; basic concepts of linear inequalities; the duality theorem; the simplex method.
- 185. Introduction to Functions of a Complex Variable.** (3) I. Mr. Burdette
 Lecture—3 hours.
 Prerequisite: course 9C.
 Differentiability of complex functions, Cauchy's integral, power series, Laurent series, residue theorem, conformal mapping.
- 198. Directed Group Study.** (1-5) I and II. The Staff (Mr. Hayes in charge)
 Prerequisite: consent of the instructor.
 Selected subjects in mathematics.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II.
 The Staff (Mr. Hayes in charge)

GRADUATE COURSES

- 201A. Functions of a Real Variable.** (3) I. Mr. Banks
 Lecture—3 hours.
 Prerequisite: course 127A-127B.
 Real number system; theory of point sets in Euclidean spaces; content; measure; Riemann-Stieltjes and Lebesgue integration.
 Offered in odd-numbered years.
- 201B. Functions of a Real Variable.** (3) II. Mr. Banks
 Lecture—3 hours.
 Prerequisite: course 201A.
 Continuation of course 201A.
 Offered in even-numbered years.
- 202A. Functional Analysis.** (3) I. Mr. Benson
 Lecture—3 hours.
 Prerequisite: courses 108 and 127A-127B.
 General theory of measure and integration; Hilbert and Banach spaces; linear operations.

- 202B. Functional Analysis.** (3) II. Mr. Benson
 Lecture—3 hours.
 Prerequisite: course 202A.
 Continuation of course 202A.
- 205A. Functions of a Complex Variable.** (3) I. Mr. Arnold
 Lecture—3 hours.
 Prerequisite: courses 127A–127B.
 Theory of analytic functions; Cauchy integral theorem; power series; analytic continuation; conformal mapping; special functions.
 Offered in odd-numbered years.
- 205B. Functions of a Complex Variable.** (3) II. Mr. Arnold
 Lecture—3 hours.
 Prerequisite: course 205A.
 Continuation of course 205A.
 Offered in even-number years.
- 208. Linear Algebra.** (3) II. Mr. Krakowski, Mr. Norton
 Lecture—3 hours.
 Vector spaces, linear transformations, Euclidean spaces.
 Offered in even-numbered years.
- 215A. Topology.** (3) I. Miss Heller
 Lecture—3 hours.
 Prerequisite: course 127A–127B.
 Topics selected from general topology (compactness, connectedness, metrization, Euclidean space); algebraic topology (complexes, homology, duality); and applications to analysis, geometry, and algebra.
 Offered in odd-numbered years.
- 215B. Topology.** (3) II. _____
 Lecture—3 hours.
 Prerequisite: course 215A.
 Continuation of course 215A.
 Offered in even-numbered years.
- *216. Integral Equations.** (3) II. Mr. Stein
 Lecture—3 hours.
 Prerequisite: courses 108 and 127A–127B.
 Volterra equations, Fredholm equations, symmetric kernels.
 Offered in odd-numbered years.
- 218. Partial Differential Equations.** (3) I. _____
 Lecture—3 hours.
 Prerequisite: courses 108 and 127A–127B.
 Topics from the theory of first order hyperbolic and elliptic partial differential equations.
 Offered in even-numbered years.
- 219. Ordinary Differential Equations.** (3) II. Mr. Banks
 Lecture—3 hours.
 Prerequisite: courses 127A–127B and 185.
 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 even-numbered years.

- 220A. Mathematics for Students in the Physical Sciences.** (3) I. Mr. Chakerian
Lecture—3 hours.
Prerequisite: courses 106, 107, 185 (185 may be taken concurrently).
Topics in ordinary and partial differential equations, boundary value problems, functions of a complex variable, matrices, and calculus of variations.
- 220B. Mathematics for Students in the Physical Sciences.** (3) II. Mr. Chakerian
Lecture—3 hours.
Prerequisite: course 220A.
Continuation of course 220A.
- 223A. Theory of Groups.** (3) I. Mr. Tamura
Lecture—3 hours.
Elements of group theory, structure and construction of composite groups, Sylow theory of groups, solvable groups, group extension.
Offered in odd-numbered years.
- 223B. Theory of Groups.** (3) II. Mr. Tamura
Lecture—3 hours.
Continuation of course 223A.
Offered in even-numbered years.
- 227. Theory of Sets.** (3) I. _____
Lecture—3 hours.
Fundamental concepts; cardinal numbers, order types, ordinal numbers. The axiom of choice and its role in the theory of sets.
Offered in odd-numbered years.
- 228. Advanced Numerical Analysis of Differential Equations.** (3) I. _____
Lecture—2 hours; laboratory—3 hours.
Prerequisite: courses 128A–128B. Recommended: course 129.
Difference methods in systems of ordinary differential equations; error analysis and stability; two-point boundary value problems; numerical analysis of partial differential equations of first and second order; relaxation techniques; higher order equations; use of digital computers.
- 229. Approximation Theory and Applications to Computation.** (2) II. _____
Lecture—2 hours.
Prerequisite: course 128A–128B. Recommended: course 185.
Orthogonal functions and least squares; Chebyshev approximations; rational approximations; approximations in several variables; approximation of analytic functions of a complex variable; approximation by continued fractions; use of approximations in computation.
- *231. Multivariate Analysis.** (3) I. Mr. Baker
Lecture—3 hours.
Prerequisite: course 131A–131B and courses 106, 107 or consent of the instructor.
Multivariate normal distribution; analysis of variance; correlation and regression; chi-square.
Offered in even-numbered years.
- *232. Theory of Estimation and Testing Hypotheses.** (3) II. Mr. Baker
Lecture—3 hours.
Prerequisite: courses 106, 107 and 131A–131B or consent of the instructor.
Estimates; asymptotic efficiency and normality; theory of statistical tests.
Offered in odd-numbered years.

* Not to be given, 1963–1964.

- 233. Design of Experiments.** (3) II. Mr. John
 Lecture—3 hours.
 Prerequisite: course 234.
 Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces.
- 234. Analysis of Variance.** (3) I. Mr. John
 Lecture—3 hours.
 Prerequisite: course 131A–131B.
 Estimation and testing for the general linear hypothesis; components of variance; multiple comparisons.
- 235A. Analytic Probability Theory.** (3) I. Mr. Borgman
 Lecture—3 hours.
 Prerequisite: course 127A–127B.
 Measure-theoretic foundations of probability; distribution functions and characteristic functions; law of large numbers and central limit theorems; conditional probabilities; martingales.
- 235B. Analytic Probability Theory.** (3) II. Mr. Borgman
 Lecture—3 hours.
 Prerequisite: course 235A.
 Continuation of course 235A.
- *236A. Advanced Mathematical Statistics.** (3) I. Mr. Borgman, Mr. John
 Lecture—3 hours
 Prerequisite: courses 127A–127B, 131A–131B.
 Distribution theory; parametric and non-parametric estimation; principles of statistical tests; sequential analysis; statistical decision functions.
- *236B. Advanced Mathematical Statistics.** (3) II. Mr. Borgman, Mr. John
 Lecture—3 hours.
 Prerequisite: course 236A.
 Continuation of course 236A.
- 240A. Differential Geometry.** (3) I. Mr. Fulton
 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.
- 240B. Differential Geometry.** (3) II. Mr. Fulton
 Lecture—3 hours.
 Prerequisite: course 240A.
 Continuation of course 240A.
 Offered in even-numbered years.
- 250A. Algebra.** (3) I. Mr. Stein
 Lecture—3 hours.
 Prerequisite: course 111A–111B (111 may be taken concurrently with 250A).
 The basic tools of commutative algebra: theory of fields; algebraic and transcendental extensions; Galois theory; valuations; ideal theory.
- 250B. Algebra.** (3) II. Miss Heller
 Lecture—3 hours.
 Prerequisite: course 250A.
 Continuation of course 250A.

290. Seminars. (1-6) I and II. The Staff (Mr. Hayes in charge)

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 statistics; (h) applied statistics; (i) applied mathematics.

299. Research. (2-6) I and II. The Staff (Mr. Hayes in charge)

PROFESSIONAL COURSE

300. The Teaching of Mathematics. (3) I. Mrs. Goldman

Prerequisite: senior or graduate standing.

Accepted in partial satisfaction of the 22-unit requirement in education for the general secondary credential and the 24-unit requirement in education for the elementary credential.

MEDICINE, SURGERY, AND CLINICS

John W. Kendrick, D.V.M., M.S., *Chairman of the Department.*
Department Office, 1315 Haring Hall

Robert M. Cello, D.V.M., *Professor of Veterinary Medicine.*
John F. Christensen, D.V.M., Ph.D., *Professor of Veterinary Medicine.*
John W. Kendrick, D.V.M., M.S., *Professor of Veterinary Medicine.*
William R. Pritchard, D.V.M., Ph.D., J.D., *Professor of Veterinary Medicine.*
John D. Wheat, D.V.M., *Professor of Veterinary Medicine.*
Theodore J. Hage, D.V.M., *Associate Professor of Veterinary Medicine.*
Jack A. Howarth, D.V.M., Ph.D., *Associate Professor of Veterinary Medicine.*
John P. Hughes, D.V.M., *Associate Professor of Veterinary Medicine.*
†Blaine McGowan, Jr., D.V.M., *Associate Professor of Veterinary Medicine.*
Edward A. Rhode, Jr., D.V.M., *Associate Professor of Veterinary Medicine.*
Atwood C. Asbury, D.V.M., *Assistant Professor of Veterinary Medicine.*
Murray E. Fowler, D.V.M., *Assistant Professor of Veterinary Medicine.*
Charles A. Hjerpe, D.V.M., *Assistant Professor of Veterinary Medicine.*
Bud C. Tennant, D.V.M., *Assistant Professor of Veterinary Medicine.*
Gordon H. Theilen, D.V.M., *Assistant Professor of Veterinary Medicine.*



David E. Brown, M.D., *Lecturer in Surgery.*
Ronald S. Downey, D.V.M., *Lecturer in Veterinary Medicine.*
Charles E. Grayson, M.D., *Lecturer in Radiology.*
Virginia D. Perryman, D.V.M., *Lecturer in Veterinary Medicine.*
Troy G. Rollins, M.D., *Lecturer in Dermatology.*
Alida P. Wind, D.V.M., *Lecturer in Veterinary Medicine.*
———, *Lecturer in Veterinary Medicine.*
———, *Lecturer in Veterinary Medicine.*
———, *Lecturer in Veterinary Medicine.*
———, *Lecturer in Veterinary Medicine.*
———, *Lecturer in Veterinary Medicine.*

VETERINARY MEDICINE

UPPER DIVISION COURSES

100. **Veterinary Medical Orientation.** (No credit) I. Mr. Christensen
Lecture—1 hour.
Prerequisite: first-year standing in the School of Veterinary Medicine.
An introduction to the literature and history, fields of specialization, and professional obligations of veterinary medicine.
110. **Medical Terminology.** (1) I. Mr. Christensen
Lecture—1 hour.
Prerequisite: first-year standing in the School of Veterinary Medicine.
An introduction to medical terminology, with special reference to the meaning of roots, prefixes, and suffixes used in the formation of medical terms.
199. **Special Study for Advanced Undergraduates.** (1-5) I and II.
The Staff (Mr. Kendrick in charge)

GRADUATE COURSES

203. **Introductory Medicine.** (4) I. Mr. Rhode, Mr. Cello
Lecture—3 hours; laboratory—3 hours.
Prerequisite: Pathology 122A-122B; Physiological Sciences 123, 140-140L.

† Absent on leave, 1963-1964.

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.

204. Infectious Diseases. (5) II. Mr. Howarth
Lecture—5 hours.

Prerequisite: course 203.

Epidemiology, pathology, and control methods on diseases of livestock, including those diseases important in public health in which domestic livestock are the reservoirs of infection.

205. Small Animal Medicine. (5) II. Mr. Cello
Lecture—5 hours.

Prerequisite: course 203.

Diagnosis, treatment, and prevention of infectious and noninfectious diseases of the dog, cat, and other small animals.

206. Large Animal Medicine. (3) II. Mr. Hughes
Lecture—3 hours.

Prerequisite: courses 203, 210.

The diagnosis and control of diseases of the gastrointestinal system, liver and peritoneum, diseases of the respiratory and cardiovascular systems, and diseases of the blood-forming organs of horses, cattle, swine, sheep, and goats.

207. Large Animal Medicine. (4) I. Mr. Asbury, Mr. Cello, Mr. Fowler
Lecture—4 hours.

Prerequisite: courses 203, 206.

The diagnosis and control of diseases of the skin, internal parasitism, mastitis, diseases of the nervous and locomotor systems, diseases of the eye, metabolic and nutritional diseases, and poisonings of horses, cattle, swine, sheep, and goats.

210. Large Animal Medicine. (2) I. Mr. McGowan, Mr. Hjerpe
Lecture—2 hours.

Prerequisite: course 203.

The diagnosis and control of internal parasitism, and diseases of the urinary systems of horses, cattle, swine, sheep, and goats.

220. Introductory Surgery. (4) II. Miss Wind, Miss Perryman
Lecture—3 hours; laboratory—3 hours.

Prerequisite: Pathology 122A-122B, Physiological Sciences 123.

Principles and methods of surgical technique.

223. Large Animal Surgery. (4) I. Mr. Wheat
Lecture—4 hours.

Prerequisite: course 220, Anatomy 220.

Diseases of domestic animals that require surgical treatment.

224. Small Animal Surgery. (2) I. Miss Wind
Lecture—2 hours.

Prerequisite: course 220.

Surgical diseases of small animals.

225. Operative Surgery. (1) I. Mr. Fowler, Miss Wind
Laboratory—4 hours.

Prerequisite: courses 223 and 224 (may be taken concurrently).

A laboratory course in specific surgical procedures in large and small animals.

230. Diseases of the Genital Organs and Obstetrics. (4) I.

Mr. Kendrick, Mr. Theilen, Mr. Tennant

Lecture—3 hours; laboratory—3 hours.

Prerequisite: Pathology 122A-122B; Physiological Sciences 123.

A course in the diagnosis, treatment, and control of diseases affecting the reproductive organs; the normal and disturbed physiology of reproduction; and obstetrics.

245. Ecological Factors of Animal Disease. (2) I.

Mr. McGowan

Lecture—2 hours.

Prerequisite: senior standing in the School of Veterinary Medicine or consent of the instructor.

Relationship of animal environment to control and prevention of disease. Application of nutrition, genetics, husbandry, and management to disease control.

249. Extra-Session Clinic. (2-4)

The Staff (Mr. Kendrick in charge)

Laboratory.

Prerequisite: completion of the first three years of the professional course in veterinary medicine.

Diagnosis and treatment of diseases and disorders of domestic animals. Work will be done in the clinic during the summer for any continuous period of six weeks.

May be repeated for credit.

250. Clinic Orientation. (1) II.

Mr. Fowler

Laboratory—3 hours.

Prerequisite: course 203.

Laboratory exercises in the practice of clinical procedures and methods of restraint used in the handling and treatment of horses, cattle, swine, sheep, dogs, cats, and other species.

251A. Clinics. (5) I.

The Staff (Mr. Kendrick in charge)

Laboratory—24 hours.

Prerequisite: courses 203, 220.

Interdepartmental course, offering training in ambulatory clinic, autopsy, clinical pathology, large animal clinic, pharmacy, poultry pathology, radiology, and small animal clinic. The student must make a passing grade in all sections to pass the course.

251B. Clinics. (5) II.

The Staff (Mr. Kendrick in charge)

Laboratory—24 hours.

Prerequisite: courses 203, 220. Course 251A is prerequisite to 251B.

Interdepartmental course, offering training in ambulatory clinic, autopsy, clinical pathology, large animal clinic, pharmacy, poultry pathology, radiology, and small animal clinic. The student must make a passing grade in all sections to pass the course.

254. Clinic Conference. (No credit) II. The Staff (Mr. Kendrick in charge)

Lecture—1 hour.

Prerequisite: course 203.

Discussion of selected cases from the clinic.

256A. Clinic Conference. (1) I.

The Staff (Mr. Kendrick in charge)

Lecture—2 hours.

Prerequisite: fourth-year standing.

Discussion of selected cases from the clinic.

- 256B. Clinic Conference.** (1) II. The Staff (Mr. Kendrick in charge)
Lecture—2 hours.
Prerequisite: fourth-year standing.
Discussion of selected cases from the clinic.
- 260. Radiology.** (2) I. Mr. Grayson, Mr. Hage
Lecture—1 hour; laboratory—3 hours.
Prerequisite: Anatomy 120.
Production of X rays, roentgenographic technique, roentgenographic interpretation, biological effect of, protection from, and the therapeutic use of ionizing irradiation as applied to veterinary medicine.
- 270A. Jurisprudence.** (0) I. Mr. Pritchard
Lecture—1 hour.
Professional ethics and legal medicine.
- 270B. Jurisprudence.** (0) II. Mr. Pritchard
Lecture—1 hour.
Professional ethics and legal medicine.
- 290. Seminar.** (1) I and II. The Staff (Mr. Cello in charge)
Seminar—2 hours.
- 299. Research.** (1-6) I and II. The Staff (Mr. Kendrick in charge)

MILITARY SCIENCE

Donn W. Yoder, Colonel, Infantry; *Chairman of the Department.*

Department Office, 131 Gymnasium

Donn W. Yoder, Colonel, Infantry; *Professor of Military Science.*

Harold V. Kays, Lieutenant Colonel, Infantry; *Associate Professor of Military Science.*

Carl L. Cunningham, Major, Chemical Corps, *Associate Professor of Military Science.*

Peter H. Thames, Captain, Infantry, *Assistant Professor of Military Science.*

In addition to courses offered in the Department of Military Science, upper division military science requires the completion of six units outside the department which may fulfill dual requirements for the baccalaureate degree in the Colleges as well as for the commission as a Second Lieutenant of the United States Army Reserve. One dual-credit unit must be taken in P.E. 10 (Physical Conditioning Activities). The remaining five dual-credit units may be completed in any of the general areas of natural science, psychology, effective communication, or political science. Elected subjects must be taken while enrolled in the advanced course. In the event that a subject was required in the student's normal academic curriculum during his freshman and sophomore years, electives must be selected either from another general area or from advanced subjects in the same area. Conversely, for subjects not required in the student's academic curriculum during his freshman and sophomore years, complete freedom of selection from the four academic areas is permissible.

Lower division Military Science requires the completion of two units outside the department during the freshman year. The subject elected for ROTC credit may be one that is required in the student's normal academic curriculum during his freshman year; but it must be from one of the general subject areas mentioned above.

The chairman of the department will evaluate and approve the elective subjects selected. Consideration will be given to the value of the subjects in furthering the professional qualifications of the student as a prospective commissioned officer in the United States Army.

College of Letters and Science.—The Bachelor of Arts degree requires the completion of 120 units. One hundred five of the 120 units must be in courses chosen from the Letters and Science List of Courses. The 6 units of lower division military science courses are included in the list. Upper division military science courses may be accredited to the remaining 15 of the total 120 units required. The dual-credit units in general areas may be selected from the List of Courses.

College of Agriculture.—The Bachelor of Science degree in agriculture requires the completion of 124 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 Agriculture.

College of Engineering.—The Bachelor of Science degree in engineering requires the completion of 132–137 units. Six units of military science 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 Engineering.

School of Veterinary Medicine.—The Bachelor of Science degree in veterinary medicine requires the completion of 124 units. Eight units of military science may be accredited toward this requirement. 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 commissions as First Lieutenants in the United States Army Veterinary Corps. The selection of those to be commissioned is based on the needs of the Army, and the qualifications of the applicant.

GENERAL MILITARY SCIENCE

For the general regulations concerning enrollment and the program in Military Science, see page 30.

LOWER DIVISION COURSES

1A. Basic General Military Science (First Year). (1) I. The Staff
Lecture—1 hour; drill—1 hour.

Prerequisite: meet enrollment criteria stated on page 30, *General Regulations*.

Organization of the Army and ROTC; individual weapons and marksmanship; leadership laboratory.

1B. Basic General Military Science (First Year). (1) II. The Staff
Lecture—1 hour; drill—1 hour.

Prerequisite: course 1A, or the equivalent.

United States Army and national security, leadership laboratory.

20A. Basic General Military Science (Second Year). (2) I. The Staff
Lecture—2 hours; drill—1 hour.

