

UNIVERSITY  
OF  
CALIFORNIA

—  
GENERAL  
CATALOGUE

1964-65

DAVIS

Office of the Registrar

# U.C./DAVIS

## GENERAL CATALOGUE

FALL AND SPRING SEMESTERS 1964-65

August 1, 1964

Price, Twenty-five Cents

UNIVERSITY OF CALIFORNIA, DAVIS

# U.C./DAVIS

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# **General Catalogue**

**DAVIS**

**Fall and Spring Semesters**

**1964-1965**

**August 1, 1964**

**UNIVERSITY OF CALIFORNIA, DAVIS**



Olson Hall

# Contents

## General

University Calendar . . . . .	6
The Regents of the University . . . . .	9
Administrative Officers . . . . .	10

## The University of California

History . . . . .	12
Government . . . . .	12
Site and Growth of the Davis Campus . . . . .	13
Survey of Curricula . . . . .	13
Degrees Awarded . . . . .	14
Summer Sessions . . . . .	15
University Extension . . . . .	15

## Admission to the University

Admission in Undergraduate Status . . . . .	17
Application for Admission . . . . .	17
Application Fee . . . . .	17
Transcripts of Record . . . . .	17
Notification of Eligibility . . . . .	17
Failure to Register . . . . .	18
Subject A: English Composition . . . . .	18
Vaccination Certificate . . . . .	18
Intercampus Transfer . . . . .	18
Preparation for University Curricula . . . . .	18
Admission to Freshman Standing . . . . .	19
Admission to Advanced Standing . . . . .	21
Requirements for Out-of-State Applicants . . . . .	22
Admission to Special Status . . . . .	23
Admission to Limited Status . . . . .	24
Admission of Applicants with Bachelors' Degrees . . . . .	24
Admission of Applicants from Other Countries . . . . .	24
Engineering Examinations . . . . .	25
Admission in Graduate Standing . . . . .	26

## General Information and Regulations

Routine of Registration . . . . .	28
Study-List Regulations . . . . .	28
Medical and Physical Examination . . . . .	29
Student Supplementary Health Insurance . . . . .	29
Health Insurance Requirement for Foreign Students . . . . .	29
Physical Education and Use of Gymnasium . . . . .	29
Military Science . . . . .	29
Expenses of Students . . . . .	31
Tuition . . . . .	32
Financial Aids and Awards . . . . .	33
Student Employment . . . . .	34
Veterans Affairs . . . . .	35
Living Accommodations . . . . .	35
Student Health Service . . . . .	36
University Library . . . . .	37
Selective Service . . . . .	37
Counseling Service . . . . .	37

## *Contents*

5

Subject A: English Composition . . . . .	38
American History and Institutions . . . . .	39
Candidacy for Degrees . . . . .	39
Credit and Scholarship . . . . .	40
Grades . . . . .	40
Grade Points . . . . .	40
Minimum Undergraduate Scholarship Requirements . . . . .	40
Credit by Examination . . . . .	42
Final Examinations . . . . .	42
Removal of Deficiencies . . . . .	42
The Honor Spirit—A Cherished Tradition . . . . .	44
Student Conduct and Discipline . . . . .	44
Leave of Absence and Honorable Dismissal . . . . .	45
Student Responsibility for Materials Submitted in Satisfaction of Course Requirements . . . . .	45
Change of College or Major . . . . .	45
Honors . . . . .	45
Transcript of Record . . . . .	46
Student Activities . . . . .	46
The Junior Year Abroad . . . . .	46
<b>Requirements and Curricula</b>	
College of Agriculture . . . . .	48
College of Engineering . . . . .	69
College of Letters and Science . . . . .	81
Courses of Instruction . . . . .	99-350
Index . . . . .	351

# University Calendar

## 1964-1965

### Davis Campus

#### Fall Semester 1964-1965

July 13, 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, Saturday	Credentials and applications for admission to graduate standing for fall semester 1964 must be filed with the Dean of the Graduate Division on or before this date.
Aug. 24, Monday	Applications for readmission to undergraduate and graduate status for fall semester 1964 must be filed with the Registrar on or before this date.
Sept. 7, Monday	Labor Day—academic and administrative holiday.
Sept. 14, Monday	Fall semester begins.
Sept. 14, Monday	Orientation and testing.
Sept. 19, Saturday	
Sept. 17, Thursday	Registration.
Sept. 18, Friday	
Sept. 21, Monday	Instruction begins.
Oct. 2, Friday	Candidates who expect to complete work for master's degrees to be conferred in January 1965 must file for candidacy on or before this date.
Oct. 5, Monday	Candidates who expect to complete work for A.B. and B.S. degrees to be conferred in January 1965, must file announcement of candidacy with the Registrar on or before this date.
	Candidates who expect to complete work for A.B. and B.S. degrees to be conferred in January 1965, must confirm their intention to graduate on or before this date. Candidates who expect to complete work for A.B. and B.S. degrees to be conferred in June 1965 must file for candidacy on or before this date. Each candidate for degree has two responsibilities: (1) announce his candidacy (2) the following semester confirm his intention to graduate.
Oct. 9, 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 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. 16, Friday	President's Reception. Petitions to drop courses without scholarship penalty must be filed with the Registrar on or before this date.
Oct. 24, Saturday	Applications to take engineering examinations required for admission in the spring semester 1965 must be filed on or before this date.
Nov. 6, Friday	Theses for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in January 1965 must be filed in final form with the committees in charge on or before this date.
Nov. 7, Saturday	Engineering examinations, lower division and upper division.
Nov. 26, Thursday	Thanksgiving holiday—academic and administrative holiday.
Nov. 27, Friday	
Nov. 28, Saturday	Fall recess—academic holiday.
Nov. 26, Thursday	
Nov. 28, Saturday	

Dec. 15, Tuesday	Applications for admission to undergraduate standing, including applications for intercampus transfer, for spring semester 1965 must be filed, with complete credentials, with the Registrar on or before this date.
Dec. 18, Friday	Theses for master's degrees to be conferred in January 1965 must be filed in final form with the committees in charge on or before this date.
Dec. 21, Monday	Christmas recess—academic holiday.
Jan. 2, Saturday	
Dec. 24, Thursday	Christmas holiday—academic and administrative holiday.
Dec. 25, Friday	
Dec. 31, Thursday	
Jan. 1, Friday	New Year's holiday—academic and administrative holiday.
Jan. 2, Saturday	

**1965**

Jan. 2, Saturday	Credentials and applications for admission to graduate standing for spring semester 1965 must be filed with the Dean of the Graduate Division on or before this date.
Jan. 4, Monday	Instruction resumes.
Jan. 8, Friday	Theses for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in January 1965 must be filed with the Dean of the Graduate Division on or before this date.
Jan. 11, Monday	Applications for readmission to undergraduate and graduate status for spring semester 1965 must be filed with the Registrar on or before this date.
Jan. 16, Saturday	Instruction ends.
Jan. 18, Monday	
Jan. 27, Wednesday	Final examinations.
Jan. 27, Wednesday	Fall semester ends.
	Theses for master's degrees to be conferred in January 1965 must be filed with the Dean of the Graduate Division on or before this date.
Feb. 1, Monday	Applications for 1965-1966 undergraduate scholarships for current students must be filed on or before this date.

**Spring Semester 1965**

Feb. 1, Monday	Spring semester begins.
Feb. 1, Monday	
Feb. 6, Saturday	Orientation and testing.
Feb. 5, Friday	Registration.
Feb. 8, Monday	Instruction begins.
Feb. 15, Monday	Applications for fellowships and graduate scholarships for 1965-1966 must be filed on or before this date.
	Applications for 1965-1966 undergraduate scholarships for new students must be filed on or before this date.
Feb. 19, Friday	Candidates who expect to complete work for the master's degrees to be conferred in June 1965 must file application for candidacy on or before this date.
Feb. 22, Monday	Washington's birthday—academic and administrative holiday.
Feb. 23, Tuesday	Candidates who expect to complete the work for A.B. and B.S. degrees in June 1965 must file announcement of candidacy with the Registrar on or before this date.
	Candidates who expect to complete work for A.B. and B.S. degrees to be conferred in June 1965, must confirm their intention to graduate on or before this date. Candidates who expect to complete work for A.B. and B.S. degrees to be conferred in January 1966 must file for candidacy on or before this date. Each candidate for degree has two responsibilities:
	(1) announce his candidacy
	(2) the following semester confirm his intention to graduate.
Feb. 26, Friday	Candidates who expect to complete work for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in June 1966 must file applications for candidacy on or before this date.
	Petitions to enroll or add courses to study lists must be filed with the Registrar on or before this date.

Mar. 1, Monday	Applications for admission to the School of Veterinary Medicine must be filed with the Registrar on or before this date.
Mar. 5, Friday	Petitions to drop courses without scholarship penalty must be filed with the Registrar on or before this date.
Mar. 12, Friday	Theses for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in June 1965 must be filed in final form with the committee in charge on or before this date.
Mar. 20, Saturday	Applications to take engineering examinations required for admission in the fall semester 1965 must be filed on or before this date.
Apr. 3, Saturday	Engineering examinations—lower division and upper division.
Apr. 12, Monday	
Apr. 17, Saturday	Spring Recess—an academic holiday.
Apr. 16, Friday	Academic and administrative holiday.
Apr. 24, Saturday	Picnic Day—academic and administrative holiday.
May 7, Friday	Theses for master's degrees to be conferred in June 1965 must be filed in final form with the committees in charge on or before this date.
May 14, Friday	Theses for the degrees of Doctor of Philosophy and Doctor of Engineering to be conferred in June 1965 must be filed with the Dean of the Graduate Division on or before this date.
May 29, Saturday	Instruction ends.
May 31, Monday	Memorial Day—academic and administrative holiday.
June 1, Tuesday	
June 10, Thursday	Final Examinations.
June 10, Thursday	Spring semester ends.
	Theses for master's degrees to be conferred in June 1965 must be filed with the Dean of the Graduate Division on or before this date.

### First Summer Session 1965

June 21, Monday	Registration and first day of instruction.
July 30, Friday	First Summer Session instruction ends.

### Second Summer Session 1965

Aug. 2, Monday	Registration and first day of instruction.
Sept. 7, Tuesday	Labor Day—academic and administrative holiday.
Sept. 10, 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, Calif. 95814

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90024

## APPOINTED REGENTS

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

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## OFFICERS OF THE REGENTS

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# University of California

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

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† Absent on leave, 1964.

# 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) 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, 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

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. A School of Law is being established on campus, and the first class will be admitted in the fall semester of 1966.

The College of Agriculture and the College of Letters and Science account for over 85 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 the 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 2,000 single students living in new University halls, and 350 married students living in campus married-student housing facilities. Flat terrain makes bicycles a favorite mode of travel, both on campus and in town.

The city of Davis, a college town of about 12,000, 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	Vegetable Crops
Agricultural Economics	Viticulture
Agricultural Education	Animal Science
Agricultural Production	Animal Husbandry
Agricultural Economics	Animal Physiology
Agronomy	Genetics
Animal Husbandry	Poultry Husbandry
Dairy Industry	Entomology
Enology	Food Science
Food Technology	Home Economics
General Agriculture	Child Development
Irrigation	Design
Landscape Horticulture	Dietetics
Pest Control	Foods
Pomology	General Home Economics
Range Management	Nutrition
Soils and Plant Nutrition	Textile Science

International Agricultural Development	Plant Pathology
Irrigation Science	Pomology
Plant Science	Vegetable Crops
Agronomy	Viticulture
Genetics	
Landscape Horticulture	Preforestry
Park Administration	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	International Relations
Anthropology	Latin
Art	Mathematics
Biological Sciences	Microbiology
Botany	Music
Chemistry	Philosophy
Dramatic Art	Physical Education
Dramatic Art and Speech	Physical Sciences
Economics	Physics
English	Political Science
French	Psychology
Geography	Sociology
Geology	Spanish
German	Zoology
History	

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 26).

### DEGREES AWARDED

Approximately 225,000 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 curriculum 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 95616.

### **SUMMER SESSIONS**

In 1965 there will be two regular six-week Summer Sessions beginning on June 21 and on August 2. The Summer Sessions will offer a number of lower division, upper division, and graduate courses of interest to students who may wish to maintain or accelerate progress toward their degree objectives. A substantial offering of upper division and graduate courses of interest to teachers and teacher candidates will also be provided, including courses for teacher candidates who have been admitted to internship programs and 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.

Summer sessions are also conducted on the Berkeley, Los Angeles, Santa Barbara, and San Francisco 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, with Northern and Southern Area headquarters in Berkeley and Los Angeles, makes available the resources of the University on a statewide basis to individuals and organizations. Extension programs are organized around the following education aims: (1) the intellectual and cultural development of adults; (2) the dissemination of new knowledge resulting from teaching and research activities within the University; (3) the continuing education of scientific, technical, and professional personnel; (4) the development of special educational programs for public and private organizations and agencies; and (5) public affairs education through programs designed to aid adults in meeting their responsibilities as citizens.

A variety of methods are used to implement these aims: classes, discussion groups, correspondence courses, conferences, institutes, short courses, lectures, motion picture production, broadcast educational television, and vocational counseling and testing (Los Angeles only).

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

For detailed information, write or telephone the University Extension office on any campus of the University or at the following additional locations: 813 South Hill Street, Los Angeles 14 (Madison 3-6123); 1221 Fourth Avenue, San Diego 1 (BELmont 2-7321); Room 15, Buena Park High School, 10th and Magnolia, Buena Park (LAmbert 6-3397); San Francisco Extension Center, 55 Laguna Street, San Francisco (UNderhill 1-6833).



**Hutchison Hall**

# Admission to the University

## ADMISSION IN UNDERGRADUATE STATUS

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

### APPLICATION FOR ADMISSION

Applications should be filed with the Office of Admissions, Room 5, Freeborn Hall, University of California, Davis, California 95616. An application form will be supplied by the Office of Admissions upon request. The application must be filed between October 1 and March 1 for the fall semester and between March 1 and October 15 for the spring semester.\* Applicants are urged to file early in the application period.

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 directed to more than one campus should not be filed.

If, after a student has filed his application, he decides to register on a different campus, he should write to the Director of Admissions, 570 University Hall, University of California, Berkeley, California 94720, 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 request must be received at least three weeks before registration.

### APPLICATION FEE

Each applicant for admission is required to pay a non-refundable 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

Each applicant is responsible for requesting the graduating high school and each college attended to send official transcripts of record directly to the Office of Admissions. Transcripts from the last college attended should include a statement of good standing or honorable dismissal. A preliminary transcript should show work in progress.

### 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 request promptly to have transcripts of record 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.

\* The deadline for filing applications for admission to the spring semester 1965 is December 15.

Students may expect notification about four weeks after final transcripts have been received by the Office of Admissions. Those who apply early may receive notification somewhat more promptly. Since the receipt of preliminary transcripts may shorten this interval, applicants should arrange for the submission of preliminary transcripts showing work in progress.

### FAILURE TO REGISTER

An applicant who is not eligible for admission or one who has been admitted but does not register in the semester for which he applied, and who thereafter desires to attend the University, must submit a new application for admission with a \$5 fee. The new application will be acted upon in the light of current availability of facilities and current admission requirements.

### SUBJECT A: ENGLISH COMPOSITION\*

The University requires every accepted student to pass an examination in English composition (the Subject A examination) or to complete in college an acceptable course of at least 3 units in English composition with a satisfactory grade. Students who enter the University with credentials showing the completion elsewhere of acceptable college-level training in composition or a score of at least 600 in the College Entrance Examination Board Achievement Test in English Composition (see page 21 for dates) taken after completion of the eleventh grade are considered to have met the Subject A requirement. All other students are required to take the examination given by the University. Although it is not a condition of admission, it must be taken at the opening of the semester of first attendance if not taken previously. Students who neither pass the examination nor meet the requirement in one of the above ways will be required to take the noncredit course in English composition, for which a fee of \$35 is charged.

### VACCINATION CERTIFICATE

Every new student and every student returning to the University after an absence of one or more semesters must present at the time of 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 inter-campus 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 March 1 for the fall semester and by October 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

\* See also, pages 38 and 336.

\*\* The deadline for filing applications for admission to the spring semester 1965 is December 15.

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, 570 University Hall, University of California, Berkeley, California 94720.

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

Applicants 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 or school of the University in which they wish to enroll.

### **ADMISSION TO FRESHMAN STANDING**

An applicant for admission to freshman standing is one who has not registered in regular session in 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 sometimes remove the deficiency during the summer; he should consult in advance the Office of Admissions.

If the applicant has registered in 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.

### **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 High School**

*Public and Private High Schools in California with College Preparatory Programs Accredited by the University of California* is published by the University annually in September. Students who graduate from high schools listed therein may be admitted to the University upon the completion of prescribed courses with the required scholarship average.

Applicants who graduate from a California school not appearing in the above list will, upon request to the Office of Admissions, be instructed as to the procedure to follow. When residents of California have attended high schools outside California, the University determines the acceptability of the high school record.

#### **Subject Requirements**

##### **(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 certified by the high school principal as University preparatory. 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*.

**Electives**

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

**Scholarship Requirements**

At least a B average is required in courses taken after the ninth year used to meet the subject requirements. Grades received in electives or in courses taken in the ninth year or earlier are not used in computing this average. Subject requirements are satisfied by courses in which a grade of C or higher has been assigned. 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 taken in the ninth year or earlier in which a grade of D or lower is received may be repeated to establish subject credit.

Courses taken after the ninth year in which a grade of C or lower is received may be repeated to establish subject credit or to improve scholarship. Grades earned in the first repetition may be used to satisfy scholarship; grades of C or higher in additional repetitions will satisfy the subject requirement but will not be counted higher than a C in scholarship computation.

Courses may be repeated in an amount not to exceed 2 units of the *a* to *f* pattern.

**Minor Deficiencies**

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

**Admission by Examination**

Applicants who are ineligible for admission to freshman standing and who have not attempted college work subsequent to high school (except during the 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.

To qualify by examination, the applicant must present scores in the Scholastic Aptitude Test and three Achievement Tests. The three Achievement

Tests are to include English composition and one from each of the following two groups:

1. Social Studies and Foreign Languages.
2. Mathematics and Sciences.

The test must be taken after completion of the first half of the eleventh grade. The first repetition of a test will be accepted, but the verbal and mathematics scores on the Scholastic Aptitude Test must be from the same sitting. The total score on the Scholastic Aptitude Test must be at least 1000; the scores on the three Achievement Tests must total at least 1650, and the score on any one Achievement Test must not be less than 500.

An applicant who has graduated from an unaccredited high school may qualify by examination under the foregoing rules.

For admission of out-of-state applicants by examination, see page 22.

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

### **Scholastic Aptitude and Achievement Test Dates**

<i>Test Dates</i>	<i>Application Deadlines</i>
Saturday, November 7, 1964 (S.A.T. California only)	October 10, 1964
Saturday, December 5, 1964	November 7, 1964
Saturday, January 9, 1965	December 12, 1964
Saturday, March 6, 1965	February 6, 1965
Saturday, May 1, 1965	April 3, 1965
Wednesday, July 14, 1965	June 16, 1965

Applicants should arrange to take the tests as early as possible. *The scores of an applicant who takes the tests in July may be reported too late for consideration for admission in the fall; similarly, the scores of an applicant who takes the tests in January will be reported too late for consideration for admission in the spring.*

### **ADMISSION TO ADVANCED STANDING**

An applicant who has registered in 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 applicants, see page 22.

The requirements for admission to advanced standing vary in accordance with the high school record of the applicant. All applicants, however, must present from the last accredited college or university attended in regular session (a) a statement of good standing, and (b) an academic record with a grade-point average\* of C or better.

\* 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. Scholarship standard is expressed by a system of grade points and grade-point averages in courses acceptable for advanced standing credit in the University of California. Grade points are assigned as follows: for each unit of A, 4 points; B, 3 points; C, 2 points; D, 1 point; E and F, no points.

1. An applicant who was eligible for admission to the University in freshman standing (see page 19) may be admitted at any time he has established an overall grade-point average of C or better.

2. An applicant who was ineligible for admission to the University in freshman standing, but whose only deficiency arose from not having studied one or more of the required high school subjects, may be admitted when the following conditions are met:

a. He has established an overall grade-point average of C or better, and

b. He has satisfied, by appropriate courses, the subject requirements for admission to freshman standing (see page 19).

*Exception:* deficiencies in subject requirements will be waived in an amount not exceeding 2 high school units if the applicant has established a minimum of 56 units passed with a grade-point average of 2.4 or better on all acceptable courses undertaken. Subject deficiencies in excess of 2 units must be satisfied.

3. An applicant who was ineligible for admission to the University in freshman standing because of low scholarship or a combination of low scholarship and incomplete subject preparation (omission, or by grades of D or lower) may be admitted when the following conditions are met:

a. He has established a minimum of 56 units passed with a grade-point average of 2.4 or better on all acceptable courses undertaken, and

b. He has satisfied, by appropriate courses, subject requirements for admission to freshman standing (see page 19) except that subject deficiencies will be waived in an amount not exceeding 2 high school units.

### **Credit for Work Taken in Other Colleges**

The University grants unit credit for courses appropriate to the curriculum in the University that have been completed in colleges and universities accredited by regional accrediting associations.

As an integral part of the system of public education of California, the University accepts, 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 course in one of the many excellent California public junior colleges. After a student has earned 70 units acceptable toward a degree no further unit credit will be granted for courses completed at a junior college.

Extension courses taken at an institution other than the University may not be acceptable. The decision regarding their acceptability rests with the Office of Admissions.

### **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, and, 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 by scholastic records, is in the upper half of those who would be eligible under the rules for California residents.

**Requirements for Freshman Standing****Graduation from High School**

For schools outside California, the University determines the acceptability of the high school record.

**Subject Requirements**

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

**Scholarship Requirements**

The scholarship requirements for in-state applicants (see page 19) apply to out-of-state applicants except that the applicant must have maintained a grade-point average of 3.4 or higher on the required high school subjects.

**Admission by Examination**

Out-of-state applicants who are ineligible for admission to freshman standing and who have not attempted college work subsequent to high school (except during the summer session between high school graduation and registration in the University) may qualify for admission by examination. The requirements for in-state applicants (see page 19) apply to out-of-state applicants 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. The score on any one Achievement Test must not be less than 500.

**Requirements for 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 attempted and 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 a minimum of 56 units passed with a grade-point average of 2.8 or higher. Subject deficiencies in excess of 2 units must be satisfied.

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 present a minimum of 56 units passed with a grade-point average of 2.8 or higher.

**ADMISSION TO SPECIAL STATUS**

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. 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. 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 or school in which the applicant plans to study. Admission is for a specified time only and a prescribed scholarship average must be maintained.

An applicant for special status must 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. 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 with a satisfactory scholarship average and who by reason of special attainments may be prepared to undertake certain courses in the University toward a definite and limited objective. An applicant for limited status must submit transcripts of record from all schools attended beyond the eighth grade. 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 in which the applicant plans to study. 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 Admissions Officer and 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. Doing so will allow time for exchange of necessary correspondence and, if the applicant is admitted, will help him in obtaining the necessary passport visa.

An applicant from another country whose native language is not English may be admitted only after demonstrating that his command of English is sufficient to permit him to profit by instruction in the University. An applicant's knowledge of English is tested by an examination given by the

University. Admission of an applicant who fails to pass this examination will be deferred until he has acquired the necessary proficiency in the use of English.

A student from a country where the language is not English is given college credit in his own language and its literature only for courses satisfactorily completed. Such credit will be allowed only for courses taken in his country at institutions of college level, or for upper division or graduate courses taken in the University of California or in another English-speaking institution of approved standing.

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 08540. The fee for these examinations 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.

The acquisition of health insurance is a condition of registration at the University of California for all foreign students except those in the United States on permanent immigration visas. Information about health insurance programs available will be sent to foreign students with the application for admission. For some campuses appropriate application forms will be included; on other campuses the application is a part of the registration procedure. For details, see page 17.

*Foreign Student Adviser.* An adviser is available to 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, 224 South Hall.

### ENGINEERING EXAMINATIONS

All students who plan to register in one of the Colleges or Schools of Engineering in either the lower division or the upper division must take an engineering qualifying examination. Application forms will be supplied by the Office of Admissions upon request.

The Lower Division Engineering Examination is an aptitude test that contains sections on technical vocabulary, mathematical reasoning, and scientific relationships. A satisfactory score on this examination is prerequisite to the standard pattern of courses in the lower division of the Colleges of Engineering; consequently, students who do not achieve a satisfactory score will not be able to begin the usual pattern of courses and therefore will require more than four years to graduate.

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 one of the Colleges or Schools of Engineering, including those from the lower division of the University. The score on this examination is used in conjunction with the student's college record to determine the eligibility status of the student planning to enroll in the upper division engineering program offered by the University.

Both examinations are given on announced dates at various test sites throughout the State.

The appropriate examination should be taken the semester preceding 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.

† 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.

**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.

**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. *All students must register in person, not by proxy.*

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 or prospective students should consult the *Schedule and Directory* for the dates to register and begin work. Late registration privileges will be granted for a three-week period following regular registration. A \$10 fee will be assessed for extra services involved in handling late registration requests. Students should keep in mind that such requests may create scholastic difficulties and if their work is subsequently found to be deficient, late registration will not be accepted as an excuse to avoid responsibility for low scholarship.

*In no event will a student be permitted to register 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.

Students who do not file study lists in accordance with the published schedule will be assessed a \$10 fee for the extra services involved.

Students may take extension courses with the consent of the appropriate dean.

## Authority of Instructors

An instructor may exclude from a class any student whose preparation for the course is inadequate. 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, 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.

**STUDENT SUPPLEMENTARY HEALTH INSURANCE**

A supplementary health insurance plan is available at the time of registration. This insurance supplements the Student Health Service program and is used for medical care needed between semesters and when away from the campus. Procuring of this insurance is strongly urged.

**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 \$110 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 \$12 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 Office of the Dean of Students—Financial Aids. 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 Office of the Dean of Students—Financial Aids 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 Office of the Dean of Students—Financial Aids, 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 and Grants-in-Aid**

All loans for both graduate and undergraduate students are initiated in the Office of Dean of Students. The University has three categories of loan funds. (1) Funds established from contributions by individuals and organizations which are administered by the University according to the wishes of the donors. These loans are not usually available during the first semester of residence and have a short term of repayment. (2) Funds established by the National Defense Education Act of 1958 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. These loans have a maximum repayment period of eleven years from the time of

graduation or leaving the University. (3) Funds established by The Regents of the University for granting loans up to \$600 per year and to a maximum of \$2,400 per student. Preference for these loans will be given to students holding fellowships, scholarships or part-time jobs. The repayment schedule has a maximum time of five years.

The number and amount of all of these loans will depend on the financial need, scholarship, promise and funds available. Loan applications should be submitted three months in advance of need.

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**

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**

### **Placement Services**

The centralized Placement Center offers placement services at no cost to students and alumni of the Davis and other campuses of the University of California. Services offered are of three types:

#### **Student Part-Time and Summer 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.

Placement advisers aid students in their search for part-time and summer employment. In addition the office receives job listings from employers and refers qualified students to these openings. To receive assistance students must be interviewed personally as satisfactory arrangements cannot be made by correspondence. Interested students should register with the Part-Time and Summer Employment Division upon their arrival on campus.

#### **Educational Placement Service**

Placement Service is available to students, former students, and graduates who are interested in teaching. The office assembles information into confidential files giving the background, training, and professional experience in order to match qualifications of its candidates with specifications of available positions. Placement advisers counsel candidates, communicate with employers, receive vacancy data, and arrange interviews. The University reserves the right to refer only those persons who are considered to be fully qualified.

**Agricultural and Industrial Placement Service**

Students and alumni seeking career employment in business, industry, agriculture, and government are invited to utilize the services of the Placement Center. Placement Advisers discuss matters of job choice and methods of obtaining these jobs with registrants. In addition, they arrange employment interviews, receive job listings from employers, and refer suitable registrants to these employers. Seniors and graduate students are urged to register with the Center early in their final year of study. Alumni may use the placement services at any time in their career.

**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. The San Francisco Office of the United States Veterans Administration is located at 49 Fourth Street, San Francisco, California 94103.

Veterans wishing to enroll under the provisions of Public Law 550 ("Korea" G. I. Bill expiring January 1, 1965) 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, California 95807.

**LIVING ACCOMMODATIONS**

The University maintains residence halls and dining units for single men and women and apartments for married students. The Davis Campus currently is able to provide living accommodations and meals for slightly less than 50 per cent of the registered students. In addition, meals only are available at the Memorial Union Dining Commons for students living off campus in private rooms or apartments.

In its residence hall program 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.

Student government functions in the residence halls: each hall maintains its own council to act on matters concerning the welfare of the individual residents.

Board and room in the University residence halls costs \$880 for the academic year. Rooms in the residence halls contain the necessary furniture, linen, blankets, and study lamps; the rent includes the weekly laundering of linen.

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

A residence card must be filed with the Dean of Women by every single woman student under 21 living off campus. This residence card must have the signature of her parent or guardian indicating approval of her residence at a specific location.

**Fraternities**

There are ten 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.

**Student Supplementary Health Insurance**

1. A supplementary health insurance plan is available at the time of registration. This insurance supplements the Student Health program and is used for medical care needed between semesters and when away from the campus. Procuring of this insurance is strongly urged.

2. *Foreign Students.* The acquisition of health insurance is a condition of registration for all non-immigrant foreign students.

**UNIVERSITY LIBRARY**

The University Library on the Davis campus contains about 340,000 books and receives annually about 7,500 current periodicals and serials. These have been selected to support the teaching and research needs of the College of Agriculture, the College of Engineering, 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 76-hour-a-week basis.

For further information students are referred to a series of information leaflets, 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. Verifications regarding enrollment, 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 Service 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 Service 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 Calendar*, 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 Achievement Test in English Composition taken after completion of the eleventh grade 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 336.) 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.

*Foreign Students.* 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. Students electing to satisfy the requirement by examination are requested to do so before the senior year. No unit credit will be received for completion of this requirement through examination.

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, 100, 102, 105, 106, 113, 128A, 163, 164, 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 227, Voorhies Hall.

### **CANDIDACY FOR DEGREES**

Each candidate for graduation must file an Announcement of Candidacy with the Registrar at the beginning of his senior year. The candidate must also confirm his intention to graduate by reporting to the Registrar during the first two weeks of his final semester. The dates for filing and confirming are published on pages 6 and 7 of the *General Catalogue*, and in the *Schedule and Directory*.

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.

Candidates for advanced degrees will file announcement of candidacy on the dates set by the Dean of the Graduate Division.

† 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.

### CREDIT AND SCHOLARSHIP

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.

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

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. A student must petition for removal of Grade E. See page 42 for details concerning the removal of deficiencies. 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 all 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.

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.

### **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 Spirit, 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 notify the Office of the Dean of Students. 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.

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.

**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, Wild West Days, and the all-important Orientation Week for incoming students.

The University band, an orchestra, ensemble groups, chorus, dramatics, 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 Motley, 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.

The University of California, Davis is a member of the Far Western Inter-collegiate Athletic Conference and stresses intramural and recreational as well as intercollegiate athletics. Included are football, basketball, track, rifle, baseball, tennis, wrestling, golf, swimming, and water polo. Independent student clubs provide the opportunity to play rugby and cricket. The Women's Athletic Association sponsors sports for all women students, including inter-collegiate playdays in basketball, volleyball, hockey, softball, badminton, tennis, rifle, and swimming.

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

**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), Padua (Italy), Tokyo

(Japan), and Madrid (Spain), 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 to 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 (University-wide) 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 (University-wide) 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 College during the senior year and completion of at least the final 24 units in the University.
    - 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:

	Units
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 agricultural business management as one of the fields of emphasis. Students interested in more advanced study may seek the doctorate in agricultural economics. 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)

	Units
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, zo- ology; 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
<b>Total units required for the Bachelor of Science degree.....</b>	<b>124</b>

\* 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, 115.

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 Master of Science and Doctor of Philosophy degrees. 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 and 3c above:

Agricultural Economics 100A, 100B, 106, and an upper division course in macro-economic theory.

\* 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 the Master of Education Degree. The department also offers programs of study leading to the secondary teaching credentials with majors in agriculture and home economics, including the credentials required for teaching classes reimbursed under the National Vocational Acts. Detailed information regarding graduate study for credentials and degrees 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 .....	(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) .....
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; Agricultural Education 160 or 187, 320A; Entomology 124; Irrigation 110; Plant Pathology 120; Soil Science 1.

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

### 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 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) .....
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; 9 units of Agricultural Economics, including six upper division units.

\* Mathematics beyond trigonometry.

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

**Agricultural Engineering**

Primary Field: No primary field given.

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

**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: 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, 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 1 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 1 or 110, and 100.

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

**Landscape Horticulture**

Primary Field: Botany 1, 111; Entomology 124 or Plant Pathology 120; Irrigation 1 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 105 and 105L, 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; 12 units in pomology (excluding courses 1 and 1L), which must include 100, 101, and 3 additional upper division units.

Secondary Field: 9 units in pomology, (excluding courses 1 and 1L), which must include 6 upper division units.

**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 upper division units of soil science.

**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; Botany 107, and one 3-unit upper division course in pomology.

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)

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) ...
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

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 100L 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.

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

**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.

**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 opera-

\* Mathematics beyond trigonometry.

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

tion, 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.

**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)	<i>Units</i>
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)....
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
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 Science and Technology 1, 103, 105, 105L and 110. In addition students following the enology area of interest in the Food Science major will take the following Viticulture and Enology courses: 3, 124, 125, 140.	

#### **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.

\* Mathematics beyond trigonometry.

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

**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)

a. <b>Home Economics and closely related fields</b>	<i>Units</i>
Lower division .....	6-12
Upper division .....	19-27
b. <b>Natural Sciences</b> .....	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. <b>Social Sciences</b> .....	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. <b>Humanities</b> .....	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 10; 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 or 196A-196B, 193 or 195, 197; English 1A, 1B; Philosophy 123 or 126; Psychology 1, 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; 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, 141; Food Science and Technology 107; Bacteriology 1; Biochemistry

\* Mathematics beyond trigonometry.

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

101; Chemistry 1A, 1B, 5, 8; Economics 1A, 1B; English 1A, 1B; Mathematics 13; Physics 2A, 2B; Physiology 1; Psychology 1.

#### **General Home Economics (Teaching and Agricultural Extension)†**

Design 130, 150; Home Economics 6, 7, 100A-100B, 112A-112B, 131, 133, 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; 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>
<b>a. Agriculture and closely related subjects.....</b>	<b>(24 units)</b>
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>b. Natural Sciences .....</b>	<b>(32 units)</b>
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

† 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.

\* Mathematics beyond trigonometry.

	Units
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
History and/or Political Science*** . . . . .	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

\*\* 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 requirement under 3c may be satisfied by completing two of the following courses:

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

\* Mathematics beyond trigonometry.

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
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; Botany 1, 111; Engineering 1A or 3, and 142; Mathematics 9A, 9B or 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)

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

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

<b>c. Social Sciences and Humanities*</b>	<b>(24 units)</b>
Economics .....	3
English and/or Speech .....	6
Electives .....	15
<b>d. Unrestricted electives .....</b>	<b>(16 units) 16</b>
<b>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.)</b>	<b>31</b>
Total units required for the Bachelor of Science degree .....	124
<b>5. Certain courses are required for the following majors and where applicable may be used in partial satisfaction of 3a, 3b, and 3c above:</b>	

#### **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; 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.

#### **Park Administration**

Botany 1, 111; Chemistry 1A, 8; Landscape Horticulture 1, 105A, 105B, 120, 128; Park Administration 110, 134, 140; Engineering 1A; Physical Education 140; Public Administration (6 units). Recommended: Agricultural Economics 18; Architecture 3 (Berkeley); Botany 107; 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 100 and 101; Soil Science 1.

#### **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 Economics 140; Agricultural Engineering 103; Irrigation 110; Viticulture 124, 125 or one 3-unit upper division course in pomology.

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

**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
Statistical methods .....	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 93.

**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

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

\* Requirement may be waived if the course is not available at the school where preveterinary work is done.

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

#### 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)	
	Units
a. Agriculture and closely related subjects.....	(29 units)
Agronomy and Range Management .....	16
Animal Husbandry .....	10
Soil Science .....	3
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) .....
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) .....	5
	—
Total units required for the Bachelor of Science degree.....	124

\*\* Mathematics beyond trigonometry.

\* 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.

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, 105, 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.

**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)

	Units
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) .....
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, 107; Agricultural Economics 1, 18, 100A, 100B; Agronomy 131; Biochemistry 101, 101L; Botany 120A, 120B; Chemistry 5, 8, 109, 110A, 110B, 112A; Engineering 1A, 3; Entomology 124; Geography 1, 3, 105, 131, 161; Geology 6, 104A, 104B, 112, 116, 117; Irrigation 100, 110, 115, 135, 150, 160; Mathematics 9A, 9B, 9C, 13, 16A, 16B, 109; 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.



Library

## 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 programs of instruction in 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 in Freshman Standing

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 70). 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:

Subject	Units
Algebra†	2
Plane geometry†	1
Trigonometry†	½
Chemistry or physics (both are desirable)	1
Mechanical drawing	1

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

### Admission to Upper Division.

The requirements for admission to the upper division in the College of Engineering are 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 (for engineering and science students)	8
c. Physics (for engineering and science students)	10
d. Engineering (subjects such as graphics, properties of materials, surveying, engineering measurements, statics, and circuit theory)	10

† Or equivalent integrated courses covering the same subject material.

	Minimum number of units
e. Humanistic-social studies (Must be selected from the list of courses approved by the Committee on Undergraduate Study) .....	6
f. Unspecified subjects (6 units may be in humanistic-social subjects; the remaining units should be in engineering, science, and mathematics subjects, and may include units in mathematics, physics, chemistry, and engineering in addition to the minimum numbers specified above; none of these units may be in military science or physical education .....	14
	<hr/> 60

The student admitted on this basis will not be required to take additional lower division courses except those which are prerequisite to upper division courses in his curriculum.

The above subject requirements are minimum. Students who enter with only 60 units will probably require more than four semesters to complete the upper division engineering curricula in the University. The University will accept a maximum of 70 units of advanced standing credit for college courses completed at a junior college.

The requirements for admission to the upper division are 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 are not 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 79).
5. Attain a grade C average in all courses of upper division level taken in satisfaction of required technical subjects 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 following two-year program is prescribed for all lower division students in the College of Engineering, with the *exception* of those students planning to enroll in the upper division program in Chemical Engineering. Its purpose is to provide the beginning students with the fundamentals in science, mathematics, and engineering essential as preparation for the professional studies of the upper division.

<b>Freshman Year</b>			
	<i>Fall</i>		<i>Spring</i>
Chemistry 1A .....	5	Chemistry 1B <sup>1</sup> .....	5
Engineering 3 .....	4	Engineering 4 .....	3
Mathematics 9A .....	4	Mathematics 9B .....	4
Humanistic-Social Studies .....	3	Physics 4A .....	4
	<hr/> 16		<hr/> 16

<b>Sophomore Year</b>			
	<i>Fall</i>		<i>Spring</i>
Engineering 45 .....	3	Engineering 35 .....	3
Mathematics 9C .....	4	Mathematics 109 .....	4
Physics 4B .....	4	Physics 4C .....	4
Humanistic-Social Studies .....	3	Humanistic-Social Studies <sup>2</sup> .....	3
Elective .....	3	Elective .....	3
	<hr/> 17		<hr/> 17

### LOWER DIVISION PROGRAM IN CHEMICAL ENGINEERING

(for students planning to enroll in the Upper Division Program  
in Chemical Engineering)

<b>Freshman Year</b>			
	<i>Fall</i>		<i>Spring</i>
Chemistry 1A .....	5	Chemistry 1B .....	5
Engineering 3 .....	4	Mathematics 9B .....	4
Mathematics 9A .....	4	Physics 4A .....	4
Humanistic-Social Studies .....	3	Humanistic-Social Studies .....	3
	<hr/> 16		<hr/> 16

<sup>1</sup> 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).

<sup>2</sup> 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.

**Sophomore Year**

Engineering 35 .....	3	Engineering 104 .....	3
Mathematics 9C .....	4	Mathematics 109 .....	4
Physics 4B .....	4	Physics 4C .....	4
Humanistic-Social Studies .....	3	Chemistry 5 .....	3
Elective .....	3	Elective .....	3
	—		—
	17		17

**UPPER DIVISION PROGRAMS**

The upper division programs of study in the several engineering areas (Agricultural, Chemical, Civil, Electrical and Mechanical) are described in the following pages. With the exception of Chemical Engineering, it will be noted that the subjects required in the first semester of the junior year are virtually the same in most of the programs. 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.

**Aerospace Engineering (133 units)**

Aerospace engineering is concerned with the problems of flight in the atmosphere of the earth and beyond. It consists of design in the airplanes, rockets, missiles, autogyros, helicopters, satellites and space stations. The field is so broad in scope that complete versatility in all aspects of aeronautics and astronautics cannot be achieved in a four-year academic program. Consequently, three programs of specialization are suggested in conjunction with a common foundation of courses. These options are: Aeronautics—A broad survey of the essentials of aeronautical systems; Aero-structures—A study of the structural aspects of aircraft, rockets, and satellites; Aerospace Mechanics—A study of the aerodynamic and inertial loading of flight vehicles and their guidance and control.

The areas of specialization may be modified to meet other areas of specialization as warranted by student interest. The purpose of the curriculum is to give the student a sound background in a chosen area of specialization while permitting him to become prepared for the additional graduate work that is becoming more and more essential in the engineering of today.

**Junior Year**

<i>Fall</i>		<i>Spring</i>	
Engineering 100A .....	3	Engineering 103 .....	3
Engineering 101 .....	2	Engineering 100B .....	3
Engineering 102 .....	3	Technical electives .....	9
Engineering 104 .....	3		—
Engineering 105 .....	3		—
Humanistic-Social Studies .....	3		—
	—		—
	17		15

**Senior Year**

Engineering 123 .....	3	Engineering 106 .....	3
Engineering 186 .....	3	Engineering 117 .....	3
Technical electives .....	9	Engineering 190 .....	2
Humanistic-Social Studies .....	3	Technical electives .....	6
—		Humanistic-Social Studies .....	3
	18		17

Suggested technical electives are:

**Aeronautics:**

Engineering 125	Mechanics of Compressible Fluids
Engineering 131	Structural Analysis
Engineering 135	Advanced Structural Analysis
Engineering 166	Automatic Feedback Control
Engineering 182	Linear Systems Analysis
Engineering 185	Intermediate Fluid Mechanics

**Aero-Structures:**

Engineering 121	Manufacturing Processes
Engineering 122	Introduction to Mechanical Vibrations
Engineering 131	Structural Analysis
Engineering 135	Advanced Structural Analysis
Engineering 183	Intermediate Mechanics of Materials
Engineering 184	Experimental Stress Analysis
Engineering 188	Engineering Materials

**Aerospace Mechanics:**

Engineering 125	Farm mechanics and machinery
Engineering 187	Automatic Feedback Control
Engineering 182	Linear Systems Analysis
Engineering 185	Intermediate Fluid Mechanics
Engineering 180	Instrumentation

### **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 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.

<b>Junior Year</b>			
<i>Fall</i>		<i>Spring</i>	
Engineering 100A .....	3	Engineering 100B .....	3
Engineering 101 .....	2	Engineering 103 .....	3
Engineering 102 .....	3	Engineering 118 or	
Engineering 104 .....	3	Engineering 131 .....	3
Engineering 105 .....	3	Engineering 186 .....	3
Humanistic-Social Studies .....	3	Technical Elective* .....	3
	<hr/> 17		<hr/> 15
<b>Senior Year</b>			
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
	<hr/> 17		<hr/> 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	Mechanics of Compressible Fluids
Engineering 132	Structural Mechanics
Engineering 133	Soil Mechanics
Engineering 136	Functional Aspects of Building Design
Engineering 168	Electromechanics
Engineering 180	Instrumentation Systems
Engineering 184	Experimental Stress Analysis
Engineering 185	Intermediate Fluid Mechanics
Soil Science 1	Introduction to Soil Science

### Chemical Engineering (133 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

\* 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.

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

##### Fall

Chemistry 110A	.....	3	Chemistry 110B	.....	3
Chemistry 112A	.....	5	Chemistry 112C	.....	3
Engineering 102	.....	3	Engineering 152	.....	4
Engineering 103	.....	3	Engineering 186	.....	3
Engineering 105	.....	3	Humanistic-Social Studies	.....	3
		17			16

##### Spring

#### Senior Year

Engineering 100A	.....	3	Engineering 106	.....	3
Engineering 101	.....	2	Engineering 155B	.....	2
Engineering 154	.....	3	Engineering 156	.....	3
Engineering 155A	.....	1	Engineering 158	.....	3
Engineering 190	.....	2	Technical elective	.....	3
Technical elective	.....	3	Humanistic-Social Studies	.....	3
Humanistic-Social Studies	.....	3			—
		17			17

Suggested technical electives are:\*\*

Bacteriology 1	Introduction to Microbiology
Bacteriology 106	Industrial Fermentations
Biochemistry 101	General Biochemistry
Biochemistry 101L	General Biochemistry Laboratory
Food Science and Technology 101	Chemistry and Biochemistry of Food Processing
Food Science and Technology 103	Physical and Chemical Methods for Food Analysis
Food Science and Technology 105, 105L	Food and Industrial Microbiology Laboratory

\*\* 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 106	Food and Industrial Microbiology
Engineering 100B	Summer Laboratory
Engineering 180	Electronics
Engineering 181	Instrumentation Systems
Mathematics 128A	Introduction to Field Theory
Mathematics 185	Numerical Analysis
Physics 121	Introduction to Functions of a Complex Variable
	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

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

#### Senior Year

Engineering 133 .....	3	Engineering 106 .....	3
Engineering 142 .....	3	Engineering 190 .....	2
Technical Electives .....	8	Technical Electives .....	9
Humanistic-Social Studies .....	3	Humanistic Social Studies .....	3

Suggested technical electives are: \*\*

*Irrigation, Drainage and Water Resources Engineering*

Engineering 125	Mechanics of Compressible Fluids
Engineering 143	Water Resources Engineering
Engineering 144	Principles of Drainage Engineering
Engineering 145	Hydraulic System Design
Engineering 146	Irrigation Engineering Laboratory
Engineering 147	Air and Water Pollution Control
Engineering 180	Instrumentation Systems
Engineering 185	Intermediate Fluid Mechanics
Irrigation 100	Soil-Water-Plant Relationships
Irrigation 160	Farm Irrigation Systems
Irrigation 170	Irrigation and Drainage Laboratory

*Structural Engineering and Mechanics*

Engineering 115	Farm Structures Design
Engineering 134	Analysis and Design of Buildings
Engineering 135	Advanced Structural Mechanics
Engineering 136	Functional Aspects of Buildings Design
Engineering 137	Construction Principles
Engineering 180	Instrumentation Systems
Engineering 184	Experimental Stress Analysis
Engineering 188	Engineering Materials

**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 105 .....	3	Engineering 182 .....	3
Humanistic-Social Studies .....	3	Physics 121 .....	3

\*\* 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.

<i>Fall</i>	<i>Senior Year</i>	<i>Spring</i>	
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
	<hr/>		
	17		17

*Suggested technical electives are:*

Engineering 124	Engineering Systems Design
Engineering 163	Data Systems
Engineering 164	Signal Analysis and Information Transmission
Engineering 165A-165B	Solid State Materials and Components
Engineering 167	Network Synthesis
Engineering 168	Electromechanics
Engineering 171A-171B	Electromagnetic Fields and Waves
Engineering 180	Instrumentation Systems
Engineering 185	Intermediate Fluid Mechanics
Engineering 186	Momentum and Energy Transfer
Engineering 187	Control Systems
Mathematics 128A-128B	Numerical Analysis
Mathematics 131A-131B	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 mechanical design.

<i>Fall</i>	<i>Junior Year</i>	<i>Spring</i>	
Engineering 100A .....	3	Engineering 103 .....	3
Engineering 100B .....	3	Engineering 118 .....	3
Engineering 101 .....	2	Technical Electives .....	6
Engineering 102 .....	3	Humanistic-Social Studies .....	3
Engineering 104 .....	3		
Engineering 105 .....	3		
	<hr/>		
	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

Suggested technical electives are: \*\*

*Heat-Fluid-Power*

Engineering 116	Agricultural Power
Engineering 124	Engineering Systems Design
Engineering 125	Mechanics of Compressible Fluids
Engineering 154	Chemical Engineering Transport Processes
Engineering 180	Instrumentation Systems
Engineering 181	Introduction to Field Theory
Engineering 182	Linear Systems Analysis
Engineering 185	Intermediate Fluid Mechanics

*Mechanical Design*

Engineering 119	Dynamics of Machines
Engineering 120	Advanced Machine Design
Engineering 121	Manufacturing Processes
Engineering 122	Introduction to Mechanical Vibrations
Engineering 124	Engineering Systems Design
Engineering 168	Electromechanics
Engineering 180	Instrumentation Systems
Engineering 182	Linear Systems Analysis
Engineering 183	Intermediate Mechanics of Materials
Engineering 184	Experimental Stress Analysis
Engineering 187	Control Systems

**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

\*\* 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.

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.

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 prerequisite courses will be taken in proper sequence.

### **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
Fluid mechanics	or power and machinery
Heat and mass transfer	Irrigation, drainage, and water re-
Hydrology	sources engineering
Solid and structural mechanics	Hydraulics

The graduate courses offered by the Department of Engineering are described in a later section of this catalogue (page 189).

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

### **Graduate Study in Applied Science**

The Department of Applied Science in the College of Engineering at the University of California, Davis, provides instruction at the graduate level leading to the degrees Master of Science in Engineering and Doctor of Philosophy in Engineering. The curriculum integrates studies in physics, chemistry, mathematics and engineering, and provides the student with the technical and scientific background for a career in nuclear science and engineering. Courses are offered both on the Davis campus and at the Livermore site of the University of California Lawrence Radiation Laboratory. The exceptional facilities of the Livermore site are used for study and research in such fields as reactor engineering, plasma physics, the behavior of materials, and computing technology. Much of the research necessary for the doctorate is conducted at the Livermore Laboratory.

The graduate courses offered by the Department of Applied Science are described in a later section of this catalogue (page 133).

## 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 88)

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. 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. Subject A (no degree credit) is considered as 3 units of work in calculating the student's course load. 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 or from B.S. to A.B. or vice versa within a given major, *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 the equivalent of 8 units in each of two languages instead of 12 units in one 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. 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 courses: 110\*, 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.

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

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

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.  
 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, 12.  
 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 3, 108, 150B, 165.  
 Sociology. All undergraduate courses except 18, 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, 150B.  
 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 102A, 102B (formerly 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:

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

**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 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 88), 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, which does not duplicate high school credit.

**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**

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.

Departmental programs are described in detail under "Courses of Instruction" beginning on page 99.

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

Students who are interested in obtaining teaching credentials are referred to page 96 of this bulletin.

**AMERICAN HISTORY AND LITERATURE**

*Major Adviser:* See Schedule and Directory.

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 30B. In addition History 4A, 4B is required for students electing History in Group 3, and English 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:

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

- History 170A, 170B
- History 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.

#### **INTERNATIONAL RELATIONS**

*Major Adviser: See Schedule and Directory.*

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 and world economics, 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 160A, 160B; 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 146 (Europe since 1870); History 190B (Far Eastern Civilization); Political Science 149 (International Communism).

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

#### **PHYSICAL SCIENCES**

*Major Adviser: See Schedule and Directory.*

The major in physical sciences is designed primarily for students who wish to obtain a general secondary credential. The lower division course require-

ments 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; Geology 1A or 6; Mathematics 9A, 9B, 9C.

##### *Upper Division Courses*

A total of 24 units of upper division courses in the physical sciences, of which not less than 15 units must be taken in a single subject; e.g., chemistry, physics, or geology.

#### **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.

#### **Preparation for Admission to Undergraduate Professional Schools**

The Schools of *Dentistry*, *Nursing*, *Optometry* and *Pharmacy* require 57-60 units of credit, including certain courses, for admission. The School of *Medicine* and the curriculum in *Physical Therapy* require 90 units of credit. While a student is enrolled in the College he must select programs of study that will satisfy College requirements, but courses can be selected that will also satisfy prerequisites for admission to a school. However, if transfer to a school is not made at the end of the sophomore year (upon completion of 60 units of credit), the student must apply for and be accepted in a major for the A.B. or B.S. degree in the College, and all subsequent programs in the College must apply toward completion of that major. The specific requirements for admission to each school are set forth in the announcement of the school, which may be obtained from the Registrar. The dean of the school in which a student is interested may be consulted for further information.

Students interested in pursuing the following preprofessional curricula are referred to the following departments: *Prelegal*—Political Science; *Pre-social Welfare*—Sociology; *Preurban and Regional Planning*—Geography.

Preparation for post-graduate training in *Medical Technology* may be accomplished by completing the regular undergraduate major program in *Microbiology*.

#### **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.

Thirty-six units in upper division courses (numbered 100-199) must be selected from the list given below.

The following list refers to the courses as given in the departmental offerings for the fall and spring semesters, 1964-1965.

- American History and Literature. All undergraduate courses.  
Anthropology. All undergraduate courses.  
Art. All undergraduate courses. Performance courses: 2A\*, 2B\*, 3A\*, 3B\*, 12\*, 14A\*, 14B\*, 16\*, 101A\*, 101B\*, 121\*, 128\*, 128B\*, 141\*, 142\*, 143\*.  
Bacteriology. All undergraduate courses except 106.  
Biological Sciences. All undergraduate courses.  
Botany. All undergraduate courses except 8, 107, 155, 180.  
Chemistry. All undergraduate courses.  
Classics. All undergraduate courses.  
Dramatic Art. All undergraduate courses. Performance courses: 124\*, 180\*.  
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.  
Military Science. All 6 units of lower division courses.  
Music. All undergraduate courses. Performance courses: 41\*, 42\*, 43\*, 44\*, 46A\*, 46B\*, 141\*, 142\*, 143\*, 144\*.  
Oriental Languages. All undergraduate courses.  
Philosophy. All undergraduate courses.  
Physics. All undergraduate courses.  
Physiology. 1, 1L.  
Political Science. All undergraduate courses.  
Psychology. All undergraduate courses.  
Russian. All undergraduate courses.  
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

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

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." Petitions to enroll in courses under these circumstances must be filed with the Office of the Registrar not later than the last day to add courses for admission with a \$5 fee. The new application will be acted upon in the study list, and this commitment may not be reversed after that date. 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.

## 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):	<i>Units</i>
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 com-

\* 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 waived if the course is not available at the school where preveterinary work is done.

§ Mathematics beyond trigonometry.

pleted at that time, but the student must supply a transcript showing work in progress.

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.

The majority of students admitted to the School of Veterinary Medicine are residents of California, but properly qualified applicants from anywhere in the world are considered. Several places in each class are occupied by students from other western states.

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	Pathology 122A, 122B .....	5	5
Physiological Sciences 101 ..	..	5	Physiological Sciences 123 ..	4	4
Physiological Sciences 101L ..	..	2	Veterinary Micro- biology 121, 124 .....	10	6
Physiological Sciences 140 ..	..	6	Veterinary Micro- biology 125 .....	..	1
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 ..	..	..
Avian Medicine 208 .....	3	..	Clinical Pathology 251A-251B .....	..	..
Clinical Pathology 201, 202 ..	3	3	Pathology 251A-251B .....	..	..
Veterinary Medicine 203, 205 .....	..	5	Public Health 240 .....	..	5
Veterinary Medicine 206 ..	..	3	Veterinary Medicine 204 ..	..	..
Veterinary Medicine 210, 220 .....	..	4	Veterinary Medicine 207 ..	4	..
Veterinary Medicine 230, 250 .....	..	2	Veterinary Medicine 223 ..	4	..
Veterinary Medicine 254 ..	4	1	Veterinary Medicine 224 ..	2	..
Veterinary Medicine 260 ..	2	..	Veterinary Medicine 225 ..	1	..
	18	20	Veterinary Medicine 245 ..	2	..
			Veterinary Medicine 251A- 251B .....	5	5
			Veterinary Medicine 256A- 256B .....	1	1
			Veterinary Medicine 270A- 270B .....	..	..
				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.)	Genetics (M.S., Ph.D.)
Agricultural Economics (M.S., Ph.D.)	Geological Sciences (M.S.)
Agricultural Education (M.Ed.)	German (M.A.)
Agronomy (M.S.)	History (M.A., Ph.D.)
Animal Husbandry (M.S.)	Home Economics (M.S.)
Animal Physiology (M.S., Ph.D.)	Horticulture (M.S.)
Anthropology (M.A., Ph.D.)	International Agricultural Development (M.S.)
Art (M.A.)	Irrigation (M.S., Ph.D.)
Biophysics (Ph.D.)	Mathematics (M.A., Ph.D.)
Botany (M.A., Ph.D.)	Microbiology (M.A., Ph.D.)
Chemistry (M.S., Ph.D.)	Music (M.A.)
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., Ph.D.)	Political Science (M.A.)
Education (Teaching Credential)	Poultry Science (M.S.)
Engineering (M.Eng., D.Eng., M.S., Ph.D.)	Psychology (M.A.)
English (M.A., Ph.D.)	Range Management (M.S.)
Entomology (M.S., Ph.D.)	Sociology (M.A.)
Food Science (M.S.)	Soil Science (M.S., Ph.D.)
French (M.A.)	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 93).

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

### **Curricula for Teacher Education**

Curricula are offered which lead to the Standard Teaching Credential with a Specialization in (1) Elementary Teaching and (2) Secondary Teaching. Curricula are also offered for the secondary credentials required for teaching classes reimbursed under the National Vocational Acts. Two routes for obtaining each type of credential are available: a student-teaching program (the usual route) and an internship program (limited in enrollment). The elementary and secondary intern programs entail enrollment in a preservice summer session involving some student teaching, 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. They are advised to consult with the appropriate subject-matter representatives and members of the Department of Education or the Department of Agricultural Education, as appropriate, as early as possible in their undergraduate careers. This planning should insure completion of credential requirements in general, as well as the specific ones in general education, in a teaching major and a teaching minor, and in professional education.

#### **GENERAL REQUIREMENTS**

Upon completion of the Davis credential programs, those students recommended to the State Department of Education by the Department of Education or by the Department of Agricultural Education for credentials will be assisted in satisfying certain requirements of the State of California. These include the submission of a health certificate dated within the 12 months preceding the date of application for the credential, the submission of duplicate personal identification cards, and the enclosure of certain fees. But students are advised to be aware at an earlier date of other requirements by the State.

In scholarship the State of California requires that "In courses above high school grade offered toward fulfillment of requirements for a credential, the applicant shall have a scholarship record of C or better on a five-point scale, or a scholarship that is required by an approved educational institution for granting a degree." Moreover, "Each assignment in directed teaching shall be completed with a grade of C or better on a five-point scale."

Each applicant for a credential must take a course in the United States Constitution. He must have attained the age of 18 years, and he must be a citizen of the United States (or present evidence of declaration of intent).

Davis requires of all candidates for credentials a bachelor's degree from Davis or from another acceptable institution, a scholarship record of 2.5 or better in upper division work and 2.75 or better in all graduate work, and admission to graduate standing in the Graduate Division. Application information for the latter, including final filing dates and forms, is available at the Graduate Office.

In addition to letters of recommendation as a part of the procedure for admission to a credential program, Davis requires a report to the Department of Education reflecting the consensus of the department on the student's mastery of his subject matter area. Students on a limited status cannot enter the teaching internship programs.

Davis also requires that when a 300-level course is available in the department of a student's major or "in the area" of a student's major, such course

will be required as a part of the student's program for the teaching credential "in addition to the state credential requirements and the student's teaching major requirements."

#### **SPECIFIC REQUIREMENTS**

##### **In General Education**

In satisfying the breadth requirements for the baccalaureate degree, most applicants for teaching credentials will have completed the State's requirements in general education. But each is responsible for so planning his courses that he can furnish proof of having completed at least forty-five semester hours of course work in an approved institution in the required number of areas of those listed.

The candidate for the secondary school credential must include course work in *four* of the areas listed; for the elementary school credential, work in *five*. Both must include the English and competency requirements described under "Humanities." "The English and the demonstrated competency shall fulfill the humanities area, but the applicant may offer additional course work in the humanities area as part of the 45 semester hours. (Not more than six semester hours of course work taken to satisfy this requirement shall apply toward the fulfillment of the requirements for either a major or a minor.)"

The areas of general education are as follows:

(1) Humanities, excluding foreign languages for the purposes of this requirement but including a year of English. (In addition, the applicant shall demonstrate competence in composition either by passing a course in composition or by passing an examination given by the institution in lieu thereof.)

(2) Social sciences. (The course work taken to satisfy Education Code Section 13132 may be counted toward this requirement.)

(3) Natural sciences.

(4) Mathematics requiring as a prerequisite an understanding and knowledge of high school algebra and geometry. (Applicants for the elementary credential should choose a course which satisfies both this requirement and section g. of 6130, requiring as a part of "professional preparation": "Three semester hours of course work in the theory of the structure, arithmetic, and algebra of the real number system or three semester hours of course work in calculus.")

(5) Fine arts.

(6) A foreign language. (The successful completion in an approved institution of an examination covering the speaking, reading, writing, and understanding of a foreign language shall be accepted in lieu of course work in a foreign language but shall not count toward the 45 semester hours specified.) For any credential issued prior to September 1, 1967, this foreign language requirement is waived for students who have completed successfully in a high school two full school years in a single foreign language.

##### **In Professional Education**

In addition to satisfying the general education requirements, the applicant for the credential must complete his "professional preparation." The Davis programs differ, as do the state requirements, in the number of courses in professional education; the secondary program requiring 16 to 17 semester hours; the elementary, 22.

##### **With a Specialization in Secondary Teaching**

The student preparing to teach in secondary schools who goes the student-teaching route would probably take Education 320A, Introduction to Teaching in Secondary Schools (1) as early as his junior year. The teaching intern student would take this course in the spring term of his senior year,

and it might be recommended rather than required for some transfer students in the intern program. The student then takes the following courses in his junior, senior, or graduate years:

- Education 110. Introduction to Educational Psychology (3)
- Education 120. Educational Sociology (3)
- Education 320E. Methods of Teaching in Secondary Schools (2)
- Education 320C. Supervised Teaching in Secondary Schools (8)

#### **With a Specialization in Elementary Teaching**

The student preparing to teach in elementary schools would take the following courses:

- Education 330A. Introduction to Teaching in Elementary Schools (2)
- Education 110. Introduction to Educational Psychology (3)
- Education 120. Educational Sociology (3)
- Education 300. Language Arts in the Elementary School (2)
- Education 302. Elementary School Curriculum: Social Studies and Science (2)
- Education 330E. Methods of Teaching in Elementary Schools (2)
- Education 330C. Supervised Teaching in Elementary Schools (8)

#### **In Teaching Majors and Minors**

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. A graduate year of work permits further selection of courses for completion of teaching majors and minors. Helpful guidance may be obtained from the subject representatives.

Teaching majors and teaching minors, as well as subject representatives, have been designated by the departments and approved by the Non-Vocational Teacher Training Committee of the Academic Senate. Teaching majors and minors are of two types: (1) "Single Subject Teaching Majors and Minors" and (2) "Teaching Major in Subject Constituting Part of an 'Interdepartmental Major' (Secondary) or 'Diversified Major' (Elementary)." For a list of the teaching majors and minors, the requirements for each, and the subject representatives, inquiry should be made to the appropriate departmental offices or to the offices of the Department of Education, the Department of Agricultural Education, the Graduate Division, or of the Registrar.

# 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, 1964-1965.

‡ Absent on leave, fall semester 1964-1965.

§ Absent on leave, spring semester 1965.

¹ Sabbatical leave in residence, 1964-1965.

² Sabbatical leave in residence, fall semester 1964-1965.

³ Sabbatical leave in residence, spring semester 1965.

\* Not to be given, 1964-1965.

⁴ Not to be given, fall semester 1964-1965.

⁵ Not to be given, spring semester 1965.

# 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

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### *Committee in Charge:*

- Maynard A. Amerine, Ph.D., *Professor of Enology.*  
Lawrence J. Andrews, Ph.D., *Professor of Chemistry.*  
Richard A. Bernhard, Ph.D., *Associate Professor of Food Science and Technology.*  
Clinton O. Chichester, Ph.D., *Professor of Food Science and Technology.*  
Edwin B. Collins, Ph.D., *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. Davis, 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 Biophysics.*  
Eugene L. Jack, Ph.D., *Professor of Food Science and Technology.*  
Walter G. Jennings, Ph.D., *Associate Professor of Food Science and Technology.*  
Jerome J. Jurinak, Ph.D., *Lecturer in Soil Chemistry.*  
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.*  
Bor S. Luh, Ph.D., *Lecturer in Food Science and Technology.*  
George L. Marsh, M.S., *Professor of Food Science and Technology.*  
Mendel Mazelis, Ph.D., *Lecturer in Food Science and Technology.*  
Emil M. Mrak, Ph.D., *Professor of 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.*

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† Absent on leave, 1964-1965.

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.*

#### 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.

## AGRICULTURAL ECONOMICS

Loy L. Sammet, Ph.D., *Chairman of the Department, Berkeley-Davis.*  
Benjamin C. French, Ph.D., *Vice-Chairman of the Department.*  
Department Office, 118 Voorhies Hall

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 (Berkeley Campus).*  
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., Ph.D., *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. Sosnick, Ph.D., *Associate Professor of Agricultural Economics.*  
Warren E. Johnston, Ph.D., *Assistant Professor of Agricultural Economics.*  
Samuel H. Logan, Ph.D., *Assistant Professor of Agricultural Economics.*  
—, *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. Faris, Mr. Foytik, Mr. Johnston, Mr. Logan, Mr. Sosnick.

*Bachelor of Science Major Program and Graduate Study.* See page 52.

### LOWER DIVISION COURSES

**1. Agricultural Industry.** (3) II. 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.

Prerequisite: sophomore standing. Not open to students with credit for Business Administration 18.

Introduction to law, contracts, sales, and agency.

**49. Field Practice.** (1) II. Mr. Snyder  
Field trip during Spring Recess to observe aspects of the production, processing, handling, and distribution of agricultural products.

### 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, 1964–1965.

**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. Logan

Lecture—3 hours.

Prerequisite: course 100A or equivalent.

The application of economic principles to 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. Johnston

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.

**115. Agricultural Business Management. (3) I.**

Mr. Foytik

Lecture—3 hours.

Prerequisite: Economics 1A or 1B or consent of the instructor.

Application of management principles and practices to agricultural business; economic and institutional aspects of organization and management; planning, control, and decision-making processes.

**120. Agricultural Policy. (3) II.**

Lecture—3 hours.

Prerequisite: Economics 1A, 1B.

Analytical and historical treatment of economic problems and of governmental policies and programs affecting American agriculture.

**125. Comparative Agriculture. (3) I.**

Mr. Hedges

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. Sosnick

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. DeLoach

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. Hedges; II. Mr. McCorkle.

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. Johnston

Lecture—2 hours; laboratory—3 hours.

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.

One field trip is required.



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.**

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.**

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.

\* Not to be given, 1964-1965.

**176. Economic Analysis in Resource Development and Use. (3) II.**

Lecture—3 hours.

Mr. Snyder

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.

**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****200A-200B. Economics of Agricultural Production, Consumption and Trade. (3-3) Yr.**

I. Mr. Dean; II. Mr. Sosnick

Lecture—3 hours.

Theory of the firm and industry, with particular reference to production; market structures, single and multiple products, uncertainty; theory of demand and consumption; and location theory and interregional trade.

**210. Econometric Methods. (3) II.**

Lecture—3 hours.

Prerequisite: Mathematics 131A or the equivalent.

Statistical models and their use in estimation of economic relationships; single and multiple equation systems.

**220. Agricultural Policy. (3) I.**

Lecture—3 hours.

Welfare considerations and efficiency criteria as related to agricultural policy; an appraisal of agricultural policy in a changing economy.

**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.

**253. Quantitative Analysis of Operational Problems. (3) I.**

Mr. Faris

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.

**257. Production Planning and Market Forecasting. (3) II.**

Mr. Logan

Lecture—3 hours.

Quantitative analysis of production systems by statistical, economic, and engineering methods; methods of forecasting prices and sales for the individual firm; problems of investment, location, scale of operations, and pricing.

**260. Administrative Organization and Policy Formation. (3) II.**

Lecture—3 hours.

Mr. DeLoach

Concepts and techniques of administration in the business firm; formulation and implementation of management goals; planning, procuring, organizing, and controlling physical factors and personnel.

**280A-280B. Analysis of Research in the Economics of Agriculture.**

(3-3) Yr.

Lecture—3 hours.

Current research problems and methods of analysis in agricultural economics. A comprehensive approach to economic problems of agriculture, including analysis of production, supply, and demand for firm and industry; regional economics, and interregional trade.

**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 Voorhies Hall

Sidney S. Sutherland, M.S., *Professor of Agricultural Education, Coordinator of Teacher Education.*

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:*

*Secondary Credentials—Agriculture.*—Mr. Juergenson.

*Secondary Credentials—Home Economics.*—Miss Johnson.

*Bachelor of Science Major Program and Graduate Study.* See page 53.  
*Requirements for Teaching Majors and Minors.* See page 53.