Prerequisite: course 1A–1B, or the equivalent.

American military history; leadership laboratory.

20B. Basic General Military Science (Second Year). (2) II. The Staff
Lecture—2 hours; drill—1 hour.

Prerequisite: course 20A or the equivalent.

Map and aerial photograph reading; introduction to basic tactics and techniques; leadership laboratory.

UPPER DIVISION COURSES

130A. Advanced General Military Science (First Year) (2) I. The Staff
Lecture—2 hours; drill—1 hour.

Prerequisite: completion of the lower division courses or the equivalent.

Leadership, military teaching principles, and leadership laboratory.

130B. Advanced General Military Science (First Year). (3) II. The Staff
Lecture—3 hours; drill—1 hour. Field trips to be arranged.

Prerequisite: course 130A.

Organization, missions, and functions of the branches of the U. S. Army; small-unit tactics; communications; leadership laboratory; pre-camp orientation.

140A. Advanced General Military Science (Second Year). (2) I. The Staff
Lecture—2 hours; drill—1 hour. Field trips to be arranged.

Prerequisite: course 130B.

Command and staff; military intelligence; training management; logistics; leadership laboratory.

140B. Advanced General Military Science (Second Year). (3) II. The Staff Lecture—3 hours; drill—1 hour. Field trips to be arranged.

Prerequisite: course 140A.

Army administration; military law; service orientation; role of the U. S. in world affairs; leadership laboratory.

ROTC Summer Training for Advanced Military Students. (3).

Summer training is of six weeks' duration from approximately June 20 to August 1.

Prerequisite: course 130A-130B.

Practical training in atomic, chemical, biological, and radiological warfare; tactical, technical, and administrative duties in the field; firing individual and crew-served weapons; bivouac; individual and small-unit tactics; and development of military leadership.

Successful completion is a requisite for the commission.

MUSIC

Richard G. Swift, M.A., *Chairman of the Department.*
Department Office, 924 Sproul Hall

Jerome W. Rosen, M.A., *Professor of Music.*
Richard G. Swift, M.A., *Associate Professor of Music.*
Larry D. Austin, M.M., *Assistant Professor of Music.*
*Robert C. Below, M.M., *Assistant Professor of Music.*
Sydney R. Charles, Ph.D., *Assistant Professor of Music.*
Theodore C. Karp, Ph.D., *Assistant Professor of Music.*



Anne R. Myers, S.M.M., *Associate in Music.*
Arthur Woodbury, M.M., *Associate in Music.*

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

A student may not receive more than 8 units of credit in performance courses.

Major Subject Advisers.—Mr. Rosen, Mr. Swift.

The Major Program

(A) Lower Division Courses.—Required: Music 1A-1B, 1C-1D, 4A-4B, 5A-5B and at least two semesters' participation in a lower division performance course (41, 43, 44, or 46A-46B). Beginning and transfer students must take an examination in piano playing during registration week. Those showing deficiencies will be required to take Music 405A-405B. Sufficient pianistic ability to perform a four-part chorale and a composition comparable in difficulty to *The Little Preludes* by Bach is prerequisite to upper division courses in the major. Undergraduate students transferring from other colleges should consult with the departmental major adviser before enrolling in any music course.

(B) Upper Division Courses.—Required: Music 104A-104B, 121A-121B and two semesters of 141, 143, or 144. In addition, eight units must be selected from the following courses: 105A-105B, 108, 112A, 112B, 199.

Individual Group Major.—Individual group majors may be established by combining the work offered in this field with courses in allied fields. The major subject adviser should be consulted for details.

GROUP I

Courses primarily for students whose major is music.

LOWER DIVISION COURSES

1A. Masterworks of Musical Literature. (2) I. Mr. Karp

Lecture—3 hours.

Prerequisite: ability to read music or consent of the instructor.

Guided listening to important works from the seventeenth century to the present and discussion of their style and form.

1B. Masterworks of Musical Literature. (2) II. Mr. Karp

Lecture—3 hours.

Prerequisite: ability to read music or consent of the instructor.

Guided listening to important works from the seventeenth century to the present and discussion of their style and form.

* Sabbatical leave in residence, fall semester, 1963-1964.

- 1C. Masterworks of Musical Literature. (2) I.** Mr. Rosen
Lecture—3 hours.
Prerequisite: courses 1A-1B and 4A-4B or consent of the instructor.
Guided listening to important works from the seventeenth century to the present and discussion of their style and form. A continuation of course 1A-1B.
- 1D. Masterworks of Musical Literature. (2) II.** Mr. Rosen
Lecture—3 hours.
Prerequisite: courses 1A-1B and 4A-4B or consent of the instructor.
Guided listening to important works from the seventeenth century to the present and discussion of their style and form. A continuation of course 1A-1B.
- 4A. Elementary Theory. (5) I.** Mr. Austin
Lecture—5 hours.
Exercises in notation, rhythm, ear-training, beginning counterpoint and harmony.
- 4B. Elementary Theory. (5) II.** Mr. Austin
Lecture—5 hours.
A continuation of course 4A.
- 5A. Intermediate Theory. (4) I.** Mr. Rosen
Lecture—4 hours.
Prerequisite: course 4A-4B.
A continuation of course 4A-4B.
- 5B. Intermediate Theory. (4) II.** Mr. Rosen
Lecture—4 hours.
Prerequisite: courses 4A-4B and 5A.

UPPER DIVISION COURSES

- *101. Modal Counterpoint. (3) I.** Mr. Karp
Lecture—3 hours.
Prerequisite: course 5B.
Sixteenth-century theory and practice. Preparatory exercises and motet writing.
- 104A. Advanced Theory. (3) I.** Mr. Swift
Lecture—3 hours.
Prerequisite: course 5A-5B.
Two and three part tonal counterpoint leading to the writing of canons, inventions, and chorale preludes.
- 104B. Advanced Theory. (3) II.** Mr. Swift
Lecture—3 hours.
Course 104A is prerequisite to 104B.
Homophonic forms, beginning with phrase and period structure.
- *105A. Principles of Composition. (3) I.** Mr. Swift, Mr. Austin
Lecture—3 hours.
Prerequisite: course 104A-104B.
Elementary assignments in free composition.
- *105B. Principles of Composition. (3) II.** Mr. Swift, Mr. Austin
Lecture—3 hours.
Course 105A is prerequisite to 105B.
Elementary assignments in free composition.

* Not to be given, 1963-1964.

- 106. Fugue.** (3) II. Mr. Karp
Lecture—3 hours.
Prerequisite: course 104A.
- 108. Instrumentation.** (3) I. Mr. Austin
Lecture—3 hours.
Prerequisite: course 5A–5B.
A study of the instruments of the orchestra, leading to practice in scoring for instrumental combinations.
- 112A. Choral Conducting.** (2) I. Mr. Rosen
Lecture—2 hours.
Prerequisite: course 5A–5B.
A study of the principles and techniques of conducting choral ensembles. Offered in odd-numbered years.
- 112B. Instrumental Conducting.** (2) II. Mr. Austin
Lecture—2 hours.
Prerequisite: course 108.
A study of the principles and techniques of conducting instrumental ensembles. Offered in even-numbered years.
- 115. Music of the Renaissance.** (3) I. Mrs. Charles
Lecture—3 hours.
Prerequisite: courses 1D and 5B, or consent of the instructor.
Survey of the period 1430–1600.
- 116. Music of the Baroque Period.** (3) II. Mrs. Charles
Lecture—3 hours.
Prerequisite: courses 1D and 5B, or consent of the instructor.
A survey of the period from Monteverdi to Handel and J. S. Bach.
- 119. Music of the 20th Century.** (3) II. Mrs. Charles
Lecture—3 hours.
Prerequisite: courses 1D and 5B, or consent of the instructor.
Critical and analytical study of works by such composers as Shoenberg, Stravinsky, Milhaud, Bartok, Hindemith, and Sessions.
Offered in odd-numbered years.
- 121A. History and Literature of Music.** (3) I. Mrs. Charles
Lecture—3 hours.
Prerequisite: courses 1C–1D, 4A–4B or consent of the instructor.
A study of the development of music from antiquity to the present; lectures, listening, technical analysis, and written reports.
- 121B. History and Literature of Music.** (3) II. Mrs. Charles
Lecture—3 hours.
Course 121A is prerequisite to 121B.
- 123A. The Piano Music of Chopin.** (3) II. Mr. Below
Lecture—3 hours.
Prerequisite: courses 1D and 5B or consent of the instructor.
A survey of Chopin's piano music, including detailed, analytic study of selected works; special consideration to problems of performance.
- *123B. The Piano Music of Debussy and Ravel.** (3) II. Mr. Below
Lecture—3 hours.
Prerequisite: courses 1D and 5B, or consent of the instructor.
A study of selected piano works of each composer, with special reference to stylistic comparison; special consideration to problems of performance.

* Not to be given, 1963–1964.

199. **Special Study for Advanced Undergraduates.** (1-4) I and II.
The Staff (Mr. Swift in charge)

GROUP II

Courses open to all students in the University.

LOWER DIVISION COURSES

10. **Basic Musicianship.** (2) I and II. Mr. Woodbury
Lecture—3 hours.
Fundamentals of music, with singing, ear-training, harmonization of melodies, and conducting.
- 27A. **Introduction to Musical Literature.** (3) I and II. Mr. Karp, Mr. Below
Lecture—2 hours; discussion—1 hour.
Lectures, guided listening, and readings designed to furnish the student with an understanding of basic musical concepts.
Intended primarily for students whose major is not music.
- 27B. **Introduction to Musical Literature.** (3) II. Mr. Woodbury
Lecture—3 hours.
Prerequisite: course 27A or consent of the instructor.
Lectures, guided listening, and readings designed to acquaint the student with stylistic elements characterizing music of the eighteenth, nineteenth and twentieth centuries.
Intended primarily for students whose major is not music.

Performance Courses

41. **University Symphony Orchestra.** (1-2) I and II. Mr. Swift
Open to any student in the University whose technical proficiency meets the requirements of concert performance.
Rehearsal and performance of symphonic music. May be repeated once for credit.
42. **The Repertory Band.** (1) I. Mr. Austin
Rehearsal—2 hours.
Prerequisite: consent of the instructor.
Open to any student in the University whose technical proficiency meets the requirements of concert performance.
Rehearsal and performance of selected music for wind ensemble. May be repeated once for credit.
43. **University Concert Band.** (2) II. Mr. Austin
Rehearsal—4 hours.
Open to any student in the University whose technical proficiency meets the requirements of concert performance.
Rehearsal and performance of band music. May be repeated once for credit.
In the fall semester, band practice and performance will be offered as an activity, rather than a course, with one two-hour rehearsal per week.
44. **University Chorus.** (2) I and II. Mr. Rosen
Rehearsal—4 hours.
Rehearsal and performance of choral music. May be repeated once for credit.
- 46A. **Chamber Music Ensemble.** (1) I. The Staff
Rehearsal—2 hours.
Open to any student in the University of sufficient technical ability to take part in ensemble combinations for strings, wind instruments, and piano.
May be repeated once for credit.

- 46B. Chamber Music Ensemble.** (1) II. The Staff
 Rehearsal—2 hours.
 Open to any student in the University of sufficient technical ability to take part in ensemble combinations for strings, wind instruments, and piano.
 May be repeated once for credit.

UPPER DIVISION COURSES

- 127A. Musical Literature: The Opera.** (3) I. Mrs. Charles
 Lecture—3 hours.
 Prerequisite: course 27A–27B or consent of the instructor.
 A study of selected operas such as *Dido and Aeneas*, *The Marriage of Figaro*, *The Barber of Seville*, *Tristan and Isolde*, *Aida*, *Pelleas and Melisande*, and *Wozzeck*, emphasizing the contribution of music to the total dramatic effect.
 Intended primarily for students whose major is not music.
- 127B. Musical Literature: The Symphony.** (3) II. Mrs. Charles
 Lecture—3 hours.
 Prerequisite: course 27A–27B or consent of the instructor.
 A study of selected symphonies by composers such as Haydn, Mozart, Beethoven, Schubert, Brahms, and Stravinsky, emphasizing form and style.
 Intended primarily for students whose major is not music.
 Offered in even-numbered years.

- 128. Musical Literature: Music in the United States.** (3) II. Mr. Swift
 Lecture—3 hours.
 Prerequisite: course 27A–27B or consent of the instructor. Intended primarily for students whose major is not music.
 A study of the musical scene in America from colonial times to the present. Lectures, reading assignments, and guided listening to representative works of significant composers.
 Offered in odd-numbered years.

Performance Courses

- 141. Advanced University Symphony Orchestra.** (1–2) I and II. Mr. Swift
 Prerequisite: 2 semesters in course 41.
 May be repeated once for credit.
- 142. Advanced Repertory Band.** (1) I. Mr. Austin
 Rehearsal—2 hours.
 Prerequisite: Music 42 or consent of the instructor.
 Open to any student in the University whose technical proficiency meets the requirements of concert performance.
 Rehearsal and performance of selected music for wind ensemble. May be repeated once for credit.
- 143. Advanced University Concert Band.** (2) II. Mr. Austin
 Rehearsal—4 hours.
 Prerequisite: 2 semesters in course 43.
 May be repeated once for credit.
- 144. Advanced University Chorus.** (2) I and II. Mr. Rosen
 Rehearsal—4 hours.
 Prerequisite: 2 semesters in course 44.
 May be repeated once for credit.

GRADUATE COURSES

- 200A-200B. **Introduction to Musicology.** (3-3) Yr. Mrs. Charles
Lecture—3 hours.
Bibliography, individual research projects, and a class problem.
- 203A. **Composition.** (3) I. Mr. Swift
Seminar—3 hours.
Prerequisite: courses 104B and 105B, or the equivalent.
Technical projects.
- 203B. **Composition.** (3) II. Mr. Swift
Seminar—3 hours.
Prerequisite: course 203A.
Free composition.
- 210A-210B. **Mensural Notation.** (3-3) Yr. Mr. Karp
Seminar—3 hours.

TEACHING METHODS COURSE

Instrumental Methods

Prerequisite: courses 1A-1B and 4A-4B, or consent of the instructor.

The courses in this series consider methods of teaching orchestra and band instruments, and include repertory and program planning for secondary schools. Each course may be repeated once for credit.

- *329A. **Stringed Instruments.** (1) I and II. _____
Laboratory—2 hours.
- 329B. **Brass Instruments.** (1) I. Mr. Woodbury
Laboratory—2 hours.
- 329C. **Woodwind Instruments.** (1) II. Mr. Woodbury
Laboratory—2 hours.

PROFESSIONAL COURSE

- 405A. **Elementary Piano.** (1) I. Mr. Below
Lecture—2 hours.
Prerequisite: consent of the instructor.
Open to music majors and candidates for the general secondary credential with a minor in music.
- 405B. **Elementary Piano.** (1) II. Mr. Below
Lecture—2 hours.
Prerequisite: course 405A or consent of the instructor.
Open to music majors and candidates for the general secondary credential with a minor in music.

* Not to be given, 1963-1964.

NEMATOLGY

Dewey J. Raski, Ph.D., *Chairman of the Department.*
Department Office, 225 Hoagland Hall

Merlin W. Allen, Ph.D., *Professor of Nematology.*
Dewey J. Raski, Ph.D., *Professor of Nematology.*



Bert Lear, Ph.D., *Lecturer in Nematology.*
Benjamin F. Lownsbery, Ph.D., *Lecturer in Nematology.*
Armand B. Maggenti, Ph.D., *Lecturer in Nematology.*
David R. Viglierchio, Ph.D., *Lecturer in Nematology.*

UPPER DIVISION COURSE

100. General Plant Nematology. (4) I. Mr. Raski
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Zoology 1A or 10.
An introduction to the classification, morphology, biology, and control of the nematodes attacking cultivated crops.

GRADUATE COURSES

220. Principles and Techniques of Nematode Taxonomy and Morphology. (3) I. Mr. Maggenti
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 100 (may be taken concurrently).
Analysis and evaluation of the techniques used in the collection, extraction, and preparation of specimens, free-hand and histologic sections; presentation of illustrative material.

221. Nematode Pathogenicity and Control. (3) II.
Lecture—1 hour; laboratory—6 hours. Mr. Lear, Mr. Lownsbery
Prerequisite: course 100.
Advanced studies of the relation of nematodes to plants and control of plant parasitic nematodes.

225. Nematode Taxonomy and Comparative Morphology. (4) II.
Lecture—2 hours; laboratory—6 hours. Mr. Allen, Mr. Maggenti
Prerequisite: course 220.
The taxonomy, morphology, and comparative anatomy of soil and fresh-water nematodes.

290. Seminar. (1) I and II. The Staff (Mr. Allen in charge)
Seminar—1 hour.

299. Research. (1-6) I and II. The Staff (Mr. Allen in charge)

NUTRITION

Charles R. Grau, Ph.D., *Chairman of the Executive Committee.*
Committee Office, 207 Poultry Husbandry Building

Committee in Charge:

Arthur L. Black, Ph.D., *Professor of Biochemistry.*
Floyd D. Carroll, Ph.D., *Associate Professor of Animal Husbandry.*
Donald B. Cordy, D.V.M., Ph.D., *Professor of Veterinary Pathology.*
Perry T. Cupps, Ph.D., *Professor of Animal Husbandry.*
†Gladys J. Everson, Ph.D., *Professor of Home Economics.*
Richard A. Freedland, Ph.D., *Assistant Professor of Physiological Sciences.*
Charles R. Grau, Ph.D., *Professor of Poultry Husbandry.*
Hubert Heitman, Jr., Ph.D., *Professor of Animal Husbandry.*
Fredric W. Hill, Ph.D., *Professor of Poultry Husbandry.*
Lucille S. Hurley, Ph.D., *Associate Professor of Nutrition.*
Max Kleiber, Sc.D., *Professor of Animal Husbandry, Emeritus.*
Frank H. Kratzer, Ph.D., *Professor of Poultry Husbandry.*
Glen P. Lofgreen, Ph.D., *Professor of Animal Husbandry.*
James H. Meyer, Ph.D., *Professor of Animal Husbandry.*
Leo C. Norris, Ph.D., *Lecturer of Poultry Husbandry.*
Daniel W. Peterson, Ph.D., *Associate Professor of Poultry Husbandry.*
Magnar Ronning, Ph.D., *Associate Professor of Animal Husbandry.*
George F. Stewart, Ph.D., *Professor of Food Science and Technology.*
Aloys L. Tappel, Ph.D., *Professor of Food Science and Technology.*
William C. Weir, Ph.D., *Professor of Animal Husbandry.*

GRADUATE COURSES

201A. Advanced General Nutrition. (3) I. The Staff (Mr. Hill in charge)
Lecture—3 hours.

Prerequisite: Bacteriology 1; Biochemistry 101; a course in animal physiology; a course in nutrition.

Advanced studies of proteins and amino acids in nutrition; metabolic function and nutritional importance of vitamins; deficiency diseases. Emphasis on comparative aspects among animal species.

201B. Advanced General Nutrition. (3) II.

Lecture—3 hours. The Staff (Mr. Ronning in charge)

Prerequisite: Bacteriology 1; Biochemistry 101; a course in animal physiology; a course in nutrition.

Advanced studies of fats and carbohydrates in energy metabolism; energy evaluation of foods; relationships of fat to degenerative diseases; minerals; water balance. Emphasis on comparative aspects of nutrition.

250. Concepts of Animal Nutrition. (2) II. Mr. Lepkovsky, Mr. Hill

Lecture—2 hours.

Prerequisite: biochemistry or physiological chemistry; Chemistry 8; Physiology 1; Zoology 1B; or consent of the instructor.

Dynamic interrelationships between food, animal, and environment, including concepts in food intake, digestion, absorption, and utilization of nutrients.

290. Seminar. (1) I and II.

The Staff

Seminar—1 hour.

Discussion and critical evaluation of advanced topics in nutrition research.

† Absent on leave, 1963–1964

PARASITOLOGY

For courses in parasitology see "Entomology," page 196.

PARK ADMINISTRATION

For courses in park administration see "Landscape Horticulture," page 240.