### LOWER DIVISION COURSE

**10. Introduction to Agricultural Education.** (2) I. Mr. Thompson  
Lecture—2 hours.

Survey of entire field of education in agriculture. Vocational surveys, occupational analysis. The role and relationship of agriculture in California and the nation to occupational opportunities. Study of professions relating to agriculture.

### 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.

**187. Extension Education in Agriculture and Home Economics.** (2) II. Miss Regan  
Lecture—1 hour; laboratory or field trip—3 hours.  
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.

† Absent on leave, fall semester, 1964–1965.

**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.

**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. Home Economics. 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.

<sup>†</sup> 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, 1964, will begin on or about September 1 and end January 29. For the spring semester, 1965, they will begin on or about February 1 and end June 11. Students should make arrangements accordingly.

Sec. 2. Home Economics. 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.

**‡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. Home Economics. Miss Johnson

Extended and varied teaching experience under supervision.

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‡ 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, 1964, will begin on or about September 1 and end January 29. For the spring semester, 1965, they will begin on or about February 1 and end June 11. Students should make arrangements accordingly.

## AGRICULTURAL ENGINEERING

Coby Lorenzen, Jr., M.S., *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.*

Allan A. McKillop, Ph.D., *Associate Professor of Agricultural Engineering and Associate Professor of Engineering.*

Herbert B. Schultz, Ph.D., *Associate Professor of Agricultural Engineering and Lecturer in Geography.*

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.*

Stanton R. Morrison, Ph.D., *Assistant Professor of Agricultural Engineering.*

Cletus E. Shertz, Ph.D., *Assistant Professor of Agricultural Engineering.*

Gerald L. Zachariah, Ph.D., *Assistant Professor of Agricultural Engineering.*



Todd V. Crawford, M.S., *Lecturer in Agricultural Engineering.*

John B. Dobie, M.S., *Lecturer in Agricultural Engineering.*

Roger E. Garrett, M.S., *Lecturer in Agricultural Engineering.*

Joseph P. Gentry, M.S., *Lecturer in Agricultural Engineering.*

Charles R. Kaupke, M.S., *Lecturer in Agricultural Engineering.*

Michael O'Brien, Ph.D., *Lecturer in Agricultural Engineering.*

Errol D. Rodda, M.S., *Acting Assistant Professor of Engineering.*

### LOWER DIVISION COURSE

#### 12. Survey and Problems in Agricultural Engineering. (2) I.

Lecture—2 hours.

Mr. Bainer, Mr. Dobie

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

- 103. Agricultural Power.** (3) II. Mr. Kaupke  
 Lecture—2 hours; laboratory—3 hours.  
 Prerequisite: Physics 2B or 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. Rodda  
 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 windbreaks. 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

## GRADUATE COURSE

- 299. Research.** (1-6) I and II. The Staff

## PROFESSIONAL COURSES

- 314A. Agricultural Engineering Problems and Techniques for Teachers.** (2) I. Mr. Gentry  
 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. Garrett

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 2B or 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

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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 and Professor of Genetics.*

†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.*

Robert S. Loomis, Ph.D., *Associate Professor of Agronomy.*

William A. Williams, Ph.D., *Associate Professor of Agronomy.*



Beecher Crampton, M.S., *Lecturer in Agronomy.*

Ray C. Huffaker, Ph.D., *Lecturer in Agronomy.*

Charles A. Raguse, Ph.D., *Lecturer in Agronomy.*

Franklin C. Raney, Ph.D., *Lecturer in Agronomy.*

Dale G. Smeltzer, Ph.D., *Lecturer in Agronomy.*

C. H. E. Werkhoven, Ph.D., *Lecturer in Agronomy.*

J. Caswell Williams, Jr., Ph.D., *Lecturer in Agronomy.*

*Departmental Major Advisers.*—Mr. Laude, 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. 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.

† Absent on leave, 1964-1965.

**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.

**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. Stanford

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. Loomis

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.**

The Staff

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. J. C. Williams

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. 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. Laude  
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)  
Tropical Crop Production (International Agricultural Development 101)  
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

Marvin Zetterbaum, Ph.D., *Chairman of the Committee.*  
Committee Office, 222 Sproul Hall.

### *Committee in Charge:*

Herbert Bogart, Ph.D., *Assistant Professor of English.*  
C. Bickford O'Brien, Ph.D., *Professor of History.*  
Kenneth Kammeyer, Ph.D., *Assistant Professor of Sociology.*  
Alan A. Stambusky, Ph.D., *Assistant Professor of Dramatic Art.*  
†Wayne Thiebaud, M.A., *Assistant Professor of Art.*  
Irwin Unger, Ph.D., *Associate Professor of History.*  
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 88).

*Group Major Adviser.*—Mr. Zetterbaum.

*The Major Program.*—See description, page 86.

*The Major with Honors.*—See description, page 87.

### 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, 1964-1965.

## ANATOMY

Logan M. Julian, D.V.M., Ph.D., *Chairman of the Department.*  
Department Office, 1042 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.*



Leslie J. Faulkin, Jr., M.A., *Acting 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. Faulkin, 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.** The Staff  
Laboratory.  
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

\* Not to be given, 1964-1965.

## ANIMAL HUSBANDRY

Hubert Heitman, Jr., Ph.D., *Chairman of the Department.*  
Department Office, 126 Animal Science Building

Floyd D. Carroll, 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.*  
Robert C. Laben, Ph.D., *Professor of Animal Husbandry.*  
Glen P. Lofgreen, Ph.D., *Professor of Animal Husbandry.*  
James H. Meyer, Ph.D., *Professor of Animal Husbandry.*  
Wade C. Rollins, Ph.D., *Professor of Animal Husbandry.*  
William C. Weir, Ph.D., *Professor of Animal Husbandry.*  
Harold H. Cole, Ph.D., *Professor of Animal Husbandry, Emeritus.*  
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 and Associate Professor of Physiology.*  
G. Eric Bradford, Ph.D., *Associate Professor of Animal Husbandry.*  
Moses T. Clegg, Ph.D., *Associate Professor of Animal Husbandry and Associate Professor of Physiology.*  
Irving I. Geschwind, 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.*  
Harold F. Hintz, Ph.D., *Assistant Professor of Animal Husbandry.*  
Robert G. Loy, Ph.D., *Assistant Professor of Animal Husbandry.*

◇

William N. Garrett, 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. Ronning, Mr. Loy.

*Bachelor of Science Major Program and Graduate Study.* See page 56.

### 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 (may be taken concurrently) 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.

11. **Livestock and Dairy Cattle Judging.** (2) II. Mr. Heitman  
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 types 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. Mr. Hintz  
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. Mr. Lofgreen  
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 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. Mr. Garrett  
Laboratory—6 hours.  
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. —  
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  
 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. Ronning  
 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  
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.** The Staff (Mr. Heitman in charge)  
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.** —————  
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.
- 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.
- 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 (Mr. Heitman in charge)  
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, 1964-1965.

## ANIMAL PHYSIOLOGY

Frederick W. Lorenz, Ph.D., *Chairman of the Department*  
Departmental Office, 1093 Haring Hall

Frederick W. Lorenz, Ph.D., *Professor of Physiology.*

Edward A. Rhode, Jr., D.V.M., *Professor of Veterinary Medicine and Professor of Physiology.*

Arthur H. Smith, Ph.D., *Professor of Physiology.*

James M. Boda, Ph.D., *Associate Professor of Animal Husbandry and Associate Professor of Physiology.*

Ray E. Burger, Ph.D., *Associate Professor of Poultry Husbandry and Associate Professor of Physiology.*

Moses T. Clegg, Ph.D., *Associate Professor of Animal Husbandry and Associate Professor of Physiology.*

Frank X. Ogasawara, Ph.D., *Assistant Professor of Poultry Husbandry and Assistant Professor of Physiology.*



Arthur L. Black, Ph.D., *Professor of Physiological Chemistry.*

Emanuel Epstein, Ph.D., *Lecturer in Plant Nutrition.*

Jiro J. Kaneko, D.V.M., *Associate Professor of Clinical Pathology.*

Edward C. Maxie, Ph.D., *Lecturer in Pomology.*

Stanton R. Morrison, Ph.D., *Assistant Professor of Agricultural Engineering.*

Pran Vohra, Ph.D., *Lecturer in Physiology.*

### *Graduate Group in Animal Physiology*

Ursula K. Abbott, Ph.D., *Associate Professor of Poultry Husbandry.*

Hans Abplanalp, Ph.D., *Associate Professor of Poultry Husbandry.*

Norman F. Baker, D.V.M., Ph.D., *Associate Professor of Parasitology.*

Ransom L. Baldwin, Jr., Ph.D., *Assistant Professor of Animal Husbandry.*

Arthur L. Black, Ph.D., *Professor of Physiological Chemistry.*

James M. Boda, Ph.D., *Associate Professor of Animal Husbandry and Associate Professor of Physiology.*

Ray E. Burger, Ph.D., *Associate Professor of Poultry Husbandry and Associate Professor of Physiology.*

Moses T. Clegg, Ph.D., *Associate Professor of Animal Husbandry and Associate Professor of Physiology.*

Harold H. Cole, Ph.D., *Professor of Animal Husbandry, Emeritus, Chairman of the Group.*

†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.*

Donald E. Jasper, D.V.M., Ph.D., *Professor of Clinical Pathology.*

Charles L. Judson, Ph.D., *Assistant Professor of Entomology.*

Logan M. Julian, D.V.M., Ph.D., *Professor of Anatomy.*

Jiro J. Kaneko, D.V.M., Ph.D., *Associate Professor of Clinical Pathology.*

Clarence F. Kelly, M.S., *Professor of Agricultural Engineering and Professor of Engineering.*

Max Kleiber, Sc.D., *Professor of Animal Husbandry, Emeritus.*

Frederick W. Lorenz, Ph.D., *Professor of Physiology.*

† Absent on leave, 1964-1965.

Robert G. Loy, Ph.D., *Assistant Professor of Animal Husbandry*.  
Larry Z. McFarland, D.V.M., Ph.D., *Assistant Professor of Anatomy*.  
Frank X. Ogasawara, Ph.D., *Assistant Professor of Poultry Husbandry and Assistant Professor of Physiology*.  
Harold R. Parker, D.V.M., Ph.D., *Assistant Professor of Physiology*.  
Stuart A. Peoples, M.D., *Professor of Comparative Pharmacology*.  
Edward A. Rhode, Jr., D.V.M., *Professor of Veterinary Medicine and Associate Professor of Physiology*.  
George W. Salt, Ph.D., *Associate Professor of Zoology*.  
Arthur H. Smith, Ph.D., *Professor of Physiology*.  
Walter S. Tyler, D.V.M., Ph.D., *Associate Professor of Anatomy*.  
Barry W. Wilson, Ph.D., *Assistant Professor of Poultry Husbandry*.  
Wilbor O. Wilson, Ph.D., *Professor of Poultry Husbandry*.  
*Departmental Major Adviser*.—Mr. Lorenz.  
*Bachelor of Science Major Program and Graduate Study*. See page 56.

**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 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.
- 108. Biodynamics.** (3) II. The Staff (Mr. Morrison in charge)  
Lecture—3 hours.  
Prerequisite: Animal Husbandry 110; Mathematics 16B; Physics 2B.  
A study of rates and dynamics of physiological processes.
- 120A. Comparative Physiology.** (2) II. Mr. Smith, Mr. Rhode  
Lecture—2 hours.  
Prerequisite: Animal Husbandry 110 or Physiological Sciences 140 or the equivalent (may be taken concurrently).  
Comparisons of physiological functions in the animal kingdom: respiration and circulation.  
Offered in odd-numbered years.
- \*120B. Comparative Physiology.** (2) I. —, Mr. Lorenz  
Lecture—2 hours.  
Prerequisite: Animal Husbandry 110 or Physiological Sciences 140 or the equivalent (may be taken concurrently). Course 120A is not prerequisite to 120B.  
Integrative mechanisms (neural and humoral).  
Offered in odd-numbered years.

\* Not to be given 1964-1965.

**\*120C. Comparative Physiology. (2) II.**

Mr. Boda, Mr. Kaneko

Lecture—2 hours.

Prerequisite: Animal Husbandry 110 or Physiological Sciences 140 or the equivalent (may be taken concurrently). Courses 120A and 120B are not prerequisite to 120C.

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

**\*214. Electroneurophysiology. (4) I.**

———, Mr. Burger

Lecture—2 hours; laboratory—6 hours.

Prerequisite: Animal Husbandry 110 or the equivalent; Biochemistry 101. Recommended: course 100.

Electrical activity of neurons and neuro-effector junctions; physiology of the neurons as studied by their electrical activity.

**243. Use of Isotopes as Tracers in Biological Research. (2) I.**

Lecture—2 hours. The Staff (Mr. Black in charge)

Discussion of the use of isotopes as tracers in biological systems.

**243L. Laboratory in Use of Isotopes as Tracers in Biological Research.**

(2) I. The Staff (Mr. Black in charge)

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.

**299. Research (1-9) I and II.**

The Staff

## 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)

\* Not to be given, 1964-1965.

**Kinesiology** (Physical Education 103A-103B)

**Physiological Chemistry** (Physiological Sciences 101, 101L)

**Intermediary Metabolism of Animals** (Physiological Sciences 205, Biochemistry 150A, 150B, Clinical Pathology 203)

**Radiation Biology** (Physiological Science 225)

**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)

**Cell Biology** (Zoology 121, 121L)

**Invertebrate Physiology** (Zoology 142 and 142L)

## ANTHROPOLOGY

Martin A. Baumhoff, Ph.D., *Chairman of the Department.*  
Department Office, 331 Voorhies Hall

David L. Olmsted, Ph.D., *Professor of Anthropology*.  
Martin A. Baumhoff, Ph.D., *Associate Professor of Anthropology*.  
Yehudi A. Cohen, Ph.D., *Associate Professor of Anthropology*.  
†Daniel J. Crowley, Ph.D., *Associate Professor of Anthropology and Associate Professor of Art*.  
†Allan D. Coulter, Ph.D., *Assistant Professor of Anthropology*.  
†Phyllis C. Jay, Ph.D., *Assistant Professor of Anthropology*.  
Warren G. Kinzey, Ph.D., *Assistant Professor of Anthropology and Assistant Professor of Zoology*.

William C. Smith, A.B., *Acting Assistant Professor of Anthropology*.  
Stephen A. Tyler, M.A., *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 88).

*Departmental Major Advisers.*—Mr. Crowley, Mr. Olmsted, Mr. Smith.

### *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. and Ph.D. degrees in anthropology. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Anthropology.

## 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. Cohen, Mr. Tyler  
 Lecture—3 hours.  
 Prehistory and growth of culture; diversity of cultures considered from the aspects of language, economics, kinship, art, magic, and religion.

† Absent on leave, fall semester 1964.

† Absent on leave, 1964-1965.

## UPPER DIVISION COURSES

- 102. Ethnology. (3) I.** Mr. Smith  
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. Whitehead  
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. Coulthard  
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. Comparative Linguistics. (3) II.** Mr. Olmsted  
Lecture—3 hours.  
Prerequisite: course 110A.  
Linguistic prehistory, historical linguistics and reconstruction; dialect geography.
- 119. Culture and Personality. (3) I.** Mr. Cohen  
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.
- 120. Language and Culture. (3) I.** Mr. Tyler  
Lecture—3 hours.  
Prerequisites: course 110A.  
Language and thought; classification of languages; linguistic aspects of culture; language, nation, and state.
- \*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.
- 122. Economic Anthropology. (3) II.** Mr. Tyler  
Lecture—3 hours.  
Prerequisite: Consent of the instructor.  
Economic behavior in non-industrial societies; its social and cultural setting, and its modern changes.

\* Not to be given, 1964-1965.

**124. Comparative Religion. (3) II.**

Mr. Cohen

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. Tyler

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) I.**

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.

**143. Peoples of India. (3) I.**

Mr. Tyler

Lecture—3 hours.

Prerequisite: course 2 or consent of the instructor.

Development of Indian cultural traditions; social organization and social trends.

**\*147. Peoples of the Pacific. (3) I.**

Mr. Coulter

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. Whitehead

Lecture—3 hours.

Prerequisite: course 1 or equivalent.

Physical characters, distribution, and relationships.

Offered in even-numbered years.

**\*154. Primate Social Behavior. (3) II.**

Mrs. Jay

Lecture—3 hours.

Prerequisite: course 1 or the equivalent.

Survey of the social behavior, organization, and ecology of monkeys and apes; their relevance to the evolution of human behavior and social groups.

**\*155. Primate Anatomy and Evolution. (3) I.**

Mr. Kinzey

Lecture—3 hours.

Prerequisite: course 1 or Zoology 1B or 25.

Survey of the major groups of living and fossil Primates with emphasis on the anatomical evidence for their interrelationships.

\* Not to be given, 1964-1965.

- 160. Contemporary Civilization. (3) I.** Mr. Cohen  
Lecture—3 hours.  
An application of anthropological principles of analysis and interpretation to contemporary civilization.
- 162. Peasant Society and Culture. (3) I.** Mr. Smith  
Lecture—3 hours.  
Prerequisite: consent of the instructor.  
Comparative study of peasant communities, utilizing historical and ethnographic sources; analysis of urban rural relations; problems of economic development and culture change.
- 165. Culture Change. (3) II.** Mr. Smith  
Lecture—3 hours.  
Prerequisite: course 2 or consent of the instructor.  
Introduction to the analysis of sociocultural stability and change; theories of innovation, diffusion, acculturation, and cultural evolution; problems of social planning.
- 195. Field Course in Archaeological Method. (2) I and II.** Mr. Baumhoff, Mr. Whitehead  
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.
- 198. Directed Group Study. (3) II.** Mr. Smith  
Discussion—3 hours.  
Prerequisite: consent of the instructor.  
Directed reading and group discussion of selected anthropological problems.
- 199. Special Study for Advanced Undergraduates. (1-3) I and II.** The Staff (Mr. Olmsted in charge)  
Investigation of special problems.

## GRADUATE COURSES

- 210. Aspects of Culture Structure. (2) II.** Mr. Coulth  
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.
- 219. Culture and Personality. (2) II.** Mr. Cohen  
Seminar—2 hours.

- 220. Field Course in Linguistics. (3) II.** Mr. Olmsted  
 Lecture—1 hour.  
 Laboratory—2 hours.  
 Prerequisite: course 110A or equivalent.  
 Techniques of eliciting, recording, and analyzing; work with a native speaker.
- \*225. Kinship and Social Structure. (2) I.** Mr. Coulthard  
 Seminar—2 hours.  
 Prerequisite: consent of the instructor.  
 Systematic treatment of ethnological data and concepts concerned with kinship and the social structuring of human societies.
- 239. Problems in African Society and Culture. (2) II.** Mr. Crowley  
 Lecture—2 hours.  
 Prerequisite: consent of the instructor.  
 Diachronic analyses of traditional institutions in sub-Saharan Africa.
- \*242. Problems in African Prehistory. (2) II.** Mr. Baumhoff  
 Seminar—2 hours.  
 Prerequisite: consent of the instructor.
- 247. Problems in the Peoples and Cultures of Oceania. (2) II.** Mr. Coulthard  
 Seminar—2 hours.
- 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.
- \*254. Primate Social Behavior. (3) II.** Mrs. Jay  
 Seminar—2 hours.  
 Analysis of primate social behavior, with particular emphasis on field studies.
- 265. Concepts and Problems in Applied Anthropology. (2) II.** Mr. Smith  
 Seminar—2 hours.  
 Prerequisite: consent of the instructor.  
 Case studies of directed culture change; problems of planning and evaluation; uses of anthropological theory and data in professional fields such as agriculture, public health, administration, and international technical assistance.
- 292. Seminar in Anthropological Linguistics. (2) I.** Mr. Olmsted  
 Seminar—2 hours.
- 299. Research. (2-6) I and II.** Mr. Olmsted

\* Not to be given, 1964-1965.

## APPLIED SCIENCE

Edward Teller, Ph.D., *Chairman of the Department.*  
Albert J. Kirschbaum, Ph.D., *Vice-Chairman of the Department.*  
Department Office, 220 Walker Engineering Building

Edward Teller, Ph.D., *Professor of Applied Science.*  
Wilson K. Talley, Ph.D., *Assistant Professor of Applied Science.*

Richard J. Borg, Ph.D., *Lecturer in Applied Science.*  
Sidney S. Fernbach, Ph.D., *Lecturer in Applied Science.*  
Harold P. Furth, Ph.D., *Lecturer in Applied Science.*  
Montgomery H. Johnson, Ph.D., *Lecturer in Applied Science.*  
John Killeen, Ph.D., *Lecturer in Applied Science.*  
Albert J. Kirschbaum, Ph.D., *Lecturer in Applied Science.*  
Leroy D. Krider, B.S., *Lecturer in Applied Science.*  
Michael M. May, Ph.D., *Lecturer in Applied Science.*  
Richard F. Post, Ph.D., *Lecturer in Applied Science.*

UPPER DIVISION COURSE  
*Davis Campus*

**100. Production and Use of Nuclear Energy. (3) I.**  
Lecture—3 hours. Mr. Teller, Mr. Talley, Mr. Post  
Prerequisite: Mathematics 109, Physics 4C.  
Introduction to nuclear energy; controlled fission reactors; peaceful uses  
of nuclear explosives; controlled thermonuclear fusion.

GRADUATE COURSES  
*Davis Campus*

**\*230A-230B. Structure of Matter. (3-3) Yr.** Mr. Teller  
Lecture—3 hours.  
Prerequisite: course 110B or Mathematics 220A, course 270 or Engineering 181.  
Classical properties of matter; introduction of quantum mechanics by the correspondence principle, perturbation theory; electron theory of atoms, molecules, and solids; quantum theory of cooperative effects.

**\*240A-240B. Nuclear Reactor Analysis. (3-3) Yr.** Mr. Talley  
Lecture—3 hours.  
Prerequisite: course 110B or Mathematics 220A (may be taken concurrently).  
The analytic techniques used in studying the physics of nuclear reactors.

**\*245. Nuclear Reactor Systems. (3) II.** Mr. Talley  
Lecture—3 hours.  
Prerequisite: course 240A.  
Those aspects of fluid dynamics, thermodynamics, heat transfer, and thermal stress analysis that apply to the engineering design of nuclear reactors. Radiation shielding, fuel cycles, isotope separation.

\* Not to be given, 1964-1965.

**\*260. Statistical Theory of Equilibrium and Transport Phenomena. (4) II.** Lecture—4 hours. Mr. Teller, Mr. Talley  
Prerequisite: course 120 or Physics 121 and course 110A or Mathematics 109.

Statistical mechanical formulation of thermodynamics with application to the various states of matter. Statistical foundation of irreversible phenomena; evaluation of the transport coefficients in fluids and metals; transport of neutrons and radiation.

**\*290. Seminar. (2) I and II.** Seminar—2 hours. The Staff  
Advanced study in various areas of applied science.

**298. Group Study. (1-3) I and II.** Lecture—1-3 hours. Mr. Talley

Advanced study in various fields of applied science. Topics may include neutron physics, nuclear technology, advanced hydrodynamics, plasma physics, advanced mathematics, or other selected subjects.

**\*299. Research (1-6) I and II.** Individual study and research. The Staff

#### UPPER DIVISION COURSES

##### *Livermore*

**110A-110B. Mathematical Methods. (3-3) Yr.** Mr. Killeen  
Lecture—3 hours.

Prerequisite: Mathematics 9C or the equivalent. Vectors, matrices, tensors, linear equations; ordinary and partial differential equations, Fourier series, orthogonal functions, function spaces; introduction to complex variables. Typical application will be presented for each topic.

**115. Elements of Programming. (3) II.** Mr. Fernbach  
Lecture—3 hours.

Prerequisite: course 110A. Lectures and laboratory work on electronic computers concerning: programming systems, languages, and flow charts. Applications to concrete problems.

**120. Chemistry for Physicists and Engineers. (4) I.** Mr. Borg  
Lecture—4 hours.

Prerequisite: Chemistry 1B and Mathematics 9C or the equivalent. Concepts of chemistry and physical chemistry, including atomic and molecular structure and the properties of liquids and solids.

**170. Switching and Computing Circuits. (3) I.** Mr. Wyman  
Lecture—3 hours.

Prerequisite: Engineering 100B and Mathematics 9C, or the equivalent. Functional and electrical analysis and synthesis of switching circuits; components and applications to digital equipment design, including highspeed computer circuits and industrial controls.

\* Not to be given, 1964-1965.

## GRADUATE COURSES

## Livermore

**210A-210B. Advanced Mathematical Methods for the Physical Sciences** (3-3) Yr. Mr. Killeen

Lecture—3 hours.

Prerequisite: course 110B or Mathematics 220A.

Theory and solution of initial value and boundary value problems for hyperbolic, parabolic, and elliptic partial differential equations, with emphasis on computational techniques and non-linear equations. Applications from hydrodynamics, transport theory, wave propagation, and plasma physics.

**220. Advanced Physical Chemistry** (3) I. Mr. Borg

Lecture—3 hours.

Prerequisite: course 120 or Chemistry 109 or Chemistry 110A.

Advanced chemical thermodynamics, chemical kinetics, electrochemistry.

**221. Physical Chemistry of Solids.** (3) II. Mr. Borg

Lecture—3 hours.

Prerequisite: course 220.

Crystal structure, heterogeneous equilibria, thermodynamics of the solid state, solid state reactions, dislocation theory, strength properties of materials, radiation damage.

**230A-230B. Structure of Matter** (3-3) Yr. Mr. Johnson

Lecture—3 hours.

Prerequisite: course 110B or Mathematics 220A, course 270 or Engineering 181.

Classical properties of matter; introduction of quantum mechanics by the correspondence principle, perturbation theory; electron theory of atoms, molecules, and solids; quantum theory of cooperative effects.

**235. Nuclear Physics.** (3) I and II. Mr. Bloom, Mr. John

Lecture—3 hours.

Prerequisite: course 230A-230B.

Basic properties of nuclei, radioactive decay, nuclear models; low-energy nuclear reactions; neutron physics; interaction of particles and radiation with matter.

**240A-240B. Nuclear Reactor Analysis** (3-3) Yr.

Lecture—3 hours.

Mr. Kirschbaum, Mr. Stuart

Prerequisite: course 110B or Mathematics 220A (may be taken concurrently).

The analytic techniques used in studying the physics of nuclear reactors.

**245. Nuclear Reactor Systems.** (3) II. —

Lecture—3 hours.

Prerequisite: Course 240A.

Those aspects of fluid dynamics, thermodynamics, heat transfer and thermal stress analysis that apply to the engineering design of nuclear reactors. Radiation shielding, fuel cycles, isotope separation.

**250. Continuum Mechanics.** (3) I and II.

Mr. Leith

Lecture—3 hours.

Prerequisite: course 110B or Mathematics 220A.

Tensor notation, algebra, and analysis. Theory of elasticity, stress-strain relations, strain energy, reciprocity laws, elastic waves. Hydrodynamics of compressible and incompressible flows in two and three dimensions.

**260. Statistical Theory of Equilibrium and Transport Phenomena. (4) II.**  
 Lecture—4 hours. Mr. Alder, Mr. Teller

Prerequisite: course 120 or Physics 121 and course 110A or Mathematics 109.

Statistical mechanical formulation of thermodynamics with application to the various states of matter. Statistical foundation of irreversible phenomena; evaluation of the transport coefficients in fluids and metals; transport of neutrons and radiation.

**270. Electromagnetic Theory. (3) I.** Mr. May  
 Lecture—3 hours.

Prerequisite: Engineering 171A-171B or Mathematics 109 or the equivalent.

Elementary electromagnetic field theory; physical properties of dielectrics and conductors; magnetic properties of materials, steady and quasi-steady currents; propagation of electromagnetic waves in vacuum and through matter.

**271. Electrodynamics. (3) II.** Mr. May  
 Lecture—3 hours.

Prerequisite: course 270.

Special relativity. Motion of charges in fields; radiation from moving charges; scattering and dispersion of electromagnetic waves. Magnetohydrodynamics and plasma physics.

**275A-275B. Plasma Physics (3-3) Yr.** Mr. Furth  
 Lecture—3 hours.

Prerequisite: course 271 or Engineering 210.

Basic equations governing the behavior of a fully ionized plasma in a magnetic field; simple plasma configurations in controlled fusion research and space applications. Theory of plasma waves and instabilities. Transport coefficients and radiation phenomena.

**290. Seminar. (2) I and II.** The Staff  
 Seminar—2 hours.

Advanced study in various areas of applied science.

**298. Group Study. (1-3) I and II.** The Staff  
 Lecture—1-3 hours.

Advanced study in various fields of applied science. Topics may include neutron physics, nuclear technology, advanced hydrodynamics, plasma physics, advanced mathematics, or other selected subjects.

**299. Research (1-6) I and II.** The Staff  
 Individual study and research.

## 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.*

Ralph M. Johnson, M.A., *Associate Professor of Art.*

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. Giamburini, 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.*

◇

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 are included in the Letters and Science List of Courses (see page 88).

*Departmental Major Advisers.*—Mr. Giamburini, Mr. Howard, Mr. Johnson, Mr. Nelson, Mr. Petersen, Mr. Wiley.

*Preparation for Art Major.*—Practice of Art: courses 2A-2B, 3A-3B, and 6 units chosen from courses 1A, 1B, 1C, and 1D. History of Art: 2 units each of (1) black and white, (2) color, and (3) sculpture or ceramics; 9 units from Art 1A, 1D, and 1B or 1C.

*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, course 148, 4 units of Group C, and 6 units chosen from Group A, B, or C.

II. *History of Art.* Required: two Art history sequences (e.g. 154A-154B), plus Art 148, Art 190, 3 additional units from Group C, and 4 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.

† Absent on leave, fall semester, 1964-1965.

† Absent on leave, 1964-1965.

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.

*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: Painting. (3) II.** Mr. Nelson  
 Lecture—3 hours.  
 Field trips are included.
- 1C. History of Medieval, Renaissance, and Modern Art: Architecture and Sculpture. (3) II.** Mr. Howard  
 Lecture—3 hours.  
 Field trips are included.
- 1D. History of Oriental Art. (3) I.** \_\_\_\_\_  
 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. Johnson, Mr. Petersen, 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.** \_\_\_\_\_  
 Laboratory—6 hours. Mr. Wiley, Mr. Johnson, Mr. Petersen  
 Introduction to color in composition.  
 Field trips are included.
- 3A. Intermediate Form and Color. (2) I and II.** \_\_\_\_\_  
 Laboratory—6 hours. Mr. Wiley, Mr. Johnson, Mr. Petersen  
 Prerequisite: courses 2A and 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 and II. Mr. Giambruni, Mrs. Horsting  
Laboratory—6 hours.  
Introduction to basic elements of three-dimensional construction and relief in clay and plaster.
- 14B. Sculpture.** (2) I and 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 and 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. Johnson, Mr. Petersen, Mr. Wiley  
Laboratory—6 hours.  
Prerequisite: courses 2A, 2B, 3A and 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. Wiley  
Laboratory—6 hours.  
Prerequisite: courses 2A, 2B, 3A and 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.

- 103. Advanced Form and Figure Composition.** (2) I and II. Mr. Petersen  
Laboratory—6 hours.  
Prerequisite: course 3B.  
Problems of light, color, and space that involve the human figure and its environment.

- 121. Architectural Design. (2) I.** Mr. Cramer  
 Laboratory—6 hours.  
 Prerequisite: two 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.** Mr. Giambruni  
 Laboratory—6 hours.  
 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.** —————  
 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.  
 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.  
 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.

**\*176. 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.

**177. Northern Renaissance Painting. (3) I.**

Lecture—3 hours.

Painting north of the Danube in the 15th and 16th centuries.

**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.

\* Not to be given, 1964-1965.

**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.

**190. The Role of Artists in Culture. (3) I.**

Lecture—3 hours.

Prerequisite: non-majors may be admitted only with the consent of the instructor.

Comparative analysis of selection, training, functions, roles, and evaluations of artists in various cultures. Written and oral reports.

**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. Wiley, Mr. Nelson**199. Special Study for Advanced Undergraduates. (1-5) I and II.**

The Staff, Mr. Nelson in charge

**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

H. E. Adler, D.V.M., Ph.D., *Chairman of the Department.*  
Department Office, 2079 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.*  
Richard Yamamoto, 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

### 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.
- \*208L. Avian Medicine Laboratory** (1) I. The Staff  
Laboratory—3 hours.  
Prerequisite: third year standing in the school of Veterinary Medicine.  
Diagnosis of avian diseases by necropsy and laboratory procedures. Selected diseases of major importance to the poultry industry will be reproduced for class use including those of bacterial, viral, and chemical origin.

- 290. Seminar in Avian Medicine.** (1) I and II. Mr. Yamamoto  
Seminar—1 hour.

- 299. Research.** (1-6) I and II. The Staff

<sup>2</sup> Sabbatical leave in residence, fall semester, 1964-1965.

<sup>†</sup> Absent on leave, 1964-1965.

<sup>\*</sup> Not to be given, 1964-1965.

## BACTERIOLOGY

John L. Ingraham, Ph.D., *Chairman of the Department.*  
Department Office, 156 Hutchison Hall

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 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 88).

*Major Advisers.*—Mr. Ingraham, Mr. Reynolds.

*The Major Program.* The undergraduate major programs are designed to provide a proper balance of studies in the biology of bacteria and other micro-organisms together with appropriate courses in mathematics and physical science. Although both the Bachelor of Arts program and the Bachelor of Science program are suitable for students who plan to do graduate work in a biological science, or who wish a professional career in bacteriology, the Bachelor of Science program offers the better preparation because of the greater emphasis in mathematics and physical science.

These majors are appropriate for students contemplating a career in Medical Technology. Such students are advised to take Veterinary Microbiology 127 and Physics 3A-3B in addition to the courses required for either the Bachelor of Science or the Bachelor of Arts major.

### *Bachelor of Arts major program*

(A) Lower Division Courses.—Bacteriology 1; Botany 1 or Zoology 1A; Chemistry 1A-1B, 8; Mathematics 16A and either 13, 16B, or 36; Physics 2A-2B.

(B) Upper Division Courses.—Bacteriology 100, 103, 104; Biochemistry 101, 101L; Chemistry 5; Genetics 100; and one course from the following group: Botany 114, 118, 119; Zoology 110.

### *Bachelor of Science major program*

(A) Lower Division Courses.—Required: Bacteriology 1; Botany 1 or Zoology 1A; Chemistry 1A-1B, 5; Mathematics 13, 16A-16B; Physics 2A-2B. Recommended: Elementary Courses in French and German.

(B) Upper Division Courses.—Bacteriology 100, 103, 104; Biochemistry 101, 101L; Chemistry 109 or 110A-110B, 112A-112C; Genetics 100; and one course from the following group: Botany 114, 118, 119; Zoology 110.

*Honors and Honors Program* (see page 89).—The honors program consists of course 194H.