PATHOLOGY

Donald R. Cordy, D.V.M., Ph.D., *Chairman of the Department.*
Department Office, 1052 Haring Hall

Donald R. Cordy, D.V.M., Ph.D., *Professor of Veterinary Pathology.*

Peter C. Kennedy, D.V.M., Ph.D., *Associate Professor of Veterinary Pathology.*

Jack E. Moulton, D.V.M., Ph.D., *Associate Professor of Veterinary Pathology.*

Donald L. Dungworth, B.V.Sc., Ph.D., *Assistant Professor of Veterinary Pathology.*



Allen C. Andersen, V.M.D, Ph.D., *Lecturer in Radiopathology.*

William P. C. Richards, M.V.Sc., *Lecturer in Veterinary Pathology.*

UPPER DIVISION COURSES

122A. Veterinary Pathology. (5) I. Mr. Cordy, Mr. Moulton

Lecture—3 hours; laboratory—6 hours.

Prerequisite: second-year standing in the School of Veterinary Medicine or consent of the instructor.

The fundamental degenerative, vascular and inflammatory processes; oncology; systemic pathology; and the pathology of communicable diseases and the toxicoses.

122B. Veterinary Pathology. (5) II.

Mr. Cordy, Mr. Dungworth, Mr. Kennedy

Lecture—4 hours; laboratory—3 hours.

Prerequisite: second-year standing in the School of Veterinary Medicine or consent of the instructor.

The fundamental degenerative, vascular and inflammatory processes; oncology; systemic pathology; and the pathology of communicable diseases and the toxicoses.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

The Staff (Mr. Cordy in charge)

GRADUATE COURSES

251A. Necropsy Laboratory. (1/2) I. The Staff (Mr. Kennedy in charge)

Laboratory—23 hours. (Hours per semester)

Prerequisite: fourth-year standing in the School of Veterinary Medicine. Supervised experience in necropsy diagnosis, including techniques and interpretation.

251B. Necropsy Laboratory. ($\frac{1}{2}$) II. The Staff (Mr. Moulton in charge)
Laboratory—23 hours. (Hours per semester)
Prerequisite: fourth-year standing in the School of Veterinary Medicine.
Supervised experience in necropsy diagnosis, including techniques and interpretation.

***280. Advanced Pathology.** (3) II. Mr. Cordy, Mr. Kennedy
Lecture—1 hour; laboratory—3 hours; discussion—1 hour.
Prerequisite: course 122A-122B.
Selected topics in the pathology of non-neoplastic diseases. Mechanisms of disease and patterns of reaction are stressed.
Offered in odd-numbered years.

281. Necropsy and Surgical Pathology. (1-4) I and II.
Laboratory. The Staff (I. Mr. Kennedy, II. Mr. Moulton, in charge)
Prerequisite: courses 122A-122B and 251A-251B.
Responsible diagnostic casework. Conduct of necropsies, slide reading, and case reporting

282. Tumor Pathology. (2) I. Mr. Dungworth, Mr. Moulton
Lecture—1 hour; laboratory—3 hours.
Prerequisite: course 122A.
The histogenesis, incidence, geographical distribution, etiology, transmission, immunity, host response, gross and microscopic structure, and metastasis of the neoplasms of domestic animals.
Offered in odd-numbered years.

290. Seminar. (1) I and II. The Staff (Mr. Kennedy in charge)
Seminar—1 hour.

291. Histopathology Conference. (1) I and II.
Lecture—1 hour. I. Mr. Kennedy, II. Mr. Moulton
Discussion of selected cases based on records and slides. Defense of diagnoses.

299. Research. (1-6) I and II. The Staff

* Not to be given, 1963-1964.

PHILOSOPHY

Neal W. Gilbert, Ph.D., *Chairman of the Department.*
Department Office, 424 Sproul Hall

Arthur Child, Ph.D., *Professor of Philosophy.*
Neal W. Gilbert, Ph.D., *Associate Professor of Philosophy.*
Ronald A. Arbini, Ph.D., *Assistant Professor of Philosophy.*
William H. Bossart, Ph.D., *Assistant Professor of Philosophy.*



Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Departmental Major Adviser.—Mr. Bossart.

The Major Program

(A) Lower Division Courses.—Required: courses 20A–20B, and 12.

(B) Upper Division Courses.—Twenty-four units in upper division courses in philosophy, selected with the approval of the departmental major adviser. Three of these units, however, may be taken in another department, if the adviser considers that the course contributes directly to the student's major program. Among courses that could be so considered are Economics 101A–101B, English 147, Political Science 113, 114, 118A–118B, and 119. These courses are also recommended as additional to the major in accordance with the direction of the student's interests and talents. Students who do not maintain a grade C average in the upper division courses of the major program will be required to withdraw from the major in philosophy.

LOWER DIVISION COURSES

- 6A. Introduction to Philosophy.** (3) I and II. The Staff
Lecture—3 hours.
Political, aesthetic, religious, metaphysical, and other concerns of philosophy, as exemplified in major works from various periods.
- 6B. Introduction to Philosophy.** (3) I and II. The Staff
Lecture—3 hours.
Continuation of course 6A.
- 12. Introduction to Logic.** (3) I. Mr. Arbini
Lecture—3 hours.
Principles of inference and definition for symbolic deductive systems; sentential connectives, quantifiers, classes and relations. Applications of such systems in mathematics, science, and ordinary language.
- 20A. History of Philosophy.** (3) I. Mr. Child
Lecture—3 hours.
Prerequisite: sophomore standing.
From the Pre-Socratics to the Scholastics.
- 20B. History of Philosophy.** (3) II. Mr. Bossart
Lecture—3 hours.
Prerequisite: sophomore standing.
From Descartes to Kant.

UPPER DIVISION COURSES
COURSES IN THE PROBLEMS OF PHILOSOPHY

Group A: Theoretical Philosophy

100. Recurrent Types of Philosophy. (3) I. Mr. Gilbert

Lecture—3 hours.

Several problems in different fields—for example, the problems of truth, causation, and freedom of the will—as treated by representatives of various perennial types of philosophy.

101. Metaphysics. (3) II. Mr. Bossart

Lecture—3 hours.

The search for being; the meaning of being and the relation of being to ontology. Possible types of world order.

Offered in odd-numbered years.

102. Theory of Knowledge. (3) II. Mr. Child

Lecture—3 hours.

Philosophical problems of perception and thought, memory and precognition, imagination, truth and error, belief and knowledge. Types of epistemology.

Offered in even-numbered years.

105. Philosophy of Religion. (3) I. Mr. Child

Lecture—3 hours.

Nature of religion; its relations to morality and institutions; sources, status, and kinds of religious knowledge; existence and nature of God; man's relations to the divine; significance of death; concepts of survival; relations of church and state.

Offered in even-numbered years.

107. Philosophy of Science. (3) II. Mr. Arbini

Lecture—3 hours.

Basic concepts and methods of the mathematical, physical, and biological sciences; philosophical reflections on science.

Offered in even-numbered years.

109. Theory of History. (3) II. Mr. Child

Lecture—3 hours.

The nature of historical thinking and of the historical process, and the relations between them.

Offered in odd-numbered years.

Group B: Philosophy of Practice

114. Ethics. (3) I. Mr. Child

Lecture—3 hours.

Principles of intelligent conduct: their status and nature; how they are discovered, known, and proved; their relationships to the principles of art, science, and logic.

Offered in odd-numbered years.

Group C: Philosophy of Production

123. Aesthetics. (3) I. Mr. Bossart

Lecture—3 hours.

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.

Offered in odd-numbered years.

126. **Philosophy of the Visual Arts.** (3) I. Mr. Bossart
Lecture—3 hours.
Prerequisite: one course in art or design, or consent of the instructor.
Aesthetics of the graphic and plastic arts.
Offered in even-numbered years.

Group D: Instrumental Philosophy

132. **History of Logic.** (3) I. Mr. Gilbert
Lecture—3 hours.
Aristotle's *Organon*; Stoic logic; the medieval contributions; the major 19th century logicians; the initiation of contemporary logic by Whitehead and Russell.
Offered in even-numbered years.

COURSES ON HISTORICAL PERIODS AND INDIVIDUAL THINKERS

Group A: Periods

145. **Medieval Philosophy.** (3) I. Mr. Gilbert
Lecture—3 hours.
Emphasis on Augustine, Aquinas, Occam, and Scotus.
Offered in odd-numbered years.
146. **Renaissance Philosophy.** (3) II. Mr. Gilbert
Lecture—3 hours.
Renaissance conceptions of man, as found in writings of Valla, Ficino, Pico, Pomponazzi, Erasmus, Vives, Luther, Montaigne, and Calvin.
Offered in odd-numbered years.
147. **Emergence of Modern Science.** (3) II. Mr. Gilbert
Lecture—3 hours.
Philosophical examination of the development of concepts of physics, chemistry, astronomy, and mathematics from the late medieval period to the time of Newton.
Offered in even-numbered years.
151. **Philosophy of the 19th Century.** (3) I. Mr. Bossart
Lecture—3 hours.
The idealism of Hegel, his contemporaries, and his successors; Marxism; the positivism of Comte and Mill; the irrationalism of Kierkegaard and Nietzsche.
Offered in odd-numbered years.
156. **Contemporary British-American Philosophy.** (3) I. Mr. Arbin
Lecture—3 hours.
Idealism; realism; pragmatism; logical empiricism; linguistic analysis.
Offered in odd-numbered years.
157. **Contemporary European Philosophy.** (3) II. Mr. Bossart
Lecture—3 hours
Existentialism, phenomenology, and their immediate antecedents.
Offered in even-numbered years.

Group B: Individual Thinkers

161. **Plato.** (3) II. Mr. Child
Lecture—3 hours.
Prerequisite: course 6A or consent of the instructor.
Themes from the thought of Plato, especially as treated in the *Phaedrus*, *Parmenides*, *Theaetetus*, *Sophist*, *Statesman*, *Philebus*, and *Timaeus*.
Offered in odd-numbered years.

162. **Aristotle.** (3) II. Mr. Child
 Lecture—3 hours.
 Prerequisite: course 6A or consent of the instructor.
 The *Metaphysics* and related portions of other treatises.
 Offered in even-numbered years.
168. **Descartes.** (3) II. Mr. Gilbert
 Lecture—3 hours.
 Philosophical works of Descartes; some reference to the Cartesians.
 Offered in odd-numbered years.
172. **Locke and Leibniz.** (3) II. Mr. Gilbert
 Lecture—3 hours.
 Locke's *An Essay concerning Human Understanding*; Leibniz' philosophy, with special reference to his criticism of Locke in *New Essays on the Human Understanding*.
 Offered in odd-numbered years.
174. **Hume.** (3) II. Mr. Arbini
 Lecture—3 hours.
 A *Treatise of Human Nature*; some reference to the *Enquiries*.
 Offered in even-numbered years.
175. **Kant.** (3) I. Mr. Bossart
 Lecture—3 hours.
 Prerequisite: course 20B or consent of the instructor.
 The *Critique of Pure Reason* and selections from other works.
 Offered in even-numbered years.
199. **Special Study for Advanced Undergraduates.** (1-4) I and II.
 Prerequisite: consent of the instructor. The Staff (Mr. Bossart in charge)

PHYSICAL EDUCATION

Charles R. Kovacic, Ed.D., *Chairman of the Department.*
Department Office, 202 Gymnasium

Charles R. Kovacic, Ed.D., *Professor of Physical Education.*
Marya Welch, Ed.D., *Associate Professor of Physical Education.*
Willard S. Lotter, Ed.D., *Associate Professor of Physical Education.*
Everett D. Ryan, Ed.D., *Associate Professor of Physical Education.*
Edmund M. Bernauer, Ph.D., *Assistant Professor of Physical Education.*
Barbara J. Heller, Ed.D., *Assistant Professor of Physical Education.*
William L. Lakie, Ed.D., *Assistant Professor of Physical Education.*
———, *Assistant Professor of Physical Education.*
Robert R. Brooks, M.A., *Assistant Supervisor of Physical Education.*
Carl E. J. Carlson, M.A., *Assistant Supervisor of Physical Education.*
Vernard B. Hickey, A.B., *Lecturer and Supervisor of Physical Education.*
Jerry W. Hinsdale, A.B., *Junior Supervisor of Physical Education.*
Ramona B. Johnson, B.S., *Junior Supervisor of Physical Education.*
†Ruth J. Rose, M.A., *Lecturer and Assistant Supervisor of Physical Education.*
Herbert A. Schmalenberger, M.A., *Associate Supervisor of Physical Education.*
George A. Stromgren, M.S., *Lecturer and Supervisor of Physical Education.*

The incidental fee, payable by all students at the time of registration, entitles students to the use of the gymnasium, swimming pool, 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. Locker keys will be turned in on the *last day of class, before the final examination period.*

Fines are imposed for each formal transaction necessitated by failure of the student to comply with the regulations of the department.

Major Advisers.—Mr. Bernauer, Miss Heller, Mr. Kovacic, Mr. Lakie, Mr. Lotter, Miss Welch.

The Major Program

(A) Lower Division Courses.—Physical Education 10 for men; Physical Education 22 and 35 for women; Physical Education 20 and 24; Physiology 1-1L; Psychology 1 or 2; Zoology 10 and Zoology 25.

(B) Upper Division Courses.—Twenty-four units of upper division courses in physical education and allied subjects, including courses 103A-103B, 130, 131, 180A-180B; one of the following: 135, 140, 145, 171; Home Economics 131 or 136.

It is also recommended that students elect a 3-unit upper division course in the area of sociology, and a 3-unit upper division course in the area of psychology to be chosen with the approval of the adviser.

LOWER DIVISION COURSES FOR MEN

1. Physical Education for Men. (½) I and II.

The Staff

Laboratory—2 hours.

Sections are organized in archery, badminton, dance (social, folk and square), baseball, basketball, boxing, football, golf, handball, soccer, tennis, touch football, track, trampolining, tumbling, wrestling, volleyball, swimming,

† Absent on leave, 1968-1964.

lifesaving and water sports. Men qualified for athletics may enroll in any sport pursued at Davis, such as baseball, basketball, football, and receive credit for this elective.

This course may be repeated for credit not to exceed a total of 4 units.

10. Professional Physical Education Activities (Men). (1) I and II.

Lecture—1 hour; laboratory—2 hours.

The Staff

Fundamental knowledges and skills in swimming, basketball, football, track, baseball, tennis, golf, combative sports, developmental activities, court sports, tumbling.

LOWER DIVISION COURSES FOR WOMEN

22. Professional Physical Education Activities (Women). (1) I and II.

Lecture—1 hour; laboratory—2 hours.

The Staff

Fundamental knowledge and skill in aquatics (swimming—beginning, intermediate, advanced, synchronized; diving; lifesaving; water safety); archery; badminton; basketball; dance (folk and square, modern, social); tennis; tumbling; gymnastics; volleyball.

26. Physical Education for Women. ($\frac{1}{2}$) I and II.

The Staff

Laboratory—2 hours.

Sections are organized in archery, badminton, dance (modern, social, folk and square), golf, tennis, trampolining, tumbling, volleyball, swimming, lifesaving and swimming formations.

This course may be repeated for credit not to exceed a total of 4 units.

35. Rhythmic Form and Analysis. (1) II.

Lecture—1 hour; laboratory—2 hours.

The fundamentals of rhythmic form; the use of rhythm as the basic element in activity and its application to physical education. A workshop class in the function of rhythm, form, and analysis.

LOWER DIVISION COURSES FOR MEN AND WOMEN

5A. First Aid. (1) I and II.

Mr. Stromgren

Lecture—2 hours.

Standard course. Upon successful completion of the course, the Red Cross Certificate is awarded.

20. Introduction to Physical Education. (1) I.

Mr. Schmalenberger

Lecture—2 hours.

An orientation and interpretation of the field of physical education for the prospective major. Open only to students specializing in physical education and candidates for the teaching credential.

24. The Theory of Swimming and Diving. (1) I and II.

Mr. Hinsdale

Lecture—1 hour; laboratory—2 hours.

Prerequisite: course 1 or 26 in swimming or equivalent.

Advanced swimming and diving, including water safety. Red Cross Senior Lifesaving Certificate awarded those who qualify. Fundamental skills and teaching techniques.

25. The Theory of Lifesaving and Water Safety. (1) I and II.

Lecture—1 hour; laboratory—2 hours.

Prerequisite: course 24 or equivalent and Red Cross Lifesaving Certificate.

Organization of waterfront activities in schools, colleges, camps, and recreation centers. Skill and techniques of teaching swimming and lifesaving. An Instructor's Red Cross Certificate awarded upon completion of the course.

***36A. Dance History and Practice. (2) I.**

Lecture—1 hour; laboratory—3 hours.

Prerequisite: body mechanics section of course 22 or 26 (may be taken concurrently).

Survey of the dance from its origins in prehistoric and antique ceremonial to 1900. A study of the materials, growth, and function of dance in society. Practice primarily in dance forms which developed out of Renaissance foundations.

***36B. Dance History and Practice. (2) II.**

Lecture—1 hour; laboratory—3 hours.

Prerequisite: body mechanics section of course 22 or 26 (may be taken concurrently).

Survey of the dance from its origins in prehistoric and antique ceremonial to 1900. A study of the materials, growth, and function of dance in society. Practice primarily in dance forms which developed out of Renaissance foundations.

***37A. Contemporary Dance Theory and Practice. (2) I.**

Lecture—1 hour; laboratory—3 hours.

Prerequisite: course 36A-36B.

A study of the perspectives and practices of contemporary American art dance: traditional forms and twentieth-century innovation. A comparative study of selected theories and practices in America, Europe, and the Orient.

***37B. Contemporary Dance Theory and Practice. (2) II.**

Lecture—1 hour; laboratory—3 hours.

Prerequisite: course 36A-36B.

A study of the perspectives and practices of contemporary American art dance: traditional forms and twentieth-century innovation. A comparative study of selected theories and practices in America, Europe, and the Orient.

44. Principles of Healthful Living. (1) II.

Miss Heller

Lecture—2 hours.

Use of scientific information, proper attitudes, knowledge and health practices in daily living.

UPPER DIVISION COURSE FOR MEN

171. Conditioning of Athletes and Care of Injuries. (2) I. Mr. Stromgren

Lecture—1 hour; laboratory—3 hours.

Prerequisite: course 5A, physiology or anatomy.

Modern principles and practices in conditioning and care of athletes. Prevention, care of athletic injuries and therapeutic exercises applied to athletic injuries; training-room equipment, protective devices and supplies.

UPPER DIVISION COURSES FOR MEN AND WOMEN

103A. Analysis of Human Movement. (4) I.

Mr. Kovacic

Lecture—3 hours; laboratory—3 hours.

Prerequisite: Physiology 1-1L.

Analysis of human movement based upon the integration of kinesiology, physiology of activity and adapted physical education.

103B. Analysis of Human Movement. (4) II.

Mr. Bernauer

Lecture—3 hours; laboratory—3 hours.

Prerequisite: Physiology 1-1L.

Analysis of human movement based upon the integration of kinesiology, physiology of activity and adapted physical education.

* Not to be given, 1963-1964.

- 110. Psychosocial Factors in Motor Performance.** (3) II. Mr. Ryan
Lecture—3 hours.
Prerequisite: Psychology 1 or 2.
Analysis of various psychological and social factors affecting the development and use of motor skills.
- 130. Principles and Theory and Physical Education.** (3) II. Miss Welch
Lecture—3 hours.
Prerequisite: course 20.
A critical analysis of the assumptions underlying the physical education program.
- 131. Organization and Administration of Physical Education.** (3) I.
Lecture—3 hours.
Prerequisite: course 130.
Principles and policies pertaining to departmental organization and administration, personnel, academic programming, facilities, equipment and supplies, intramural and interscholastic relationships, public relations and legal practices.
- 135. Measurement and Evaluation in Physical Education.** (3) I.
Lecture—3 hours. Mr. Bernauer
Historical background and review of measurement and evaluation in physical education; statistical procedures essential in measurement; basic principles of constructing and selecting tests; interpretation of results; analysis of selected research studies.
- 140. Recreation in the Community.** (2) II. Mr. Lotter
Lecture—2 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.
- 145. School Health Education.** (2) II. Miss Heller
Lecture—2 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.
- 180A. Physical Education in the Secondary School.** (2) I.
Lecture—2 hours. Miss Heller, Mr. Lakié
Prerequisite: course 130 and individual proficiency in activities.
An analysis and study of the principles and methods basic to the physical education program in the secondary school; the role of the teacher in the program and the competencies necessary to carry out the functions of the physical education teacher.
- 180B. Physical Education in the Secondary School.** (2) II.
Lecture—2 hours. Miss Heller, Mr. Lakié
Prerequisite: course 130 and individual proficiency in activities.
An analysis and study of the principles and methods basic to the physical education program in the secondary school; the role of the teacher in the program and the competencies necessary to carry out the functions of the physical education teacher.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II.
Prerequisite: consent of department. The Staff (Mr. Kovacic in charge)

PROFESSIONAL COURSE

380A. Methods of Physical Education in the Secondary School. (2) I.

Lecture—1 hour; laboratory—3 hours. Miss Heller, Mr. Lakie

Prerequisite: course 130 and individual proficiency in activities. Course 180A-180B must be taken concurrently.

The methods of teaching group and individual activities in the secondary school; program planning; class management; organization of the intramural and extramural programs. Laboratory experience in teaching methods.

380B. Methods of Physical Education in the Secondary School. (2) II.

Lecture—1 hour; laboratory—3 hours. Miss Heller, Mr. Lakie

Prerequisite: course 130 and individual proficiency in activities. Course 180A-180B must be taken concurrently.

The methods of teaching group and individual activities in the secondary school; program planning; class management; organization of the intramural and extramural programs. Laboratory experience in teaching methods.

PHYSICS

William J. Knox, Ph.D., *Chairman of the Department.*
Department Office, 109 Physical Science Building

David B. Beard, Ph.D., *Professor of Physics.*
Milton E. Gardner, Ph.D., *Professor of Physics.*
John A. Jungerman, Ph.D., *Professor of Physics.*
Charles G. Patten, Ph.D., *Professor of Physics.*
William J. Knox, Ph.D., *Associate Professor of Physics.*
Ian E. McCarthy, Ph.D., *Associate Professor of Physics.*
Franklin P. Brady, Ph.D., *Assistant Professor of Physics.*
James P. Hurley, Ph.D., *Assistant Professor of Physics.*
James A. McCray, Ph.D., *Assistant Professor of Physics.*
William W. True, Ph.D., *Assistant Professor of Physics.*

Letters and Science List.—All undergraduate courses in physics are included in the Letters and Science List of Courses (see page 93).

Major Subject Advisers.—Mr. Gardner, Mr. McCray, Mr. True.

Bachelor of Arts Major Program

(A) Lower Division Courses.—Required: Physics 4A, 4B, 4C or the equivalent, Chemistry 1A, Mathematics 9A, 9B, 9C or their equivalent. Recommended: Mathematics 7B and a reading knowledge of French and German.

(B) Upper Division Courses.—Required: Physics 105A, 105B, 108, 110A, 110B, 121, 122, and Mathematics 106, 107. Recommended: Physics 115, 129 or 140, and Mathematics 185.

Bachelor of Science Major Program

(A) Lower Division Courses.—Required: Physics 4A, 4B, 4C, or the equivalent, Chemistry 1A, 1B, Mathematics 9A, 9B, 9C or their equivalent. Recommended: Mathematics 7B and a reading knowledge of French and German.

(B) Upper Division Courses.—Required: Physics 105A, 105B, 108, 110A, 110B, 115, 116, 121, 122, 129, 140, and Mathematics 106, 107. Recommended: Physics 107, 112, Mathematics 108, and 185.

Honors and Honors Program (see page 94).—The honors program in physics consists of three units of course 194H open to seniors who qualify for the honors program. Students may be graduated with honors in physics upon the 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, and 4C are for students whose major is physics and for students preparing for applications of physics in Colleges of Engineering and Chemistry. Either 4B or 4C may be taken after 4A.

All students planning to take lower division courses (except course 10) should have completed trigonometry.

2A. General Physics Lecture. (3) I and II. Mr. Hurley, Mr. McCarthy
Lecture—3 hours.

Mechanics, properties of matter, heat, and sound.

- 2B. General Physics Lecture.** (3) I and II. Mr. McCarthy, Mr. Hurley
Lecture—3 hours.
Prerequisite: course 2A.
Properties of light, electricity, magnetism, and atomic and nuclear physics.
- 3A. General Physics Laboratory.** (1) I and II. Mr. Hurley, Mr. McCarthy
Laboratory—3 hours.
Mechanics, properties of matter, heat, and sound. Experimental work
planned to accompany the lectures in course 2A.
- 3B. General Physics Laboratory.** (1) I and II. Mr. McCarthy, Mr. Hurley
Laboratory—3 hours.
Properties of light, electricity, magnetism, and atomic and nuclear physics.
Experimental work planned to accompany the lectures in course 2B.
- 4A. General Physics.** (4) II. Mr. Gardner
Lecture—3 hours; laboratory—3 hours.
Prerequisite: Mathematics 9B or the equivalent (may be taken concur-
rently).
Mechanics, properties of matter.
- 4B. General Physics.** (4) I. Mr. Gardner
Lecture—3 hours; laboratory—3 hours.
Prerequisite: course 4A, Mathematics 9C (may be taken concurrently).
Electricity and magnetism.
- 4C. General Physics.** (4) II. Mr. Patten
Lecture—3 hours; laboratory—3 hours.
Prerequisite: course 4A, Mathematics 9C (may be taken concurrently).
Heat, wave motion, sound, and light.
- 10. Basic Concepts of Physics.** (3) I. Mr. Knox
Lecture—3 hours.
Development of the principles of physics, classical and modern, with em-
phasis on concepts rather than applications. Includes lecture-demonstrations
and problem assignments.
Not open to students who have received credit for any of 2A, 2B, 4A, 4B,
4C, or the equivalent.

UPPER DIVISION COURSES

- Courses 4A, 4B, 4C or their equivalent and differential and integral calculus
are prerequisite to all upper division courses, except course 107.
- 104. Vector Analysis.** (3) I. _____
Lecture—3 hours.
Elements of vector and tensor analysis with applications to physics.
Offered in even-numbered years.
- 105A. Analytic Mechanics.** (3) I. Mr. Hurley
Lecture—3 hours.
Principles and applications of Newtonian mechanics.
- 105B. Analytic Mechanics.** (3) II. Mr. Hurley
Lecture—3 hours.
Continuation of 105A; introduction to Lagrange's and Hamilton's equa-
tions.
- 107. Introduction to Electronics.** (3) I. Mr. Gardner
Lecture—3 hours.
Prerequisite: course 2B, or equivalent.
Elementary principles of single-phase alternating-current circuits, char-
acteristics of thermionic tubes and a study of simple electronic circuits.
Offered in odd-numbered years.

- 108. Physical Optics.** (3) II. Mr. McCray
Lecture—3 hours.
The phenomena of diffraction, interference, and polarization of light, and their applications.
- 110A. Electricity and Magnetism.** (3) I. Mr. True
Lecture—3 hours.
Prerequisite: Mathematics 106, 107.
Elementary and mathematical theory of electrostatics, magnetostatics, steady currents, and electron theory of solids.
- 110B. Electricity and Magnetism.** (3) II. Mr. True
Lecture—3 hours.
Prerequisite: course 110A.
Elementary and mathematical theory of magnetism, alternating currents, plasmas, and electromagnetic waves.
- 112. Thermodynamics and Statistical Physics.** (3) II. Mr. Beard
Lecture—3 hours.
The thermal properties of matter, with an introduction to the mathematical theory of heat conduction, the kinetic theory of matter, and thermodynamics, and statistical mechanics.
Offered in even-numbered years.
- 115. Introduction to Quantum Mechanics.** (3) I. Mr. Brady
Lecture—3 hours.
Prerequisite: courses 105A, 121.
The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.
- 116. Advanced Electronics.** (3) I. Mr. McCray
Lecture—2 hours; laboratory—3 hours.
Prerequisite: mathematics through introduction to partial differential equations and Laplace transforms, or consent of the instructor. (Physics 107 is strongly recommended.)
Response of various circuits to pulses and sinusoidal signals; RCL resonant circuits; coupled resonant circuits; transmission lines; delay cables; pulse amplifiers; cathode followers; voltage discrimination scalars; and multi-channel analyzers.
- 121. Introduction to Atomic Structure.** (3) I. Mr. Patten
Lecture—3 hours.
An introduction to atomic physics treating cathode and positive rays, the electron, thermionic emission, the photoelectric effect, the structure of the atom, and the interpretation of spectra and X rays.
- 122. Advanced Physics Laboratory.** (1-2) II. Mr. Knox
Laboratory.
Prerequisite: course 121.
Experimental techniques and measurements in physical optics and in atomic, nuclear, and solid-state physics.
- 129. Nuclear Physics.** (3) II. Mr. McCray
Lecture—3 hours.
Prerequisite: courses 115, 121.
Survey of basic nuclear properties and concepts requiring only rudimentary knowledge of quantum mechanics.

140. Introduction to Solid-State Physics. (3) II. Mr. McCarthy
Lecture—3 hours.

Prerequisite: course 121.

An elementary survey of the classification and properties of solids. Ionic, covalent, molecular, metallic and semiconducting crystals. Dielectric, thermal, magnetic, conductive, and mechanical properties. Superconductivity, ferromagnetism, defects in solids.

Offered in odd-numbered years.

194H. Special Study for Honors Students. (3) I and II. The Staff

Prerequisite: open only to seniors who qualify for the honors program. Independent research and/or reading on selected topics.

199. Special Study for Advanced Undergraduates. (1-5) I and II. The Staff

All special work of upper division grade not included in courses announced above.

GRADUATE COURSES

205. Theoretical Mechanics. (3) I. Mr. Patten

Lecture—3 hours.

Prerequisite: courses 105A, 105B or the equivalent.

The generalized methods of Lagrange, Hamilton, and Jacobi. Advanced theories leading to the formulation of quantum mechanics.

210A. Theory of Electricity and Magnetism. (3) I. Mr. Jungerman

Lecture—3 hours.

Prerequisite: courses 110A and 110B, or the equivalent; a working knowledge of differential equations.

Classical description of the electromagnetic field, including boundary value problems, conservation laws, and plane electromagnetic waves.

210B. Theory of Electricity and Magnetism. (3) II. Mr. Jungerman

Lecture—3 hours.

Prerequisite: course 210A or the equivalent.

Classical description of the electromagnetic field, including radiating systems, special theory of relativity, multipole fields, and electron theory.

215A. Quantum Mechanics. (3) II. Mr. Beard

Lecture—3 hours.

Prerequisite: courses 115 and 205.

Development and interpretation of the Schrödinger wave equation and Heisenberg matrix mechanics; approximation methods; applications to atomic, molecular, and solid-state problems.

Offered in even-numbered years.

215B. Quantum Mechanics. (3) I. Mr. True

Lecture—3 hours.

Prerequisite: course 215A.

Radiation theory; scattering theory, including multiple scattering leading to elementary many-body approximations. Dirac wave equations leading to elementary field theory.

Offered in odd-numbered years.

215C. Advanced Quantum Mechanics. (3) II. Mr. True

Lecture—3 hours.

Prerequisite: course 215B, or consent of the instructor.

Advanced topics in quantum mechanics of current interest such as quantum electrodynamics, field theory, dispersion relations, and the many-body problem.

Offered in even-numbered years.

- 219. Statistical Mechanics and Kinetic Theory. (3) I.** Mr. Beard
Lecture—3 hours.
Prerequisite: courses 115, 205.
Foundations of statistical mechanics. Classical and quantum statistics, with applications to properties of matter; kinetic theory; gases at very low pressure; Boltzmann transport equation; irreversible processes.
Offered in odd-numbered years.
- 229A. Nuclear Theory. (3) I.** Mr. Brady
Lecture—3 hours.
Prerequisite: course 215A.
Review and survey of basic nuclear properties. Two-nucleon systems, nuclear forces, and models.
Offered in odd-numbered years.
- 229B. Nuclear Theory. (3) II.** Mr. Brady
Lecture—3 hours.
Prerequisite: course 229A.
Nuclear reactions; electromagnetic interactions of nuclei; beta decay; introduction to meson theory of nuclear forces.
Offered in even-numbered years.
- 229C. Advanced Nuclear Theory. (3) I.** Mr. McCarthy
Lecture—3 hours.
Prerequisite: course 229B, or consent of the instructor.
Advanced topics in theoretical nuclear physics of current interest such as beta decay, reaction theory, and nuclear models.
Offered in odd-numbered years.
- 290. Seminar. (1-3) I and II.** Mr. Knox
Advanced study in various fields of modern physics. Topics will vary from year to year.
- 299. Research. (1-6) I and II.** The Staff

PHYSIOLOGICAL SCIENCES

Stuart A. Peoples, M.D., *Chairman of the Department.*
Department Office, 2165 Haring Hall

Arthur L. Black, Ph.D., *Professor of Physiological Chemistry.*
Louis W. Holm, Ph.D., *Professor of Physiology.*
Stuart A. Peoples, M.D., *Professor of Comparative Pharmacology.*
Leon H. Schmidt, Ph.D., *Professor of Comparative Pharmacology.*
Richard A. Freedland, Ph.D., *Assistant Professor of Physiological Sciences.*
Harold R. Parker, D.V.M., Ph.D., *Assistant Professor of Physiology.*



Allen C. Andersen, V.M.D., Ph.D., *Lecturer in Radiopathology.*
Freddy Moller, D.V.M., *Lecturer in Physiological Chemistry.*
Rocco J. Della Rosa, Ph.D., *Lecturer in Radiobiology.*
Marvin Goldman, Ph.D., *Lecturer in Radiobiology.*

UPPER DIVISION COURSES

101. Physiological Chemistry. (5) II. Mr. Black, Mr. Freedland, Mr. Moller
Lecture—5 hours.

Prerequisite: quantitative and organic chemistry. Recommended: a course in physiology (may be taken concurrently).

Chemical and physical properties of substances comprising the animal body with major emphasis on the changes during metabolism and factors influencing these reactions. Biochemistry of the endocrine glands and other specialized tissues and body fluids; energy metabolism and nutrition.

101L. Physiological Chemistry Laboratory. (2) II.

Laboratory—6 hours. Mr. Black, Mr. Freedland, Mr. Moller
Prerequisite: course 101 (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.

123. Comparative Pharmacology. (4) I. Mr. Peoples
Lecture—2 hours; laboratory—6 hours.

Prerequisite: second-year standing in the School of Veterinary Medicine or consent of the instructor.

The action of drugs on the physiological mechanism of domestic animals.

124. Comparative Pharmacology and Therapeutics. (4) II.

Lecture—3 hours; laboratory—3 hours. Mr. Peoples, Mr. Fowler
Prerequisite: course 123 or consent of the 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.

140. Mammalian Physiology. (6) II. Mr. Holm, Mr. Parker
Lecture—6 hours.

Prerequisite: Physiology 1 and 1L or Zoology 1A-1B; Physics 2A-2B; Chemistry 1A-1B, 8.

A comprehensive survey of mammalian physiology.

140L. Laboratory in Mammalian Physiology. (3) II.

Laboratory—9 hours.

Mr. Holm, Mr. Parker

Prerequisite: course 140 or equivalent (may be taken concurrently).

Laboratory exercises designed to illustrate physiological interactions among systems in a variety of mammalian forms.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

The Staff (Mr. Peoples in charge)

GRADUATE COURSES

205. Intermediary Metabolism of Animals. (3) II. Mr. Black, Mr. Freedland

Lecture—3 hours.

Prerequisite: biochemistry and physiology or consent of the instructor.

A survey of chemical pathways of metabolism with emphasis on studies in intact animals. Biosynthesis of major tissue constituents such as carbohydrates, amino acids and proteins, lipids, nucleic acids, and porphyrins. Hormonal control of metabolic reactions.

Offered in odd-numbered years.

225. Fundamentals of Radiation Biology. (3) II.

Lecture—3 hours.

Mr. Andersen, Mr. Della Rosa, Mr. Goldman

Prerequisite: one year of physics, introductory biochemistry, introductory physiology. Recommended: first course in analytical geometry and calculus.

A survey of effects of ionizing radiations on biological systems with emphasis upon mammals. Special problems of radiological physics, radiation chemistry, physiology, pathology, and radioactivity in the biosphere are studied.

265. Experimental Physiology. (3) I.

Mr. Holm

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 140-140L or Animal Husbandry 110; Animal Husbandry 102; and consent of the instructor.

Selected lectures and experiments on the physiology of the nervous system, neutrality regulation, cardiac function and rumen function. Preparation and study of certain endocrine deficiencies and excesses.

290. Seminar. (1) I and II.

The Staff

Seminar—1 hour.

299. Research in Physiological Sciences. (1-6) I and II.

The Staff

PHYSIOLOGY

For courses in physiology see "Animal Physiology," page 129, and "Zoology," page 320.

PLANT NUTRITION

For courses in plant nutrition see "Soils and Plant Nutrition," page 309.

PLANT PATHOLOGY

Lysle D. Leach, Ph.D., *Chairman of the Department.*
Department Office, 350 Biological Sciences Building

W. Harley English, Ph.D., *Professor of Plant Pathology.*
Raymond G. Grogan, Ph.D., *Professor of Plant Pathology.*
William B. Hewitt, Ph.D., *Professor of Plant Pathology.*
Byron R. Houston, Ph.D., *Professor of Plant Pathology.*
Lysle D. Leach, Ph.D., *Professor of Plant Pathology.*
George Nyland, Ph.D., *Professor of Plant Pathology.*
Edward E. Wilson, Ph.D., *Professor of Plant Pathology.*
Edward E. Butler, Ph.D., *Associate Professor of Plant Pathology.*
James E. DeVay, Ph.D., *Associate Professor of Plant Pathology.*
Joseph M. Ogawa, Ph.D., *Associate Professor of Plant Pathology.*
Robert N. Campbell, Ph.D., *Assistant Professor of Plant Pathology.*
Philip M. Halisky, Ph.D., *Assistant Professor of Plant Pathology.*
Thomas A. Shalla, Ph.D., *Assistant Professor of Plant Pathology.*
Robert J. Shepherd, Ph.D., *Assistant Professor of Plant Pathology.*



Tsune Kosuge, Ph.D., *Lecturer in Plant Pathology.*

Departmental Major Adviser.—Mr. English.

Bachelor of Science Major Program and Graduate Study. See page 63.

UPPER DIVISION COURSES

120. Plant Diseases. (4) I and II.

Lecture—2 hours; laboratory—6 hours. I. Mr. English, Mr. Shepherd; II. Mr. Campbell, Mr. Halisky.

Prerequisite: Botany 1. Recommended: Bacteriology 1.

A general course on the nature, cause, and control of plant diseases.

122. Plant Pathology Methods. (3) I.

Mr. Nyland

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 120.

Elementary methods and techniques used in the study of plant diseases.

125. Diseases of Field and Vegetable Crop Plants. (3) I.

Lecture—1 hour; laboratory—6 hours.

Mr. Grogan, Mr. Houston

Prerequisite: course 120.

The pathology of important field and vegetable crop plants. Diagnosis, host reaction, factors influencing inception and severity of the disease, dissemination and control.

Frequent field trips are required.

126. Diseases of Fruit, Nut, and Vine Crop Plants. (3) II.

Lecture—1 hour; laboratory—6 hours.

Mr. Ogawa

Prerequisite: course 120.

The pathology of important fruit, nut, and vine crop plants. Diagnosis, host reaction, factors influencing inception and severity of the disease, dissemination and control.

Frequent field trips are required.