*Graduate Study.*—The Graduate Group in Microbiology offers programs of study and research leading to the M.A. and Ph.D. degrees in general microbiology, including bacteriology. The offerings of the Department of Bacteriology are augmented by courses and personnel of the Departments of

Biochemistry, Botany, Food Science and Technology, and Viticulture and Enology, 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 or 112A, Physics 2B.

Microscopy, cytology, and growth of microorganisms; effects of the physico-chemical environment; microbial genetics.

**103. Microbial Metabolism. (2) I.**

Mr. Hungate

Lecture—2 hours.

Prerequisite: course 1; Biochemistry 101.

A survey of the metabolic activities of microbes.

**103L. Microbial Metabolism Laboratory. (2) I.**

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; mechanisms of regulation; 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 bacteriophages.

**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)

## BIOCHEMISTRY AND BIOPHYSICS

Eric E. Conn, Ph.D., *Chairman of the Department*  
Department Office, 554 Hutchison Hall

Eric E. Conn, Ph.D., *Professor of Biochemistry.*

Paul K. Stumpf, Ph.D., *Professor of Biochemistry.*

Sterling Chaykin, Ph.D., *Associate Professor of Biochemistry.*

†Lloyd L. Ingraham, Ph.D., *Associate Professor of Biophysics.*

Richard S. Criddle, Ph.D., *Assistant Professor of Biophysics.*

Jack Preiss, Ph.D., *Assistant Professor of Biochemistry.*

Irwin H. Segel, Ph.D., *Assistant Professor of Biochemistry.*

Mendel Mazelis, Ph.D., *Lecturer in Food Science and Technology.*

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 and II. Mr. Conn, Mr. Segel  
Lecture—3 hours.

Prerequisite: Chemistry 1B; Chemistry 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. I. Mr. Criddle, Mr. Mazelis; II. Mr. Preiss  
Lecture—1 hour; laboratory—6 hours.

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. 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.

† Absent on leave, 1964-1965.

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 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 110B.

Application of modern physical concepts and experimental methods to the problems of large molecules of biological interest.

**210. Enzyme Chemistry. (3) II.**

—, Mr. Stumpf

Lecture—3 hours.

Prerequisite: course 101 or equivalent; Chemistry 109 or 110B. Recommended: Chemistry 112B.

Chemical and physical-chemical properties of coenzymes and enzymes; their role in biochemical processes.

**\*210L. Enzyme Chemistry Laboratory. (3)**

Lecture—1 hour; laboratory—6 hours.

Prerequisite: courses 101L and 210 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)

**Microbial Biochemistry** (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)

\* Not to be given, 1964-1965.

## BIOLOGICAL SCIENCES

Herbert B. Currier, Ph.D., *Chairman of the Committee.*  
Committee Office, 162 Robbins Hall

### *Committee in Charge:*

Herbert B. Currier, Ph.D., *Professor of Botany.*  
Warren G. Kinzey, Ph.D., *Assistant Professor of Anthropology and Professor of Zoology.*  
Monica Riley, Ph.D., *Assistant Professor of Bacteriology.*  
Robert L. Rudd, Ph.D., *Associate Professor of Zoology.*  
Mortimer P. Starr, Ph.D., *Professor of Bacteriology.*

**Letters and Science List.**—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

**Major Advisers.**—(see *Schedule and Directory*).

**The Major in Biological Sciences.**—A biological sciences major may serve as a general education in the broad field of biology, or as a basis for graduate study leading to advanced degrees preparatory for academic and professional careers in teaching, research, medicine, medical technology, dentistry and other professional fields. It can incorporate most of the life sciences major for the general secondary teaching credential.

The degree programs are designed for students desiring a basic understanding of the living world. They permit a wider choice of courses than is possible with most departmental majors. A student can arrange a program dealing chiefly with the structural, taxonomic, functional and evolutionary aspects of biology, Plan I, or one in which these are less extensively studied and more attention is given to physicochemical phenomena and a description of living material on a molecular basis, Plan II. A Bachelor of Arts or a Bachelor of Science degree can be obtained under either plan. Within each major program, special interests of the student can be met with elective courses.

Advisers will be available whose experience and interests are most relevant to the phase of biology in which the student is interested. If the student has decided on the area of his special interest at the time he makes application for admission, he should so indicate on the admission form in order to be directed to the appropriate adviser. Other students may select a field of interest at a later time. In addition to the general advisers in biological sciences, advisers in each of the following specialties will be available: Botany, Zoology, Bacteriology, Genetics, Entomology, Physiology, Biochemistry and Biophysics.

***The Major Program.***

Plan I.

***Bachelor of Arts.***

**Lower Division Courses.**—Required: Botany 1; Zoology 1A-1B; Chemistry 1A, and either 1B or 8; an introductory course in entomology or bacteriology. Recommended: other introductory courses in 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. The program must include a course dealing with invertebrate animals; one with vertebrates; a course in systematic botany; a course in plant morphology; and one course in each of the two following fields: genetics and/or evolution (Genetics 10 does not satisfy this requirement), and physiology.

*Bachelor of Science.*

Lower Division Courses.—Required: Botany 1; Zoology 1A-1B; Chemistry 1A, and either 1B or 8; Bacteriology 1; Physics 2A-2B; Mathematics 13. Recommended: other introductory courses in natural sciences and mathematics; Anthropology 1; Entomology 1; Geography 1, 3; Geology 1A-1B; 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: plant morphology and taxonomy, animal morphology and taxonomy, physiology, 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 students may elect additional upper division courses in the above-mentioned groups and/or in other biological fields, such as microanatomy, biochemistry, ecology, paleontology, microtechnique, microbiology, bacteriology and parasitology.

## Plan II.

*Bachelor of Arts.*

Lower Division Courses.—Required: Botany 1; Zoology 1A-1B; Bacteriology 1; Chemistry 7A-7B, or 1A-1B and 5; Physics 2A-2B; Mathematics 16A-16B.

Upper Division Courses.—Required: Chemistry 112A-112C; Biochemistry 101; Genetics 100, ten units selected from the Biological Sciences Plan II Course List (below).

*Bachelor of Science.*

Lower Division Courses.—Required: Botany 1; Zoology 1A-1B; Bacteriology 1; Chemistry 7A-7B or 1A-1B and 5; Physics 2A-2B; Mathematics 13, 16A-16B.

Upper Division Courses.—Required: Chemistry 112A-112C, 110A-110B; Biochemistry 101, 101L; Physics 121 or 112; Genetics 100; ten units selected from the Biological Sciences Plan II Course List (below).

Biological Sciences Plan II Required Course List.—Upper Division Courses in Botany; Zoology; Bacteriology; Biochemistry and Biophysics; Genetics; other biology courses upon approval of the adviser.

*The Honors Program.*—Students on the honor list may enroll in an Honors Program of courses leading to honors with the bachelor's degree (see page 89).

A special study course (194H) involving either independent research or reading on an appropriate topic, followed by preparation of an honors thesis (course 195H) based primarily on the work done in the prerequisite course, must be completed.

*Teaching Major.*—A degree in biological sciences satisfies the requirement for a teaching major in the life sciences for both elementary and secondary teaching credentials, except that for the elementary credential Entomology 10 must be included in the program, and for the secondary credential, 15 of the advanced units must be in one department.

## UPPER DIVISION COURSES

**194H. Special Study for Honors Students. (2-4) I and II.**

The Staff (Mr. Currier 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. Currier 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, Emeritus.*  
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.*  
Floyd M. Ashton, Ph.D., *Associate Professor of Botany.*  
Elizabeth G. Cutter, Ph.D., *Associate Professor of Botany.*  
†Chester L. Foy, Ph.D., *Associate Professor of Botany.*  
†Jack Major, Ph.D., *Associate Professor of Botany.*  
Rolf Y. Berg, Ph.D., *Assistant Professor of Botany.*  
Bruce A. Bonner, Ph.D., *Assistant Professor of Botany.*  
Norma J. Lang, Ph.D., *Assistant Professor of Botany.*  
Kenneth Wells, Ph.D., *Assistant Professor of Botany.*

◇

David E. Bayer, Ph.D., *Lecturer in Botany.*  
Paul A. Castelfranco, Ph.D., *Lecturer in Botany.*  
Oliver A. Leonard, Ph.D., *Lecturer in Botany.*  
Donald E. Seaman, Ph.D., *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 88).

*Departmental Major Adviser.*—Mr. Wells.

### *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, 116, 118 or 119; 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.

† Absent on leave, 1964-1965.

*Honors and Honors Program* (see page 90).—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.

*Teaching Major and Minor*.—Elementary and Secondary Credential.

Subject Representative: Kenneth Wells.

**Major:** Teaching major same as undergraduate major for degree (A.B. or B.S.)

**Minor:** Botany 1: and a minimum of 15 units in botany or closely related subject. Student must consult with subject representative.

*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. Miss Lang, Mr. Tucker, Mr. Weier, Mr. Wells  
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. Miss Cutter  
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. Ashton  
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. Tucker  
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. Stocking  
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.

- 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.
- 117. Plant Ecology. (3) II.** —  
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.
- 118. Phycology. (4) II.** Miss Lang  
Lecture—2 hours; laboratory—6 hours.  
Morphology, physiology, genetics, evolution, distribution, cultivation, and economic importance of freshwater and marine algae; field trips.
- 119. Mycology. (4) I.** Mr. Wells  
Lecture—2 hours; laboratory—6 hours.  
Introduction to structure, relationships, life cycles, and genetics of selected species of fungi.
- 120A. Plant Physiology. (3) I.** Mr. Currier  
Lecture—3 hours.  
Prerequisite: course 111; Biochemistry 101 (may be taken concurrently).  
The cell as a physicochemical system; plant-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.  
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. Bonner  
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, or Biochemistry 101.  
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.
- 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.

**180. Biological Evaluation of Herbicides. (3) II.**

Mr. Bayer

Lecture—1 hour; laboratory—6 hours.

Prerequisite: courses 107 and 111 (may be taken concurrently).

Principles dealing with the physical, chemical, and physiological aspects of herbicides. Laboratory, greenhouse, and field studies illustrating these principles in herbicide evaluation; emphasis and upon biological assays upon the interpretation of biological data.

**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**

All graduate courses are open to qualified undergraduates.

**\*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) II.**

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.

\* Not to be given, 1964-1965.

**215. Light and Plant Growth. (2) I.**

Mr. Bonner

Lecture—2 hours.

Prerequisites: courses 120A, 120B; Physics 2B or equivalent.

Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis.

**216A. Advanced Morphology of Vascular Plants. (3) II.**

Mr. Gifford

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.

**\*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.

**\*255. Principles of Plant Taxonomy. (3) I.**

Mr. Berg

Lecture—1 hour; discussion—1 hour; laboratory—3 hours.

Prerequisite: course 108. Recommended: courses 105 and 116; Genetics 103.

Evaluation of different approaches to biological classification; theory of evolutionary classification; examples of how various disciplines—anatomy, embryology, biochemistry, paleontology, ecology—contribute to the elucidation of problems of taxomic relationships, mainly of genera and higher categories.

**256. Experimental Plant Taxonomy. (3) II.**

Mr. Tucker

Lecture—1 hour; discussion—1 hour; laboratory—3 hours.

Prerequisite: course 108. Recommended: course 117, Genetics 103.

The study of variation in natural populations in relation to taxonomy; the application of population-sample analysis, cytogenetics, transplant studies, and other experimental techniques to the elucidation of taxonomic problems.

**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. Stocking, Mr. Currier

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. (1-6) I and II.**

The Staff

\* Not to be given, 1964-1965.

## RELATED COURSES

- Cytogenetics** (Genetics 101, 101L)  
**Organic Evolution** (Genetics 103)  
**Pathogenic Fungi** (Plant Pathology 224)  
**Fruit Morphology** (Pomology 110)  
**Cell Biology** (Zoology 121, 121L)  
**Limnology** (Zoology 140, 140L)  
**Use of Isotopes as Tracers in Biological Research**  
    (Animal Physiology 243, 243L)  
**Physiology of Crop Plants** (Agronomy 131)  
**Chemical and Physical Methods in Biological Research** (Agronomy 206)  
**The Physiology of Bacteria** (Bacteriology 100)  
**Plant Biochemistry** (Biochemistry 222)  
**Water-Soil Plant Relationships** (Irrigation 100)  
**Physiology of Fruit Plants** (Pomology 116)  
**Principles of Plant Nutrition** (Soils and Plant Nutrition 116)  
**Vegetable Physiology** (Vegetable Crops 121)  
**Plant Regulators in Horticulture** (Viticulture and Enology 108)

## 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., *Associate 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.*



Robert E. Lovins, Ph.D., *Lecturer in Chemistry.*  
Peter A. Rock, Ph.D., *Acting 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 88).

*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 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 89).—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. Maciel in charge; II. Mr. Allen 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. Rock; II. ——

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. Bottini

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. Lovins; II. ——

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

**105. Advanced Quantitative Analysis.** (3) II. Mr. Swinehart

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 and II. I. Mr. Volman; II. Mr. Brinton

Lecture—3 hours.

Prerequisite: course 5 or 7B; Mathematics 9C or 16B; one year of college physics.

The general principles of physical chemistry and elementary thermodynamics.

**110B. Physical Chemistry.** (3) I and II. I. Mr. Savitsky; II. Mr. Keefer

Lecture—3 hours.

Prerequisite: course 110A.

A continuation of course 110A.

**111. Physical Chemistry.** (3) I and II. I. Mr. Warren; II. Mr. Rock

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) II.

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.

**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. Young

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. Thiesseu

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.

**224. Inorganic Chemistry. (3) II.**

Mr. Musker, Mr. Swinehart

Lecture—3 hours.

Prerequisite: course 124 or consent of the instructor.

An analysis of theoretical and experimental work regarding the chemistry of the light and heavy elements with emphasis on stability of compounds, complexes in various oxidation states, stereochemistry, kinetics and mechanism of substitution and oxidation-reduction reactions, and spectral properties.

\* Not to be given, 1964-1965.

**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. Nash, Mr. Zweifel

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.

**\*298. Group Study. (1) II.**

Lecture—1 hour.

Lectures and group discussion of special topics in advanced physical chemistry.

**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.

**CLASSICS**

For courses in Classics see "Foreign Languages" on page 210.

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\* Not to be given, 1964-1965.

## 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., *Associate Professor of Clinical Pathology.*

### UPPER DIVISION COURSES

**199. Special Study for Advanced Undergraduates. (1-4) I and II. The Staff**

#### GRADUATE COURSES

**201. Clinical Hematology and Bacteriology. (3) I.** Mr. Schalm, Mr. Kaneko  
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 bacte-  
riologic techniques as applied to mastitis diagnosis.

**202. Clinical Biochemistry. (3) II.** Mr. Jasper, Mr. Kaneko  
Lecture—2 hours; laboratory—3 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 elec-  
trolyte balance, liver function, kidney function, urinalysis, osteological dis-  
eases, thyroid function, and disorders of carbohydrate, protein and lipid  
metabolism.

**203. Biochemistry of Metabolic Diseases. (3) I.** 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. (1) 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.

† Absent on leave, 1964-1965.

<b>251B. Clinical Pathology Laboratory. (½) II.</b>	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.	
<b>290. Seminar. (1) I and II.</b>	The Staff (Mr. Kaneko in charge)
Seminar—1 hour.	
<b>298. Directed Group Study (1-3) I and II.</b>	The Staff
Prerequisite: consent of the instructor.	
Selected topics in Clinical Pathology.	
<b>299. Research. (1-9) I and II.</b>	The Staff

## **DESIGN**

For courses in design, see "Home Economics" on page 246.

## DRAMATIC ART AND SPEECH

Theodore J. Shank, Ph.D., *Chairman of the Department.*  
Department Office, 126 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.*  
Daniel L. Hannon, M.F.A., *Assistant Professor of Dramatic Art.*  
Douglas McDermott, Ph.D., *Assistant Professor of Dramatic Art.*  
Gerald P. Mohrmann, 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.*



Gene A. Chesley, B.A., *Lecturer in Dramatic Art.*  
Leonard G. Homann, B.A., *Lecturer in Speech.*  
Kenneth C. Lyman, Ph.D., *Lecturer in Speech.*  
Donovan J. Ochs, M.A., *Acting Assistant Professor of Speech.*  
Robert K. Sarlos, M.A., *Acting Assistant Professor of Dramatic Art.*

*Letters and Science List.*—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

*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* (see page 89).—The honors program consists of Dramatic Art 194H (Special Study for Honors Students) in addition to the regular major.

### DRAMATIC ART AND SPEECH MAJOR

*Major Advisers.*—Mrs. Alder, 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, 1964-1965.

(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 Honors Program* (see page 89).—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. Stambusky

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. McDermott, Mr. Stambusky

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.

**110. Advanced Acting (3) II.** Mr. McDermott

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 10A or 10B or equivalent and consent of instructor.

Advanced theory and practice in the art of acting, with emphasis on individual problems. Detailed study of the Stanislavski system of acting and other advanced acting theories.

**\*115. Advanced Study of Major Film Makers. (3) II.** Mr. d'Harnoncourt

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 15 or consent of the instructor.

Analysis of the contribution of some outstanding film creators. Study of diverse aesthetic theories of the cinema and their application to selected films.

**124. Visual Aspects of Dramatic Presentation. (3) I.** Mr. Chesley

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. Hannon

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.

\* Not to be given, 1964-1965.

**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. Stambusky

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.

**165. Dramatic Theory and Criticism. (3) II.**

Mr. Shank

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. Shank 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. Shank 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. Shank 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. Special Problems in Advanced Acting.** (3) I. Mr. Stambusky  
Lecture—2 hours; Laboratory—2 hours.  
Study of specialized advanced-acting problems arising from differences in the type and style of dramatic production as they relate to the history, theory, and practice of acting through the ages.
- 224. Visual Theater.** (3) II. Mr. Chesley  
Seminar—2 hours.  
Selected theoretical and practical problems of the visual theater.
- 225. Design for the Theater.** (3) I. Mr. Hannon  
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) II. 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. Shank in charge)  
Advanced practice in acting, design, directing, playwriting, and technical theatre.

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\* Not to be given, 1964-1965.

299. Individual Study. (1-6) I and II. The Staff (Mr. Shank in charge)

**SPEECH**

*Letters and Science List.*—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

**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.

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.

Mrs. Alder

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.

\* Not to be given, 1964-1965.

117. **Theories of Rhetoric and Criticism.** (3) I. Mr. Mohrmann  
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. Ochs  
Lecture—3 hours.  
A survey of public address in its major periods of influence in western civilization.  
Offered in odd-numbered years.
140. **Argumentation and Debate.** (3) I. —————  
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. The Staff  
Prerequisite: consent of the instructor.  
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 (Mrs. Alder in charge)

## ECONOMICS

Frank C. Child, Ph.D., *Chairman of the Department.*  
Department Office, 378 Voorhies Hall

Frank C. Child, Ph.D., *Professor of Economics.*

Thomas Mayer, Ph.D., *Professor of Economics.*

†Bruce Glassburner, Ph.D., *Associate Professor of Economics.*

Ralph C. James, Ph.D., *Associate Professor of Economics.*

Tsung-yuen Shen, Ph.D., *Associate Professor of Economics.*

†Martin P. Oettinger, Ph.D., *Assistant Professor of Economics.*

Hiromitsu Kaneda, Ph.D., *Assistant Professor of Economics.*

—, *Assistant Professor of Economics.*



Andrzej Brzeski, M.A., *Acting Assistant Professor of Economics.*

Wallace A. Atherton, Ph.D., *Lecturer in Economics.*

Jerry C. Kenley, B.A., *Lecturer in Economics.*

William H. Pietsch, M.B.A., *Lecturer in Economics.*

*Letters and Science List.*—All undergraduate courses in economics are included in the Letters and Science List of Courses (see page 88).

*Departmental Major Advisers.*—Mr. Brzeski, Mr. Kaneda, Mr. Shen.

*Graduate Adviser.*—Mr. Mayer.

### *The Major Program*

(A) Lower Division Courses.—Required: Economics 1A-1B and 6 additional units in social science; Economics 12 or a course in statistics approved by the department; at least a C average in these courses. Students planning to major in economics should complete these courses by the end of the sophomore year.

(B) Upper Division Courses.—Required: A total of 24 units of economics including (1) Economics 100A, 100B, (2) either 110A or 110B, and (3) 6 units selected from one of the following course combinations: Economics 101A and 101B; Economics 110A and 110B; Economics 116 and 117; Economics 121A and 121B; Economics 130 and 131; Economics 135A and 135B; Economics 150A and 150B; Economics 160A and 160B.

It is recommended that Economics 100A, 100B, and 110A or 110B be taken during 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.

*Graduate Study.*—Students who meet the admission requirements of the Graduate Division and the Department of Economics may pursue studies leading to the degree of Master of Arts. Fields of emphasis for graduate study include: Economic Theory, Money and Banking, Economic Development, Economic History, Economic Fluctuations, International Economics, Labor Economics, Industrial Organization, Comparative Economic Systems, and History of Economic Thought.

Requirements for the Master's degree may be fulfilled under Plan I or Plan II. Plan I requires a minimum of 20 units of graduate work and a thesis. The program must include four graduate courses in economics, two of which must

† Absent on leave, 1964-1965.

be in the field of the M.A. thesis, and at least one of which must be economic theory. The remainder of the required 20 units may be selected from upper division and graduate courses offered by the Economics Department or other departments. Plan II requires a minimum of 24 units of graduate work of which at least 12 units must be in graduate courses in economics and 3 units must be a graduate course in economic theory. In addition, candidates under Plan II must pass two comprehensive written examinations in fields of emphasis offered by the department. Under both plans a grade average of at least B is required.

#### LOWER DIVISION COURSES

**1A. Principles of Economics.** (3) I and II.

The Staff

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.

The Staff

Lecture—2 hours; discussion—1 hour.

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. Pietsch

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; depreciation; introduction to cost accounting; analysis of financial statements; social accounting.

**12. Introduction to Quantitative Methods in Economics.** (4) I and II.

Lecture—3 hours; laboratory—2 hours.

Mr. Brzeski

Prerequisite: two years of high school algebra or the equivalent.

Methods of analyzing quantitative economic and business data, including descriptive statistics, sampling and statistical inference, index numbers, correlation, and time series. Emphasis on the logic of procedures, interpretation, and application. Primarily for Economics majors.

#### UPPER DIVISION COURSES

**100A. Economic Theory.** (3) I.

Mr. Child

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

Price and distribution theory.

**100B. Economic Theory.** (3) II.

Mr. Child

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

Scope and method of economic science; theory of income and employment.

**101A. History of Economic Thought.** (3) I.

Mr. Shen

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

Historical survey of economic doctrines, with emphasis on the classical school and its antecedents.

**101B. History of Economic Thought.** (3) II.

Mr. Shen

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

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.**

Mr. Shen

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.**

Lecture—3 hours.

Prerequisite: courses 1A and 1B or consent of the instructor.

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.**

Mr. Atherton

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

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. Atherton

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

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. Kaneda

Lecture—3 hours.

Prerequisite: courses 1A and 1B or consent of the instructor.

Theories of economic development and underdevelopment; economic policy for growth and development.

**116. Comparative Economic Systems. (3) I.**

Mr. Brzeski

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

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.

**117. The Soviet Economy. (3) II.**

Mr. Brzeski

Lecture—3 hours.

Prerequisite: course 1A, 1B, or consent of the instructor.

Survey of Soviet economic development: institutions, methods of planning, and performance.

**121A. Industrial Organization I. (3) I.**

Mr. James

Lecture—3 hours.

Prerequisite: course 1A, 1B, or consent of the instructor.

An appraisal of the prevalence of effectiveness of competition in the American Economy; market structure, conduct, and economic performance of a variety of industries.

**121B. Industrial Organization II. (3) II.**

Mr. James

Lecture—3 hours.

Prerequisite: course 121A or consent of the instructor.

Public policy in a private-enterprise economy in light of the economist's concept of competition; and monopoly: anti-trust policy and the preservation of competition; the economics of regulated industries.

**130. Public Finance and Taxation. (3) I.**

Mr. Kenley

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

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.

Prerequisite: courses 1A, 1B or consent of the instructor.

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. Kenley

Lecture—3 hours.

Prerequisite: Mathematics 13 or Economics 12, or 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.

Prerequisite: courses 1A, 1B or consent of the instructor.

The monetary economy: commercial and central banking; monetary and income theory; monetary policy.

**150.A Labor Economics. (3) I.**

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

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.**

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

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.**

Mr. Shen

Lecture—3 hours.

Prerequisite: courses 1A, 1B or consent of the instructor.

International trade theory; analysis of selected international and economic problems.

- 160B. International Economic Relations. (3) II. Mr. Shen  
 Lecture—3 hours.  
 Prerequisite: courses 1A, 1B or consent of the instructor.  
 International finance; U. S. foreign trade policies and their impact on the world economy.
190. Senior Seminar. (3) II. —————  
 Prerequisite: senior standing; open only to economics majors.  
 Selected topics in economic analysis and public policy.
199. Special Study for Advanced Undergraduates. (1-5) I and II. The Staff
- 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. Shen  
 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. Mr. Atherton  
 Lecture—3 hours.  
 American and European economic history. Emphasis upon development of economic institutions.
215. Economics of Underdeveloped Countries (3) I. Mr. Kaneda  
 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. —————  
 Seminar—3 hours.  
 Theory of the labor market; trade union movements.
260. International Economic Relations. (3) II. Mr. Kaneda  
 Seminar—3 hours.  
 Theory of international trade, policy problems in international relations.
299. Individual Study. (1-5) I and II. The Staff

## EDUCATION

Hugh C. Black, Ph.D., *Chairman of the Department.*  
Department Office, 228 Voorhies Hall

Hugh C. Black, Ph.D., *Associate Professor of Education.*  
Julius M. Sassenrath, Ph.D., *Associate Professor of Education.*  
Robert A. Braund, Ed.D., *Assistant Professor of Education.*  
Leroy F. Troutner, Ph.D., *Assistant Professor of Education.*



J. Richard Blanchard, M.S., *Lecturer in Education.*  
George D. Yonge, Ph.D., *Assistant Professor of Education.*  
Robert E. Hapworth, M.A., *Lecturer in Education, Supervisor of Teacher Education.*  
Douglas L. Minnis, Ed.D., *Lecturer in Education, Supervisor of Teacher Education.*  
Walter T. Mara, M.S., *Lecturer in Education, Supervisor of Teacher Education.*  
Shirley J. Skinner, M.A., *Lecturer in Education, Supervisor of Teacher Education.*  
Margaret R. Sutherland, Ph.D., *Lecturer in Education, Supervisor of Teacher Education.*  
\_\_\_\_\_, *Lecturer in Education, Supervisor of Teacher Education.*

*Letters and Science List.*—Education 110.

*Credentials Counselors:*

Secondary.—Mr. Braund, Mr. Mara, Mr. Troutner.  
Elementary.—Mrs. Skinner, Mr. Minnis, Mr. Hapworth.  
Curricula for Teacher Education.—See pp. 96-98.

### UPPER DIVISION COURSES

**110. Introduction to Educational Psychology. (3) I and II.**  
Lecture—3 hours. Mr. Sassenrath, Mr. Yonge

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) II.** Mr. Yonge  
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, Mr. Troutner  
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.

**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 bibliographies. Designed to assist upper division and graduate students in preparation of research papers and dissertations.

**163. Guidance and Counseling. (3) I.**

Mr. Braund, Mr. Yonge

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. Mrs. Skinner**

Lecture—2 hours.

Prerequisite: consent of the instructor.

Principles, procedures, and curricular materials for developing oral and written language skills.

**302. Elementary School Curriculum. (2) I and II.**

Lecture—2 hours.

Mr. Minnis, Mr. Hapworth

Current conceptions of the elementary school curriculum with emphasis on the role of social studies and science and on effective teaching methods.

**320A. Introduction to Teaching in Secondary Schools. (1) I and II. The Staff**

Lecture—1 hour; laboratory—2 hours.

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. The Staff**

Prerequisite: course 320E (must be taken concurrently).

Directed teaching for candidates for the general secondary credential.

May be repeated for credit up to a total of 8 units.

‡ 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, 1964, will begin on or about September 10 and end January 29. For the spring semester, 1965, they will begin on or about February 1 and end June 15. Students should make arrangements accordingly.

**‡320E. Methods of Teaching in Secondary Schools. (2) I and II. The Staff**  
Lecture—2 hours.

Prerequisite: course 320C (must be taken concurrently).

Methods of teaching in the secondary school; selection, organization, and evaluation of teaching materials including the use of audio-visual aids and the services of counseling and guidance programs.

**330A. Introduction to Teaching in Elementary Schools. (2) I and II.**  
Lecture—1 hour; laboratory—3 hours. Mr. Minnis

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, Mr. Hapworth

Prerequisite: course 330E (must be taken concurrently).

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, Mr. Hapworth

Prerequisite: course 330C (must be taken concurrently).

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, 1964, will begin on or about September 10 and end January 29. For the spring semester, 1965, they will begin on or about February 1 and end June 15. 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.*
- S. Milton Henderson, 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.*
- Reese H. Vaughn, 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.*
- Harry Brandt, Ph.D., *Associate Professor of Engineering.*
- 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.*
- Donald G. Childers, Ph.D., *Assistant Professor of Engineering.*
- Robert B. Fridley, M.S., *Assistant Professor of Engineering and Assistant Professor of Agricultural Engineering.*
- James R. Hutchinson, Ph.D., *Assistant Professor of Engineering.*
- S. Russell Keim, Ph.D., *Assistant Professor of Engineering.*
- Jack W. LaPatra, Ph.D., *Assistant Professor of Engineering.*
- Victor R. Latorre, Ph.D., *Assistant Professor of Engineering.*
- Herschel H. Loomis, Ph.D., *Assistant Professor of Engineering.*
- Alan T. McDonald, M.S., *Acting Assistant Professor of Engineering.*
- Paul S. Moller, M.S., *Acting Assistant Professor of Engineering.*
- Earl W. Owen, D.Eng.Sci., *Assistant Professor of Engineering.*
- Errol D. Rodda, Ph.D., *Acting Assistant Professor of Engineering.*
- Cletus E. Schertz, Ph.D., *Assistant Professor of Engineering and Assistant Professor of Agricultural Engineering.*

Theodor S. Strelkoff, Ph.D., *Assistant Professor of Engineering and Assistant Professor of Irrigation.*  
 An T. Yang, D.Eng.Sci., *Assistant Professor of Engineering*  
 Wilson K. Talley, Ph.D., *Assistant Professor of Engineering and Assistant Professor of Applied Science.*  
 Steven Whitaker, Ph.D., *Assistant Professor of Engineering.*

J. Robert Freeman, E.E., *Lecturer in Engineering.*  
 Jerald M. Henderson, M.S., *Associate in Engineering.*  
 Daniel J. Krause, M.S., *Acting Assistant Professor of 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.

Piller

Lecture—2 hours; laboratory—3 hours.

Prerequisite: plane trigonometry. Not open to students in Engineering.

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). Not open to students who have received credit for course 1A.

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. Henderson

Lecture—2 hours; laboratory—3 hours.

Prerequisite: mechanical drawing; trigonometry; Mathematics 9A (may be taken concurrently).

Principles of descriptive geometry and of mechanical and freehand drawing; their application in the representation, visualization, and solution of engineering problems.

##### 35. Statics. (3) I and II.

Mr. Henderson

Lecture—3 hours.

Prerequisite: Physics 4A; Mathematics 9C.

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, Mr. Krause

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. La Patra, Mr. Owen

Lecture—3 hours.

Prerequisite: Mathematics 109, 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.**

Mr. Childers

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. Childers, Mr. Zachariah

Laboratory—6 hours.

Prerequisite: course 100A (should be taken concurrently).

Instruction and practice in the use of basic electronics devices and measuring instruments. Laboratory problems involving both experimental and analytical design techniques. Problem topics include passive and active circuits, electromechanical devices, signal analysis and nonlinear components.

**102. Dynamics. (3) I and II.**

Möller, Yang &amp; Mr. Beadle

Lecture—3 hours.

Prerequisite: course 35; Mathematics 109 or the equivalent.

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. Whitaker

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.**

Lecture—3 hours.

Mr. Rodda, Mr. McDonald, Mr. Hutchinson

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.

**105. Thermodynamics (3) I and II.**

Lecture—3 hours.

Mr. Caswell, Mr. Whitaker, Mr. McDonald

Prerequisite: course 102 (may be taken concurrently); Chemistry 1B or 8; Physics 4C.

Thermodynamics of one-component systems; equations of state; first and second laws applied to both closed and steady flow systems; phase equilibrium; work-producing and work-absorbing cycles; measures of performance.

**106. Engineering Economics. (3) I and II.**Krone  
Mr. Keim

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 186.

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. Chancellor  
Lecture—2 hours; laboratory—3 hours.  
Prerequisite: course ~~106~~, 105  
Principles of internal combustion engines and accessories for stationary and mobile power. Design criteria for agriculture.
- 118. Machine Design. (3) II.** Mr. Kemper  
Lecture—2 hours; laboratory—3 hours.  
Prerequisite: 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. Yang  
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. Yang  
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. Cheney  
Lecture—3 hours.  
Prerequisite: course 102.  
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, 105.

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. Mechanics of Compressible Fluids.** (3) II.

Mr. Moller

Lecture—3 hours.

Prerequisite: courses 103 and 105.

The theory of one-dimensional, compressible flow with related phenomena; unsteady flow in conduits; application to fluid machinery.

**131. Structural Analysis.** (3) I and II.

*Brush*  
Mr. Keim

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. Cheney

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.

*Krone*  
Mr. Cheney

Lecture—3 hours.

Prerequisite: course 104; Engineering 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.

Mr. Cheney

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 Building Design. (3) II.**

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.**

*Cheney*  
Mr. Klem

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**

Mr. Scott

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; course 133; or 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 (may be taken concurrently), 185.

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. (4) II.** Mr. Whitaker  
 Lecture—4 hours.  
 Prerequisite: course 105; Chemistry 110A.  
 Use of the principles of conservation of mass and energy in chemical process calculations. Application of the laws of thermodynamics, with particular emphasis on the behavior of fluids, phase equilibria, and chemical reaction equilibria.
- \*154. Chemical Engineering Transport Processes. (3) I.** Mr. Smith  
 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.  
 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.** Mr. Smith  
 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.** Mr. Latorre  
 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. Latorre  
 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.

\* Not to be given, 1964-1965.

**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.** Mr. Loomis

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.

**167. Network Synthesis. (3) II.**

Mr. LaPatra

Lecture—3 hours.

Prerequisite: course 182.

An introduction to modern network synthesis techniques. Topics include one- and two-part networks, approximation problems, realization procedures, and filter theory.

**168. Electromechanics. (3) II.**

Mr. LaPatra

Lecture—3 hours.

Prerequisite: course 100A.

Electromechanical devices from a systems viewpoint. Topics include principles of rotating and translating electromechanical energy converters, energy relations, transfer function analysis, device dynamics, topological representation of devices and device control.

**170. Electronic Systems Design. (3) II.**

Mr. Freeman

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.

*See below***171A. Electromagnetic Fields and Waves. (3) I.**

Lecture—3 hours.

Prerequisite: course 181. (Not open to students taking Physics 110A and 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.

**171B. Electromagnetic Fields and Waves. (3) II.***See 171A*

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 Systems. (3) I.**

Mr. Owen

Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 100A.

Analytical and design methods common to all instrumentation systems; statistical methods; dynamic response; transducers; signal conditioning, data transmission and readout.

**181. Introduction to Field Theory. (3) I and II.**

Mr. Powers

Lecture—3 hours.

Prerequisite: Mathematics 109.

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. McKillop

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) I and II.***Hatchins*

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—2 hours; laboratory—3 hours.

Prerequisite: course 104.

Experimental methods for the analysis of stress and strain, including photoelasticity, brittle lacquers, mechanical and electrical strain gages and instrumentation; analog methods and principles of similitude for loaded structural models.

**185. Intermediate Fluid Mechanics. (3) I.**

Mr. Moller

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 and II.**

Mr. Brandt

Lecture—3 hours.

Prerequisite: course 103.

Fundamental concepts of momentum and energy transfer in fluids; their application to heat transfer and flow processes.

**187. Control Systems. (3) II.**

Mr. Owen

Lecture—3 hours.

Prerequisite: course 182.

Design and analysis of closed-loop automatic control systems. Examples are drawn from all engineering fields. The mathematical representation of systems; frequency and S-plane methods; stability criteria; application of analog computers; introduction to nonlinear systems.

**188. Engineering Materials. (2) I.**

Mr. Krause

Lecture—2 hours.

Prerequisite: course 45, Mathematics 109.

Characteristics of engineering materials such as metals, natural and synthetic organic materials, and fluids. Illustration for engineering design.

**\*189. Dimensional Analysis and Theory of Models. (2) I.**

Mr. Keim

Lecture—2 hours.

Prerequisite: course 103.

Dimensions; dimensionless products and algebraic theory; similarity and models; applications in solid and fluid mechanics, thermodynamics, and electrodynamics.

**190. Professional Responsibilities of Engineers. (2) I and 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. Convective Heat Transfer. (3) II.**

Mr. McKillop

Lecture—3 hours.

Prerequisite: courses 186 and 230.

Development of equations describing heat and momentum transfer by convection during laminar and turbulent flow; discussion of allied topics such as boiling and condensation.

**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. Brandt

Lecture—2 hours.

Prerequisite: course 186.

The transfer of radiant energy, gaseous radiation, geometrical and spectral characteristics of systems involving thermal radiation.

\* Not to be given, 1964-1965.

<b>210. Field Theory. (3) I.</b>	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.	
<b>220. Mechanical Vibrations. (3) II.</b>	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.	
<b>225. Theory of Elasticity. (3) I.</b>	Mr. Beadle
Lecture—3 hours.	
Prerequisite: Mathematics 109, or the equivalent.	
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.	
<b>226. Theory of Elastic Stability. (3) II.</b>	Mr. Cheney, Mr. Keim
Lecture—3 hours.	
Prerequisite: course 183 or consent of the instructor.	
Stability analysis of structural elements by solution of differential equation; energy approximations; variational methods; buckling of rectangular plates; introduction to inelastic and creep buckling.	
<b>230. Engineering Analysis. (3) II.</b>	Mr. Talley
Lecture—3 hours.	
Prerequisite: Mathematics 109, or the equivalent.	
Methods of theoretical analysis of typical engineering problems in heat transfer, fluid mechanics, electrical network, mechanical vibrations, and elasticity.	
<b>235. Energy Methods in Applied Mechanics. (3) I.</b>	Mr. Keim <i>Brosh</i>
Lecture—3 hours.	
Prerequisite: course 102 and Mathematics 109.	
Principles of mechanics; variational principles; equilibrium and stability of deformable bodies; generalized theories of dynamics; equations of Lagrange and Hamilton; vibrations; orbits and trajectories; optimization.	
<b>*241. Mechanics of Open-Channel Flow. (3) II.</b>	Mr. Strelkoff
Lecture—3 hours.	
Prerequisite: course 141; 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, graphical and numerical solutions; supercritical flows; shock waves; hydraulic jump. Solutions by digital computer.	
Offered in odd-numbered years.	

\* Not to be given, 1964-1965.

**252. Advanced Engineering Thermodynamics. (3) I.** Mr. Smith  
Lecture—3 hours.

Prerequisite: course 105 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.

**254. Mass Transfer. (3) II.** Mr. Caswell  
Lecture—3 hours.

Prerequisite: course 154, or the equivalent.

The laws of molecular diffusion in multi-component fluid and solid mixtures including the effects of concentration, temperature, electric and pressure fields. Convective mass transfer; mass, heat, and momentum transfer analogies.

**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.** *Smith*  
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.

**260. System Analysis. (3) I.** Mr. Owen  
Lecture—3 hours.

Prerequisite: course 182.

Properties of systems and their mathematical characteristics, state-space concepts, time-invariant systems, time-carrying systems, discrete time systems, real-time analysis, frequency methods.

**261. Nonlinear Control Systems. (3) II.** Mr. Owen  
Lecture—3 hours.

Prerequisite: course 166 or the equivalent.

Techniques for solving nonlinear control problems, state-space methods, stability theorems, Lyapunov's methods, sinusoidal describing functions, on-off systems.

Offered in odd-numbered years.

**\*262. Control System Optimization. (3) II.** Mr. Owen  
Lecture—3 hours.

Prerequisite: course 187 or the equivalent.

Optimization of systems by the adjustment of parameters and by the use of Pontryagin's maximum principle and Bellman's principle of optimality.

**263. Theory of Automata. (3) II.** Mr. Loomis  
Lecture—3 hours.

Prerequisite: course 163 or the equivalent.

A study of finite and infinite automata; finite-state machines, the state of assignment problem, questions of synchronization, delay and rate of operation, neural network models; turning machines and computability; non-deterministic machines; reliability.

\* Not to be given, 1964-1965.

**265. Theory of Semiconductor Devices. (3) I.**

Mr. Freeman

Lecture—3 hours.

Prerequisite: course 165 or the equivalent.

The theoretical development of the concepts germane to design of semiconductor electronic devices, including microelectronic circuits.

**267A. Network Theory. (3) I.**

Mr. LaPatra

Lecture—3 hours.

Prerequisite: course 167.

Advanced topics in network analysis, including the graph theory approach, matrix techniques, distributed parameter circuits, and time-varying networks.

**267B. Network Theory. (3) II.**

Mr. LaPatra

Lecture—3 hours.

Prerequisite: course 267A.

Advanced topics in network synthesis, including n-port networks, switching networks, and communication nets. Topological analysis of linear and sampled data systems.

**269. Theory of Magnetics. (3) II.**

Mr. Freeman

Lecture—3 hours.

Prerequisite: course 165 or the equivalent.

A development of the theory of magnetism in solids and analyses of systems composed of arrays of magnetic components.

**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.

Math 109 and

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 109, 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. Amoroch

Lecture—3 hours.

Prerequisite: courses 142 and 145; Mathematics 109.

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 109. 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 109, and 185. Recommended: course 185.

Dimensional analysis; general equations of motion, momentum, and energy; stream function; classical hydrodynamics; velocity potential; conformal mapping. *odd years.*

**278B. Advanced Fluid Mechanics. (3) I.**

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.

**280. Process Control. (3) II.**

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Lecture—3 hours.

Prerequisite: course 187.

Automatic control of physical and chemical processes. Consideration of sensing elements, control modes and final control elements. Computer simulation of processes and associated control systems.

**290. Seminar. (1) II.**

The Staff

Seminar—1 hour.

Discussion of current graduate research with particular attention to validity of experimental procedures, and including oral and written presentation of a term paper.

**298. Group Study. (1-5) I and II. The Staff (Mr. S. M. Henderson in charge)**

Engineering topics important to agriculture such as: vibration, indeterminant 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, 222 Sproul Hall

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.*  
Herbert Bogart, Ph.D., *Assistant Professor of English.*  
Wayne C. Harsh, Ph.D., *Assistant Professor of English.*  
Robert Hogan, Ph.D., *Assistant Professor of English.*  
Robert H. Hopkins, Ph.D., *Assistant Professor of English.*  
†Hilton J. Landry, Ph.D., *Assistant Professor of English.*  
Arthur E. McGuinness, Ph.D., *Assistant Professor of English.*  
Daniel S. Silvia, Jr., Ph.D., *Assistant Professor of English.*  
Edwin Honig, M.A., *Visiting Professor of English.*



Franklin S. Wise, M.A., *Associate in English.*

### ENGLISH MAJOR

*Letters and Science List.*—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

*Departmental Major Advisers.*—Mr. Bogart, Mr. Fishman, Mr. Halio, Mr. Harsh, Mr. Hogan, Mrs. Homann, Mr. Hopkins, Mr. McGuinness, Mr. Silvia. Miss Van Norden, Mrs. Wright.

#### *The Major Program*

(A) Lower Division Courses.—First year, English 1A-1B, Second Year, English 45A, English 46A-46B (46A to be taken before English 46B). Recommended: a course in philosophy, a course in classics.

(B) Upper Division Courses.—Twenty-four units of upper-division courses in literature, which must include 117J, 9 units of courses in literature prior to 1800; and 9 in literature after 1800. These divisions include all courses except the writing and language courses: 106G, 106L, and 110.

Students working for high or highest honors at graduation or planning to do graduate work in English must take in their senior year 197, Special Examination in English and American Literature, for which 3 units is given. All other English majors and minors are urged to take this Special Examination as the culmination of their study in English and American literature. Recommended: A course in English history.

Although only 24 units are required for the major, a total of 30 units in English is allowed by the College of Letters and Science to count towards graduation. For honor students, more than 30 units in English is allowed.

† Absent on leave, 1964-1965.

‡ Absent on leave, fall semester, 1965.

\* Sabbatical leave in residence, spring semester, 1965.

Besides the departmental major, an English teaching major in the teacher-training curriculum requires courses 106L, 110, and 300 (which counts as 2 units of credit in education). These may be postponed to the fifth year.

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 89).—The honors program consists of course 197 in the senior year in addition to the regular major.

*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.**

Lecture—1 hour; discussion—2 hours. Mr. Halio, Mr. Hogan, Mr. Hopkins

**1B. First-Year Reading and Composition. (3) I and II.**

Mr. Bogart, Mrs. Homann, Mr. McGuinness

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. Bogart

Lecture—3 hours.

Prerequisite: course 1A.

**30B. Survey of American Literature after the Civil War. (3) II.**

Lecture—3 hours. Mr. Wiggins

Prerequisite: course 1A. Course 30A is not prerequisite to 30B.

**31. Intermediate Composition. (3) II.**

Mr. McGuinness

Lecture—3 hours.

Prerequisite: course 1B.

Designed primarily for non-majors who wish to improve their skills in expository writing.

**45A. Critical Reading of Poetry. (3) I and II.**

Lecture—3 hours. Mr. Silvia, Miss Van Norden, Mrs. Wright

Prerequisite: course 1B.

Analysis and evaluation of works representing main types of English and American poetry.

**\*45B. Critical Reading of Prose. (3) I and II.**

Mr. Silvia

Lecture—3 hours.

Prerequisite: course 45A.

Analysis and evaluation of works representing main types of English and American prose.

\* Not to be given, 1964-1965.

**46A. Masterpieces of English Literature.** (3) I and II.

Lecture—3 hours. Mr. Hanzo, Mr. McGuinness, Mrs Wright

Prerequisite: course 1A. Recommended: course 1B.

Selected works of principal writers before the eighteenth century; lectures and discussion. Designed for majors and nonmajors.

**46B. Masterpieces of English Literature.** (3) I and II.

Lecture—3 hours. Mr. Halio, Mrs. Homann, Mr. Hopkins

Prerequisite: course 1A. Recommended: course 1B.

Selected works of principal writers after 1700; lectures and discussion. Designed for majors and nonmajors.

**47. Introduction to Modern Literature.** (3) II.

Mr. Weber

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. Honig

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. Hogan, Mr. Harsh

Lecture—3 hours.

Prerequisite: course 1B.

Designed to develop a clear, accurate, interesting style. Required of prospective high school English teachers.

**110. Language.** (3) II.

Mr. Harsh

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. Hogan

Lecture—3 hours.

**116. The English Bible as Literature.** (3) II.

Miss Van Norden

Lecture—3 hours.

**117J. Shakespeare.** (3) I and II.

Mrs. Wright, Mr. Halio, Mr. Hogan

Lecture—3 hours.

Study of twelve to fifteen of Shakespeare's principal plays.

**\*117S. Shakespeare.** (3) I.

Mrs. Wright

Lecture—3 hours.

Study of selected plays of Shakespeare. May not be taken for credit by students whose major is English nor counted as part of the minor in English for prospective teachers.

\* Not to be given, 1964-1965.

119. <b>The Age of Johnson.</b> (3) II. Lecture—3 hours.	Mr. Hopkins
125C. <b>The English Novel.</b> (3) I. Lecture—3 hours. From the beginnings to Dickens.	Mrs. Needham
125D. <b>The English Novel.</b> (3) II. Lecture—3 hours. From Dickens to Hardy.	Mrs. Needham
125E. <b>The American Novel.</b> (3) I. Lecture—3 hours. Reading and discussion of selected American novels.	Mr. Bogart
125F. <b>The English Novel.</b> (3) II. Lecture—3 hours. From Hardy to the present.	Mr. Fishman
131. <b>Early American Literature.</b> (3) I. Lecture—3 hours. Literature in America to 1800.	Mr. Weber
132. <b>Romanticism in American Literature.</b> (3) II. Lecture—3 hours. Irving, Cooper, Emerson, Thoreau, and other early nineteenth-century writers.	Mr. Bogart
133. <b>Hawthorne and Melville.</b> (3) I. Lecture—3 hours.	Mr. Weber
*134. <b>American Literature from 1865 to 1914.</b> (3) I. Lecture—3 hours.	—
135. <b>Modern American Literature.</b> (3) II. Lecture—3 hours. Twentieth-century prose, poetry, and drama.	—
137. <b>American Literary Humor.</b> (3) I. Lecture—3 hours. Prerequisite: course 1A. The American humorous vision as expressed in such modes as comedy, satire, irony, and their combinations from the 17th century to the present, with attention given to such matters as the nature of humor and the cultural influences affecting its development.	Mr. Weber
*144A. <b>Masterpieces of World Literature: The Epic.</b> (3) I. Miss Van Norden Lecture—3 hours. Iliad; Odyssey; Aeneid; Beowulf; Divine Comedy; Paradise Lost.	—
*144B. <b>Masterpieces of World Literature: The European Novel.</b> (3) II. Lecture—3 hours. Representative European novelists of the nineteenth and twentieth centuries.	—
*147. <b>Introduction to Principles of Criticism.</b> (3) II. Lecture—3 hours. Examination of the principal theories of literary criticism and their application to literature, with emphasis on modern criticism.	—

\* Not to be given, 1964-1965.

149. **The English Lyric.** (3) II. Mr. Honig  
 Lecture—3 hours.  
 Reading and discussion of representative lyric poems, English and American.
- \*151. **Study of a Major Writer.** (3) I and II. —  
 Lecture—3 hours.  
 With the consent of the instructor, this course may be repeated for credit.
154. **Chaucer.** (3) II. Mr. Silvia  
 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. Mrs. Wright  
 Lecture—3 hours.  
 Beginnings of the English Renaissance, and literature of the sixteenth century.
- 158B. **Literature of the Seventeenth Century.** (3) I. Mr. Hanzo  
 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. McGuinness  
 Lecture—3 hours.
177. **The Romantic Period.** (3) II. Mr. Staples  
 Lecture—3 hours.  
 Wordsworth, Coleridge, Byron, Shelley, Keats, and their eighteenth-century precursors.
187. **Prose and Poetry of the Victorian Period.** (3) I. Mr. Fishman  
 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. Fishman  
 Lecture—3 hours.  
 Wells, Shaw, Conrad, Hardy, Housman, and other representative writers.
192. **British Literature from 1918 to the Present.** (3) II. Mr. Fishman  
 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.
197. **Special Reading and Examination in English and American Literature.** (3) I and II. The Staff  
 Lecture—3 hours.  
 Open to all English majors or minors in their senior year and required of all English honor students who desire to earn high or highest honors at graduation or who desire to be recommended for graduate work in English.

\* Not to be given, 1964–1965.

- 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. Wiggins  
Lecture—3 hours.
- 211A. Introduction to Old English.** (3) I and II. Mrs. Homann, Mr. Silvia  
Lecture—3 hours.  
Old English language and literature.
- \*211B. Beowulf.** (3) II. Mr. Silvia  
Lecture—3 hours.  
Prerequisite: course 211A or the equivalent.
- \*212. Middle and Early Modern English.** (3) II. Mrs. Homann, Mr. Silvia  
Lecture—3 hours.  
A study of the English language and its dialects as exhibited in literary texts dating from the twelfth through the seventeenth centuries.
- \*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.
- 230. Medieval Literature.** (3) II. Mrs. Homann, Mr. Silvia  
Lecture—3 hours.
- \*231. Renaissance Literature.** (3) II. Mrs. Wright  
Lecture—3 hours.
- \*232. Literature of the Earlier Seventeenth Century.** (3) I. Mr. Hanzo  
Lecture—3 hours.
- 233. Literature from 1660 to 1745.** (3) II. Mrs. Needham  
Lecture—3 hours.
- \*234. Literature of the Later Eighteenth Century.** (3) I. —————  
Lecture—3 hours.
- \*235. Literature of the Romantic Period.** (3) II. Mr. Fishman  
Lecture—3 hours.
- \*236. Victorian Literature.** (3) I. Mr. Staples  
Lecture—3 hours.
- \*237. Twentieth-Century British Literature.** (3) II. Mr. Hanzo, Mr. O'Connor  
Lecture—3 hours.

- \*238. **American Literature to the Civil War.** (3) I. Mr. Weber  
Lecture—3 hours.
- \*239. **American Literature After the Civil War.** (3) II. Mr. O'Connor, Mr. Weber, Mr. Wiggins  
Lecture—3 hours.
- \*250. **Topics in Medieval Literature.** (3) II. Mrs. Homann, Mr. Silvia  
Seminar—3 hours.
251. **Topics in Renaissance Literature.** (3) II. Mr. Baker  
Seminar—3 hours.
252. **Topics in the Literature of the Earlier Seventeenth Century.** (3) I. Miss Van Norden  
Seminar—3 hours.
- \*253. **Topics in Literature from 1660 to 1745.** (3) I. Mrs. Needham  
Seminar—3 hours.
- \*254. **Topics in the Literature of the Later Eighteenth Century.** (3) II. \_\_\_\_\_  
Seminar—3 hours.
- \*255. **Topics in the Literature of the Romantic Period.** (3) I. Mr. Fishman  
Seminar—3 hours.
- \*256. **Topics in Victorian Literature.** (3) II. Mr. Staples  
Seminar—3 hours.
- \*257. **Topics in Twentieth-Century British Literature.** (3) I. Mr. Hanzo, Mr. O'Connor  
Seminar—3 hours.
- \*258. **Topics in American Literature to the Civil War.** (3) II. Mr. Weber  
Seminar—3 hours.
- \*259. **Topics in American Literature After the Civil War.** (3) I. Mr. O'Connor, Mr. Weber, Mr. Wiggins  
Seminar—3 hours.
- \*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.
270. **Arthurian Romance.** (3) I. Mrs. Homann  
Seminar—3 hours.  
The Arthurian tradition in the Middle Ages.
- \*271. **Chaucer.** (3) II. Mrs. Homann, Mr. Silvia  
Seminar—3 hours.
272. **Shakespeare.** (3) II. Mr. Halio  
Seminar—3 hours.
- \*273. **Elizabethan and Jacobean Drama.** (3) II. Mrs. Homann  
Seminar—3 hours.
- \*274. **Milton.** (3) I. Miss Van Norden  
Seminar—3 hours.

\* Not to be given, 1964-1965.

**\*275. Sense and Sensibility in the Eighteenth Century. (3) II.**

Seminar—3 hours. Mrs. Needham  
Rationalism and sentimentalism in eighteenth-century thought and literature.

**276. Studies in American Writers. (3) II.**

Seminar—3 hours. Mr. O'Connor, Mr. Weber, Mr. Wiggins  
Examination of a major figure. With the consent of the instructor, this course may be repeated for credit.

**\*277. Modern Anglo-Irish Writers. (3) II.**

Mr. Staples

Seminar—3 hours.

Examination of major figures.

**278. James Joyce. (3) II.**

Mr. Staples

Seminar—3 hours.

Comprehensive study of the Joyce canon.

**279. Studies in Modern British and American Literature. (3) I.**

Seminar—3 hours. Mr. Hanzo, Mr. O'Connor, Mr. Weber  
Themes and forms common to British and American writers of the twentieth century.

**\*280. American-European Literary Relations. (3) I.** Mr. Carter, Mr. Weber

Seminar—3 hours.

The interchange of ideas and genres between Europe and America from the seventeenth through the twentieth century.

**281. Dramatic Literature. (3) II.**

Mr. Hogan

Seminar—3 hours.

Problems in dramatic theory and criticism.

**282A. Fiction. (3) I.**

Mrs. Needham

Seminar—3 hours.

Problems in the theory and practice of fiction.

**282B. Poetics. (3) I.**

Mr. Honig

Seminar—3 hours.

Problems in the theory and practice of poetry.

**283. Literary Criticism. (3) I.**

Mr. Fishman

Seminar—3 hours.

A survey of literary criticism from Aristotle to the present.

**\*284. Modern Critical Theory. (3) I.**

Mr. Fishman, Mr. O'Connor

Seminar—3 hours.

Examination of problems in the theory underlying the practice of literary criticism from Eliot to the present.

**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

\* Not to be given, 1964-1965.

**PROFESSIONAL COURSE**

**300. Problems in Teaching English Literature and Composition in Secondary Schools. (2) I.** Mr. Harsh

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 341; for programs in Enology see curriculum in Food Science, pages 59, 209 and curriculum in Agricultural Production, pages 55, 54.

## 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.*  
Albert A. Grigarick, Jr., Ph.D., *Assistant Professor of Entomology.*  
Charles L. Judson, Ph.D., *Assistant Professor of Entomology.*  
G. A. H. McClelland, Ph.D., *Assistant Professor of Entomology.*  
Frank E. Strong, Ph.D., *Assistant Professor of Entomology.*

Merlin W. Allen, Ph.D., *Professor of Nematology.*  
James R. Douglas, Ph.D., *Professor of Parasitology.*  
Paul D. Hurd, Jr., Ph.D., *Lecturer in Entomology (Berkeley campus).*  
John W. MacSwain, Ph.D., *Professor of Entomology (Berkeley campus).*

### 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, 1964–1965.

- 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.  
 Offered in even-numbered years.
- 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 hours; 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.
- 126. Medical Entomology. (3) I.** Mr. McClelland  
 Lecture—3 hours.  
 Prerequisite: one course in entomology or consent of instructor.  
 Biology of insects and other arthropods of medical importance throughout the world, with special emphasis on epidemiology of human diseases.
- 126L. Medical Entomology Laboratory. (1) I.** Mr. McClelland  
 Laboratory—3 hours.  
 Prerequisite: course 126 (may be taken concurrently).  
 Demonstration and practice in the entomological aspects of human disease epidemiology.

**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

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. (1-9) I and II.**

The Staff

\* Not to be given, 1964-1965.

## FOOD SCIENCE AND TECHNOLOGY

Reese H. Vaughn, Ph.D., *Chairman of the Department.*  
Department Office, 126A Cruess Hall

Clinton O. Chichester, Ph.D., *Professor of Food Science and Technology.*  
Edwin B. Collins, 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.*  
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.*  
Richard A. Bernhard, Ph.D., *Associate Professor of Food Science and Technology.*  
Walter G. Jennings, Ph.D., *Associate Professor of Food Science and Technology.*  
Martin W. Miller, 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 R. Whitaker, Ph.D., *Associate Professor of Food Science and Technology.*  
George K. York, II, Ph.D., *Assistant Professor of Food Science and Technology.*

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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).*  
Michael J. Lewis, Ph.D., *Lecturer in Food Science and Technology.*  
Box S. Luh, Ph.D., *Lecturer in Food Science and Technology.*  
Mendel Mazelis, 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.*  
Joseph M. Smith, Sc.D., *Professor of Engineering and Food Science and Technology.*  
A. Dinsmoor Webb, Ph.D., *Professor of Enology.*  
Morris H. Woskow, Ph.D., *Lecturer in Food Science and Technology and Lecturer in Psychology.*

*Departmental Major Advisers.* Mr. Marsh, Mr. Miller; Food Science (Dairy Science), Mr. Collins; Food Science (Enology), Mr. Webb.

*Bachelor of Science Major Program and Graduate Study.* See page 58.

## LOWER DIVISION COURSE

**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.

Taxonomy, physiology, ecology, and control of microorganisms important in manufacturing and ripening foods, producing defects and spoilage; disposing of wastes, and protecting public health; bacteriophage action and control.

**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.

Laboratory procedures selected to follow subject matter sequence of course 105.

**106. Food and Industrial Microbiology Summer Laboratory. (2)**

Laboratory—90 hours total.

Mr. Lewis, Mr. Miller

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; development 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.**

Mr. Dunkley, Mr. Harper, Mr. Guymon

Lecture—3 hours; laboratory—6 hours.

Prerequisite: Mathematics 16B; Physics 2B, 3B; Chemistry 109.

Application of the conservation of mass and energy to food processing. Elements of fluid mechanics and heat transfer and introduction to process principles, including counter-current operation and equilibrium stage processing. Field trips to food processing operations in the area.

**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.**

Mr. Dunkley

Lecture—3 hours.

Prerequisite: Biochemistry 101 or the equivalent; Bacteriology 1.

Principles of dairy processing including pasteurization, sterilization, homogenization, separation, and condensing.

**118B. Principles of Dairy Processing. (3) II.**

Mr. Nickerson

Lecture—3 hours.

Prerequisite: Biochemistry 101 or the equivalent; Bacteriology 1.

Principles of dairy processing including freezing, drying, crystallization, emulsification, and stabilization.

**122. Enzyme Technology. (3) II.**

Mr. Whitaker

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.

Offered in even-numbered years.

**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.

**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. Feeney  
Prerequisite: Biochemistry 101; Chemistry 109 or 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.  
Offered in odd-numbered years.

**\*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 115)  
**Small Grains, Corn, Sorghum, and Beans** (Agronomy 111)  
**Industrial Fermentations** (Bacteriology 106)  
**Chemistry of Natural Products** (Chemistry 150A, 150B)  
**Crop Production Under Tropical Conditions** (International Agricultural  
Development 101)  
**Concepts of Animal Nutrition** (Nutrition 250)  
**Handling, Storage, and Transit of Fruits** (Pomology 112)  
**Technology of Handling Poultry Products** (Poultry Husbandry 121)  
**Handling, Storage, and Transit of Vegetables** (Vegetable Crops 112)  
**Enology: Wine Processing and Analyses** (Viticulture 124)  
**Enology: Wine Preparation** (Viticulture 125)  
**Principles of Distillation and Brandy Technology** (Viticulture 140)

\* Not to be given, 1964-1965.

## FOREIGN LANGUAGES

Merle L. Perkins, Ph.D., *Chairman of the Department.*  
Department Office, 524 Sproul Hall

Merle L. Perkins, Ph.D., *Professor of French.*  
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.*  
Clifford A. Bernd, Ph.D., *Associate Professor of German.*  
Donald G. Castanien, Ph.D., *Associate Professor of Spanish.*  
Roland W. Hoermann, Ph.D., *Associate Professor of German.*  
Martin Kanes, Docteur de l'Université de Paris, Ph.D., *Assistant Professor of French.*  
Daniel S. Keller, Ph.D., *Associate Professor of Spanish.*  
Ulrich Gaier, Dr.Phil., *Assistant Professor of German.*  
Richard E. Grimm, Ph.D., *Assistant Professor of Classics.*  
†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.*  
English Showalter, Jr., Ph.D., *Assistant Professor of French.*  
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.*  
Robert E. Kelsey, A.B., *Acting Assistant Professor of Spanish.*  
Anthony S. Kawczynski, Mag. Phil., *Lecturer in Foreign Languages.*  
Esther N. Keller, M.Ed., *Associate in Spanish.*  
Frieda M. Lacing, M.A., *Associate in French.*  
Rosabianca T. LoVerso, M.A., *Associate in French and Italian.*  
Henry F. Loyzelle, A.B., *Associate in Italian.*  
Russell L. Pfohl, M.A., *Lecturer in French.*  
Raul Pimentel, M.A., *Lecturer in German.*  
Josette Sénauteur, Licence, *Associate in French.*  
Alex M. Shane, Jr., M.A., *Acting Assistant Professor of Russian.*  
Maria Stoffers-Edlinger, Ph.D., *Lecturer in German.*  
Leonilla F. Strelkoff, M.A., *Associate in French and Russian.*  
Elizabeth H. Wierzbianska, M.A., *Associate in Spanish*

## 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 88.

### 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.

† Absent on leave, 1964-1965.

**\*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 88.

*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 89).—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.

\* Not to be given, 1964-1965.

## 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. No credit will be allowed if the student has completed two or more 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. Only two units of credit will be allowed if the student has completed three or more 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 Sénateur  
 Lecture—3 hours.
- 101B. Advanced Grammar, Composition, and Conversation.** (3) II. Miss Sénateur  
 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. —————  
 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.

\* Not to be given, 1964-1965.

- \*117B. **Novelists and Moralists of the Seventeenth Century.** (3) II.  
Lecture—3 hours. Mr. Pfohl  
Offered in even-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. Showalter  
Lecture—3 hours.  
Plays of Marivaux and Beaumarchais; novels of Lessage, 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, and 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, and 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. Mr. Showalter  
Lecture—3 hours.  
With the consent of the instructor, this course may be repeated for credit.  
Offered in even-numbered years.

\* Not to be given, 1964-1965.

- 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 odd-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 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. (1-4) I and II.** The Staff
- GRADUATE COURSES**
- \*201. History of the French Language. (3) I.** \_\_\_\_\_  
 Seminar—3 hours.  
 Offered in odd-numbered years.
- \*202. Medieval French Literature. (3) II.** \_\_\_\_\_  
 Seminar—3 hours.  
 Offered in even-numbered years.
- 217. Seventeenth-Century French Literature. (3) II.** Mr. Pfohl  
 Seminar—3 hours.  
 Offered in odd-numbered years.
- 218. Eighteenth-Century French Literature. (3) I.** Mr. Showalter  
 Seminar—3 hours.  
 With the consent of the instructor, this course may be repeated for credit.  
 Offered in even-numbered years.
- 219. Nineteenth-Century French Literature. (3) II.** Mr. Bach  
 Seminar—3 hours.  
 With the consent of the instructor this course may be repeated for credit.  
 Offered in odd-numbered years.
- \*220. Twentieth-Century French Literature. (3) II.** Mr. Lindsay  
 Seminar—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 88.

*Departmental Major Advisors.*—Mr. Hoermann, Mr. Nerjes.  
*Graduate Adviser.*—Mr. Hoermann.

***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

\* Not to be given, 1964-1965.

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 89).—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. No credit will be allowed if the student has completed two or more 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. Only two units of credit will be allowed if the student has completed three or more 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. Nerjes  
Lecture—3 hours.

**101B. Advanced Grammar, Composition, and Conversation.** (3) II. Mr. Pimentel  
Lecture—3 hours.

102. **German Poetry.** (3) I. Mr. Gaier  
 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. Nerjes  
 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** (3) I. Mr. Hoermann  
 Lecture—3 hours.  
 The reaction against rationalism and the liberation of feeling.  
 Offered in even-numbered years.
110. **The Romantic Movement.** (3) II. Mr. Hoermann  
 Lecture—3 hours.  
 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 odd-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. Bernd  
 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 through the Baroque.  
 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.

\* Not to be given, 1964-1965.

- \*130A. Advanced Grammar and Composition. (3) I. The Staff  
 Lecture—3 hours.  
 Prerequisite: courses 101A and 101B, or either course with grade of B or better.  
 Offered in odd-numbered years.
- 130B. Advanced Grammar and Composition. (3) II. The Staff  
 Lecture—3 hours.  
 Prerequisite: courses 101A and 101B, or either course with grade B or better.  
 Offered in odd-numbered years.
135. History of the German Language. (3) I. Mr. Pimentel  
 Lecture—3 hours.  
 Offered in even-numbered years.
- \*150. Masterpieces of German Literature. (3) I. The Staff  
 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. Bernd  
 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

- \*202. Middle High German. (3) I. —————  
 Seminar—3 hours.
- \*205. Sixteenth- and Seventeenth-Century German Literature. (3) I. Mr. Gaier  
 Seminar—3 hours.
- \*208. Eighteenth-Century German Literature. (3) II. Mr. Nerjes  
 Seminar—3 hours.
211. Nineteenth-Century German Literature. (3) I. Mr. Bernd  
 Seminar—3 hours.
217. Twentieth-Century German Literature. (3) I. Mr. Hoermann  
 Seminar—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 88.

\* Not to be given, 1964-1965.

## LOWER DIVISION COURSES

1. **Elementary Greek—Beginning.** (4) I. Mr. Thompson  
 Recitation—4 hours.  
 No credit will be allowed if the student has completed two or more years of high school Greek.
2. **Elementary Greek—Continued.** (4) II. Mr. Thompson  
 Recitation—4 hours.  
 Prerequisite: course 1 or the equivalent. Only two units of credit will be allowed if the student has completed three or more years of high school Greek.

## 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*.
103. **Sophocles.** (3) I. Mr. Grimm  
 Lecture—3 hours.  
 Prerequisite: course 101 or the equivalent.  
 Reading of selected Trojan or Theban plays; lectures on Sophocles' role in the development of Attic tragedy.  
 Offered in even-numbered years.
104. **Thucydides.** (3) II. Mr. Thompson  
 Lecture—3 hours.  
 Prerequisite: course 101 or the equivalent.  
 Historical and philological study of the text.  
 Offered in odd-numbered years.

## 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 88.

## 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. No credit will be allowed if the student has completed two or more 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. Only two units of credit will be allowed if the student has completed three or more 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 88.

Departmental Major Adviser.—Mr. Grimm

*The Major Program*

(A) Lower Division Courses.—Latin 1, 2, and 3 or their equivalents. Recommended: Classics 39A-39B; Greek 1, 2.

(B) Upper Division Courses.—Required: 24 units of upper division courses, including 120. Two courses may be chosen from related courses in other fields. Students majoring in Latin must maintain at least a C average in upper division courses.

## LOWER DIVISION COURSES

## 1. Elementary Latin—Beginning. (4) I.

Mr. Galvin

Recitation—4 hours.

No credit will be allowed if the student has completed two or more years of high school Latin.