199. Special Study for Advanced Undergraduates. (1-5) I and II. The Staff

GRADUATE COURSES

- 202. Research Techniques and Instrumentation in Plant Pathology.** (4) I.
Lecture—2 hours; laboratory—6 hours. Mr. Kosuge, Mr. Nyland
Prerequisite: course 120.
Principles and practices of advanced techniques used in plant pathology research.
- 205. Advanced Study of Field and Vegetable Crop Diseases.** (4) I.
Lecture—2 hours; laboratory—6 hours. Mr. Grogan, Mr. Houston
Prerequisite: course 120; Botany 119.
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.
- 206. Advanced Study of Fruit and Nut Diseases.** (4) II.
Lecture—2 hours; laboratory—6 hours. Mr. Ogawa, Mr. Wilson
Prerequisite: course 120; Botany 119.
A clinical study of the factors affecting initiation, development and control of selected fungus, bacterial, and virus diseases of perennial fruit and nut plants. Methods of control and modes of fungicidal and bactericidal action of control chemicals.
- 210. Physiology of Plant Pathogens.** (2) II. Mr. DeVay
Prerequisite: courses 120 and 202; Biochemistry 101; Chemistry 5 and 8; recommended: Botany 120A-120B.
Current concepts of the physiology of plant pathogens and host pathogen relationships.
- 210L. Physiology of Plant Pathogens.** (2) II. Mr. DeVay
Laboratory—6 hours.
Prerequisite: course 210 (may be taken concurrently); recommended: Botany 121A-121B or Biochemistry 101L.
Laboratory experimentation on plant pathogens and host-pathogen relationships.
- 224. Pathogenic Fungi.** (4) II. Mr. Butler
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Botany 119.
Morphology and taxonomy of fungi, with special emphasis on plant pathogens.
- 226. Plant Virology.** (4) I. Mr. Shalla
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 120.
Viruses as causal agents of plant diseases; the nature, morphology, chemical, physical and serological properties of plant viruses; methods of transmission including insect vector relationships; application of techniques and equipment used in research.
- 235. Advanced Plant Pathology.** (4) II. Mr. Hewitt, Mr. Leach
Lecture—3 hours; discussion—1 hour.
Prerequisite: consent of the instructor.
A study of the factors influencing pathogenicity and of the reaction of host plants to disease.
- 290. Seminar.** (1) I and II. Mr. Campbell
Seminar—1 hour.
- 299. Research.** (1-6) I and II. The Staff

POLITICAL SCIENCE

Clyde E. Jacobs, Ph.D., *Chairman of the Department.*
Department Office, 259 Academic Office Building

Clyde E. Jacobs, Ph.D., *Professor of Political Science.*
Lloyd D. Musolf, Ph.D., *Professor of Political Science.*
Vernon J. Puryear, Ph.D., *Professor of Political Science.*
Paul E. Zinner, Ph.D., *Associate Professor of Political Science.*
Alexander J. Groth, Ph.D., *Assistant Professor of Political Science.*
———, *Assistant Professor of Political Science.*
John R. Owens, Ph.D., *Assistant Professor of Political Science.*
Stuart A. Scheingold, Ph.D., *Assistant Professor of Political Science.*
Marvin Zetterbaum, Ph.D., *Assistant Professor of Political Science.*



John F. Gallagher, M.A., *Acting Assistant Professor of Political Science.*
E. Lester Levine, M.A., *Lecturer in Political Science.*
James S. Nyman, M.A., *Lecturer in Political Science.*

Letters and Science List.—All undergraduate courses in Political Science are included in the Letters and Science List of Courses. (See page 93.)

Departmental Major Advisers.—Mr. Gallagher, Mr. Groth, Mr. Jacobs, Mr. Owens, Mr. Puryear, Mr. Scheingold, Mr. Zetterbaum, Mr. Zinner.

Graduate Advisers.—Mr. Owens, Mr. Puryear, Mr. Zinner.

The American History and Institutions Requirement may be satisfied by any two of the following courses: 1A, 1B, 102, 105, 113, 128A, 157A, 157B, 163, 166. See also page 38.

The Major Program

(A) Lower Division Courses.—Required: courses 1A, 1B, 2, 3, and either History 4A–4B or History 17A–17B, and a minimum average grade of C in these courses. Economics 1A and Philosophy 6A or 20A are recommended as preparation for the major.

(B) Upper Division Courses.—Required: 24 units as follows:

- (1) 18 units in Political Science. This must include at least one course from each of four of the six groups offered: American Government, Political Theory, International Relations, Comparative Government, Public Law and Political Parties.
- (2) 6 additional units in political science or related subjects chosen in consultation with the adviser.

Political Science students must maintain at least a grade C average in the major.

The Master of Arts Degree in Political Science.—The Department offers graduate study leading to the Master of Arts Degree in Political Science. Information concerning admission to candidacy for this degree and requirements for completion may be obtained at the department office.

LOWER DIVISION COURSES

- | | |
|---|-----------|
| 1A. American Government. (3) I and II.
Lecture—2 hours; recitation—1 hour.
National, state, and local government in the United States. | The Staff |
| 1B. American Government. (3) I and II.
Lecture—2 hours; recitation—1 hour.
National, state, and local government in the United States. | The Staff |

- 2. Introduction to Government (Comparative Government).** (3) I and II.
Lecture—2 hours; recitation—1 hour. Mr. Puryear, Mr. Zinner
Constitutional principles, governmental institutions, and political problems
of selected European governments.
- 3. International Relations.** (3) I and II. Mr. Groth, Mr. Puryear
Lecture—2 hours; recitation—1 hour.
Rise and development of the Western State systems; problems of national-
ism and imperialism, particularly in connection with the peace settlement
following World War II.

UPPER DIVISION COURSES

- 100. American National Government.** (3) I and II. Mr. Nyman
Lecture—3 hours.
Prerequisite: Not open to students having credit for course 1A or 1B.
Basic principles of American National Government; its structure, powers,
and operations.
- 102. State Government and American Federalism.** (3) II. Mr. Levine
Lecture—2 hours; discussion—1 hour.
Prerequisite: not open to students who have credit for course 104.
State constitutions, institutions, political patterns, and public programs;
the challenge of contemporary problems; state-national conflict and coopera-
tion in the American federal system.
- 103. Local Government.** (3) I. Mr. Levine
Lecture—2 hours; discussion—1 hour.
Patterns, programs, problems, and legal powers of government in counties,
municipalities, and special districts; professional management and non-
partisan politics; community power structures; local autonomy and central
financing; the governmental challenge of metropolitan areas.
- *104. California State and Local Government.** (3) II. _____
Lecture—2 hours; discussion—1 hour.
Prerequisite: not open to students who have credit for course 102.
California's constitution, party system, legislature, executive agencies, ad-
ministration, courts, major public programs and problems, state-local rela-
tions, county, city, school and special district governments.
Offered in odd-numbered years.
- 105. The Legislative Process.** (3) II. Mr. Owens
Lecture—3 hours.
An analysis of the legislative process in the United States with emphasis
on Congressional and state legislative functions, organization, and practices.
- 112. Contemporary Democratic Theory.** (3) II. Mr. Zetterbaum
Lecture—2 hours; recitation 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.
- 113. American Political Theory.** (3) I. Mr. Zetterbaum
Lecture—2 hours; recitation—1 hour.
Underlying theories and principles of United States government and
politics.

* Not to be given, 1963-1964.

- *114. Polity and Economy: Political Foundations of Economic Thought.** (3) II. Mr. Zetterbaum
Lecture—3 hours.
Interpretation of human nature and institutions underlying the relationship of economic doctrines to political science in classical and modern writers, notably Aristotle, Locke, Mandeville, Montesquieu, Rousseau, Adam Smith, and Marx.
- 118A. History of Political Theory.** (3) I. Mr. Zetterbaum
Lecture—2 hours; recitation—1 hour.
Critical analyses of the works of major political philosophers. Classical and medieval political philosophy—Plato, Aristotle, Cicero, St. Thomas.
- 118B. History of Political Theory.** (3) II. Mr. Zetterbaum
Lecture—2 hours; recitation—1 hour.
Critical analyses of the works of major political philosophers. Modern political philosophy—Machiavelli, Hobbes, Locke, Rousseau, Burke, Nietzsche.
- 119. Recent Political Theory: Democracy, Fascism, and Communism.** (3) II. Mr. Groth
Lecture—2 hours; recitation—1 hour.
Examination of representative works of the principal competing modern ideologies, including those of Mill, Dewey, Nietzsche, Marx, Engels and Lenin.
- 122. Principles of International Law.** (3) II. Mr. Scheingold
Lecture—3 hours.
Assessment of functions and limitations of law in world politics, with particular attention to the sources of international law and the institutional framework of world order.
- *124. International Organization.** (3) II. _____
Lecture—2 hours; recitation—1 hour.
The preservation of world peace through collective security arrangements. Analysis of the conditions under which international organizations can or cannot preserve peace, through examination of the record of the United Nations, League of Nations, and more restricted security organizations.
- 128A. Recent American Foreign Policy.** (3) I. Mr. Puryear
Lecture—3 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.
- 128B. The Conduct of American Foreign Relations.** (3) II. Mr. Puryear
Lecture—2 hours; recitation—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.
- 131. Soviet Foreign Policy.** (3) I. Mr. Zinner
Lecture—2 hours; recitation—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.
- *137. International Relations in the Middle East.** (3) I. _____
Lecture—3 hours.
Policies and diplomacy of the Middle Eastern countries; foreign policies of the major powers in the Middle East.

* Not to be given, 1963-1964.

- 139. International Relations in Western Europe.** (3) I. Mr. Scheingold
Lecture—3 hours.
Study of the emerging unity in Western Europe and its implications for the North Atlantic area.
- 141A. Soviet and East European Governments.** (3) I. Mr. Zinner
Lecture—2 hours; recitation—1 hour.
The governmental systems of the Soviet Union and the East European satellites; background seizure of power, techniques of totalitarian control.
- *141B. Soviet and East European Governments.** (3) II. Mr. Zinner
Lecture—2 hours; recitation—1 hour.
The governmental systems of the Soviet Union and the East European satellites; background seizure of power, techniques of totalitarian control.
- *142. Government and Politics in the Middle East.** (3) II. _____
Lecture—3 hours.
Political institutions of the Middle Eastern countries.
- *144. Government in Great Britain and the British Commonwealth.** (3) I. _____
Lecture—2 hours; recitation—1 hour. Mr. Groth
The democratic process in Britain; party politics; the cabinet system; the colonies; the evolution of the British Commonwealth.
- 147A. Western European Government: France and Italy.** (3) I. Mr. Groth
Lecture—3 hours.
The evolution and contemporary nature of French and Italian political institutions.
- 147B. Western European Government: Germany.** (3) II. Mr. Groth
Lecture—3 hours.
Comparative study of the politics and institutions of constitutional and totalitarian government in Germany since 1930. Current problems of a divided Germany.
- 149. International Communism.** (3) II. Mr. Zinner
Lecture—2 hours; recitation—1 hour.
The international communist movement; Leninist organizational precepts; relations among Communist parties (the Comintern and Cominform); centralized direction vs. local autonomy; problems of leadership and social composition; the Communist parties as adjuncts of Soviet foreign policy.
- 150. Jurisprudence.** (3) I. Mr. Scheingold
Lecture—3 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.
- 156. Administrative Law.** (3) I. Mr. Musolf
Lecture—2 hours; recitation—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.
- 157A. American Constitutional Law.** (3) I. Mr. Jacobs
Lecture—1 hour; recitation—2 hours.
Prerequisite: course 1A or History 17A–17B.
Analysis of judicial cases and related materials illustrating the historical and current interpretations of the Constitution.

* Not to be given, 1963–1964.

- 157B. American Constitutional Law. (3) II.** Mr. Jacobs
Lecture—1 hour; recitation—2 hours.
Prerequisite: course 157A.
Analysis of judicial cases and related materials illustrating the historical and current interpretations of the Constitution.
- 158. Problems of Constitutional Interpretation. (3) II.** Mr. Scheingold
Lecture—3 hours.
Prerequisite: course 157A.
Selected current topics relating to federalism and the separation of powers.
- 161. Political Behavior. (3) II.** Mr. Owens
Lecture—2 hours; recitation—1 hour.
Prerequisite: course 1A.
The individual and group determinants of political belief and action. Political institutions considered in relation to individual values and behavior.
- 163. Political Parties. (3) I.** Mr. Owens
Lecture—2 hours; recitation—1 hour.
Nature and function of political parties; their origin, development, structure, economic and social composition, internal management and control; relation of parties and pressure groups to legislation and administration; analysis of pressure politics as distinguished from party politics.
- 166. Public Policy and the Governmental Process. (3) II.** Mr. Gallagher
Lecture—2 hours; recitation—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.
- 181. Elements of Public Administration. (3) I.** Mr. Gallagher
Lecture—2 hours; recitation—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.
- 199. Special Study for Advanced Undergraduates. (1-5) I and II.** The Staff

GRADUATE COURSES

- 218. Political Theory. (3) I and II.** Mr. Zetterbaum
Seminar—2 hours.
Prerequisite: consent of the instructor.
- 223. International Relations. (3) I.** Mr. Puryear
Seminar—2 hours.
Prerequisite: consent of the instructor.
Selected problems of international politics.
- 224. International Organization. (3) II.** _____
Seminar—2 hours.
Prerequisite: consent of the instructor.
- 230. American Foreign Policy. (3) II.** Mr. Puryear
Seminar—2 hours.
- *237. Middle Eastern Governments. (3) I.** _____
Seminar—2 hours.
Prerequisite: consent of the instructor.

* Not to be given, 1963-1964.

- 241A. Soviet and East European Governments.** (3) I. Mr. Zinner
Seminar—2 hours.
Prerequisite: consent of the instructor.
- 241B. Soviet and East European Governments.** (3) II. Mr. Zinner
Seminar—2 hours.
Prerequisite: consent of the instructor.
- 244. British Government.** (3) II. Mr. Groth
Seminar—2 hours.
Prerequisite: consent of the instructor.
- 247A. Western European Governments.** (3) I. Mr. Groth
Seminar—2 hours.
Prerequisite: consent of the instructor.
Contemporary problems, with emphasis on France and Italy.
- 247B. Western European Governments.** (3) II. Mr. Scheingold
Seminar—2 hours.
Prerequisite: consent of the instructor.
Contemporary problems, with emphasis on Germany.
- 257. Comparative Public Law.** (3) I. Mr. Scheingold
Seminar—2 hours.
Prerequisite: consent of the instructor.
- 280. Public Administration.** (3) II. Mr. Musolf
Seminar—2 hours.
Prerequisite: consent of the instructor.
An examination of American administrative values.
- 291. American Public Law.** (3) II. Mr. Jacobs
Seminar—2 hours.
Prerequisite: consent of the instructor.
Selected current topics.
- 295. Political Parties.** (3) I. Mr. Owens
Seminar—2 hours.
Selected topics.
- 296. State and Local Government.** (3) II. ———
Seminar—2 hours.
Selected institutions, processes, and problems.
- 299. Research.** (1-6) I and II. The Staff
- 299D. Directed Reading.** (1-6) I and II. The Staff
Primarily for Master of Arts candidates who elect Plan II (non-thesis plan).
- PROFESSIONAL COURSE
- 400A. Field Work in Political Science.** (1-4) I. The Staff
Prerequisite: consent of the instructor.
Directed study and internship in a governmental agency, office, or political party.
- 400B. Field Work in Political Science.** (1-4) II. The Staff
Prerequisite: consent of the Instructor.
Directed study and internship in a governmental agency, office, or political party.

POMOLOGY

Dillon S. Brown, Ph.D., *Chairman of the Department.*
Department Office, 1039 Horticulture Science Building

Royce S. Bringhurst, Ph.D., *Professor of Pomology.*
Reid M. Brooks, Ph.D., *Professor of Pomology.*
Dillon S. Brown, Ph.D., *Professor of Pomology.*
Lawrence L. Claypool, Ph.D., *Professor of Pomology.*
Julian C. Crane, Ph.D., *Professor of Pomology.*
William H. Griggs, Ph.D., *Professor of Pomology.*
Carl J. Hansen, M.S., *Professor of Pomology.*
Hudson T. Hartmann, Ph.D., *Professor of Pomology.*
Claron O. Hesse, Ph.D., *Professor of Pomology.*
Frank W. Allen, M.S., *Professor of Pomology, Emeritus.*
Luther D. Davis, Ph.D., *Professor of Pomology, Emeritus.*
E. Louis Proebsting, Ph.D., *Professor of Pomology, Emeritus.*
Warren P. Tufts, Ph.D., *Professor of Pomology, Emeritus.*
Dale E. Kester, Ph.D., *Associate Professor of Pomology.*
———, *Assistant Professor of Pomology.*



Muriel V. Bradley, Ph.D., *Lecturer in Pomology.*
Peter B. Catlin, Ph.D., *Lecturer in Pomology.*
Omund Lilleland, Ph.D., *Lecturer in Pomology.*
Edward C. Maxie, Ph.D., *Lecturer in Pomology.*
Harold P. Olmo, Ph.D., *Professor of Viticulture.*
Roger J. Romani, Ph.D., *Lecturer in Pomology.*
Eugene F. Serr, Jr., B.S., *Lecturer in Pomology.*
Noel F. Sommer, Ph.D., *Lecturer in Pomology.*
Kiyoto Uriu, Ph.D., *Lecturer in Pomology.*

Departmental Major Advisers.—Mr. Bringhurst, Mr. Crane.
Bachelor of Science Major Program and Graduate Study. See page 63.

LOWER DIVISION COURSES

- 1. Introduction to Pomology. (2) I.** Mr. Hansen
Lecture—2 hours.
A survey of the fruit industry and an introduction to the principles underlying the behavior of fruit plants.
- 1L. Introduction to Pomology Laboratory. (1) I.** Mr. Kester
Laboratory—3 hours.
Prerequisite: course 1. (May be taken concurrently.)
Application of the principles underlying the behavior of fruit plants.
- 3. Citrus and Other Subtropical Fruits. (2) II.** Mr. Serr
Lecture—2 hours.
The production of the evergreen 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.

- 9. Principles of Plant Propagation.** (2) II. Mr. Hartmann
Lecture—1 hour; laboratory—3 hours.
Prerequisite: Botany 1.
Principles of propagating horticultural plants with special emphasis on anatomical and physiological relationships.

UPPER DIVISION COURSES

- 100. Fruit and Nut Plants.** (3) I. Mr. Bringhurst
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Botany 1.
Origin, history, distribution and adaptation of fruit and nut plants; their structure and function in relation to environment and cultural practices.
- 101. Development of Buds, Flowers, and Fruits.** (3) II. Mr. Brown
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Botany 1.
The nature and development of buds, flowers, and fruits in relation to the culture of fruit and nut plants and their environment.
- 110. Fruit Morphology.** (3) I. Mr. Brooks
Lecture—1 hour; laboratory—6 hours.
Prerequisite: Botany 1.
The morphological development of the flower, fruit, and seed of more than thirty typical horticultural species.
- 112. Handling, Storage, and Transit of Fruits.** (3) I. Mr. Claypool, Mr. Maxie
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 101; Botany 111.
Fundamentals of fruit-handling operations, cooling, storage, and transportation; emphasis on physiological principles underlying fruit maturity and post-harvest practices.
- 114. Fruit Breeding.** (3) II. Mr. Olmo
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 101; Genetics 100.
The genetics and cytology of fruit species in relation to varietal improvement, including a study of sterility, incompatibility, interspecific hybridization, and clonal selection in fruit varieties.
- 116. Physiology of Fruit Plants.** (3) II. Mr. Hartman
Lecture—3 hours.
Prerequisite: courses 100 and 101; Botany 111.
Physiological processes in the growth and development of fruit plants; metabolic relationships; influence of environment and culture.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSES

- *201. Biochemistry and Physiology of Fruits.** (2) II. Mr. Maxie
Lecture—2 hours.
Prerequisite: Botany 111 and Biochemistry 101, or consent of the instructor.
Biochemical and physiological phenomena of growth, maturation, ripening, and senescence of fruit. (Open to qualified upper division students.)

* Not to be given, 1963-1964.

GRADUATE COURSES

290. Seminar. (1) I and II. Mr. Griggs
Seminar—1 hour.
291. Seminar in Postharvest Physiology. (1) I and II. Mr. Maxie
Seminar—1 hour.
Prerequisite: consent of the instructor.
An intensive study of selected topics in the field of postharvest physiology of fruits and vegetables. This seminar will be conducted jointly with Vegetable Crops 291.
299. Research. (1-6) I and II. The Staff

POULTRY HUSBANDRY

Fredric W. Hill, Ph.D., *Chairman of the Department.*

Department Office, 109 Poultry Husbandry Building

- Charles R. Grau, Ph.D., *Professor of Poultry Husbandry.*
Fredric W. Hill, Ph.D., *Professor of Poultry Husbandry.*
Frank H. Kratzer, Ph.D., *Professor of Poultry Husbandry.*
Samuel Lepkovsky, Ph.D., *Professor of Poultry Husbandry (Berkeley campus).*
Frederick W. Lorenz, Ph.D., *Professor of Poultry Husbandry.*
Arthur H. Smith, Ph.D., *Professor of Poultry Husbandry.*
Lewis W. Taylor, Ph.D., *Professor of Poultry Husbandry (Berkeley campus).*
Wilbor O. Wilson, Ph.D., *Professor of Poultry Husbandry.*
Vigfus S. Asmundson, Ph.D., *Professor of Poultry Husbandry, Emeritus.*
Ursula H. Abbott, Ph.D., *Associate Professor of Poultry Husbandry.*
Hans Abplanalp, Ph.D., *Associate Professor of Poultry Husbandry.*
‡Daniel W. Peterson, Ph.D., *Associate Professor of Poultry Husbandry.*
Frank X. Ogasawara, Ph.D., *Assistant Professor of Poultry Husbandry.*
Barry W. Wilson, Ph.D., *Assistant Professor of Poultry Husbandry.*



- A. Wade Brant, Ph.D., *Lecturer in Food Science and Technology.*
Leo C. Norris, Ph.D., *Lecturer in Poultry Husbandry.*
George F. Stewart, Ph.D., *Professor of Food Science and Technology.*

Departmental Major Adviser.—Mr. Ogasawara.