## 2. Elementary Latin—Continued. (4) II.

Mr. Grimm

Recitation—4 hours.

Prerequisite: course 1 or two years of high school Latin or consent of the instructor. Only two units of credit will be allowed if the student has completed three or more years of high school Latin.

## 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 I 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.

\* Not to be given, 1964-1965.

- 104. Roman Comedy: Plautus and Terence. (3) I.** Mr. Thompson  
 Lecture—3 hours.  
 Prerequisite: course 3 or the equivalent.  
 Survey of the early Roman theater; selected comedies of Plautus and Terence.  
 Offered in even-numbered years.
- \*105. Vergil: Eclogues and Georgics. (3) II.** Mr. Grimm  
 Lecture—3 hours.  
 Prerequisite: course 3 or the equivalent.  
 Selected readings in the earlier poetic works of Vergil.  
 Offered in even-numbered years.
- 106. Pliny and Martial. (3) II.** Mr. Grimm  
 Lecture—3 hours.  
 Prerequisite: course 3 or the equivalent.  
 Selected letters of Pliny and epigrams of Martial; literary and historical trends in Rome during the first and early second century A.D.  
 Offered in odd-numbered years.
- 120. Latin Composition. (3) II.** The Staff  
 Lecture—3 hours.  
 Prerequisite: course 3 or the equivalent.  
 Survey of classical Latin syntax; extensive practice in prose composition.
- 199. Special Study for Advanced Undergraduates. (1-5) I and II.** The Staff

#### 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 88.

#### LOWER DIVISION COURSES

- 1. Elementary Russian—Beginning. (4) I.** Mr. Shane  
 Recitation—3 hours; laboratory—2 hours.  
 This course corresponds to the first two years of high school Russian. No credit will be allowed if the student has completed two or more years of high school Russian.
- 2. Elementary Russian—Continued. (4) II.** Mr. Shane  
 Recitation—3 hours; laboratory—2 hours.  
 Prerequisite: course 1 or two years of high school Russian. Only two units of credit will be allowed if the student has completed three or more years of high school Russian.
- 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.
- 1G. Russian for Graduate Students. (No credit) I.** Mrs. Strelkoff  
 Lecture—3 hours.  
 A course designed to prepare students for the graduate reading examination.

\* Not to be given, 1964-1965.

## UPPER DIVISION COURSES

**101A. Advanced Grammar, Composition and Conversation.** (3) I. Mr. Shane  
Lecture—3 hours.  
Prerequisite: course 4 or the equivalent.

**101B. Advanced Grammar, Composition, and Conversation** (3) II. Mr. Shane  
Lecture—3 hours.  
Prerequisite: course 101A 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, Kataev, 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 88.

*Departmental Major Advisers.*—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 89).—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.

\* Not to be given, 1964-1965.

## 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.  
 No credit will be allowed if the student has completed two or more 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. Only two units of credit will be allowed if the student has completed three or more 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 and II. The Staff  
 Lecture—3 hours.  
 Prerequisite: course 4, or the equivalent. Required as preparation for the major.
- 25B. **Advanced Spanish.** (3) II. The Staff  
 Lecture—3 hours.  
 Prerequisite: course 4, or the equivalent. Required as preparation for the major.

## 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.** Lecture—3 hours. (3) I. Miss Zardoya  
 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. Castanien  
 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.
- 115A. **Spanish Lyric Poetry: Middle Ages to 1700.** (3) I. Miss Zardoya  
Lecture—3 hours.  
Offered in even-numbered years.
- 115B. **Spanish Lyric Poetry: 1700 to Present.** (3) II. Miss Zardoya  
Lecture—3 hours.  
Offered in odd-numbered years.
119. **The Spanish Novel of the Nineteenth Century.** (3) I. Mr. Ullman  
Lecture—3 hours.  
Offered in even-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 and 25B.
- 130B. **Advanced Grammar and Composition.** (3) II. Mr. Myers  
Lecture—3 hours.  
Prerequisite: courses 25A and 25B. Course 130A is not prerequisite to 130B.
134. **Survey of Spanish Culture.** (3) II. Miss Zardoya  
Lecture—3 hours.  
The growth and development of Spain's culture and civilization from ancient times to the present.
- \*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.

\* Not to be given, 1964-1965.

**\*150. Masterpieces of Spanish Literature. (3) I.**

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 odd-numbered years.

**151. Study of a Major Writer. (3) II.**

Mr. Kelsey

Lecture—3 hours.

With the consent of the instructor, this course may be repeated for credit.

**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

Seminar—3 hours.

Prerequisite: Latin 1 or the equivalent.

**\*231. Spanish Literature of the Golden Age. (3) II.**

Mr. Castanien

Seminar—3 hours.

**234. Twentieth-Century Spanish Poetry. (3) I.**

Miss Zardoya

Seminar—3 hours.

Offered in even-numbered years.

**\*235. Twentieth-Century Spanish Prose. (3) I.**

Miss Zardoya

Seminar—3 hours.

Offered in odd-numbered years.

**236. Spanish American Poetry and Drama of the National Period. (3) II.**

Mr. Keller

Seminar—3 hours.

Offered in odd-numbered years.

**\*237. The Spanish American Novel of the National Period. (3) II.**

Mr. Keller

Seminar—3 hours.

Offered in even-numbered years.

**299. Research. (1-4) I and II.**

The Staff

\* Not to be given, 1964-1965.

## **FRENCH**

For courses in French see "Foreign Languages" on page 211.

## **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 and 39B. Greek Literature in Translation.
- 40. Roman Literature in Translation.

### **DRAMATIC ART**

- 158A and 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

Alex S. Fraser, Ph.D., *Chairman of the Department*  
Department Office, 201 Hutchison Hall

Robert W. Allard, Ph.D., *Professor of Genetics and Professor of Agronomy.*  
Alex 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., Ph.D., *Assistant Professor of Genetics.*



Barbara D. Maling, Ph.D., *Lecturer in 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 Genetics and Professor of Agronomy.*  
Vigfus S. Asmundson, Ph.D., *Professor of Poultry Husbandry, Emeritus.*  
G. Eric Bradford, Ph.D., *Associate 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.*  
Alex 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., *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.*  
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., *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.*  
Stephen L. Wolfe, Ph.D., *Assistant Professor of Zoology.*

*Departmental Major Adviser.*—Mr. Stebbins.

*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.

† Absent on leave, 1964-1965.

## LOWER DIVISION COURSE

**10. Heredity and Evolution. (3) II.**

Mr. Fraser

Lecture—3 hours.

For students not specializing in biology. No credit to students who have had or are taking upper division genetics, botany, or zoology courses. The general principles of the laws of heredity and evolution.

## UPPER DIVISION COURSES

**100. Principles of Genetics. (3) I and II.**

I. Mr. Allard, Mr. Fraser, Mr. Bernstein; II. Mr. Fraser, Mr. Bernstein.  
Lecture—3 hours; conference—1 hour.

Prerequisite: general botany or general zoology.

Introduction to genetics with some consideration of its applications in agriculture and biology.

Students taking course 100L concurrently will include their conference hour within the laboratory period of that course.

**100L Principles of Genetics Laboratory. (1) I and II.**

Mr. Bernstein

Laboratory—3 hours.

May be taken concurrently with course 100.

Laboratory work in elementary genetics to supplement course 100.

**\*101. Cytogenetics. (3) II.**

Lecture—3 hours.

Prerequisite: course 100; general cytology (Botany 130 or its equivalent).  
Genetics as related to cytological conditions.

**\*101L Cytogenetics Laboratory. (2) II.**

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.

**105. Population Genetics. (3) I.**

Mr. Fraser

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 100.

An introductory course in the analysis and interpretation of population genetics, and of quantitative genetic systems.

**\*106. Advanced Genetics. (3) I.**

Mr. Green, Mr. Bernstein, Mr. Snow

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.

\* Not to be given, 1964-1965.

**115. Human Genetics. (3) II.**

Mr. Green

Lecture—3 hours.

Prerequisite: introductory course in zoology, botany, or biology; upper division standing.

Principles of genetics applied to the physical, biochemical, and mental characteristics of man; genetics of human populations; the heredity-environment problem.

**199. Special Study for Advanced Undergraduates. (1-5) I and II.**

Mr. Fraser

**GRADUATE COURSES****206. Current Problems in Genetics. (3) I and II.**

I. Mrs. Maling;

Lecture—2 hours; laboratory—2 hours.

II. —

Prerequisite: course 100, 100L 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

Seminar—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

Seminar—1 hour; individual conferences.

Prerequisite: course 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.**

—

Seminar—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.

**294. Seminar in Breeding Systems. (1-3) II.**

Mr. Hansche

Seminar—1 hour; individual conferences.

Prerequisite: course 291.

Topics of current interest relating genetics to problems of animal and plant breeding.

**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. Rollins 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

Kenneth Thompson, Ph.D., *Chairman of the Department*  
Department Office, 330 Voorhies Hall

Howard F. Gregor, Ph.D., *Associate Professor of Geography.*

Kenneth Thompson, Ph.D., *Associate Professor of Geography.*

Philip L. Wagner, Ph.D., *Associate Professor of Geography.*



Stephen C. Jett, B.A., *Acting Assistant Professor of Geography.*

Paul D. Marr, M.A., *Acting Assistant Professor of Geography.*

Herbert B. Schultz, Ph.D., *Lecturer in Geography and Associate Professor of Agricultural Engineering.*

*Letters and Science List.*—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

*Departmental Major Adviser.*—Mr. Wagner.

### *The Major Program*

(A) Lower Division Courses.—Required: Geography 1, 2, 3, 5; 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).

Students who desire to prepare themselves for further training or employment in the field of Urban and Regional Planning may do so by completing certain additional courses, while fulfilling the requirements for the major, in consultation with the departmental adviser.

*Graduate Study.*—The department offers a program of study and research leading to the M.A. degree in Geography. Detailed information regarding graduate study may be obtained from the Graduate Adviser, Department of Geography.

### LOWER DIVISION COURSES

#### 1. **Introduction to Physical Geography.** (3) I and II.

Lecture—3 hours.

Mr. Jett, 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 and II.

Mr. Wagner

Lecture—3 hours.

A study of the basic cultural elements of geography (especially population distribution, general settlement and land-use patterns, and economies) 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—2 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.

**4. Introduction to Maps. (2) II.**

Mr. Jett

Lecture—2 hours.

History and principles of cartography; great map-makers; national surveys; modern trends in mapping.

**5. Introductory Economic Geography. (3) I.**

Mr. Thompson

Lecture—3 hours.

Geographic aspects of the production, exchange, and consumption of goods.

**UPPER DIVISION COURSES****101. Methods of Geographic Research. (3) II.**

Mr. Marr

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.

**105. Cartography. (3) I.**

Mr. Gregor

Lecture—1 hour; laboratory—4 hours.

Prerequisite: course 4 or 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.

**106. Interpretation of Aerial Photographs. (3) II.**

Mr. Marr

Lecture—1 hour; laboratory—4 hours.

Prerequisite—course 1.

Analysis of landscape from aerial photographs: land forms; vegetation; land use; settlements; transport and communications.

**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.

- 125. The Geography of North Africa and the Near East.** (3) I.      Mr. Marr  
Lecture—3 hours.  
Prerequisite: courses 1 and 2 or consent of the instructor.  
Physical, cultural, and historical geography of the Arab World and its near neighbors.
- 126. The Geography of Sub-Saharan Africa.** (3) II.      Mr. Jett  
Lecture—3 hours.  
Prerequisite: courses 1 and 2 or consent of the instructor.  
Physical, cultural, and historical geography of Africa south of the Sahara.
- 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.  
Prerequisite: course 5, or consent of the instructor.  
Factors in economic regionalism. Analysis of major economic regions of the earth.
- 143. Political Geography.** (3) II.      Mr. Thompson  
Lecture—3 hours.  
Area 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.
- 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.
- 156. Regional Structure.** (3) II.      Mr. Marr  
Lecture—3 hours.  
Prerequisite: course 1 or 2.  
The concept of regional structure and its application to geographic problems; nodes, linkages, circulation, and regions. Quantitative and cartographic methods of regional research.
- 161. The Conservation of Natural Resources.** (3) II.      Mr. Jett  
Lecture—3 hours.  
The general principles of conservation and their application, especially in the United States.
- 162. Geography of Water Resources.** (3) I.      Mr. Marr  
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.

\* Not to be given, 1964-1965.

**170. Cultural Ecology. (3) I.**

Mr. Jett

Lecture—3 hours.

Prerequisite: course 2 or Anthropology 2.

Theories of environment-man relations. Ecologic relations of gatherers, fishermen, hunters, swidden cultivators, peasants; their impact on environment; their domestic plants and animals.

**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.

## **GEOLOGY**

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.*  
James W. Valentine, 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 88).

*Departmental Major Adviser.*—Mr. Todd.

### **GEOLOGY 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 mathematics and natural science courses including:

(A) Lower Division Courses.—Chemistry 1A-1B or preferably 7A-7B; Geology 1A-1B, 6; Mathematics 9A-9B-9C; Physics 4A, 4C. Recommended: Zoology 1A; Mathematics 13; Chemistry 5, Physics 4B.

(B) Upper Division Courses.—24 units of upper division courses in Geology including the following: Geology 102A-102B, 103, 111, 116, and a summer field course, Geology 118 as offered at the University of California, Berkeley and Los Angeles, or its equivalent at another institution with departmental approval.

Students who have special interests in paleontology, biostratigraphy, engineering geology, hydrogeology, mineralogy, or petrology of igneous, metamorphic or sedimentary rocks should take additional elementary and advanced courses in such fields as chemistry, physics, mathematics, zoology, genetics, engineering and soil science. Because consideration must be given to the prerequisites of such courses, students are required to consult their adviser as early as possible.

#### *Bachelor of Arts Major Program*

(A) Lower Division Courses.—Chemistry 1A or 7A; Geology 1A-1B, 6; Physics 2A; Zoology 1A; and one of the following courses: Chemistry 1B or 7B; Mathematics 13; Physics 2B; Zoology 1B.

(B) Upper Division Courses.—Geology 102A, 103, 111, 116, and other upper division courses in geology and related fields to total not less than 24 units selected in accordance with a plan approved by the major adviser.

*Honors and Honors Program* (see page 89).—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 Geology 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 Geology.

#### 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. Guidotti  
 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

- 102A—102B. Field Geology** (2-2) I and II. The Staff  
 Laboratory and field—1 day per week.  
 Prerequisite: courses 1A, 103 (may be taken concurrently).  
 Principles and methods of geologic mapping. Preparation of geologic reports.
- 103. Petrology.** (4) I. Mr. Durrell  
 Lecture—2 hours; laboratory—6 hours.  
 Prerequisite: courses 1A, 6.  
 Origins and characteristics of rocks. Laboratory study of hand specimens.
- 104A. Crystallography and Optical Mineralogy.** (4) I. 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) II. 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. Pessagno  
 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. Valentine  
 Lecture—3 hours.  
 Prerequisite: course 1B.  
 The principles of stratigraphy, sedimentation, and sedimentary tectonics.
- 116. Structural Geology. (3) II** 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.
- 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. Todd  
 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.
- 152. Photogeology. (2) II.** Mr. Higgins  
 Lecture—1 hour; laboratory—3 hours.  
 Prerequisite: course 1A or 150.  
 Introduction to aerial photography and photogrammetry; the use of air photos in interpretation of regional geologic structure, rock types, and geologic history by analysis of land forms, drainage patterns, soils, vegetation, and outcrop patterns.  
 Offered in odd-numbered years.
- 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  
 Seminar—2 hours.  
 Prerequisite: course 117 or the equivalent.  
 Surficial processes and evolution of land forms.  
 Offered in even-numbered years.
- 255. Metamorphic Petrology. (3) I.** 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.

<b>257. Sedimentary Petrology.</b> (3) I.	Mr. Todd
Lecture—1 hour; laboratory—6 hours.	
Prerequisite: course 104B.	
Examination and interpretation of sedimentary rocks using the petrographic microscope.	
<b>260. Paleontology.</b> (3) I.	Mr. Valentine
Lecture—1 hour; laboratory—6 hours.	
Prerequisite: course 111.	
Morphological and biostratigraphic studies of Mesozoic and Cenozoic invertebrates important as index fossils.	
<b>280. Igneous Petrology.</b> (3) II.	Mr. Emerson
Lecture—1 hour; laboratory—6 hours.	
Prerequisite: course 104A.	
Origin and classification of the igneous rocks.	
<b>298. Group Study.</b> (2) I and II.	The Staff
<b>299. Research.</b> (1-6) I and II.	The Staff

## **GERMAN**

For courses in German see "Foreign Languages" on page 214.

## **GREEK**

For courses in Greek see "Foreign Languages" on page 214.

## HISTORY

Walter L. Woodfill, Ph.D., *Chairman of the Department.*  
Department Office, 169 Voorhies Hall

W. Turrentine Jackson, Ph.D., *Professor of History.*  
C. Bickford O'Brien, Ph.D., *Professor of History.*  
James H. Shideler, Ph.D., *Professor of History.*  
F. Wilson Smith, 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.*  
Rollie E. Poppino, Ph.D., *Associate Professor of History.*  
Richard N. Schwab, Ph.D., *Associate Professor of History.*  
Irwin Unger, Ph.D., *Associate Professor of History.*  
F. Roy Willis, Ph.D., *Associate Professor of History.*  
Craig B. Fisher, Ph.D., *Assistant Professor of History.*  
†David L. Jacobson, Ph.D., *Assistant Professor of History.*  
Richard Millman, Ph.D., *Assistant Professor of History.*  
Donald C. Swain, Ph.D., *Assistant Professor of History.*

—  
C. Roland Marchand, Ph.D., *Acting Assistant Professor of History.*  
Peter H. Shattuck, M.A., *Lecturer in History.*

## HISTORY

*Letters and Science List.*—All undergraduate courses in history are included in the Letters and Science List of Courses (see page 88).

*Departmental Advisers.*—Mr. Fisher, Mr. Jacobson, Mr. Liu, Mr. Paret, Mr. Poppino, Mr. O'Brien, Mr. Schwab, Mr. Shideler, Mr. Swain, Mr. Unger.

*Graduate Advisers.*—Mr. Woodfill, Mr. O'Brien, Mr. Shideler.

*Introductory Courses.*—Courses 4A, 4B, 17A and 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 39.

### *The Major Program*

(A) *Lower Division Courses.*—Required: courses 4A-4B, 17A-17B. It is recommended that students, in consultation with their advisers, also take 6 units (normally a two-semester sequence of courses) in one of the following fields: cultural anthropology, cultural geography, principles of economics, English literature, literature of the United States, philosophy, political science, psychology, or sociology.

(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 9 units (including a two-semester sequence of courses) in a field of concentration (for "field" see below).

(c) A minimum of 6 units in another field of history. (The fields referred to in (b) and (c) above are Europe, Great Britain, Far East, Latin America, and the United States.)

(2) History students must maintain at least a grade C average in the major.

† Absent on leave, fall semester, 1964-1965.

*Honors and Honors Program* (see page 89).—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 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.** 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) 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) I and II.** Mr. Marchand  
 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. Fisher  
 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. Fisher  
Lecture—3 hours.  
A study of the period 1300–1600, with primary attention to the leading figures and with readings from their major works.
- \*132. **Europe in the Seventeenth and Eighteenth Centuries.** (3) I. —  
Lecture—3 hours.  
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.
141. **France since 1815.** (3) I. Mr. Willis  
Lecture—3 hours.
- 144A. **History of Germany to 1815.** (3) I. Mr. Paret  
Lecture—3 hours.  
A history of the Germanies 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.
- 145A. **Europe in the Nineteenth Century.** (3) I. Mr. Millman  
Lecture—3 hours.  
A survey of the history of Western Europe from 1815 to 1870.

\* Not to be given, 1964–1965.

- 145B. Europe in the Nineteenth Century. (3) II.** Mr. Millman  
 Lecture—3 hours.  
 A survey of the history of Western Europe from 1870 to 1914.
- 146A. Europe in the Twentieth Century. (3) I.** Mr. Willis  
 Lecture—3 hours.  
 A survey of the history of Europe from 1914 to 1939.
- 146B. Europe in the Twentieth Century. (3) II.** Mr. Willis  
 Lecture—3 hours.  
 A survey of the history of Europe from 1939 to the present.
- 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.
- 148A. Diplomatic History of Modern Europe. (3) I.** Mr. Millman  
 Lecture—3 hours.  
 A survey of the diplomatic relations of the European powers from the eighteenth century to the middle of the nineteenth century.
- 148B. Diplomatic History of Modern Europe. (3) II.** Mr. Millman  
 Lecture—3 hours.  
 A survey of the diplomatic relations of the European powers from the middle of the nineteenth century to the 1930s.
- 149. History of Military Thought and Policy from Machiavelli 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: courses 151A and 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: courses 151A and 151B or the equivalent, or consent of the instructor.  
 Reading in sources and monographs, sixteenth and seventeenth centuries; discussion and reports.
- 160. Spain from the Sixteenth to the Eighteenth Centuries. (3) II.** ——  
 Lecture and discussion—3 hours.  
 Emphasis on Spanish political, social, and economic developments from about 1475 to about 1789, with some attention to cultural and intellectual factors. Discussion and reports.

\* Not to be given, 1964-1965.

- 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.
- 167. Proseminar in Latin American History. (3) I.** Mr. Poppino  
 Discussion—3 hours.  
 Prerequisite: courses 161A and 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) II.** 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.

\* Not to be given, 1964-1965.

**\*172A. The Jacksonian Era. (3) I.**

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 sectional and national rivalries.

**\*172B. American Civil War. (3) II.**

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 1900 to the 1930's.

**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 from the 1930's to the present.

**175A. Intellectual History of the United States. (3) I.**

Mr. Smith

Lecture—3 hours.

A history of ideas—political, economic, social, religious—in America. From colonial times to the 1860s.

**175B. Intellectual History of the United States. (3) II.**

Mr. Smith

Lecture—3 hours.

A history of ideas—political, economic, social, religious—in America. From the 1860s to the present.

**\*176A. Social and Cultural History of the United States. (3) I.**

Lecture—3 hours.

Mr. Shideler

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.

\* Not to be given, 1964-1965.

**\*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. —————

Lecture—3 hours.

Prerequisite: courses 17A and 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.

**185. History of Science and Technology in America.** (3) II. Mr. Swain

Lecture—3 hours.

A study of science and technology in America, emphasizing the development of scientific ideas and institutions.

**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.

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\* Not to be given, 1964-1965.

**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.

**192. Modern China and the West. (3) II.**

Mr. Liu

Discussion—3 hours.

Prerequisite: course 191B, or consent of the instructor.

Selected topics in the history of modern China and her relations with the West.

**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: courses 137A and 137B or equivalent.

Topics relating to the political and cultural history of Russia in the seventeenth, eighteenth, and nineteenth centuries.

**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.

**245. History of the Napoleonic Era. (3) I and II.**

Mr. Paret

Seminar—3 hours.

Prerequisite: a reading knowledge of French or German; consent of the instructor.

Political, intellectual, social, and military history of Europe from the Consulate to the Congress of Vienna.

<b>246. Europe in the Twentieth Century.</b> (3) II. Seminar—3 hours. Political history of Europe since World War I.	Mr. Willis
<b>251. English History.</b> (3) I and II. Seminar—3 hours.	Mr. Woodfill
<b>261. Latin American History.</b> (3) I and II. Seminar—3 hours. Prerequisite: two semesters of Latin American history; consent of the instructor; reading knowledge of Spanish or Portuguese.	Mr. Poppino
<b>270. Early American History.</b> (3) I and II. Seminar—3 hours.	Mr. Jacobson
<b>271. History of the American West.</b> (3) I and II. Seminar—3 hours.	Mr. Jackson
<b>*272. History of the United States, 1815-1865.</b> (3) I and II Seminar—3 hours.	—
<b>273. History of the United States, 1865-1900.</b> (3) I and II. Seminar—3 hours. Prerequisite: consent of the instructor. Selected topics in American history from the Civil War to the Progressive Movement.	Mr. Unger
<b>275. Intellectual History of the United States.</b> (3) I and II. Seminar—3 hours. Research and studies in the main intellectual currents of American history.	Mr. Smith
<b>288. Agricultural History of the United States.</b> (3) I and II. Seminar—3 hours.	Mr. Shideler
<b>291. Chinese History.</b> (3) I and II. Seminar—3 hours.	Mr. Liu
<b>299. Research.</b> (1-4) I and II.	The Staff

## PROFESSIONAL COURSE

<b>*300. The Teaching of History in the Secondary School and the Junior College.</b> (2) I. 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.	The Staff
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<sup>4</sup> Not to be given, fall semester, 1964-1965.

\* Not to be given 1964-1965.

## HOME ECONOMICS

Lucille S. Hurley, Ph.D., *Acting 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.*

\_\_\_\_\_, *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 and Associate Professor of Art.*

Robert C. Arneson, M.F.A., *Assistant Professor of Design and Assistant Professor of Art.*

Roberta R. Collard, Ph.D., *Assistant Professor of Child Development.*

Elizabeth M. Elbert, Ph.D., *Assistant Professor of Home Economics.*

Robert O. Herrmann, Ph.D., *Assistant Professor of Consumption Economics.*

Ruth J. Horsting, M.A., *Assistant Professor of Design and Assistant Professor of Art.*

Emmy E. Werner, Ph.D., *Assistant Professor of Child Development.*

\_\_\_\_\_, *Assistant Professor of Home Economics.*

\_\_\_\_\_, *Assistant Professor of Home Economics.*

Gordon E. Cusick, Ph.D., *Visiting Assistant Professor of Textile Science.*

◆  
R. Lorene Dryden, M.A., *Lecturer in Home Economics.*

Doris F. Heineman, B.A.E., *Lecturer in Design.*

Arline Johnson, M.S., *Lecturer in Education.*

Agnes McClelland, M.A., *Lecturer in Home Economics.*

Eleanor A. Vergin, M.S., *Lecturer in Home Economics.*

Jane N. Welker, M.A., *Nursery School Teacher.*

*Departmental Major Advisers.*—Mr. Arneson, Miss Collard, Mr. Cramer, Miss Dryden, Miss Elbert, Miss Everson, Mrs. Heineman, Mr. Herrmann, Mrs. Horsting, Mrs. Hurley, Miss McClelland, Miss Morris, Mr. Shapiro, Miss Vergin, Miss Werner.

*Graduate Adviser.*—Miss Paul.

*Teaching Credential Adviser.*—Miss Johnson.

*Bachelor of Science Major Program and Graduate Study.* See page 59.

### DESIGN

#### LOWER DIVISION COURSES

##### 6A. Theory of Design. (2) I and II.

Laboratory—6 hours.

Basic elements of form, texture, and color in two and three dimensions; studio exercises.

The Staff

##### 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.

## 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 (may 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.** \_\_\_\_\_  
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: course 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.

#### UPPER DIVISION COURSES

- 100A-100B. Experimental Food Study.** (2-2) Yr. Miss Elbert  
 Lecture 2 hours.  
 Prerequisite: Chemistry 8; Bacteriology 1.  
 Introduction to chemical and bacteriological aspects of food, and their relation to physical and chemical changes in food preparation; food combinations and service.
- 101A-101B. Experimental Food Study Laboratory.** (1-1) Yr. Miss Elbert  
 Laboratory—3 hours.  
 Prerequisite: course 100A-100B (should be taken concurrently).  
 Introduction to chemical and bacteriological aspects of food, and their relation to physical and chemical changes in food preparation; food combinations and service.
- 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 and physics to experimental food studies; development of experimental attitudes and techniques.

- 112A-112B. Nutrition and Dietetics. (2-2) Yr.** Miss Everson  
Lecture—2 hours.  
Prerequisite: 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 Everson  
Laboratory—3 hours.  
Prerequisite: course 112A-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 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.** \_\_\_\_\_  
Lecture—2 hours; laboratory—6 hours.  
Prerequisite: course 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.** \_\_\_\_\_  
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.** \_\_\_\_\_  
Lecture—3 hours; laboratory—3 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 preschool children.
- 133. Laboratory in Child Development. (1) I and II.** Miss Collard  
Laboratory—3 hours.  
Prerequisite: course 131 (may be taken concurrently).  
Laboratory conducted at the nursery school.
- 136. Development in Middle Childhood and Adolescence. (3) II.** Miss Werner  
Lecture—3 hours.  
Prerequisite: Psychology 1 or 2.  
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.

**138. Exceptional Children. (3) II.**

Miss Collard, Miss Werner

Lecture—3 hours.

Prerequisite: courses 131 and 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.**

Miss Vergin

Lecture—3 hours.

Prerequisite: Psychology 1.

Management principles in relation to home and family resources.

**140L. Laboratory in Home Management. (2) I and II.**

Miss Vergin

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, 6L.

The chemical and physical structure of textile fibers, and its relations to fiber and fabric properties.

- 162. The Textile Economy.** (3) II. 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.** (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) I. Mr. Cusick
- 299. Research.** (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. Miss Johnson  
Lecture—2 hours.  
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 Voorhies Hall

## *Committee in Charge:*

Norman B. Akesson, M.S., *Professor of Agricultural Engineering.*

J. Richard Blanchard, M.S., *University Librarian.*

Floyd D. Carroll, Ph.D., *Professor of Animal Husbandry.*

†Bruce Glassburner, Ph.D., *Associate Professor of Economics.*

Robert M. Hagan, Ph.D., *Professor of Irrigation and Professor of Engineering.*

Trimble R. Hedges, Ph.D., *Professor of Agricultural Economics.*

Donald E. Jasper, D.V.M., Ph.D., *Professor of Clinical Pathology.*

Edward C. Maxie, Ph.D., *Lecturer in Pomology.*

Duane S. Mikkelsen, Ph.D., *Professor of Agronomy.*

Maurice L. Peterson, Ph.D., *Professor of Agronomy* (Berkeley campus).

William C. Smith, A.B., *Acting Assistant Professor of Anthropology.*

James M. Tinley, Ph.D., *Professor of Agricultural Economics.*

Lynn D. Whittig, Ph.D., *Associate Professor of Soil Science.*

*Major Advisers.*—Mr. Hedges, Mr. Mikkelsen.

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.

## UPPER DIVISION COURSES

**101. Crop Production under Tropical Conditions.** (3) I. The Staff  
Lecture—3 hours. (Mr. Williams in charge)

Prerequisite: Botany 1.

Climatic and soil adaptation; varieties and varietal improvement in annual and perennial crops; pests, diseases, and their control; fertilization and other management practices.

**102. Livestock Production under Tropical Conditions.** (3) II. The Staff  
Lecture—3 hours. (Mr. Carroll in charge)

Prerequisite: Genetics 100; Animal Husbandry 103 (may be taken concurrently).

Kinds and breeds of livestock in tropical agriculture; breeding, feeding, and nutrition; pests, diseases, and their control; management practices.

**190. Proseminar in International Agricultural Development.** (1) I and II. The Staff  
Lecture—1 hour. (Mr. Smith in charge)

Prerequisite: consent of the instructor.

Problems of coordinating principles and information from technical agriculture and the social sciences in the context of economic development.

**198. Directed Group Study.** (1-5) I and II. The Staff (Mr. Akesson in charge)  
Prerequisite: consent of the instructor.  
Selected topics for advanced undergraduates.

**199. Special Study for Advanced Undergraduates.** (1-5) I and II. The Staff (Mr. Mikkelsen in charge)

**280. Social, Technological, and other Factors in Agricultural Development.**  
(2) I and II. The Staff (I. — in charge; II. — in charge)  
Seminar—2 hours.

Problem identification and analysis in agricultural development; cultural forces; political, social, and economic organization; human factors in relation to resource use and technology; function and use of the change agent; program development, planning, and execution.

**299. Research.** (1-5) I and II. The Staff (Mr. Hedges in charge)

† Absent on leave, 1964-1965.

## 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 Amoroch, 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., *Associate 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. Biggar, Mr. Henderson.

*Adviser for Engineering.*—Mr. Scott.

*Advisor for Plant Physiology.*—Mr. Hagan.

*Adviser for Soil Science.*—Mr. Nielsen.

*Bachelor of Science Major Program and Graduate Study.* See page 62.

### LOWER DIVISION COURSE

#### 1. Water and Man. (3) II.

Mr. Hagan

Lecture—3 hours.

Prerequisite: sophomore standing or consent of the instructor.

Water as a factor in civilization and man's environment; water supply and utilization problems emphasizing irrigation, drainage, and other water management considerations in developing areas. A cultural and technical course providing an introduction to water science and engineering.

### UPPER DIVISION COURSES

#### 100. Water-Soil-Plant Relationships. (3) I.

Mr. Hagan

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 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. Amorochio

Lecture—3 hours; laboratory—3 hours.

Prerequisite: Physics 2B; Mathematics 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.**

Lecture—2 hours.

Mr. Henderson

Prerequisite: senior standing in irrigation science or soil science.

Water as an agricultural resource; water management on range, terrace, valley, and basin lands; irrigation practices as related to soil, drainage, and salinity conditions; interrelations of irrigation with tillage, fertilization, and other cultural practices.

**140. Drainage of Agricultural Lands. (2) II.**

Mr. Luthin

Lecture—2 hours.

Prerequisite: courses 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, requirements, adjudication, administration, loss, and evaluation. Irrigation enterprises: kinds, organization, financing, public regulation, operation, and usefulness under different conditions.

**160. Farm Irrigation Systems. (3) II.**

—

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: courses 100 and 160 (160 may be taken concurrently), or consent of the instructor.

Laboratory and field exercises on ground water, wells, and pumping plants; water-soil-plant relationships; farm irrigation system design and operation; evaluation of water application methods; drainage investigation techniques; layout of farm drainage systems. Occasional field trips.

- 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

**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 physico-chemical principles governing interactions of ionic constituents in water with soils and plants. Topics include hydrodynamic 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 109 or and consent of instructor.  
An advanced course on physics of soil water with emphasis on unsaturated flow problems in soils including hydrodynamics 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.** (1-6) I and II. The Staff  
Individual research in irrigation science.



For additional courses in irrigation, drainage, and water resources engineering, see the Engineering course section, pages 180-193.

**ITALIAN**

For courses in Italian see "Foreign Languages," page 218.

## LANDSCAPE HORTICULTURE

Richard W. Harris, Ph.D., *Chairman of the Department.*  
Department Office, 106 Landscape Horticulture Building

Richard W. Harris, Ph.D., *Professor of Landscape Horticulture.*

Harry C. Kohl, Jr., Ph.D., *Professor of Floriculture.*

†John H. Madison, Ph.D., *Associate Professor of Landscape Horticulture.*

Roy Sachs, Ph.D., *Associate Professor of Landscape Horticulture.*

Andrew T. Leiser, Ph.D., *Assistant Professor of Landscape Horticulture.*



Robert D. Danielson, M.S., *Lecturer in Landscape Architecture.*

Leonard H. McVicar, *Lecturer in Park Administration.*

—, *Lecturer in City and Regional Planning.*

*Departmental Major Advisers.*—Landscape Horticulture, Mr. Danielson, Mr. Harris; 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. Harris  
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.

† Absent on leave, fall semester, 1964-1965.

**105A. Taxonomy of Landscape Trees. (3) I.**

Mr. Leiser

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.

**105B. Taxonomy of Landscape Shrubs. (3) II.**

Mr. Leiser

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. Leiser

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.

**120. Physiology of Ornamental Plants. (3) I.**

Mr. Kohl

Lecture—3 hours.

Prerequisite: Botany 111.

Physiological processes of ornamental plants; their response to environment and cultural practices.

**121. Analysis of Horticultural Problems. (2) I.**

Mr. Sachs

Lecture—1 hour; laboratory—3 hours.

Prerequisite: course 120 (should be taken concurrently).

Principles and methods of analyzing responses of ornamental plants to environment and cultural practices.

**125. Floriculture and Nursery Management. (3) II.**

Mr. Kohl, Mr. Sachs

Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 120.

Practices and principles in planning and producing ornamental crops. Several field trips required.

**\*128. Advanced Landscape Horticulture. (2) II.** Mr. Harris, Mr. Madison

Lecture—1 hour; laboratory—3 hours.

Prerequisite: course 120.

Practices and principles in planning, establishing, and maintaining plantings in the landscape with emphasis on trees and turf. Several field trips required.

**198. Directed Group Study. (1-5) I and II.**

The Staff (Mr. Harris in charge)

Prerequisite: 3 units of upper division work in landscape horticulture; consent of the instructor.

Selected problems in floriculture, nursery management, and landscape horticulture.

**199. Special Study for Advanced Undergraduates. (1-5) I and II.**

Prerequisite: consent of the instructor. The Staff (Mr. Harris in charge)

\* Not to be given, 1964-1965.

## GRADUATE COURSES

- 290. Seminar.** (1) I and II. Mr. Harris, Mr. Sachs  
 Seminar—1 hour.  
 Selected topics in floriculture, nursery management, and landscape horticulture.
- 299. Research.** (1-6) I and II. The Staff (Mr. Sachs in charge)  
 Prerequisite: graduate standing.

## RELATED COURSES

- Business Law: Introduction** (Agricultural Economics 18)  
**Managerial Accounting** (Agricultural Economics 111)  
**Agricultural Business Management** (Agricultural Economics 115)  
**Weed Control** (Botany 107)  
**Plant Ecology** (Botany 117)  
**Economic Entomology** (Entomology 124)  
**Introduction to Climate and Weather** (Geography 3)  
**Water-Soil-Plant Relationships** (Irrigation 100)  
**Plant Disease** (Plant Pathology 120)  
**Principles of Plant Propagation** (Pomology 9)  
**Introduction to Soil Science** (Soil Science 1)  
**Vegetable Breeding** (Vegetable Crops 120)

## 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. Mr. McVicar  
 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.

\* Not to be given, 1964-1965.

**RELATED COURSES**

- Economic Analysis in Resource Development and Use** (Agricultural Economics 176)
- Technical Journalism** (Agricultural Education 188)
- Plane Surveying** (Engineering 1A)
- Introduction to Cultural Geography** (Geography 2)
- Urban Geography** (Geography 155)
- The Conservation of Natural Resources** (Geography 161)
- General Geology: Physical** (Geology 1A)
- Elementary Statistics** (Mathematics 13)
- Recreation in the Community** (Physical Education 140)
- Local Government** (Political Science 103)
- California State and Local Government** (Political Science 104)
- Political Behavior** (Political Science 161)
- Elements of Public Administration** (Political Science 181)
- Personnel Administration and Human Relations** (Political Science 183)
- Social Psychology** (Psychology 145)
- Introduction to Range Management** (Range Management 1)
- Work and Leisure** (Sociology 160)
- Complex Social Organizations** (Sociology 180)

**LATIN**

For courses in Latin see "Foreign Languages" on page 219.

## MATHEMATICS

Edward B. Roessler, *Chairman of the Department.*  
Department Office, 824 Sprout Hall

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.*

Sherman K. Stein, Ph.D., *Professor of Mathematics.*

\_\_\_\_\_, *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.*

Takayuki Tamura, D.Sc., *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.*

Gulbank D. Chakerian, Ph.D., *Assistant Professor of Mathematics.*

Fred Krakowski, Ph.D., *Assistant Professor of Mathematics.*

Melven R. Krom, Ph.D., *Assistant Professor of Mathematics.*

Gary J. Kurowski, Ph.D., *Assistant Professor of Mathematics.*

Edward J. Tully, Jr., Ph.D., *Assistant Professor of Mathematics.*

Fawzi M. Yaqub, Ph.D., *Assistant Professor of Mathematics.*



Fred J. Lorenzen, Jr., M.S., *Associate 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 88.)

*Major Subject Advisers.*—Mr. Adler, Mr. Baker, Mr. Borgman, Mr. Chakerian, Mr. Krakowski, Mr. Krom, Mr. Norton, Mr. Stein and Mr. Tully.

### *Bachelor of Arts Major Program*

(A) Lower Division Courses.—Required: courses 7B, 9A, 9B, 9C. Total: 15 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:

(A) Lower Division Courses.—Required: courses 7B, 9A, 9B, 9C. Total: 15 units.

† Absent on leave, fall semester, 1964-1965.

(B) Upper Division Courses.—The student must pass successfully courses 108, 109, 111A, 127A, one course in geometry, and at least 11 additional units in upper division or graduate mathematics courses. Total: 24 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

**7A. Introduction to Mathematical Structures. (3) I and II.** The Staff  
Lecture—3 hours.

Lecture—3 hours  
Prerequisite: two years of high school algebra or the equivalent; trigonometry.

Topics selected from advanced algebra; including combinations and permutations, theory of equations, matrices and determinants.

**7B. Introduction to Mathematical Structures. (3) I and II.** The Staff  
Lecture—3 hours.

Prerequisite: course 7A or 9B.  
An introduction to axiomatics by means of the study of number systems.

An introduction to axiomatics by means of the study of number systems and other algebraic systems.

## 9A. Analytic Geometry and Calculus, First Course. (4) I and II. Lecture 4 hours

Lecture—4 hours. The Staff  
Prerequisites: two years of high school algebra or the equivalent; plane

**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.** **Practicum—2 hours.** **Score—16B. Colorants and their Use.** **W.H. Weller, M.A., The Staff.**

Prerequisite: course 9A or 16B. Only two units of credit will be allowed to students who have received credit for course 16B or 3B.

### Continuation of course 9A.

**9C. Analytic Geometry and Calculus, Third Course.** (4) I and 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.

**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. Alder, Mr. Stein

Lecture—3 hours.

Introduction to fundamental mathematical ideas selected from the principal areas of modern mathematics.

**41. Discrete Probability.** (3) II.

Mr. Albert

Lecture—3 hours.

Prerequisite: two years of high school algebra and consent of the instructor.

Introduction to logic, set theory, probability, vectors, and matrices. Applications to elementary Markov chains.

**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.

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.

**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.

**109. Advanced Topics in Analysis. (4) I and II.**

Mr. Arnold

Lecture—4 hours.

Prerequisite: course 9C or 4B. Only three units credit will be given to students who have received credit for course 106. Not open for credit to students who have received credit in course 107.

Vector analysis; series solutions of differential equations; functions of several variables.

**111A. Introduction to Higher Algebra. (3) II.**

Mr. Yaqub

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.

**\*114. The Theory of Convex Sets. (3) I.**

—

Lecture—3 hours.

Prerequisite: courses 9C and 7B, or consent of the instructor.

Topics selected from the theory of convex bodies, convex functions, geometric inequalities, combinatorial geometry, and integral geometry.

Offered in odd-numbered years.

**\*115A. The Theory of Numbers. (3) I.**

Mr. Alder

Lecture—3 hours.

Prerequisite: course 7B.

Divisibility and related topics; congruences; diophantine equations; selected topics from the theory of prime numbers; congruences of the first degree.

**\*115B. The Theory of Numbers. (3) II.**

Mr. Alder

Lecture—3 hours.

Prerequisite: course 7B. Course 115A is not a prerequisite to 115B.

Continued fractions; partitions; congruences of higher degree; primitive roots; quadratic reciprocity law.

\* Not to be given, 1964-1965.

**116. Metric Differential Geometry. (3) II.**

Mr. Fulton

Lecture—3 hours.

Prerequisite: course 109, or consent of the instructor.

Vector analysis; curves and surfaces in three dimensions.

Offered in odd-numbered years.

**119. Theory of Differential Equations. (3) II.**

Lecture—3 hours.

Prerequisite: course 109.

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.**

Mr. Krakowski

Lecture—3 hours.

Prerequisite: course 127A.

Continuation of course 127A.

**128A. Numerical Analysis. (3) I.**

Mr. Kurowski

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.**

Mr. Kurowski

Lecture—3 hours.

Prerequisite: course 128A.

Continuation of course 128A.

Offered in even-numbered years.

**129. Theory of Automatic Digital Computers. (3) II.**

Mr. Norton

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 9B or 16B.

A basic, introductory course in the theory and applications of statistical methods.

<b>131B. Introduction to Mathematical Statistics.</b> (3) II.	Mr. Albert
Lecture—3 hours.	
Prerequisite: course 131A.	
Continuation of course 131A.	
<b>132. Introduction to Stochastic Processes.</b> (3) II.	Mr. John
Lecture—3 hours.	
Prerequisite: course 131A.	
Random walks; recurrent events; Markov chains; birth and death processes.	
<b>*168. Linear Programming and Game Theory.</b> (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.	
Offered in odd-numbered years.	
<b>185. Introduction to Functions of a Complex Variable.</b> (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.	
<b>198. Directed Group Study.</b> (1-5) I and II.	The Staff
Prerequisite: consent of the instructor.	
Selected subjects in mathematics.	
<b>199. Special Study for Advanced Undergraduates.</b> (1-5) I and II.	The Staff (Mr. Roessler in charge)
<b>GRADUATE COURSES</b>	
<b>201A. Functions of a Real Variable.</b> (3) I.	Mr. Chakerian
Lecture—3 hours.	
Prerequisite: course 127B.	
Real number system; theory of point sets in Euclidean spaces; content; measure; Riemann-Stieltjes and Lebesgue integration.	
<b>201B. Functions of a Real Variable.</b> (3) II.	Mr. Chakerian
Lecture—3 hours.	
Prerequisite: course 201A.	
Continuation of course 201A.	
<b>*202A. Functional Analysis.</b> (3) I.	Mr. Benson
Lecture—3 hours.	
Prerequisite: courses 108 and 127B.	
General theory of measure and integration; Hilbert and Banach spaces; linear operations.	
<b>*202B. Functional Analysis.</b> (3) II.	Mr. Benson
Lecture—3 hours.	
Prerequisite: course 202A.	
Continuation of course 202A.	
<b>205A. Functions of a Complex Variable.</b> (3) I.	Mr. Benson
Lecture—3 hours.	
Prerequisite: course 127B.	
Theory of analytic functions; Cauchy integral theorem; power series; analytic continuation; conformal mapping; special functions.	

\* Not to be given, 1964-1965.

**205B. Functions of a Complex Variable. (3) II.**

Mr. Benson

Lecture—3 hours.

Prerequisite: course 205A.

Continuation of course 205A.

**\*208. Linear Algebra. (3) II.**

Lecture—3 hours.

Vector spaces, linear transformations, Euclidean spaces.

Offered in even-numbered years.

**215A. Topology. (3) I.**

Mr. Stein

Lecture—3 hours.

Prerequisite: course 127B.

Topics selected from general topology (compactness, connectedness, metrization, Euclidean space); algebraic topology (complexes, homology, duality); and applications to analysis, geometry, and algebra.

**215B. Topology. (3) II.**

Mr. Stein

Lecture—3 hours.

Prerequisite: course 215A.

Continuation of course 215A.

**216. Integral Equations. (3) II.**

—

Lecture—3 hours.

Prerequisite: courses 108 and 127B.

Volterra equations, Fredholm equations, symmetric kernels.

Offered in odd-numbered years.

**218. Partial Differential Equations. (3) I.**

Mr. Banks

Lecture—3 hours.

Prerequisite: courses 108 and 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. Kurowski

Lecture—3 hours.

Prerequisite: courses 109, 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. Kurowski

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.

\* Not to be given, 1964–1965.

**223B. Theory of Groups. (3) II.**

Mr. Tamura

Lecture—3 hours.

Continuation of course 223A.

**225. Metamathematics. (3) II.**

Mr. Krom

Lecture—3 hours.

Prerequisite: courses 111A and either 125 or Philosophy 12.

Axiomatizability, consistency, and completeness of formalized mathematical theories. Definability in formal languages.

**\*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: course 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.

**231. Multivariate Analysis. (3) I.**

Mr. Baker

Lecture—3 hours.

Prerequisite: courses 131B and 109 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 109 and 131B or consent of the instructor.

Estimates; asymptotic efficiency and normality; theory of statistical tests.

Offered in odd-numbered years.

**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 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 127B.

Measure-theoretic foundations of probability; distribution functions and characteristic functions; law of large numbers and central limit theorems; conditional probabilities; martingales.

\* Not to be given, 1964-1965.

**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 127B, 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.**

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.**

Lecture—3 hours.

Prerequisite: course 240A.

Continuation of course 240A.

Offered in even-numbered years.

**250A. Algebra. (3) I.**

Mr. Yaquib

Lecture—3 hours.

Prerequisite: course 111B (111B 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.**

Mr. Yaquib

Lecture—3 hours.

Prerequisite: course 250A.

Continuation of course 250A.

**290. Seminar. (1-6) I and II.**

The Staff

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

**PROFESSIONAL COURSE****300. The Teaching of Mathematics. (3) I.**

Mr. Lorenzen

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.

\* Not to be given, 1964-1965.

## **MEDICINE, SURGERY, AND CLINICS**

R. M. Cello, D.V.M., *Acting 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.*  
Blaine McGowan, Jr., D.V.M., *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.*  
Edward A. Rhode, Jr., D.V.M., *Associate Professor of Veterinary Medicine and Professor of Physiology.*  
†Gordon H. Theilen, 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.*

## 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. Rhode in charge)

† Absent on leave, fall semester, 1964-1965.

† Absent on leave, 1964-1965.

## 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.

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, Miss Perryman  
 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. Tennant, 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, Mr. Asbury  
 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  
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. Cello 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. Cello 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. Cello 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. Tennant in charge)  
Lecture—1 hour.  
Prerequisite: course 203.  
Discussion of selected cases from the clinic.

- 256A. Clinic Conference. (1) I.** The Staff (Mr. Tennant in charge)  
Lecture—2 hours.  
Prerequisite: fourth-year standing.  
Discussion of selected cases from the clinic.
- 256B. Clinic Conference. (1) II.** The Staff (Mr. Tennant 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. Cello in charge)

## MILITARY SCIENCE

Orrin A. Tracy, Colonel, Infantry; *Chairman of the Department.*  
Department Office, 131 Gymnasium

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Orrin A. Tracy, Colonel, Infantry; *Professor of Military Science.*  
Peter H. Thames, Captain, Infantry; *Assistant Professor of Military Science.*  
Rockwell C. Cramer, Captain, Artillery; *Assistant Professor of Military Science.*  
John R. Nee, Captain, Chemical Corps; *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 29.

#### 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 29, *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 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 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.*

†Larry D. Austin, M.M., *Associate Professor of Music.*

Richard G. Swift, M.A., *Associate Professor of Music.*

Sydney R. Charles, Ph.D., *Assistant Professor of Music.*

Theodore C. Karp, Ph.D., *Assistant Professor of Music.*



Marvin H. Tartak, M.A., *Acting Assistant Professor of Music.*

Robert S. Bloch, M.A., *Lecturer in Music.*

Adrienne M. Castellan, B.A., *Associate in Music.*

Arthur N. 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 88).

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, 42, 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 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, 142, 143, or 144. In addition, at least eight units must be selected from the following courses: 105B, 108, 112A, 112B, 114, 115, 116, 117, 118, 119, 199.

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 advised to withdraw from the major in Music.

Attention is called to the requirements in foreign languages for higher degrees in Music: a reading knowledge of French or German for the M.A. degree in both composition and musicology. Undergraduates contemplating advanced study in Music should prepare to satisfy these requirements as they proceed to the bachelor's degree.

*Individual Group Major.*—Individual group majors may be established by combining the work offered in this field with courses in allied fields. The major subject adviser should be consulted for details.

*Teaching Major and Minor.*—see p. 98.

† Absent on leave, 1964-1965.

**Graduate Study.**—The Department of Music offers programs of study and research leading to the M.A. degree in composition or musicology. Detailed information regarding graduate study may be obtained from the graduate adviser for Music, Mr. Karp.

**GROUP I**

Courses primarily for students whose major is music.

**LOWER DIVISION COURSES**

- 1A. Masterworks of Musical Literature.** (2) I. Mr. Swift  
 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. Swift  
 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.
- 1C. Masterworks of Musical Literature.** (2) I. Mrs. Charles  
 Lecture—3 hours.  
 Prerequisite: courses 1A, 1B, 4A and 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 and 1B.
- 1D. Masterworks of Musical Literature.** (2) II. Mrs. Charles  
 Lecture—3 hours.  
 Prerequisite: courses 1A, 1B, 4A and 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 and 1B.
- 4A. Elementary Theory.** (5) I. Mr. Bloch  
 Lecture—5 hours.  
 Exercises in notation, rhythm, ear-training, beginning counterpoint and harmony.
- 4B. Elementary Theory.** (5) II. Mr. Bloch  
 Lecture—5 hours.  
 A continuation of course 4A.
- 5A. Intermediate Theory.** (4) I. Mr. Rosen  
 Lecture—4 hours.  
 Prerequisite: courses 4A and 4B.  
 A continuation of courses 4A and 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.

\* Not to be given, 1964-1965.

- 104A. Advanced Theory. (3) I.** Mr. Swift  
 Lecture—3 hours.  
 Prerequisite: course 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.  
 Prerequisite: course 104A.  
 Homophonic forms, beginning with phrase and period structure.
- \*105A. Principles of Composition. (3) I.** Mr. Swift, Mr. Austin  
 Lecture—3 hours.  
 Prerequisite: course 104B.  
 Elementary assignments in free composition.
- \*105B. Principles of Composition. (3) II.** Mr. Swift, Mr. Austin  
 Lecture—3 hours.  
 Prerequisite: course 104A.  
 Elementary assignments in free composition.
- \*106. Fugue. (3) II.** Mr. Karp  
 Lecture—3 hours.  
 Prerequisite: course 104A.
- 108. Instrumentation. (3) II.** Mr. Bloch  
 Lecture—3 hours.  
 Prerequisite: course 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 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.
- 114. Polyphonic Music of the Medieval Period. (3) I.** Mr. Karp  
 Lecture—3 hours.  
 Prerequisite: courses 1D and 5B, or consent of the instructor.  
 An historical survey of the development of polyphonic music in the medieval period.
- \*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.

\* Not to be given, 1964–1965.

- 117. Music of the Classic Period. (3) I.** Mr. Swift  
 Lecture—3 hours.  
 Prerequisite: courses 1D and 5B, or consent of the instructor.  
 An historical survey of the music and style of the classic period.
- 118. Music of the Romantic Period. (3) II.** Mrs. Charles  
 Lecture—3 hours.  
 Prerequisite: courses 1D and 5B, or consent of the instructor.  
 An historical survey of the music and style of the romantic period.
- 119. Music of the 20th Century. (3) II.** Mr. Tartak  
 Lecture—3 hours.  
 Prerequisite: courses 1D and 5B, or consent of the instructor.  
 Critical and analytical study of works by such composers as Schoenberg, Stravinsky, Milhaud, Bartok, Hindemith, and Sessions.
- 121A. History and Literature of Music. (3) I.** Mr. Karp  
 Lecture—3 hours.  
 Prerequisite: courses 1C, 1D, and 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.** Mr. Karp  
 Lecture—3 hours.  
 Prerequisite: course 121A.
- \*123A. The Piano Music of Chopin. (3) II.** —  
 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.** —  
 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.
- 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. Tartak, Mr. Karp  
 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.

\* Not to be given, 1964-1965.

**27B. Introduction to Musical Literature. (3) II.**

Mr. Tartak

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. Bloch

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. Woodbury, Mr. Swift

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. Woodbury, Mr. Swift

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 (Mr. Bloch in charge)

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 (Mr. Bloch in charge)

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.**

Mr. Tartak

Lecture—3 hours.

Prerequisite: courses 27A and 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: courses 27A and 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.

### **Performance Courses**

- 141. Advanced University Symphony Orchestra (1-2) I and II. Mr. Bloch**  
Prerequisite: 2 semesters in course 41.  
May be repeated once for credit.

**142. Advanced Repertory Band. (1) I. Mr. Woodbury, Mr. Smith**  
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. Woodbury, Mr. Smith**  
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

- |   |                        |
|---|------------------------|
| <b>200A-200B. Introduction to Musicology.</b> (3-3) Yr.<br>Lecture—3 hours.<br>Bibliography, individual research projects, and a class problem. | Mrs. Charles           |
| <b>203A. Composition.</b> (3) I.<br>Seminar—3 hours.<br>Prerequisite: courses 104B and 105B, or the equivalent.<br>Technical projects.          | Mr. Rosen              |
| <b>203B. Composition.</b> (3) II.<br>Seminar—3 hours.<br>Prerequisite: course 203A.<br>Free composition.  | Mr. Rosen              |
| <b>*210A-210B. History of Notation.</b> (3-3) Yr.<br>Seminar—3 hours.   | Mr. Karp               |
| <b>215A-215B. Topics in Music History.</b> (3-3) Yr.<br>Seminar—3 hours.<br>Studies in selected areas of music history and theory.              | Mrs. Charles, Mr. Karp |

\* Not to be given, 1964-1965.

- 240A-240B. Techniques of Analysis. (3-3) Yr.** Mr. Karp, Mr. Swift  
 Seminar—3 hours.  
 Analysis and analytical techniques as applied to music of all historical style periods.
- 299. Individual Study. (2-4) I and II.** The Staff  
 Special studies and projects for the advanced graduate student in musical composition or music history.

#### 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.** Mr. Block  
 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. Tartak  
 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. Tartak  
 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, 1964-1965.

## NEMATOLOGY

Merlin W. Allen, Ph.D., *Chairman of the Department.*  
Department Office, 223 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. Lownsberry, Ph.D., *Lecturer in Nematology.*  
Armand R. 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.** Mr. Lear, Mr. Lownsberry  
Lecture—1 hour; laboratory—6 hours.  
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.** Mr. Allen  
Lecture—2 hours; laboratory—6 hours.  
Prerequisite: course 220.  
The taxonomy, morphology, and comparative anatomy of soil and freshwater 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)

† Absent on leave, 1964-1965.  
\* Not to be given, 1964-1965.

## NUTRITION

Charles R. Grau, Ph.D., *Chairman of the Executive Committee.*  
Committee Office, 150B Poultry Husbandry Building

### *Committee in Charge:*

Ransom L. Baldwin, Jr., Ph.D., *Assistant Professor of Animal Husbandry.*  
Arthur L. Black, Ph.D., *Professor of Physiological Chemistry.*  
Floyd D. Carroll, Ph.D., *Professor of Animal Husbandry.*  
Perry T. Cupps, Ph.D., *Professor of Animal Husbandry.*  
Gladys J. Everson, Ph.D., *Professor of Home Economics.*  
Robert E. Feeney, Ph.D., *Professor of Food Science and Technology.*  
Richard A. Freedland, Ph.D., *Assistant Professor of Physiological Chemistry.*  
William N. Garrett, Ph.D., *Lecturer in Animal Husbandry.*  
Charles R. Grau, Ph.D., *Professor of Poultry Husbandry.*  
Hubert Heitman, Jr., Ph.D., *Professor of Animal Husbandry.*  
Frederic 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 in 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.*  
Barry W. Wilson, Ph.D., *Assistant Professor of Poultry 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.** The Staff (Mr. Ronning in charge)  
Lecture—3 hours.

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  
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.

## ORIENTAL LANGUAGES

Benjamin E. Wallacker, Ph.D., *Visiting Associate Professor of Oriental Languages.*

*Letters and Science List.*—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

### LOWER DIVISION COURSES

**1A-1B. Elementary Modern Chinese.** (4-4) Yr. Mr. Wallacker  
Lecture—3 hours; laboratory—2 hours.  
Introduction to the standard or “National Language” (Kuo Yü) of China.

### UPPER DIVISION COURSES

**100. Languages of Eastern Asia.** (3) II. Mr. Wallacker  
Lecture—3 hours.  
A survey course on the nature and distribution of the main languages of Eastern Asia.

**112. Chinese Literature in Translation.** (3) I. Mr. Wallacker  
Lecture—3 hours.  
No knowledge of Chinese is required.  
Representative works—including classics, histories, belles-lettres, and fiction—in English translation.

## PARASITOLOGY

For courses in parasitology see “Entomology,” page 203.

## PARK ADMINISTRATION

For courses in park administration see “Landscape Horticulture,” page 258.

## 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., *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. (½) 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. (½) 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.

**\*283. Pathology of Irradiation. (2) I.**  
Lecture—1 hour; laboratory—3 hours.  
Prerequisite: course 122B.  
Explanation and demonstration of radiation-induced changes at lethal and sublethal levels. Types of radiations briefly described, with emphasis on ensuing gross and subgross damage. Enrollment limited.  
Offered in even-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, 1964-1965.

## PHILOSOPHY

Neal W. Gilbert, Ph.D., *Chairman of the Department.*  
Department Office, 422 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.*

Paul J. Johnson, M.A., *Acting Assistant Professor of Philosophy.*

**Letters and Science List.**—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

**Departmental Major Advisers.**—Mr. Gilbert, 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 a departmental major adviser.

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

**6. 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.

**12. Introduction to Logic.** (3) I and II. The Staff  
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 and II. The Staff  
Lecture—3 hours.  
From the Pre-Socratics to the Scholastics.

**20B. History of Philosophy.** (3) I and II. The Staff  
Lecture—3 hours.  
From Descartes to Kant.

### UPPER DIVISION COURSES

#### COURSES IN THE PROBLEMS OF PHILOSOPHY

**100. Recurrent Types of Philosophy.** (3) I.  
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.

**103. Philosophy of Mind. (3) II.**

Mr. Arbini

Lecture—3 hours.

The relation between mind and body, our knowledge of other minds, and the explanation of mental acts. Discussion of such concepts as action, intention, and causation.

Offered in odd-numbered years.

**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) I.**

Mr. Arbini

Lecture—3 hours.

Basic concepts and methods of the mathematical, physical, and biological sciences; philosophical reflections on science.

**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.

**114. Ethics. (3) I.**

—, Mr. Johnson

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.

**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.

**\*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.

**137. Philosophy of Language. (3) II.**

Mr. Arbini

Lecture—3 hours.

Problems that arise from the consideration of natural and formalized languages. Such authors as Aristotle, Wittgenstein, Austin, Carnap, Quine, and Ziff, and their contributions to semantic analysis.

Offered in odd-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, Ockham, 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. Arbini

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.

\* Not to be given, 1964-1965.

## Group B: Individual Thinkers

- 161. Plato. (3) II.** Mr. Child  
 Lecture—3 hours.  
 Prerequisite: course 6 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 6 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's 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.
- 185. Founders of Modern Thought. (3) I and II.** The Staff  
 Lecture—3 hours.  
 Influential theories of metaphysics, theory of knowledge, and ethics from Descartes through Nietzsche. An introductory course designed primarily for graduate students outside philosophy.
- 199. Special Study for Advanced Undergraduates. (1-5) I and II.** The Staff  
 Prerequisite: consent of the instructor.

\* Not to be given, 1964-1965.

## PHYSICAL EDUCATION

Vernard B. Hickey, B.A., *Acting Chairman of the Department.*  
Department Office, 264 Gymnasium

<sup>1</sup>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.*

◇

William C. Adams, M.A., *Acting Assistant Professor of Physical Education.*  
Robert R. Brooks, M.A., *Associate Supervisor of Physical Education.*  
Carl E. J. Carlson, M.A., *Assistant Supervisor of Physical Education.*  
Vernard B. Hickey, B.A., *Intercollegiate Athletics Director and Supervisor of Physical Education.*  
Jerry W. Hinsdale, A.B., *Assistant Supervisor of Physical Education.*  
Ramona B. Johnson, B.S., *Junior Supervisor of Physical Education.*  
Dorothy N. Lyons, A.A., *Associate in Physical Education.*  
Herbert A. Schmalenberger, M.A., *Associate Supervisor of Physical Education.*  
George A. Stromgren, M.S., *Lecturer and Supervisor of Physical Education.*  
\_\_\_\_\_, *Lecturer and Assistant 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*

Students will specialize in one of two areas of concentration, i.e., biological aspects or psychological aspects of physical education.

(A) Lower Division Courses.—Required of all students: Chemistry 1A, Mathematics 13, Physical Education 45, Physics 2A, Physiology 1, Psychology 1, Zoology 1A and Zoology 25. Those students interested in the biological aspects of physical education will be required to take Chemistry 8 and Zoology 1B.

(B) Upper Division Courses.—Required of all students: Physical Education 103, 104, 110, 120, and 135. Required of students in biological area: Animal Husbandry 110; recommended: Animal Physiology 102. Required of students in psychological area: Psychology 112 and three courses selected from one of the following groups: a) Psychology 108, 130, 134, 147; b) Psychology 145, Sociology 152, 160.

<sup>1</sup> Sabbatical leave in residence, 1964-1965.

Students who are preparing for careers as teachers upon consultation with their adviser will elect additional physical education courses that satisfy requirements for the teaching credential.

**LOWER DIVISION COURSES FOR MEN****1. Physical Education for Men. (3) 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, 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.**

The Staff

Lecture—1 hour; laboratory—2 hours.

Fundamental knowledges and skills in swimming, basketball, football, track, baseball, tennis, golf, combative sports, developmental activities, court sports, tumbling.

**LOWER DIVISION COURSES FOR WOMEN****22. Professional Physical Education Activities (Women). (1) I and II.**

The Staff

Lecture—1 hour; laboratory—2 hours.

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. (3) 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, life-saving 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.**

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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.

**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. Mr. Hinsdale  
 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: courses 36A and 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: courses 36A and 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.

**45. Foundations of Physical Education.** (3) I.

Mr. Bernauer, Mr. Lakie

Lecture—3 hours.

Survey of the mode, expressive form, development and objective of human movement.

#### UPPER DIVISION COURSES 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.

\* Not to be given, 1964-1965.

## UPPER DIVISION COURSES FOR MEN AND WOMEN

- 103. Analysis of Human Movement. (4) I.** Mr. Kovacic  
Lecture—3 hours; laboratory—3 hours.  
Prerequisite: Physics 2A, Physiology 1, Zoology 25.  
Anatomical and physiological concepts and physical laws as applied to human movement.
- 104. Physiology of Muscular Activity. (4) II.** Mr. Bernauer  
Lecture—3 hours; laboratory—3 hours.  
Prerequisite: course 103, Chemistry 1A, Zoology 1A.  
Neuromuscular and circulatory-respiratory response to exercise in man including the regulation of body fluids, blood gases and body temperature. Adaptation to persistent programs of physical training are reviewed.
- 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.
- 120. Sports in American Society. (3) I.** Mr. Lakie  
Lecture—3 hours.  
Prerequisite: History 17A.  
The interrelationships of sports with other aspects of society, including family, church, school and government; consideration of the manner in which sports may be used to contribute to human welfare in our advanced technological society.
- 130. Principles and Theory and Physical Education. (3) II.** Miss Welch  
Lecture—3 hours.  
A critical analysis of the assumptions underlying the physical education program.
- 135. Research Design and Instrumentation in Physical Education. (3) I.** Mr. Bernauer  
Lecture—2 hours; laboratory—3 hours.  
Prerequisite: Mathematics 13.  
Methods, techniques, and design of experimental research in physical education.
- 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.

**180. Physical Education in the Secondary School. (3) I.**

Lecture—3 hours.

Miss Heller, Mr. Schmalenberger

Prerequisite: course 130.

An analysis and study of the principles and methods basic to physical education in the secondary school.

**199. Special Study for Advanced Undergraduates. (1-5) I and II.**

Prerequisite: consent of department. The Staff (Mr. Kovacic in charge)

**PROFESSIONAL COURSE****380. Methods of Physical Education in the Secondary School. (3) II.**

Lecture—1 hour; laboratory—6 hours. Miss Heller, Mr. Schmalenberger

Prerequisite: course 180.

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

James E. Draper, 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.*  
William W. True, Ph.D., *Associate Professor of Physics.*  
Franklin P. Brady, Ph.D., *Assistant Professor of Physics.*  
Glen W. Erickson, Ph.D., *Assistant Professor of Physics.*  
Claude Garrod, Ph.D., *Assistant Professor of Physics.*  
James P. Hurley, Ph.D., *Assistant Professor of Physics.*  
James A. McCray, Ph.D., *Assistant Professor of Physics.*



Kenneth A. Amos, B.Sc., *Acting Instructor in Physics.*

*Letters and Science List.*—All undergraduate courses in physics are included in the Letters and Science List of Courses (see page 88).

*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 104, 105A, 105B, 108, 110A, 110B, 121, 122 and Mathematics 109. Recommended: Physics 115 and either 129 or 140.

### *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 104, 105A, 105B, 108, 110A, 110B, 115, 116, 121, 122, 129, 140, and Mathematics 109. Recommended: Physics 107, 112, Mathematics 127A, 127B, and 185.

*Honors and Honors Program* (see page 89).—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. Erickson, Mr. McCarthy  
Lecture—3 hours.  
Mechanics, properties of matter, heat, and sound.
- 2B. General Physics Lecture.** (3) I and II. Mr. McCarthy, Mr. Erickson  
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. Erickson, 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. Erickson  
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) I and II. Mr. Amos, 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. Amos  
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 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.** (2) I. Mr. Draper  
Lecture—2 hours.  
Elements of vector and tensor analysis with applications to physics.
- 105A. Analytic Mechanics.** (3) I. Mr. Garrod  
Lecture—3 hours.  
Principles and applications of Newtonian mechanics.
- 105B. Analytic Mechanics.** (3) II. Mr. Garrod  
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, characteristics of thermionic tubes and a study of simple electronic circuits.
- 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. Patten  
Lecture—3 hours.  
Prerequisite: Mathematics 109.  
Elementary and mathematical theory of electrostatics, magnetostatics, steady currents, and electron theory of solids.
- 110B. Electricity and Magnetism. (3) II.** Mr. Patten  
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. McCray  
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.
- 115. Introduction to Quantum Mechanics. (3) I.** Mr. Jungerman  
Lecture—3 hours.  
Prerequisite: course 105A. Recommended: course 121.  
The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.
- 116. Electronics for Physicists. (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. (Course 107 is strongly recommended.)  
Responses of the differentiators, integrators, and compensated attenuator to pulses and sinusoidal signals, resonant circuits, transfer function, transmission lines, feedback, pulse operational and distributed amplifiers, cathode and emitter followers, transistor switches and binaries, voltage discriminators, scalers, tunnel diodes, multichannel 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. Draper

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. Brady

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.