Bachelor of Science Major Program and Graduate Study. See page 56.

LOWER DIVISION COURSES

10. **Poultry Production.** (3) I. Mr. Ogasawara
Lecture—3 hours.
A survey of principles and practices involved in poultry production. Designed for students not specializing in avian sciences.
11. **Laboratory in Poultry Production.** (1) I. Mr. Ogasawara
Laboratory—3 hours.
Prerequisite: course 10 (may be taken concurrently).
Laboratory studies in poultry biology and techniques of poultry production.
12. **Survey of Poultry and Allied Industries.** (2) II.
The Staff (Mr. Peterson, Mrs. Abbott in charge)
Lecture—1 hour; discussion—1 hour.
A survey of industries based on or related to poultry and poultry products, the hatchery industry, the feed industry, egg and meat production; technology of eggs and meat; and related specialized enterprises.

UPPER DIVISION COURSES

103. **Experimental Basis of Animal Improvement.** (2) I. Mr. Abplanalp
Lecture—2 hours.
Prerequisite: Genetics 100.
Review of experiments in selection and animal breeding with reference to their applications in poultry.

‡ Absent on leave, fall semester, 1963-1964.

- 103L. Laboratory in Poultry Breeding.** (1) I. Mr. Abplanalp
 Laboratory—3 hours.
 Prerequisite: Genetics 100; course 103 (may be taken concurrently).
 Problems in quantitative genetics with applications to practical poultry breeding procedures. Exercises in the analysis, interpretation, and use of breeding records.
- 104. Introduction to Avian Anatomy and Physiology.** (2) I. Mr. B. W. Wilson
 Lecture—2 hours.
 Prerequisite: Physiology 1 and 1L; Zoology 1B.
 Adaptations of birds to terrestrial, aerial, and aquatic life; the functional anatomy of the skeletal, nervous, integumentary, circulatory, and muscular systems.
- 105. Avian Nutrition.** (3) II. Mr. Grau, Mr. Kratzer
 Lecture—2 hours; laboratory—3 hours.
 Prerequisite: Biochemistry 101 or equivalent.
 A study of the fundamentals of nutrition specifically related to avian organisms. Introduction to methods used in nutritional evaluations.
- 106. Poultry Feeds and Feeding.** (2) II. Mr. Kratzer, Mr. Grau
 Lecture—1 hour; laboratory—3 hours.
 Prerequisite: course 105 (may be taken concurrently).
 A study of the manufacture, composition, and use of poultry feedstuffs.
- 107. Avian Physiology.** (2) II. Mr. Lorenz
 Lecture—2 hours.
 Prerequisite: Physiology 1 and 1L or Animal Husbandry 110 or equivalent; Zoology 1B.
 Physiology of the various systems of birds with emphasis on reproduction digestion, metabolism, and endocrinology.
- 108. Avian Physiology Laboratory.** (2) II. Mr. Lorenz
 Lecture—1 hour; laboratory—3 hours.
 Prerequisite: course 107 (may be taken concurrently); consent of the instructor.
 Selected problems in the physiology of birds.
- *112. Poultry Meat Production.** (3) II. _____
 Lecture—3 hours.
 Prerequisite: senior standing in animal science or consent of the instructor.
 The relation of heredity, nutrition, physiology and environment to the breeding, feeding and management of poultry for meat production with particular reference to turkeys and chickens.
- 121. Poultry Products Technology.** (2) I. Mr. Peterson, Mr. Stewart, Mr. Brant
 Lecture—2 hours.
 Prerequisite: consent of the instructor.
 Physical, chemical, and nutritional composition of poultry products; quality criteria and standards; physical, chemical, and microbiological factors influencing keeping quality.
- 149. Environmental Physiology of Domestic Animals.** (2) I. Mr. W. O. Wilson
 Lecture—2 hours.
 Prerequisite: Zoology 1A-1B.
 The effect of environmental factors on physiological processes related to animal production.
 Offered in odd-numbered years.

* Not to be given, 1963-1964.

198. **Directed Group Study.** (1-2) I and II. The Staff
Prerequisite: consent of the instructor.
Selected topics in the avian sciences.
199. **Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff (Mr. Hill in charge)
Prerequisite: courses basic to problem elected; consent of the instructor.
Problems may be elected relating to the nutrition, breeding, incubation, physiology, and egg quality of chickens or turkeys.

GRADUATE COURSES

202. **Experimental Incubation and Avian Teratology.** (4) I. Mrs. Abbott, Mr. Taylor
Lecture—2 hours; laboratory—6 hours.
Prerequisite: Zoology 100 and 100L; Chemistry 8. Recommended: Zoology 107.
Problems of embryonic development, causes of embryonic mortality and terata in poultry, and principles of artificial incubation.
203. **Quantitative Genetics and Animal Breeding.** (3) I. Mr. Abplanalp
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Mathematics 105A, 105B or the equivalent. Recommended: Mathematics 16A.
The genetic theory of selection, population structure and induced variation, and its implications in the design of animal breeding experiments.
290. **Seminar.** (1) I and II. The Staff (Mr. Hill in charge)
Seminar—1 hour.
Reports and discussion of recent advances and selected topics of current interest in avian genetics, physiology, and nutrition, and poultry-products technology.
298. **Group Study.** (1-2) I and II. The Staff
Group study of advanced topics in the avian sciences.
299. **Research.** (1-9) I and II. The Staff

RELATED COURSES

- Fundamentals of Farm Management** (Agricultural Economics 140)
Poultry Pathology Laboratory (Avian Medicine 112)
Animal Hygiene (Veterinary Microbiology 111)
Advanced General Nutrition (Nutrition 201A, 201B)
Concepts of Animal Nutrition (Nutrition 250)

PSYCHOLOGY

Stanley Coopersmith, Ph.D., *Chairman of the Department.*
Department Office, 356 Academic Office Building

William F. Dukes, Ph.D., *Professor of Psychology.*
Stanley Coopersmith, Ph.D., *Associate Professor of Psychology.*
Robert Sommer, Ph.D., *Associate Professor of Psychology.*
Jarvis R. Bastian, Ph.D., *Assistant Professor of Psychology.*
Jay S. Caldwell, Ph.D., *Assistant Professor of Psychology.*
Paul Dempsey, Ph.D., *Assistant Professor of Psychology.*
Andrew K. Solarz, Ph.D., *Assistant Professor of Psychology.*



Sumner B. Morris, Ed.D., *Lecturer in Psychology.*
Marion C. Prentice, B.A., *Acting Assistant Professor of Psychology.*

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Departmental Major Advisers.—Mr. Caldwell, Mr. Dempsey, Mr. Solarz, Mr. Bastian, Miss Prentice, Mr. Sommer.

The Major Program

(A) Lower Division Courses.—Required: (1) course 1A-1B or courses 1 and 2; (2) 3 units of statistics; (3) 6 units of biological science, composed of one of these three combinations: Zoology 1A-1B, Zoology 1A and Physiology 1, or Zoology 10 and Physiology 1; (4) 6 units of sociology and/or cultural anthropology. Requirements should be completed before the beginning of the junior year and must be completed before the beginning of the senior year.

(B) Upper Division Courses.—Twenty-four units of advanced work in psychology (courses numbered above 99) with the following specific requirements: (1) course 196 (to be taken during the senior year); (2) course 106; (3) three courses from one of the following groups and two courses from the other: (Group A) 108, 130, 131, 134, 150; (Group B) 112, 145, 147, 165, 168.

Before graduation the student must complete 6 units of philosophy. These may be taken at any time during the four years, and may be either lower or upper division courses.

Honors and Honor Program (see page 94).—The honors program comprises course 194H, which includes an honors thesis, to be taken normally during the senior year.

LOWER DIVISION COURSES

1. Introduction to Psychology: General Processes. (3) I and II. The Staff
Lecture—3 hours.

The general processes and principles of behavior, the facts on which they are based, and the methods used to study them; emphasis on motivation, emotion, frustration and conflict, learning, remembering, thinking, language, attending, and perceiving.

2. Introduction to Psychology: Individual Differences. (3) I and II.
Lecture—3 hours. The Staff

Differences in behavior, the factors contributing to their development, and the methods used to investigate them; emphasis on abilities, interests, aptitudes, intelligence, and personality.

3. Quantitative Description of Behavior. (3) II. Mr. Dempsey
Lecture—3 hours.

Prerequisite: course 1A, 1 or 2 (may be taken concurrently); Mathematics D or equivalent; Mathematics 13.

Principles and problems of measurement in psychology; methods of ordering and comparing measurements; inference and prediction from psychological data.

33. Personal and Social Adjustment. (3) I and II.

Lecture—3 hours.

I. Mr. Dempsey, II. ———

Prerequisite: course 1A, 1 or 2.

A continuation of courses 1 and 2, intended primarily for students who will not major in psychology. The dynamics of normal personality development. Family relationships, social adjustment, and self-evaluation are emphasized.

UPPER DIVISION COURSES

106. Experimental Psychology. (4) I. Mr. Dukes, Mr. Caldwell

Lecture—2 hours; laboratory—6 hours.

Prerequisite: courses 1, 2 and 3.

Laboratory investigation of selected problems, including the design, execution, and formal reporting of experiments.

108. Physiological Psychology. (3) I.

Mr. Solarz

Lecture—3 hours.

Prerequisite: course 1A or 1 or 2; Zoology 1B or Physiology 1.

A study of the relationships between behavioral adjustments and receptor-, connector-, effector-systems.

112. Developmental Psychology. (3) I and II.

Miss Prentice

Lecture—3 hours.

Prerequisite: course 1A, 1 or 2; not open for credit to students who have received credit for Home Economics 131.

An ontogenetic account of human behavior through adolescence with emphasis on motor skills, mental abilities, motivation, and social interaction.

130. Learning. (3) I.

Mr. Caldwell

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 1A, 1 or 2.

Consideration of major theories of learning and memory with critical examination of relevant experimental, clinical and social data.

131. Perception. (3) II.

Mr. Dukes

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 1A, 1 or 2.

The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events.

134. Motivation. (3) II.

Mr. Caldwell

Lecture—3 hours.

Prerequisite: course 1 or 2.

Factors activating and directing behavior; contemporary theories of motives; pertinent data from laboratory, clinic, and field observation.

145. Social Psychology. (3) II.

Mr. Dempsey

Lecture—3 hours.

Prerequisite: course 1A, 1 or 2.

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.

- 147. Personality Theory and Assessment. (3) I.** Mr. Coopersmith
Lecture—2 hours; laboratory—2 hours.
Prerequisite: 6 units of advanced work in psychology (courses numbered above 99).
A systematic consideration of contemporary theories in the field of personality, together with an exploration and evaluation of some of the principal methods of collecting relevant empirical evidence.
- 150. Comparative Psychology. (3) II.** Mr. Solarz
Lecture—3 hours; laboratory—1 hour.
Prerequisite: course 1A, 1 or 2.
A phylogenetic account of behavior with emphasis on the similarities and differences in response patternings evident at various levels. The relative influence of internal and external factors on these patternings and their modifiability.
- 165. Clinical Psychology: Techniques and Problems in Diagnosis. (3) I.**
Lecture—2 hours; laboratory—2 hours. Mr. Dempsey
Prerequisite: courses 1 and 2; 145 or 168; 3 units of statistics.
The interview and psychological test as diagnostic instruments. An examination of underlying theory and methods of construction and standardization; an evaluation of empirical results. Laboratory work in interviewing and testing.
- 168. Abnormal Psychology. (3) I.** Mr. Sommer
Lecture—3 hours.
Prerequisite: course 1A, 1 or 2.
A descriptive and functional account of behavior disorders with primary consideration given to neurotic and psychotic behavior. Methods and theories of psychotherapy.
- 194H. Special Study for Honors Students. (3) I and II.** The Staff
Prerequisite: 15 units in psychology and honors status.
Independent investigation of an empirical problem. A written report in thesis form required. May be repeated once for credit.
- 196. Advanced General Psychology. (3) II.** Mr. Bastian
Seminar—3 hours.
Prerequisite: 12 units of advanced work in psychology (courses numbered above 99).
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.
- 199. Special Study for Advanced Undergraduates. (1-3) I and II.**
Investigation of special problems. The Staff (Mr. Dukes in charge)

PUBLIC HEALTH

William R. Pritchard, D.V.M., Ph.D., J.D., *Acting Chairman
of the Department.*

Department Office, 1018 Haring Hall

William R. Pritchard, D.V.M., Ph.D., J.D., *Professor of Veterinary Medicine.*
John B. Enright, Ph.D., *Associate Professor of Veterinary Public Health.*
Walter W. Sadler, D.V.M., M.P.H., *Associate Professor of Veterinary Public
Health.*



Frederick N. Cooper, B.S., *Lecturer in Public Health.*
John H. Jones, M.D., *Lecturer in Public Health.*

UPPER DIVISION COURSES

199. Special Study for Advanced Undergraduates. (1-5) I and II.
The Staff (Mr. Pritchard in charge)

GRADUATE COURSES

- 240. Public Health for Veterinarians.** (5) II.
Lecture—5 hours. Mr. Cooper, Mr. Enright, Mr. Sadler
Prerequisite: third-year standing in the School of Veterinary Medicine.
A study of those aspects of public health that are of concern to the veteri-
narian with particular reference to the zoonoses and the control of diseases
spread through meat, milk, and other foods.
- 290. Seminar.** (1) I and II. The Staff (Mr. Pritchard in charge)
Seminar—1 hour.
- 299. Research.** (1-6) I and II. The Staff (Mr. Pritchard in charge)

RANGE MANAGEMENT

Henry J. Vaux, Ph.D., *Chairman of the Committee (Berkeley Campus).*
Committee Office, 131 Hunt Hall

Committee in Charge:

Harold H. Biswell, Ph.D., *Professor of Forestry (Berkeley campus).*
Harold F. Heady, Ph.D., *Professor of Forestry (Berkeley campus).*
R. Merton Love, Ph.D., *Professor of Agronomy (Vice Chairman of the Committee).*
Henry J. Vaux, Ph.D., *Professor of Forestry (Berkeley campus).*
William C. Weir, Ph.D., *Professor of Animal Husbandry.*



Beecher Crampton, M.A., *Lecturer in Agronomy.*
Glen P. Lofgreen, Ph.D., *Professor of Animal Husbandry.*
William A. Williams, Ph.D., *Associate Professor of Agronomy.*

Instruction in Range Management is not organized as a single administrative unit in the University, but the relevant courses are offered by a number of departments, and are coordinated by the committee in charge.

Group Major Advisers.—Mr. Lofgreen, Mr. Williams.

Bachelor of Science Major Program and Graduate Study. See page 66.

LOWER DIVISION COURSES

1. **Introduction to Range Management.** (3) I. Mr. Biswell
Lecture—3 hours.

Basic principles of range management and their relationships to the management of wildlands for livestock production, wildlife, water, recreation and timber.

49. **Range Management Field Practice Course.** (No credit) Mr. Love

Approximately four weeks devoted to field studies of range conditions and methods of utilization in various parts of the state. Required of all students with a major in range management.

UPPER DIVISION COURSES

100. **Range Plants.** (3) I. Mr. Crampton
Lecture—1 hour; laboratory—6 hours.
Prerequisite: Botany 1.

Systematic relationships and identification of range grasses, legumes, forbs and shrubs; their distribution, environmental requirements and use.

103. **Grassland Inventory, Analysis and Planning.** (3) II. Mr. Heady
Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 100 or consent of the 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.

133. **Grassland Ecology.** (3) II. Mr. Heady
Lecture—3 hours.
Prerequisite: course in plant ecology or consent of the instructor.
Composition, structure, development and habitat factors of native North American grasslands. Principles of grassland management for forage production.
Offered in even-numbered years.
198. **Directed Group Study.** (1-5) I and II. The Staff
Prerequisite: consent of instructor.
Directed group study of selected topics in range management for advanced undergraduates.
199. **Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff
Prerequisite: senior standing and consent of the instructor.

GRADUATE COURSES

290. **Seminar.** (2) I and II. The Staff
Seminar—2 hours.
Prerequisite: course 133.
299. **Research.** (1-6) I and II. The Staff

RELATED COURSES

- Forage Crops** (Agronomy 112)
Introduction to Animal Husbandry (Animal Husbandry 7)
Introduction to Animal Husbandry Laboratory (Animal Husbandry 7L)
Feeds and Feeding (Animal Husbandry 103)
Meat Production (Animal Husbandry 118)
Plant Ecology (Botany 117)

RUSSIAN

For courses in Russian, see "Foreign Languages" on page 203.

SOCIOLOGY

Bennett M. Berger, Ph.D., *Chairman of the Department.*
Department Office, 311 Academic Office Building

Edwin M. Lemert, Ph.D., *Professor of Sociology.*
Bennett M. Berger, Ph.D., *Associate Professor of Sociology.*
Charles D. Bolton, Ph.D., *Assistant Professor of Sociology.*
Kenneth C. W. Kammeyer, Ph.D., *Assistant Professor of Sociology.*



Ivor P. Oxaal, M.A., *Acting Assistant Professor of Sociology.*
Winslow Rouse, Ph.D., *Lecturer in Sociology.*
John F. Scott, M.A., *Lecturer in Sociology.*

Letters and Science List.—All undergraduate courses are included in the Letters and Science List of Courses (see page 93).

Major Advisers.—Mr. Berger, Mr. Bolton, Mr. Lemert.

The Major Program

(A) Lower Division Courses.—Sociology 1, 2; Anthropology 1 or 2; Psychology 1 and 2 and a course in statistics approved by the department.

(B) Upper Division Courses.—Required: 24 upper division units in sociology, to include Sociology 105 and either Sociology 165 or Sociology 185 depending upon the needs and interests of the student.

LOWER DIVISION COURSES

- 1. Introduction to Sociology.** (3) I and II. The Staff
Lecture—3 hours.
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.** (3) I and II. The Staff
Lecture—3 hours.
A study of social organization and institutions, with attention to the application of concepts and related research findings.
- 3. Social Problems.** (3) I and II. The Staff
Lecture—3 hours.
A general sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement.
- 18. Interpretation of Quantitative Sociological Data.** (3) II. Mr. Kammeyer
Lecture—3 hours.
Prerequisite: sophomore standing.
Historical and current trends in quantitative social research. Interpretation of measures, tables, and graphs of the type most frequently encountered in current-day sociological studies.

UPPER DIVISION COURSES

- 105. Introduction to Methods of Sociological Study.** (3) I. Mr. Kammeyer
Lecture—3 hours.
Prerequisite: 6 units of sociology; a course in statistics approved by the department (may be taken concurrently).
Examination of methodological problems and technical procedures: selection and definition of problems of investigation; selection, description, classification, and analysis of data.

- 120. Social Disorganization and Sociopathic Behavior.** (3) I. Mr. Lemert
Lecture—3 hours.
Prerequisite: courses 1 and 2 and upper division standing.
A survey of the incidence and forms of social disorganization. An analysis of selected deviant and sociopathic behaviors.
- 123. American Society.** (3) I. Mr. Bolton
Lecture—3 hours.
Prerequisite: 6 units in the social sciences or consent of the instructor.
The institutional structure and social organization of the United States.
- 125. Collective Dynamics and Social Movements.** (3) II. Mr. Bolton
Lecture—3 hours.
Prerequisite: course 1 or consent of the instructor.
Non-institutionalized forms of group behavior; social contagions, fashion movements, public opinion formation, reform and revolutionary movements. Their relations to social change and popular culture in mass societies.
- 126. Society, Culture, and Personality.** (3) I. Mr. Scott
Lecture—3 hours.
Prerequisite: courses 1 and 2.
The interrelationships of society, culture and personality in primitive and modern settings with special attention to social roles. Emphasis upon comparative materials.
- 130. Race Relations and Minority Groups.** (3) I. Mr. Oxaal
Lecture—3 hours.
Prerequisite: 6 units of social science or consent of the instructor.
A study of contacts and interaction between racial and ethnic groups; sources and effects of prejudice and discrimination; programs for reducing intergroup tensions.
- 140. Social Stratification.** (3) I. Mr. Berger
Lecture—3 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.
- 144. Rural Society.** (3) II. Mr. Kammeyer
Lecture—3 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.
- *150. Criminology.** (3) II. Mr. Lemert
Lecture—3 hours.
Prerequisite: courses 1 and 2 and upper division standing.
The sociological analysis of criminal behavior in relation to social structure and the criminalization process.
- 152. Juvenile Delinquency.** (3) II. Mr. Lemert
Lecture—3 hours.
Prerequisite: 6 units of social science or consent of the instructor.
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.

160. Work and Leisure. (3) II.

Mr. Berger

Lecture—3 hours.

Prerequisite: course I.

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.

165. Sociological Theory. (3) II.

Mr. Bolton

Lecture—3 hours.

Prerequisite: six units of sociology or consent of the instructor.

Analysis of major theoretical and conceptual systems in sociology.

170. Population. (3) I.

Mr. Kammeyer

Lecture—3 hours.

Prerequisite: 6 units of social science or consent of the 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.

180. Complex Social Organizations. (3) II.

Scott

Lecture—3 hours.

Prerequisite: course I or consent of the 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.

185. The Field of Social Welfare. (3) II.

Mr. Rouse

Lecture—3 hours.

Prerequisite: courses 1 and 2; upper division standing or consent of the instructor.

A sociological analysis of social work as an institution. Attention given to agency organization and functions.

199. Special Study for Advanced Undergraduates. (1-3) I and II.

Open to seniors only.

The Staff (Mr. Lemert in charge)

PROFESSIONAL COURSE

401. Institutional Field Work. (1-3) I and II.

Study of formal and informal organization of institutions. Administrative and therapeutic procedures considered. Students will gain experience in different departments of correctional institutions and submit an analysis of a phase of institutional operation based upon a program of related reading.

SOILS AND PLANT NUTRITION

Perry R. Stout, Ph.D., *Chairman of the Department.*
Department Office, 139B Hoagland Hall

Daniel G. Aldrich, Ph.D., *Professor of Soils (Irvine Campus).*
Francis E. Broadbent, Ph.D., *Professor of Soil Microbiology.*
Constant C. Delwiche, Ph.D., *Professor of Soil Science.*
Frank F. Harradine, Ph.D., *Professor of Soil Morphology.*
Victor V. Rendig, Ph.D., *Professor of Soils and Plant Nutrition.*
Perry R. Stout, Ph.D., *Professor of Soil Science.*
Lannes E. Davis, Ph.D., *Professor of Soils, Emeritus.*
James A. Vomocil, Ph.D., *Associate Professor of Soil Physics.*
Lynn D. Whittig, Ph.D., *Associate Professor of Soil Science.*
John L. McMurdie, Ph.D., *Assistant Professor of Soil Physics.*



Eugene L. Begg, B.S., *Lecturer in Soil Morphology.*
Arthur L. Brown, Ph.D., *Lecturer in Soils and Plant Nutrition.*
Emanuel Epstein, Ph.D., *Lecturer in Plant Nutrition.*
Delbert W. Henderson, Ph.D., *Associate Professor of Irrigation.*
Jerome J. Jurinak, Ph.D., *Lecturer in Soil Chemistry.*
Duane S. Mikkelsen, Ph.D., *Professor of Agronomy.*
H. Michael Reisenauer, Ph.D., *Lecturer in Soils and Plant Nutrition.*
James Vlamis, Ph.D., *Lecturer in Soils and Plant Nutrition.*

Departmental Major Adviser.—Mr. McMurdie.

Bachelor of Science Major Program and Graduate Study. See page 66.

PLANT NUTRITION

UPPER DIVISION COURSE

116. **Principles of Plant Nutrition.** (3) II. Mr. Epstein
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Botany 111; Chemistry 5.
Evolution and scope of plant nutrition; essential and other elements; mechanisms of absorption and translocation; functions of inorganic nutrients; deficiencies and toxicities; relation to animal nutrition; experimental techniques, including solution culture and use of radioisotopes.

SOIL SCIENCE

No student will be accepted as a major student in soil science who has not attained at least an average of grade C in each of the fields of required courses in chemistry, physics, botany, bacteriology, and the geological sciences.

LOWER DIVISION COURSE

1. **Introduction to Soil Science.** (3) I. Mr. Whittig
Lecture—2 hours; laboratory—3 hours.
Prerequisite: Chemistry 1A.
Elementary principles of soil-plant interrelations; development of soil as a natural body; physical, chemical, and biological properties of soils; soil moisture; effect of management practices on soil properties; composition and use of fertilizers.

UPPER DIVISION COURSES

- 104. Soil Chemistry. (3) I.**
 Lecture—2 hours; laboratory—3 hours.
 Prerequisite: course 1; Chemistry 5, 8.
 Mineral and organic constituents of soils and their chemical reactions: the interactions of the liquid and solid phases including ion exchange and other colloidal phenomena; the chemical reactions involved in aggregation and structure formation; chemical factors of soil formation.
- 105. Summer Field Course. (5)** Mr. Harradine
 Lecture—8 hours; Laboratory—48 hours.
 Prerequisite: course 118.
 Field study of soil characteristics, development, and morphology of soils. Field work in soil surveying including mapping and classifying soils; and the preparation of soil reports. Field practice in identifying and judging the probable value of the dominant soils of the state for agricultural, grazing, and forest use.
- 107. Principles of Soil Physics. (3) II.** Mr. Vomocil
 Lecture—2 hours; laboratory—3 hours.
 Prerequisite: course 1; Physics 2A–2B.
 Introduction to physical properties and behavior of mineral and organic soil particles and structural units; effect of environmental factors and cultural treatments on structure; soil-water relations; laboratory evaluation of effect of treatments on aggregation, permeability and strength.
- 108. Soil and Plant Relations. (2) II.** Mr. Rendig
 Lecture—2 hours.
 Prerequisite: course 1; Chemistry 8.
 Physicochemical properties of soils in relation to plant growth, occurrence and availability of plant nutrients, mechanisms of nutrient uptake.
- 109. Soil Fertility. (2) I.** Mr. Vlamis
 Lecture—2 hours.
 Prerequisite: course 1; Chemistry 1A–1B.
 The nature of fertilizers and soil amendments, their properties, methods of application, and reaction upon soils and plants.
- 111. Soil Microbiology and Soil Biochemistry. (3) I.** Mr. Broadbent
 Lecture—2 hours; laboratory—3 hours.
 Prerequisite: course 1; Bacteriology 1; Chemistry 8.
 Microorganisms occurring in soils, biochemical activities of the soil population, and the formation and properties of soil organic matter.
- 118. Soil Morphology and Survey. (3) II.** Mr. Harradine
 Lecture—2 hours; laboratory—3 hours.
 Prerequisite: course 1; Geology 1A.
 Soil-forming factors and processes; study of the soil profile; soil survey practices; relationship between soil groups and agricultural use.
 Field trips required.
- 123. Soil Analysis. (3) II.** Mr. Brown
 Lecture—1 hour; laboratory—6 hours.
 Prerequisite: course 1; Chemistry 5.
 Methods of chemical analysis of soils, fertilizers, and plant material, including those useful in evaluating fertility and alkali problems.
- 124. Recent Advances in Soil Science. (1) II.** Mr. Jurinak
 Lecture—1 hour.
 Prerequisite: senior standing.

- 135. Soil Management and Conservation.** (2) II. Mr. Reisenauer
Lecture—2 hours.
Prerequisite: senior standing in soil science or irrigation science and concurrent enrollment in Irrigation 135.
Effect of various soil management and conservation practices including irrigation, reclamation, fertilization, tillage, and cropping on the physical, chemical and microbiological properties of soils and their relationship to crop production.
- 198. Directed Group Study.** (1-5) I and II. The Staff
Directed group study in soil science for advanced undergraduates.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSES

- 207. Soil Physics.** (3) II. Mr. McMurdie
Lecture—3 hours.
Prerequisite: course 107. Recommended: Mathematics 106, 107.
Physical processes occurring in soils; selected topics in the soil-plant relationship.
- 214. Soil Mineralogy.** (3) II. Mr. Whittig
Lecture—1 hour; laboratory—6 hours.
Nature, properties, and occurrence of the more common minerals in soils and rocks. Application of methods of mineral analysis in study of formation and properties of soils. X-ray, thermal, surface area, petrographic, and elemental analyses of mineral fractions.
Offered in odd-numbered years.
- 215. Physical Chemistry of Soils.** (2) I. Mr. Jurinak
Lecture—2 hours.
Prerequisite: course 104; Chemistry 110A-110B; or 109 with consent of the instructor.
Physicochemical, colloidal, and surface aspects of the soil system.
Offered in odd-numbered years.
- 216. Advanced Soil Biology.** (2) I. Mr. Broadbent, Mr. Epstein, Mr. Rendig
Lecture—2 hours.
Prerequisite: courses 108, 111; Plant Nutrition 116.
Chemistry of plant residues and their decomposition by soil microorganisms; soil organic matter and its properties. Influence of soil conditions on plant growth and composition. The ionic environment of cells and tissues; permeability of cell membranes; ion absorption and transport.
Offered in odd-numbered years.
- 290. Seminar.** (1) I. Mr. Jurinak
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.
- 299. Research in Soil Science.** (1-6) I and II. The Staff

RELATED COURSE

- Use of Isotopes as Tracers in Biological Research.** (Animal Physiology 234, 243L)
- Water-Soil-Plant Relationships** (Irrigation 100)

SPANISH

For courses in Spanish see "Foreign Languages" on page 203.

SPEECH

For courses in speech see "Dramatic Art and Speech" on page 163.

SUBJECT A

Department Office, 176 Academic Office Building

Leonard G. Homann, A.B., *Instruction Supervisor in Subject A.*

———, *Associate in Subject A*

———, *Associate in Subject A*

———, *Associate in Subject A*

———, *Associate in Subject A*

———, *Associate in Subject A*

Subject A. English Composition. (No credit) I and II. The Staff

Required of all students who do not pass the examination in Subject A. Fee, \$35. To those students who maintain an average grade of A during the first seven weeks of the semester and pass a special examination with a grade of A, half of the fee will be refunded; they may discontinue attending the course.

TEXTILE SCIENCE

For courses in textile science, see "Home Economics" on page 230.

VEGETABLE CROPS

James E. Knott, Ph.D., Sc.D., (hon.c.), *Chairman of the Department.*

Department Office, 150 Hunt Hall

Glen N. Davis, Ph.D., *Professor of Vegetable Crops.*
James F. Harrington, Ph.D., *Professor of Vegetable Crops.*
James E. Knott, Ph.D., Sc.D., (hon.c.), *Professor of Vegetable Crops.*
Louis K. Mann, Ph.D., *Professor of Vegetable Crops.*
Leonard L. Morris, Ph.D., *Professor of Vegetable Crops.*
Harlan K. Pratt, Ph.D., *Professor of Vegetable Crops.*
Charles M. Rick, Jr., Ph.D., *Professor of Vegetable Crops.*
Paul G. Smith, Ph.D., *Professor of Vegetable Crops.*
John C. Lingle, Ph.D., *Associate Professor of Vegetable Crops.*
Arthur R. Spurr, Ph.D., *Associate Professor of Vegetable Crops.*



William J. Flocker, Ph.D., *Lecturer in Vegetable Crops.*
†Fredrick D. Howard, Ph.D., *Lecturer in Vegetable Crops.*
†Lawrence Rappaport, Ph.D., *Lecturer in Vegetable Crops.*
Masatoshi Yamaguchi, Ph.D., *Lecturer in Vegetable Crops.*

Departmental Major Adviser.—Mr. Davis.

Bachelor of Science Major Program and Graduate Study. See page 63.

LOWER DIVISION COURSES

- 1. Vegetable Production. (2) II.** Mr. Flocker
Lecture—2 hours.
Principles involved in vegetable production; survey of the vegetable industry.
- 1L. Vegetable Crops Production Laboratory. (1) II.** Mr. Flocker
Laboratory—3 hours.
Prerequisite: course 1 (may be taken concurrently).
Application of the principles underlying vegetable production techniques of seeding, propagation and culture of vegetables.
One or more field trips.

UPPER DIVISION COURSES

- 101. Major California Vegetable Crops. (3) I.** Mr. Lingle
Lecture—3 hours.
Prerequisite: course 1, or consent of the instructor.
Adaptation, distribution, growth habits, and methods of production and handling of the principal California vegetable crops. The application of pertinent experimental evidence to production problems is stressed.
- 105. Systematic Olericulture. (2) I.** Mr. Smith
Laboratory—6 hours.
Prerequisite: course 1; Botany 1.
Origin, history, types, classification, nomenclature, and adaptation of the more important American vegetable varieties; minor vegetable crops; trends in development of new varieties. One or more field trips.
- 112. Handling, Storage, and Transit of Vegetables. (3) I.** Mr. Morris
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1; Botany 111; or consent of the instructor.

† Absent on leave, 1963–1964.

Physiological processes contributing to the postharvest deterioration of vegetables and their relation to practices involved in harvesting, packing, transit, storage, and marketing. One or more field trips will be made.

118. **Vegetable-Seed Production.** (2) II. Mr. Harrington
Lecture—2 hours.

Prerequisite: course 1; Botany 111. Recommended: course 105.

Principles of vegetable-seed production; physiological factors affecting induction of seeding, seed development, viability and longevity of seed. One or more field trips.

120. **Vegetable Breeding.** (3) I. Mr. Rick
Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 1; Genetics 100. Recommended: course 105.

Genetics, cytology, reproductive mechanisms, floral morphology, and field-plot techniques as related to the improvement of the vegetable crop species. One or more field trips will be made.

121. **Vegetable Physiology.** (3) II. Mr. Mann, Mr. Pratt
Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 1; Botany 111.

Physiological principles involved in the production of vegetables.

190. **Proseminar.** (1) II. Mr. Knott
Seminar—1 hour.

Prerequisite: consent of instructor.

Current problems and research in vegetable production.

198. **Directed Group Study.** (1-5) I and II. The Staff (Mr. Davis in charge)
Prerequisite: consent of instructor.

Directed group study of selected topics in vegetable crops for advanced undergraduates.

199. **Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSES

290. **Seminar.** (1) I and II. The Staff (Mr. Spurr in charge)
Seminar—1 hour.

291. **Seminar in Postharvest Physiology.** (1) I and II.

Seminar—1 hour.

The Staff (Mr. Pratt in charge)

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.

299. **Research.** (1-6) I and II. The Staff

VETERINARY MEDICINE

For courses in veterinary medicine, see "Medicine, Surgery, and Clinics," page 253.

VETERINARY MICROBIOLOGY

James R. Douglas, Ph.D., *Chairman of the Department.*

Department Office, 2004 Haring Hall

Hugh S. Cameron, D.V.M., Ph.D., *Professor of Veterinary Microbiology.*

James R. Douglas, Ph.D., *Professor of Parasitology.*

Delbert G. McKercher, D.V.M., Ph.D., *Professor of Veterinary Virology.*

John W. Osebold, D.V.M., Ph.D., *Professor of Immunology.*

Clyde Stormont, Ph.D., *Professor of Immunogenetics.*

Jacob Traum, D.V.M., *Professor of Veterinary Medicine, Emeritus.*

Norman F. Baker, D.V.M., Ph.D., *Associate Professor of Parasitology.*

¹Ernst L. Biberstein, D.V.M., Ph.D., *Associate Professor of Microbiology.*



Michel M.-J. Lavoipierre, M.B., Ch.B., *Lecturer in Parasitology.*

Stewart H. Madin, D.V.M., Ph.D., *Professor of Public Health and Bacteriology (Berkeley Campus).*

UPPER DIVISION COURSES

111. Animal Hygiene. (3) II.

Mr. Cameron

Lecture—3 hours.

Prerequisite: Bacteriology I.

The causes, prevention, control, and eradication of animal diseases important in economic livestock production and public health.

121. Microbiology. (10) I.

Mr. McKercher, Mr. Osebold

Lecture—5 hours; laboratory—15 hours.

Prerequisite: second-year standing in the School of Veterinary Medicine or consent of the instructor.

The principles of immunity, and a study of the bacterial, mycotic, and viral disease-producing agents of importance in veterinary medicine.

124. Veterinary Parasitology. (6) II.

Mr. Baker, Mr. Douglas, Mr. Lavoipierre

Lecture—3 hours; laboratory—9 hours.

Prerequisite: second-year standing in the School of Veterinary Medicine or consent of the instructor.

The protozoan, helminth, and arthropod parasites of domesticated animals with emphasis on biology, life history, identification, and control.

125. Veterinary Medical Genetics. (1) II.

Mr. Stormont

Lecture and demonstration—1 hour.

Prerequisite: Genetics 100 or its equivalent. Recommended: general bacteriology or microbiology.

Inheritance of resistance to disease; breeding for resistance to disease; blood groups and their applications in clinical medicine and breeding programs; lethal and sublethal traits in farm animals.

*127. Medical Microbiology. (5) II.

Mr. Biberstein

Lecture—3 hours; laboratory—6 hours.

Prerequisite: Bacteriology 1; Zoology 1A (1B recommended); Chemistry 8. The pathogenic microorganisms (exclusive of protozoa) affecting man; immunological phenomena especially as related to human disease.

Offered in odd-numbered years.

¹ Sabbatical leave in residence, 1963–1964.

* Not to be given, 1963–1964.

199. **Special Study for Advanced Undergraduates.** (1-5) I and II.
The Staff (Mr. Douglas in charge)

GRADUATE COURSES

270. **Advanced Immunology.** (4) II. Mr. Osebold
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 121 or 127 or consent of the instructor.
Dynamics of infection and resistance: host responses to invasion of foreign substances, antibody production and manifestations of antigen-antibody reactions, immunochemistry. Immunological considerations of the groups of disease agents.
Offered in even-numbered years.
290. **Seminar.** (1) I and II. Mr. Osebold
Seminar—1 hour.
299. **Research.** (1-6) I and II. The Staff

VITICULTURE AND ENOLOGY

James A. Cook, Ph.D., *Chairman of the Department.*
Department Office, 1027 Horticultural Sciences Building

Maynard A. Amerine, Ph.D., *Professor of Enology.*
Harold W. Berg, M.S., *Professor of Enology.*
James F. Guymon, Ph.D., *Professor of Enology.*
Ralph E. Kunkee, Ph.D., *Assistant Professor of Enology.*
Harold P. Olmo, Ph.D., *Professor of Viticulture.*
†Robert J. Weaver, Ph.D., *Professor of Viticulture.*
A. Dinsmoor Webb, Ph.D., *Professor of Enology.*
Albert J. Winkler, Ph.D., *Professor of Viticulture, Emeritus.*
James A. Cook, Ph.D., *Associate Professor of Viticulture.*
Lloyd A. Lider, Ph.D., *Associate Professor of Viticulture.*
Klayton E. Nelson, Ph.D., *Associate Professor of Viticulture.*



Julian C. Crane, Ph.D., *Professor of Pomology.*
George L. Marsh, M.S., *Professor of Food Science and Technology.*
Vernon L. Singleton, Ph.D., *Lecturer in Enology.*

Departmental Major Advisers.—Viticulture, Mr. Lider; Food Science, Mr. Webb.

Bachelor of Science Major Program and Graduate Study (Viticulture).
See page 63.

Bachelor of Science Major Program and Graduate Study (Enology). See page 53.

VITICULTURE

LOWER DIVISION COURSES

1. **Introduction to Grape Growing. (2) I.** Mr. Olmo
Lecture—2 hours.
An elementary survey of the grape industry. Botany and distribution of the vine, climatic requirements, cultural practices, utilization of crop, and the principal diseases and insects.
2. **Grape Production. (2) I.** Mr. Lider
Lecture—1 hour; laboratory—3 hours.
Prerequisite: course 1 (may be taken concurrently).
A course covering the principal varieties and the principles and practices involved in the production of table, raisin, and wine grapes. Not open for credit to students in the major.
3. **Introduction to Wine Making. (2) II.** Mr. Amerine, Mr. Singleton
Lecture—2 hours.
An introduction to the wine industry, including fermentation, wine types, handling and diseases, and economic problems of the industry.

UPPER DIVISION COURSES

105. **Systematic Viticulture and Principles of Fruit Handling. (3) I.**
Lecture—1 hour; laboratory—6 hours. Mr. Nelson, Mr. Lider
Prerequisite: course 1 or Pomology 2.
Botanical classification of the grape—the principal varieties, rootstocks,

† Absent on leave, 1963–1964.

and species; production factors affecting maturity and quality of the fruit for raisins, wine and table grapes; harvesting, handling, and marketing of table grapes; raisin making; costs and returns.

108. Plant Regulators in Horticulture. (2) I. Mr. Crane, Mr. Kunkee
Lecture—2 hours.

Prerequisite: course 1; Botany 111; or consent of instructor.

History, occurrence, extraction, and measurement, chemical nature, developmental and physiological effects, role, and theories of action of plant growth regulators; methods of application and factors altering effectiveness; horticultural applications in the control of plant and fruit responses.

116. General Viticulture. (4) II. Mr. Cook, Mr. Lider

Lecture—3 hours; laboratory—3 hours.

Prerequisite: course 1.

Plant structure and physiology; principles underlying propagation, pruning, grafting and cultivation; and factors influencing fruit development and quality.

124. Enology: Wine Processing and Analyses. (3) II. Mr. Berg, Mr. Amerine

Lecture—1 hour; laboratory—6 hours.

Prerequisite: Bacteriology 1; Chemistry 5. Recommended: courses 1 and 3 and Food Technology 107.

Introduction to enology: wine types and analyses, nonbacterial disorders and their control, fining, filtration, and the preparation of vermouths and sparkling wines.

125. Enology: Wine Preparation. (3) I. Mr. Webb

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 105; Bacteriology 1; Chemistry 5, 8.

The principles and practices of making the various standard types of wine, with special reference to the varieties used, and the method of vinification required for each.

140. Principles of Distillation and Brandy Technology. (3) II. Mr. Guymon

Lecture—2 hours; laboratory—3 hours.

Prerequisite: Chemistry 5, 8.

The distillation process, theory, calculations and technological aspects, mass and energy transfer relationships, with emphasis upon the alcohol-water system and the distillation of wines; brandy types, analysis, production factors and legal aspects.

190. Proseminar in Viticulture. (1) I. Mr. Olmo

Lecture—1 hour.

Prerequisite: consent of the instructor.

Reports and discussions of recent advances in viticulture.

191. Proseminar in Enology. (1) II. Mr. Amerine, Mr. Webb

Lecture—1 hour.

Prerequisite: consent of the instructor.

Reports and discussions of recent advances in enology.

198. Directed Group Study. (1-5) I and II. The Staff

Prerequisite: consent of the instructor.

Directed group study of selected topics in viticulture and enology for advanced undergraduates.

199. Special Study for Advanced Undergraduates. (1-5) I and II.

The Staff

GRADUATE COURSES

217. **Microbiology of Wine Production.** (2) II. Mr. Kunkee
Lecture—1 hour; laboratory—3 hours.
Prerequisite: Bacteriology 1, 105A or 105B; Chemistry 5, 8. Open to properly qualified undergraduates with the permission of the instructor.
Nature, development, physiology, biochemistry and control of yeasts and bacteria involved in the making, aging, and spoilage of wine.
290. **Seminar.** (1) II. Mr. Webb
Seminar—1 hour.
Prerequisite: consent of the instructor.
299. **Research.** (1-6) I and II. The Staff

RELATED COURSE

Fruit Breeding (Pomology 114)

ZOOLOGY

Milton A. Miller, Ph.D., *Chairman of the Department.*
Department Office, 247 Animal Science Building

- †Milton Hildebrand, Ph.D., *Professor of Zoology.*
†Everett W. Jameson, Jr., Ph.D., *Professor of Zoology.*
Milton A. Miller, Ph.D., *Professor of Zoology.*
Lauren E. Rosenberg, Ph.D., *Professor of Zoology.*
———, *Professor of Zoology.*
Loye H. Miller, Ph.D., LL.D., *Professor of Biology, Emeritus.*
Tracy I. Storer, Ph.D., LL.D., *Professor of Zoology, Emeritus.*
Reed A. Flickinger, Ph.D., *Associate Professor of Zoology.*
Charles R. Goldman, Ph.D., *Associate Professor of Zoology.*
George W. Salt, Ph.D., *Associate Professor of Zoology.*
Ernest J. DuPraw, Ph.D., *Assistant Professor of Zoology.*
Jürgen H. H. Jacobs, Ph.D., *Assistant Professor of Zoology.*
Warren G. Kinzey, Ph.D., *Assistant Professor of Zoology and Assistant Professor of Anthropology.*
†Robert L. Rudd, Ph.D., *Assistant Professor of Zoology.*
Stephen L. Wolfe, Ph.D., *Assistant Professor of Zoology.*



- Norman F. Baker, D.V.M., Ph.D., *Assistant Professor of Parasitology*
Raymond D. Barnes, A.B., *Associate in Zoology.*
James R. Douglas, Ph.D., *Professor of Parasitology.*

PHYSIOLOGY

Letters and Science List.—Physiology 1, 1L.

LOWER DIVISION COURSES

- 1. Introductory Physiology Lecture.** (3) I. Mr. Jacobs
Lecture—3 hours.
Prerequisite: high school chemistry.
The physiology of muscle, nerve, central nervous system, sensation, circulation, respiration, excretion, and digestion.
- 1L. Introductory Physiology Laboratory.** (2) I. Mr. Jacobs
Laboratory—6 hours.
Prerequisite: course 1 completed or in progress.

ZOOLOGY

Letters and Science List.—All undergraduate courses in zoology except course 104 are included in the Letters and Science List of Courses (see page 93).

Departmental Major Advisers.—Mr. DuPraw, Mr. Goldman, Mr. Jacobs, Mr. Wolfe.

Bachelor of Arts Major Program

(A) Lower Division Courses.—Zoology 1A and 1B; Chemistry 1A and 1B or 8.

(B) Upper Division Courses.—24 units of upper division courses in zoology (not more than 4 units of zoology courses in the 190 series may be counted

† Absent on leave, 1963–1964.

‡ Absent on leave, fall semester, 1963–1964.

in this requirement). Students in the A.B. program are required to complete the following core courses:

1. *Vertebrate Embryology with laboratory, or Vertebrate Comparative Anatomy.*—Zoology 100, 100L, or 106.
2. *Invertebrate Zoology.*—Zoology 112.
3. *Genetics.*—Genetics 100.
4. *Physiology with laboratory.*—Zoology 142, 142L, or any related animal physiology course.

Any courses taken outside the department in partial satisfaction of the core course requirement will be counted toward the satisfaction of the 24 unit requirement.

Within the major program there are four principal areas of concentration for which electives are recommended as follows:

1. *Preparation for Graduate Study.*—Elementary courses in Botany, Biochemistry, Chemistry, a second foreign language, Physics, Calculus, and Statistics, with attention to the requirements for advanced degrees.

2. *Preparation for Careers as Teachers.*—To provide desirable breadth of training, additional courses in Botany, Bacteriology, Cell Biology, Chemistry, and Physics, Entomology, Field Zoology, and Physiology.

3. *Preparation for Careers as Technicians.*—Courses 104, 107, 110 and suitable electives in Biochemistry, Parasitology and Physiology.

4. *Preparation for Careers in Wildlife.*—The A.B. program may serve as preparation for careers in wildlife but the B.S. program (see later) is specifically designed for that purpose. Hence, students in the A.B. program interested in wildlife careers should select as many electives as possible from the courses listed under the B.S. program.

Bachelor of Science Major Program

The B.S. program is specifically designed as an interdisciplinary major with an area emphasis in wildlife for students with professional orientation in that field. All other zoology majors should take the A.B. program.

(A) Lower Division Courses.—Required: course 1A, 1B; Botany 1; Chemistry 1A, 8; Entomology 1; Mathematics 13. Recommended: Agronomy 1; Bacteriology 1; Geography 1, 3; Geology 1A; Physics 2A, 2B; Soil Science 1.

(B) Upper Division Courses.—Thirty-six units of upper division courses including 21 units of required courses and the remaining 15 to be selected from four groups of electives listed below (at least one course must be taken from each elective group). At least 24 units must be in upper division zoology courses (but with approval of the major adviser, 6 units of the 24 may be satisfied by upper division courses in other sciences related to the student's program).

Required: Botany 108; Geography 161; Zoology 116, 125, 125L, and 6 units of upper division electives in zoology.

Elective groups (at least one course from each group is required).

Group 1. Ecology and Limnology.—Botany 117; Entomology 127; Zoology 140–140L.

Group 2. Physiology and Nutrition.—Animal Husbandry 105, 110; Poultry Husbandry 105.

Group 3. Parasitology and Pathology.—Pathology 122A–122B, Veterinary Microbiology 111 and 124.

Group 4. Vertebrate Zoology.—Zoology 133, 134.

Honors and Honors Program (see page 94).—The honors program comprises courses 194H and 195H. These two courses will be accepted as part of the 24-unit requirement in upper division courses.

Graduate Study.—The Department of Zoology offers programs of study and research leading to the M.A. and Ph.D. degrees.

LOWER DIVISION COURSES

1A. General Zoology. (4) I. The Staff

Lecture—2 hours; laboratory—6 hours.

Introduction to the structure, physiology, classification, and interrelations of animals, and the principles of evolution and heredity.

1B. General Zoology. (4) II. Mr. Salt

Lecture—2 hours; laboratory—6 hours.

Prerequisite: course 1A.

Structure of the vertebrate body with special reference to the mammal and bird; gross and microscopic anatomy of organs and organ systems.

10. General Biology. (3) II. _____

Lecture—3 hours; demonstration section—1 hour.

Not open for credit to students who have had course 1A, but students who have taken course 10 may elect course 1A for credit. Open without prerequisite to all students, but designed for those not specializing in animal biology.

Consideration of the main facts and principles of animal biology, with emphasis on animal biology and special reference to evolution, heredity, and the bearing of biology upon human life.

25. General Human Anatomy. (3) II. Mr. Kinzey

Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 1A or 10 or Physiology 1; and sophomore standing.

A basic study of human anatomy with demonstration and laboratory study of prepared human dissections, models, and microscopic materials. Not open to premedical students.

UPPER DIVISION COURSES

100. Vertebrate Embryology. (2) I. Mr. Flickinger

Lecture—2 hours.

Prerequisite: course 1B.

Embryologic development of the vertebrates, including amphibian, chick, and mammal.

100L. Vertebrate Embryology Laboratory. (2) I. Mr. Flickinger

Laboratory—6 hours.

Prerequisite: course 100, which should be taken concurrently.

103. Experimental Embryology. (2) II. Mr. Flickinger

Lecture—2 hours.

Prerequisite: course 100.

Mechanisms of growth and differentiation of embryonic, malignant and regenerating tissues.

- 103L. Experimental Embryology Laboratory.** (2) II. Mr. Flickinger
Laboratory—6 hours.
Prerequisite: course 103 (may be taken concurrently).
The application of transplantation, organ and tissue culture, and selected chemical techniques to developmental problems.
- 104. Materials and Methods of Animal Micrology.** (3) II. Mr. DuPraw
Lecture—1 hour; laboratory—6 hours.
Prerequisite: course 1B. (Limited enrollment.)
History, theory, and application of methods for microscopic work in the animal sciences.
- 106. Comparative Anatomy of the Vertebrates.** (4) II. Mr. Hildebrand
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1B. Recommended: courses 100, 100L.
Evolution and adaptations of organ systems and phylogeny of the major vertebrate groups.
- 107. Microanatomy.** (4) I. Mr. Rosenberg
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1B.
The finer structure and activities of organs, tissues, and cells of vertebrates, with emphasis on those of mammals.
- 110. Protozoology.** (4) II. Mr. Rosenberg
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1A and junior standing.
Structure, life history, and ecology of the groups of protozoa with emphasis on relationships to biological problems.
Minimum enrollment of 5 students.
- 112. Invertebrate Zoology.** (4) II. Mr. Miller
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1A and junior standing.
Anatomy, classification and natural history of representative invertebrate animals, excluding protozoans and insects.
- 116. Economic Vertebrate Zoology.** (3) I. _____
Lecture—2 hours; laboratory—3 hours.
Prerequisite: course 1A and junior standing.
Relation of vertebrate animals to human affairs; effect of settlement, forestry, agriculture, and hunting on wild populations; attention to rodents, deer, carnivorous mammals and birds, fur production, game birds, food and game fisheries; principles and agencies of management and conservation.
Minimum enrollment of 5 students.
- 121. Cell Biology.** (3) I. Mr. DuPraw
Lecture—3 hours.
Prerequisite: Biochemistry 101 and Genetics 100, or the equivalent; or consent of the instructor.
The mechanics of living systems. A combined ultrastructural, physiological, and biochemical analysis of subcellular organization, including such topics as nucleic acid "code," synthesis of specific macromolecules, contractility, photosynthesis and respiration, cell division, molecular structure of organelles, and cell regulatory mechanisms.
- 121L. Cell Biology Laboratory.** (2) I. Mr. DuPraw
Laboratory—6 hours.
Prerequisite: course 104 or the equivalent; course 121 (should be taken concurrently); consent of the instructor.

Exercises illustrating principles of cell biology; individual programs of research, employing one or more advanced techniques.

125. **Animal Ecology.** (2) I. Mr. Salt
Lecture—2 hours.
Prerequisite: A natural history or field course in biology.
Theory of relationships between animals and their environments.
- 125L. **Field Ecology.** (2) I. Mr. Salt
Laboratory—6 hours.
Prerequisite: course 125 (may be taken concurrently).
Laboratory and field investigations of ecological phenomena.
- *126. **Chemical Embryology.** (2) I. Mr. Flickinger
Lecture—2 hours.
Prerequisite: course 100; Chemistry 1B or 8. Recommended: course 103.
Molecular aspects of embryonic development and regeneration.
133. **Biology of the Cold-Blooded Vertebrates.** (4) II. Mr. Jameson
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1B.
Fishes, amphibians and reptiles; identification and classification; ecologic and geographic distribution; field study of habits and life histories; emphasis on species in California and western North America.
Offered in odd-numbered years.
134. **Biology of Birds and Mammals.** (4) II. Mr. Jameson
Lecture—2 hours; laboratory—6 hours.
Prerequisite: course 1B.
Identification, ecologic and geographic distribution; field study of habits and life histories; emphasis on species in California and Western North America.
Field trips included.
Offered in spring semester of even-numbered years.
140. **Limnology.** (2) II. Mr. Goldman
Lecture—2 hours.
Prerequisite: junior standing in one of the biological sciences. (Laboratory strongly recommended in conjunction with lecture course.)
The biology and productivity of inland waters with emphasis on the physical and chemical environment.
- 140L. **Limnology Laboratory.** (2) II. Mr. Goldman
Laboratory—6 hours.
Prerequisite: course 140 (may be taken concurrently).
Limnological studies of lakes, streams, and reservoirs with interpretation of aquatic ecology.
142. **Invertebrate Physiology.** (2) II. Mr. Jacobs
Lecture—2 hours.
Prerequisite: course 112 (may be taken concurrently); Chemistry 1A; Physics 2A–2B. Recommended: Animal Physiology 100.
Comparison of the physiology of invertebrate organ systems.
- 142L. **Invertebrate Physiology Laboratory.** (2) II. Mr. Jacobs
Laboratory—6 hours.
Prerequisite: course 142 (may be taken concurrently).
Studies and experiments on the physiological mechanisms of invertebrate organ systems.

* Not to be given, 1963–1964.

- 144. Oceanography.** (3) I. Mr. Goldman
Lecture—2 hours; laboratory—3 hours.
Prerequisite: a course in biology; Chemistry 1A; Physics 1A; junior standing.
Biological, chemical, physical, and geological aspects of the marine environment. Consideration will be given to biological communities, productivity, the distribution of currents and tides, the origin of ocean basins, and marine sedimentation.
- *147. Zoogeography.** (2) I. Mr. Jameson
Lecture—2 hours.
Prerequisite: course 1A or Entomology 1.
Movements of terrestrial animals. The role of geologic, climatic, and biologic changes in the geographic distribution of animals.
- *148. Animal Phylogeny and Evolution.** (3) II. Mr. Rudd
Lecture—3 hours.
Prerequisite: course 1A or Entomology 1. Recommended: course 147 and Genetics 100.
The origins and relationships of the major groups of animals, with emphasis on the analysis of variation and the mechanics of evolutionary change.
- 194H. Special Study for Honors Students.** (2-3) I and II. The Staff
- 195H. Honors Thesis in Zoology.** (1) I and II. The Staff
Prerequisite: course 194H and second-semester senior standing.
A comprehensive paper incorporating the studies undertaken in Zoology 194H.
- 199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff

GRADUATE COURSES

- 290. Seminar.** (1) I and II. Mr. Rosenberg I, Mr. Hildebrand II
Seminar—1 hour.
- 291. Seminar in Protozoology.** (1) II. Mr. Rosenberg
Seminar—1 hour.
Prerequisite: course 110 or consent of the instructor.
Reports and discussion on selected topics in the field of protozoology.
- 292. Seminar on Development.** (1) I. Mr. DuPraw, Mr. Flickinger
Seminar—1 hour.
Prerequisite: consent of the instructor.
Reports and discussion on embryology, morphogenesis, and developmental mechanisms.
- *293. Seminar in Invertebrate Zoology.** (1) I. Mr. Jacobs, Mr. Miller
Seminar—1 hour.
Prerequisite: course 112 or consent of the instructor.
Reports and discussion on selected topics in invertebrate zoology with emphasis on recent advances.
- 294. Seminar in Animal Ecology.** (1) I. Mr. Salt
Seminar—1 hour.
Prerequisite: course 125 or consent of the instructor.
Discussion of advanced topics in the field of animal ecology.

* Not to be given, 1963-1964

- *295. Seminar in Limnology.** (1) II. Mr. Goldman
Seminar—1 hour.
Prerequisite: course 140 or consent of the instructor.
Reports and discussion on recent developments in limnology and related advances in oceanography.
- *296. Seminar in Parasitology.** (1) I and II. Mr. Baker, Mr. Douglas
Seminar—1 hour.
Prerequisite: consent of the instructor.
Reports and discussion of fundamental principles and selected topics in parasitology.
- *297. Seminar on Systematic Zoology and Evolution.** (1) II. Mr. Rudd, Mr. Hildebrand
Seminar—1 hour.
Prerequisite: consent of the instructor.
Reports and discussion on 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.
- 299. Research in Zoology.** (1-6) I and II. The Staff

RELATED COURSES

- General Cytology (Botany 130)
Genetics (All courses)
Animal Physiology (All courses)
Mammalian Physiology (Physiological Sciences 140 and 140L)
Avian Physiology (Poultry Husbandry 107 and 108)
Elements of Animal Nutrition (Animal Husbandry 105)
Metabolism and Food Utilization (Animal Husbandry 120)
Intermediary Metabolism of Animals (Physiological Sciences 205)
Biochemical Aspects of Endocrinology (Animal Husbandry 230)
Advanced Immunology (Veterinary Microbiology 270)
Fundamentals of Radiation Biology (Physiological Sciences 225)
Bacteriology and Microbiology (All courses)
Graduate Seminar in Microbiology (Veterinary Microbiology 290)
Principles and Techniques of Nematode Taxonomy and Morphology (Nematology 220)
Nematode Taxonomy and Comparative Morphology (Nematology 225)
Introduction to Entomology (Entomology 1)
Natural History of the Insects (Entomology 10)
Structure and Function in Insects (Entomology 106)
Systematic Entomology (Entomology 112)
Insect Ecology (Entomology 127)
Graduate Seminar in General Entomology (Entomology 290)
Invertebrate Paleontology (Geological Sciences 111)

* Not to be given, 1963-1964.

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Registrar, University of California, Berkeley, Berkeley 4

Registrar, University of California, Davis.

Registrar, University of California, Los Angeles, Los Angeles 24.

Registrar, University of California, Riverside, Riverside.

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EMIL M. MRAK
Chancellor at Davis