**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. Draper

Lecture—3 hours.

Prerequisite: course 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. Hurley

Lecture—3 hours.

Prerequisite: course 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. Hurley

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. True

Lecture—3 hours.

Prerequisite: course 115.

Development and interpretation of the Schrödinger wave equation and Heisenberg matrix mechanics; approximation methods; applications to atomic, molecular, and solid-state problems.

**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.

<b>215C. Advanced Quantum Mechanics. (3) II.</b>	Mr. Erickson
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.	
<b>219. Statistical Mechanics and Kinetic Theory. (3) I.</b>	Mr. Garrod
Lecture—3 hours. Prerequisite: courses 112, 115.	
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.	
<b>229A. Nuclear Theory. (3) I.</b>	Mr. Brady
Lecture—3 hours. Prerequisite: course 215A.	
Review and survey of basic nuclear properties. Two-nucleon systems, nuclear forces, and models.	
<b>229B. Nuclear Theory. (3) II.</b>	Mr. Brady
Lecture—3 hours. Prerequisite: course 229A.	
Nuclear reactions; electromagnetic interactions of nuclei; beta decay; introduction to meson theory of nuclear forces.	
<b>229C. Advanced Nuclear Theory. (3) I.</b>	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.	
<b>242. Plasma Physics. (3) II.</b>	Mr. Hurley
Lecture—3 hours. Prerequisite: course 210B (may be taken concurrently). Recommended: course 219.	
Motion of charged particles in electromagnetic fields; macroscopic equations; boundary layer problems; linear and nonlinear oscillations; diffusion; stability.	
<b>290. Seminar. (1-3) I and II.</b>	Mr. Knox
Advanced study in various fields of modern physics. Topics will vary from year to year.	
<b>299. Research. (1-6) I and II.</b>	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 Chemistry.*  
Harold R. Parker, D.V.M., Ph.D., *Assistant Professor of Physiology.*  
Norman W. Scholes, Ph.D., *Assistant Professor of Pharmacology.*



Allen C. Andersen, V.M.D., Ph.D., *Lecturer in Radiopathology.*  
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  
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. Mr. Freedland  
Laboratory—6 hours.

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, Mr. Scholes  
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. Mr. Peoples, Mr. Fowler, Mr. Scholes  
Lecture—3 hours; laboratory—3 hours.

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.

Offered in odd-numbered years.

**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. (1-9) I and II.**

The Staff

**PHYSIOLOGY**

For additional courses in physiology see "Animal Physiology," page 124, and "Zoology," page 344.

**PLANT NUTRITION**

For courses in plant nutrition see "Soils and Plant Nutrition," page 332.

## PLANT PATHOLOGY

Lysle D. Leach, Ph.D., *Chairman of the Department.*  
Department Office, 350 Hutchison Hall

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.*  
Donald E. Mathre, 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.

I. Mr. English; II. Mr. Shepherd, Mr. Campbell, Mr. Mathre  
Lecture—2 hours; laboratory—6 hours.

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. Kosuge

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.

Mr. Houston

Lecture—1 hour; laboratory—6 hours.

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.

Mr. Wilson

Lecture—1 hour; laboratory—6 hours.

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. 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.

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.

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. Lecture—2 hours.

Prerequisite: course 202; Biochemistry 101; Chemistry 5. 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. Shepherd. Seminar—1 hour.

**299. Research. (1-9) I and II.** The Staff.

## POLITICAL SCIENCE

Clyde E. Jacobs, Ph.D., *Chairman of the Department.*  
Department Office, 227 Voorhies Hall

Charles M. Hardin, Ph.D., *Professor of Political Science.*

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*

John F. Gallagher, Ph.D., *Assistant Professor of Political Science.*

Alexander J. Groth, Ph.D., *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.*

◇

Phyllis Louellyn Cohan, M.A., *Associate in Political Science.*

Edmond Costantini, M.A., *Lecturer in Political Science.*

Gerald R. Friedberg, A.B., *Acting Assistant Professor of Political Science.*

Joyce J. Kallgren, M.A., *Lecturer in Political Science.*

Dennis A. Livingston, A.B., *Acting Assistant Professor of Political Science.*

Louis F. Weschler, M.A., *Acting Assistant Professor of Political Science.*

Amos Yoder, Ph.D., *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 88.)

**Department Major Advisors.**—Mr. Friedberg, Mr. Gallagher, Mr. Groth, Mr. Hardin, Mr. Jacobs, Mr. Livingston, Mr. Musolf, Mr. Owens, Mr. Puryear, Mr. Weschler, and Mr. Zetterbaum.

**Graduate Advisers.**—Mr. Owens, Mr. Puryear.

**The American History and Institutions Requirement** may be satisfied by any two of the following courses: 1A, 1B, 100, 102, 105, 106, 113, 128A, 163, 164, 166. See also page 39.

### **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 6 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.

§ Absent on leave, spring semester, 1964-1965.

† Absent on leave, 1964-1965.

## LOWER DIVISION COURSES

- 1A. American Government.** (3) I and II. The Staff  
 Lecture—2 hours; recitation—1 hour.  
 National, state, and local government in the United States.
- 1B. American Government.** (3) I and II. The Staff  
 Lecture—2 hours; recitation—1 hour.  
 National, state, and local government in the United States.
- 2. Introduction to Government (Comparative Government).** (3) I and II. Mr. Puryear, Mr. Groth  
 Lecture—2 hours; recitation—1 hour.  
 Constitutional principles, governmental institutions, and political problems of selected European governments.
- 3. International Relations.** (3) I and II. Mr. Livingston, Mr. Puryear  
 Lecture—2 hours; recitation—1 hour.  
 Rise and development of the Western State systems; problems of nationalism and imperialism, particularly in connection with the peace settlement following World War II.

## UPPER DIVISION COURSES

- 100. American National Government.** (3) I and II. The Staff  
 Lecture—3 hours.  
 Prerequisite: not open to students having credit for course 1A or 1B.  
 Presidential leadership, executive-legislative relationships, the development of effective and accountable administration; defense and foreign policy; government and science.
- 101. Contemporary Political Science.** (3) I. Mr. Friedberg  
 Lecture-recitation—3 hours.  
 History, nature, and methodology of the discipline; and the problems, schools of thought, and trends within the field at present.
- \*102. State Government and American Federalism.** (3) II. Mr. Weschler  
 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 cooperation in the American federal system.
- 103. Local Government.** (3) I. Mr. Weschler  
 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. Mr. Gallagher  
 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, administration, courts, major public programs and problems, state-local relations, county, city, school and special district governments.  
 Offered in odd-numbered years.

\* Not to be given, 1964-1965.

- 105. The Legislative Process. (3) II.** Mr. Costantini  
 Lecture—3 hours.  
 An analysis of the legislative process in the United States with emphasis on Congressional and state legislative functions, organization, and practices.
- 106. The Presidency. (3) I.** Mr. Weschler  
 Lecture—3 hours.  
 The office, powers, and role of the President of the United States.
- 112. Principles of International Law. (3) II.** Mr. Livingston  
 Lecture—2 hours; discussion—1 hour.  
 The major contemporary attempts to reformulate traditional democratic theory; attempts to replace traditional theory by conceptual models derived from modern social science findings.
- 113. American Political Thought. (3) II.** Mr. Friedberg  
 Lecture-discussion—3 hours.  
 An investigation of several prominent interpretations of the American intellectual experience tested against the history of American political thought. Interpretations to be investigated will include those of Hartz, Bell, Mills, Boorstin, Lipset, and others.
- 115. Basic Problems of Political Theory. (3) II.** Mr. Zetterbaum  
 Lecture—2 hours; discussion—1 hour.  
 An inquiry into the possibility of an objective theoretical understanding of the political sphere not modeled on modern natural science, together with a critique from the perspectives of scientism, historicism, and analytic philosophy.
- 117A. Marxism. (3) I.** Mr. Friedberg  
 Lecture—2 hours; discussion—1 hour.  
 The forerunners of Marx; the writings of Marx.
- 117B. Marxism. (3) II.** Mr. Friedberg  
 Lecture—2 hours; discussion—1 hour.  
 Engels and later socialists: Kautsky, Bernstein, and Lenin. Marxian socialism in Europe and America after 1900. Contemporary socialism.
- 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. Livingston  
 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) I.** Mr. Livingston  
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. Yoder  
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.
- \*139. International Relations in Western Europe. (3) I.** —  
Lecture—3 hours.  
Study of the emerging unity in Western Europe and its implications for the North Atlantic area.
- \*140. Democracy and Dictatorship. (3) I.** Mr. Zinner  
Lecture—2 hours; discussion—1 hour.  
Prerequisite: course 2 or the equivalent.  
Analytical study of differences and similarities in the political process under democratic and dictatorial government.
- 141A. Soviet and East European Governments. (3) I.** Mr. Yoder  
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.** —  
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.
- 144. Government in Great Britain and the British Commonwealth. (3) I.** Mr. Groth  
Lecture—2 hours; recitation—1 hour.  
The democratic process in Britain; party politics; the cabinet system; the colonies; the evolution of the British Commonwealth.
- 145. Government and Politics in Emergent Nations. (3) II.** Mr. Yoder  
Lecture—2 hours; discussion—1 hour.  
Prerequisite: course 2 or the equivalent.  
Conceptual study of problems of political organization and procedure in the context of rapid change engendered by social revolution in "emergent countries" and liberation from colonial oppression.

\* Not to be given, 1964-1965.

- 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. Yoder  
 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 and 17B.  
 Analysis of judicial cases and related materials illustrating the historical and current interpretations of the Constitution.
- 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 1A.  
 Selected current topics relating to federalism and the separation of powers.
- \*161. Political Behavior.** (3) II. —————  
 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.

\* Not to be given, 1964-1965.

- 164. Group Politics. (3) I.** Mr. Hardin  
Lecture—3 hours.  
An analysis of class, sectional, ethnic, religious, economic and other interests in relation to constitutional government. The problems of balancing liberty and order and of reconciling claims of diversity with those of uniformity.
- 166. Public Policy and the Governmental Process. (3) II.** Mr. Weschler  
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.
- 168. Politics of Water Development. (3) II.** Mr. Hardin  
Lecture—3 hours.  
Water policy and administration in the United States with special emphasis on California; international problems relating to the control, development, distribution, and use of water resources.
- 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.
- 183. Administrative Behavior. (3) II.** Mr. Musolf  
Lecture—3 hours.  
The implications for American public administration of evolving concepts about behavior in organizations, especially those concepts based upon human-relations research.
- 199. Special Study for Advanced Undergraduates. (1-5) I and II. The Staff**

## GRADUATE COURSES

- 213. Problems in American Politics. (3) II.** Mr. Friedberg  
Seminar—2 hours.  
Selected problems with emphasis on ideology, value, and consensus.
- 218. Political Theory. (3) I.** 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.
- 241A. Soviet and East European Governments. (3) I.** —————  
Seminar—2 hours.  
Prerequisite: consent of the instructor.

\* Not to be given, 1964-1965.

- 241B. Soviet and East European Governments. (3) II.** —  
 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) I.** Mr. Jacobs  
 Seminar—2 hours.  
 Prerequisite: consent of the instructor.  
 Selected current topics.
- 295. Political Parties. (3) I.** Mr. Hardin  
 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.

\* Not to be given, 1964-1965.

## POMOLOGY

Dillon S. Brown, Ph.D., *Chairman of the Department.*  
Department Office, 1039 Wickson Hall

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.*  
Paul E. Hansche, 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.

† Absent on leave, fall semester, 1964-1965.

- 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. Griggs  
 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 development of flower, fruit, and seed structures of representative fruit types.
- 112. Handling, Storage, and Transit of Fruits. (3) I.** Mr. Claypool  
 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.** The Staff (Mr. Uriu in charge)  
 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.)

## GRADUATE COURSES

290. Seminar. (1) I and II. The Staff  
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).*  
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.*  
Ray E. Burger, Ph.D., *Associate Professor of Poultry Husbandry and Associate Professor of Physiology.*  
Daniel W. Peterson, Ph.D., *Associate Professor of Poultry Husbandry.*  
Frank X. Ogasawara, Ph.D., *Assistant Professor of Poultry Husbandry and Assistant Professor of Physiology.*  
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 57.

### 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; 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.

- 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  
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  
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. Burger  
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. Burger  
Lecture—1 hour; laboratory—3 hours.  
Prerequisite: course 107 (may be taken concurrently); consent of the instructor.  
Selected problems in the physiology of birds.
- 109. Genes and Gene Action in Poultry. (2) II.** Mrs. Abbott  
Lecture—2 hours.  
Prerequisite: Genetics 100.  
Gene, genotype, and developmental environment in relation to avian mutations; emphasis on developmental genetics of avian and other species.
- \*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.**  
Lecture—2 hours. Mr. Peterson, Mr. Stewart, Mr. Brant  
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.

\* Not to be given, 1964-1965.

**149. Environmental Physiology of Domestic Animals. (2) I.** Lecture—2 hours. Mr. W. O. Wilson  
 Prerequisite: Zoology 1B.  
 The relation of environmental factors on physiological processes related to animal production.  
 Offered in odd-numbered years.

**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.** Lecture—2 hours; laboratory—6 hours. Mrs. Abbott, Mr. Taylor  
 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 Voorhies Hall

†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.*  
Gordon H. Berman, Ph.D., *Assistant Professor of Psychology.*  
Jay S. Caldwell, Ph.D., *Assistant Professor of Psychology.*  
Rudolf Kalin, Ph.D., *Assistant Professor of Psychology.*  
Thomas Natsoulas, Ph.D., *Assistant Professor of Psychology.*  
Marion C. Prentice, Ph.D., *Assistant Professor of Psychology.*  
†Andrew K. Solarz, Ph.D., *Assistant Professor of Psychology.*

◇

Nancy Bay Brzeski, M.A., *Associate in Psychology.*  
Herbert O. Dörken, Ph.D., *Lecturer in Psychology.*  
Benjamin Hart, M.S., D.V.M., *Acting Assistant Professor of Psychology.*  
Sumner B. Morris, Ed.D., *Lecturer in Psychology.*  
Theodore Parks, M.S., *Acting Assistant Professor of Psychology.*  
Morris H. Waskow, Ph.D., *Lecturer in Psychology and Food Science and Technology.*

*Letters and Science List.*—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

*Departmental Major Advisers.*—Mr. Caldwell, Mr. Solarz, Mr. Bastian, Miss Prentice, Mr. Sommer.

## *The Major Program*

(A) Lower Division Courses.—Required: (1) courses 1A and 1B or courses 1 and 2; (2) course 3; (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, 132, 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 89).—The honor 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.

‡ Absent on leave, fall semester, 1964–1965.

† Absent on leave, 1964–1965.

**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) I and II.**

Miss Prentice

Lecture—3 hours.

Prerequisite: course 1A, 1 or 2 (may be taken concurrently); Mathematics D or equivalent.

Principles and problems of measurement in psychology; methods of ordering and comparing measurements; inference and prediction from psychological data. Primarily for Psychology majors.

**33. Personal and Social Adjustment. (3) I and II. I. Mr. Morris; II. ———**

Lecture—3 hours.

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 and II.**

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. Hart

Lecture—2 hours; laboratory—1-2 hours.

Prerequisite: course 1A, 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 and II.**

Mr. Parks

Lecture—2 hours; laboratory—1-2 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.

**132. Language and Cognition. (3) I.**

Mr. Bastian

Lecture—3 hours.

Prerequisite: 6 units of upper division work in psychology.

Psychological examination of linguistic actions, their development and role in human conduct; analysis of their contribution to perception and thought.

**134. Motivation. (3) II.**

Mr. Natsoulas

Lecture—2 hours; laboratory—1-2 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) I and II.**

Mr. Sommer

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. Kalin

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) I.**

Mr. Berman

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 1 or 2, or Zoology 1A and 1B.

Comparative analysis of sensory and response systems, and of various processes such as motivation, intelligence, problem solving, and imprinting, in representative vertebrates and invertebrates.

**150. Comparative Psychology. (3) II.**

Mr. Berman

Lecture—2 hours; laboratory—2 hours.

Prerequisite: course 150A.

Comparative analysis of social behaviors in representative vertebrates and invertebrates: dominance-submission, territoriality communication, and parent-infant relationships.

**165. Clinical Psychology: Techniques and Problems in Diagnosis. (3) II.**

Lecture—2 hours; laboratory—2 hours.

Mr. Dörken

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 and II.**

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. Coopersmith in charge)

## GRADUATE COURSES

**201A. Proseminar in General Psychology. (3) I.**

Mr. Bastian

Seminar—3 hours.

Prerequisite: 18 units of upper division psychology or consent of the instructor.

An intensive consideration of major areas and problems in general experimental psychology.

**288. Research Preceptorship. (3) I and II.**

The Staff

Laboratory and discussion—6 to 9 hours.

Advanced research by the student in collaboration with one member of the staff.

**290. Seminar. (3) I and II.**

Mr. Coopersmith

Seminar—3 hours.

Advanced study in the areas of modern psychology. The subjects will vary from year to year and will be announced at the beginning of each semester.

(a) The Psychology of Architecture, I., Mr. Sommer

(b) Experimental Personality, II., Mr. Natsoulas

(c) Psychobiology, I., Mr. Bastian

**299. Research. (1-6) I and II.**

The Staff

Laboratory, library, or field work as the problem requires.

## 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.*

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Frederick N. Cooper, B.S., *Lecturer in Public Health.*

Bernhard C. Hertlein, M.S., *Lecturer in Public Health.*

John H. Jones, M.D., *Lecturer in Public Health.*

Hans P. Riemann, D.V.M., Ph.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 veterinarian 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. Love, Mr. Williams.

*Bachelor of Science Major Program and Graduate Study.* See page 66.

### LOWER DIVISION COURSE

#### 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.

### 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. One Saturday field trip.

#### 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.

- 105. Summer Field Course. (4)** Mr. Williams  
Lecture—8 hours; laboratory—24 hours.  
Prerequisite: consent of the instructor.  
Four weeks devoted to field studies of range condition and methods of utilization in various parts of the state. Required of all students with a major in range management.
- 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. (1-2) I and II.** The Staff  
Seminar—number of hours and units of credit to be announced and will depend on subject matter covered.  
Prerequisite: course 133.
- 299. Research. (1-9) 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 220.

## SOCIOLOGY

Bennett M. Berger, Ph.D., *Chairman of the Department.*  
Department Office, 308 Voorhies Hall

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Edgar Z. Friedenberg, Ph.D., *Professor of Sociology.*  
Edwin M. Lemert, Ph.D., *Professor of Sociology.*  
\_\_\_\_\_, *Professor of Sociology.*

Bennett M. Berger, Ph.D., *Associate Professor of Sociology.*

Cesar Graña, Ph.D., *Associate Professor of Sociology.*

Kenneth C. W. Kammeyer, Ph.D., *Assistant Professor of Sociology.*

Robert Maisel, Ph.D., *Assistant Professor of Sociology.*

Ivar Oxaal, Ph.D., *Assistant Professor of Sociology.*



Bruce Hackett, M.A., *Acting Assistant Professor of Sociology.*  
John F. Scott, M.A., *Lecturer in Sociology.*  
Winslow Rouse, Ph.D., *Lecturer in Sociology.*

*Letters and Science List.*—All undergraduate courses are included in the Letters and Science List of Courses (see page 88).

*Departmental Major Advisers.*—(a) Undergraduate: Mr. Kammeyer, Mr. Oxaal, Mr. Scott, (b) Pre-Social Welfare: Mr. Lemert, (c) Graduate: Mr. Berger, Mr. Graña, Mr. Lemert.

### *The Major Program*

(A) Lower Division Courses.—Sociology 1, 2, and 18 or its equivalent are required; also required are six units selected from Anthropology 2, Economics 1A and 1B, and Psychology 1 and 2. Also recommended are Anthropology 1 and Philosophy 12, 20A-20B.

(B) Upper Division Courses.—24 units of sociology including 105 and 165A, 165B are required. Recommended courses in other departments are Anthropology 102, 119, 124, 128; History 101; Philosophy 107, 151, 156; Political Science 150, 161; Psychology 145; Mathematics 105A-105B.

(C) Pre-Social Welfare students. Lower Division Courses: Sociology 1, 3, 18 and Psychology 1, and 2 are required. Recommended are Anthropology 2, Sociology 2, Economics 1A, 1B, Philosophy 12, Political Science 1A, 1B.

Upper Division Courses: Sociology 105, 120, 165A or 165B, 185 and Psychology 112, 147, 165, 168 are required. Also required are six additional units selected from Sociology 130, 131, 140, 150, 152, 170; Psychology 145; Economics 105. Also recommended are Anthropology 119, 128; Economics 116, 130, 150A, 150B; Home Economics 136, 138; Political Science 103, 104, 181.

The department will certify the completion of a major program only if a grade of at least C is maintained in upper division courses taken in the department. Students who do not maintain such an average may be dismissed from the sociology major.

*Graduate Study.*—The department offers a program of study leading to the M.A. degree in Sociology. Further information regarding graduate study may be obtained at the department office.

## LOWER DIVISION COURSES

1. **Introduction to Sociology.** (3) I and II. Mr. Maisel, Mr. Oxaal  
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. Mr. Scott  
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. Mr. Maisel  
Lecture—3 hours.  
A general sociological consideration of contemporary social problems in relation to socio-cultural 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 sociological studies. Designed for majors in sociology.
25. **Sociology of Popular Culture.** (3) II. Mr. Graña  
Lecture—3 hours.  
The historical emergence of popular culture. "High" culture, "folk" culture and "mass" culture; the democratization of cultural values; the organization of popular tastes; characteristic art forms of popular culture: literature, music, the graphic arts. The social structure of audiences.

## 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.
108. **Advanced General Sociology.** (3) I. Mr. Berger  
Lecture—3 hours.  
Prerequisite: 6 units of sociology or consent of the instructor.  
The place of sociology among the sciences and the humanities; critical analysis of basic concepts of sociology and their application to specific problems; the bearing of such analysis on problems of social order and social change.
118. **Political Sociology.** (3) II. Mr. Oxaal  
Lecture—3 hours.  
Prerequisite: course 1 or consent of the instructor.  
The relation of social cleavages and social cohesion to the functioning of political institutions; the social bases of local and national power structures; social sources of political movements; analysis of concepts of alienation, revolution, ideology, ruling class, and elite.
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. Friedenberg  
 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. Sociology of Intellectual Life. (3) I.** Mr. Graña  
 Lecture—3 hours.  
 Prerequisite: Upper division standing and consent of the instructor.  
 Sociological analysis of the intelligentsia; types of intellectuals, theories concerning their social role; research on the social sources of intellectual work in politics, literature, art and science; historical considerations of intellectual milieux; international comparisons of intellectuals.
- 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.
- 131. Sociology of the Family and Kinship. (3) II.** Mr. Scott  
 Lecture—3 hours.  
 Prerequisite: course 1 or consent of the instructor.  
 The relation of family forms to social stratification, ethnic groups, and industrialization; universal and variable functions of reproductive institutions; current trends in family structure of industrial societies; the influence of fertility, divorce rates, and age-grading on those trends.
- 140. Social Stratification. (3) I.** Mr. Hackett  
 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.**  
 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.
- 146. Sociology of Religion. (3) I.** Mr. Graña  
 Lecture—3 hours.  
 Prerequisite: 6 units of sociology or consent of the instructor.  
 The relationship between social structure and religious life. Social class, political behavior, and religious affiliation. The passage from "sacred" to "secular" ways of life. Religion and social change in advanced societies. Churches as social organizations. "Established" churches and religious "cults."

**148. Collective Dynamics and Social Movements. (3) II.**

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 in mass societies.

**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 1.

Historical and comparative analysis of problems associated with quality of work and quantity of leisure; impact of cultural and social change on occupational pattern and leisure activity.

**165. Sociological Theory. (3) I.**

Mr. Oxaal

Lecture—3 hours.

Prerequisite: 6 units of sociology.

Sociological theories of the 19th century. Conservative and liberal traditions of sociological thought. "Classical" sociological theory. Among the thinkers discussed are Comte, St. Simon, Marx, and Durkheim.

**165B. Sociological Theory. (3) II.**

Lecture—3 hours.

Prerequisite: 6 units of sociology.

Major sociological theorists from the late 19th century to the present. Among the thinkers discussed are Weber, Simmel, Mead, Dewey, Freud, and Parsons.

**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.**

Mr. Hackett

Lecture—3 hours.

Prerequisite: course 1 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.

\* Not to be given, 1964-1965.

**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)

## GRADUATE COURSES

**205. Methodological Critique of Research. (2) II.**

Mr. Kammeyer

Lecture and discussion—2 hours.

Prerequisite: course 105, 18, or consent of the instructor.

Methodological analysis and criticism of empirical research exemplifying different types of research design. Examination of surveys, experiments, historical and comparative studies, and studies using biographical and demographic data.

**220. Deviance, Law, and Social Control. (2) I.**

Mr. Lemert

Lecture and discussion—2 hours.

Prerequisite: course 120 or consent of the instructor.

The relation of crime, mental disorder, and other forms of deviance to cultural values, norms, and legal institutions; formal and informal means for the social control of deviance.

**226. Social Interaction and Personality. (2) I.**

Mr. Maisel

Lecture and discussion—2 hours.

Prerequisite: course 126 or consent of the instructor.

The influence of social structure, personality, and social interaction in face-to-face social situations; the relations of role-taking and personal autonomy to the development of the self; social-psychological processes in intimate and small-group situations.

**252. Sociology of Art. (2) II.**

Mr. Graña

Lecture and discussion—2 hours.

Prerequisite: course 25 and 125 or consent of the instructor.

The relationship of social class, institutions, and value system to art. The art of primitive, aristocratic and democratic societies. Art and political ideology. The question of art as "representative" of social values. Artists as a social type.

**265. Sociological Theory. (2) I.**

Mr. Oxaal

Lecture and discussion—2 hours.

Prerequisite: courses 165A and 165B or consent of the instructor.

The emergence of sociological thinking as part of the history of ideas; the application of sociological analysis to sociological ideas. The French sociological tradition from Saint-Simon to Durkheim; the influence of Marxist thinking on subsequent sociological ideas.

**290. Seminar. (2) I and II.**

The Staff

Seminar—2 hours.

Analysis of current thought on a specific problem in sociology. The content of the course will vary from year to year.

**299. Individual Study. (1-6) I and II.**

The Staff, Mr. Berger in charge

Directed reading and periodic conferences on a topic not offered in the regular curriculum.

## 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

—, *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.*  
Richard G. Bureau, Ph.D., *Assistant Professor of Soil Science.*  
John L. McMurdie, Ph.D., *Assistant Professor of Soil Physics.*



Eugene L. Begg, B.S., *Lecturer in Soil Morphology.*  
James W. Biggar, Ph.D., *Lecturer in Irrigation.*  
Arthur L. Brown, Ph.D., *Lecturer in Soils and Plant Nutrition.*  
William J. Chancellor, Ph.D., *Associate Professor of Agricultural Engineering.*  
James A. Cook, Ph.D., *Professor of Viticulture.*  
Lloyd D. Doneen, Ph.D., *Professor of Irrigation.*  
Emanuel Epstein, Ph.D., *Lecturer in Plant Nutrition.*  
†William J. Flocker, Ph.D., *Lecturer in Vegetable Crops.*  
Robert M. Hagan, Ph.D., *Professor of Irrigation.*  
Delbert W. Henderson, Ph.D., *Associate Professor of Irrigation.*  
Ray C. Huffaker, Ph.D., *Lecturer in Agronomy.*  
Jerome J. Jurinak, Ph.D., *Lecturer in Soil Chemistry.*  
John C. Lingle, Ph.D., *Associate Professor of Vegetable Crops.*  
James N. Luthin, Ph.D., *Professor of Irrigation.*  
Duane S. Mikkelsen, Ph.D., *Professor of Agronomy.*  
Donald R. Nielsen, Ph.D., *Associate Professor of Irrigation.*  
H. Michael Reisenauer, Ph.D., *Lecturer in Soils and Plant Nutrition.*

*Departmental Major Adviser.*—Mr. McMurdie.

*Bachelor of Science Major Program and Graduate Study.* See page 67.

### 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 the required courses in chemistry, physics, botany, bacteriology, and the geological sciences.

† Absent on leave, 1964-1965.

## 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.** Mr. Bureau  
 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 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. Reisenauer  
 Lecture—2 hours.  
 Prerequisite: course 1; Chemistry 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.  
 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. McMurtrie  
 Lecture—3 hours.  
 Prerequisite: course 107. Recommended: Mathematics 109.  
 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 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 micro-organisms; 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 even-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.

*Soils and Plant Nutrition*

335

299. Research. (1-6) I and II.

The Staff

RELATED COURSES

Use of Isotopes as Tracers in Biological Research. (Animal Physiology 243, 243L)

Water-Soil-Plant Relationships (Irrigation 100)

## **SPANISH**

For courses in Spanish see "Foreign Languages" on page 221.

## **SPEECH**

For courses in speech see "Dramatic Art and Speech" on page 165.

## **SUBJECT A**

Department Office, 176 Voorhies Hall

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Leonard G. Homann, A.B., *Instruction Supervisor 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 246.

## VEGETABLE CROPS

Oscar A. Lorenz, Ph.D., *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.*  
Oscar A. Lorenz, 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.*  
James E. Knott, Ph.D., Sc.D., (hon.c.), *Professor of Vegetable Crops,*  
*Emeritus.*  
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.*  
Frederick 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. Harrington  
Lecture—2 hours.  
Principles involved in vegetable production; survey of the vegetable industry.
- 1L. **Vegetable Crops Production Laboratory.** (1) II. Mr. Harrington  
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, 1964-1965.

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.

**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.

**190. Proseminar. (1) II.** Mr. Lorenz  
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

**221. Vegetable Physiology. (3) II.** \_\_\_\_\_, Mr. Pratt  
Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 1, Botany 111.

Physiological principles involved in the production of vegetable crop species.

**290. Seminar. (1) I and II.** The Staff (Mr. Spurr in charge)  
Seminar—1 hour.

**291. Seminar in Postharvest Physiology. (1) I and II.** The Staff (Mr. Pratt in charge)  
Seminar—1 hour.

Prerequisite: consent of instructor.

An intensive study of selected topics in the field of postharvest physiology of fruits and vegetables. This seminar will be conducted jointly with Pomology 291.

**298. Group Study. (1-5) I and II.** The Staff (Mr. Yamaguchi in charge)  
Discussion—1-5 hours.

Current concepts, techniques, and procedures applicable to research and to the production of vegetables.

**299. Research. (1-9) I and II.** The Staff

## VETERINARY MEDICINE

For courses in veterinary medicine, see "Medicine, Surgery, and Clinics," page 269.

## VETERINARY MICROBIOLOGY

James R. Douglas, Ph.D., *Chairman of the Department.*  
Department Office, 2004 Haring Hall

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.*  
Hugh S. Cameron, D.V.M., Ph.D., *Professor of Veterinary Microbiology, Emeritus.*  
Jacob Traum, D.V.M., *Professor of Veterinary Medicine, Emeritus.*  
Norman F. Baker, D.V.M., Ph.D., *Associate Professor of Parasitology.*  
Ernst 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).*  
Richard N. Rossan, Ph.D., *Lecturer in Parasitology.*

### UPPER DIVISION COURSES

#### 111. Animal Hygiene. (3) II.

Lecture—3 hours.

Prerequisite: Bacteriology 1.

The causes, prevention, control, and eradication of animal diseases important in economic livestock production and public health.

#### 121. Microbiology. (10) I.

Mr. Biberstein, Mr. McKercher

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. Rossan

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.

† Absent on leave, 1964–1965.

**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

\* Not to be given, 1964-1965.

## VITICULTURE AND ENOLOGY

James A. Cook, Ph.D., *Chairman of the Department.*  
Department Office, 1027 Wickson Hall

Maynard A. Amerine, Ph.D., *Professor of Enology.*  
Harold W. Berg, M.S., *Professor of Enology.*  
James A. Cook, Ph.D., *Professor of Viticulture.*  
James F. Guymon, Ph.D., *Professor of Enology.*  
Klayton E. Nelson, Ph.D., *Professor of Viticulture.*  
A. Dinsmoor Webb, 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.*  
Albert J. Winkler, Ph.D., *Professor of Viticulture, Emeritus.*  
Lloyd A. Lider, Ph.D., *Associate Professor of Viticulture.*



Julian C. Crane, Ph.D., *Professor of Pomology.*  
Mark W. Kliewer, Ph.D., *Lecturer in Viticulture.*  
George L. Marsh, M.S., *Professor of Food Science and Technology.*  
Cornelius S. Ough, B.S., *Lecturer in Enology.*  
Vernon L. Singleton, Ph.D., *Lecturer in Enology.*

*Departmental Major Advisers.*—Viticulture, Mr. Lider; Food Science (Enology), Mr. Webb; Agricultural Production (Enology), Mr. Webb.

*Bachelor of Science Major Program and Graduate Study (Viticulture).* See page 63 and 54.

*Bachelor of Science Major Program and Graduate Study (Enology).* See page 54.

### 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.

Offered in odd-numbered years.

##### 3. Introduction to Wine Making. (2) II.

Mr. Singleton, Mr. Amerine

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 permission of the instructor.

Botanical classification of the grape—the principal varieties, rootstocks,

† Absent on leave, 1964–1965.

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. Weaver  
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 or permission of the instructor.

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.

Offered in even-numbered years.

**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

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 consent 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 COURSES

**Introduction to Food Science** (Food Science 1)

**Analysis of Foods by Sensory Methods** (Food Science 107)

**Fruit Breeding** (Pomology 114)

## ZOOLOGY

†Herman T. Spieth, Ph.D., *Chairman of the Department.*  
Milton Hildebrand, Ph.D., *Acting 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.*

†Herman T. Spieth, Ph.D., *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.*

†Charles R. Goldman, Ph.D., *Associate Professor of Zoology.*

Robert L. Rudd, Ph.D., *Associate Professor of Zoology.*

George W. Salt, Ph.D., *Associate Professor of Zoology.*

Kenneth E. F. Watt, Ph.D., *Associate Professor of Zoology.*

Ernest J. DuPraw, Ph.D., *Assistant Professor of Zoology.*

Warren G. Kinzey, Ph.D., *Assistant Professor of Zoology and Assistant Professor of Anthropology.*

Stephen L. Wolfe, Ph.D., *Assistant Professor of Zoology.*

—, *Assistant Professor of Zoology.*

—, *Assistant Professor of Zoology.*



Norman F. Baker, D.V.M., Ph.D., *Associate Professor of Parasitology.*

James R. Douglas, Ph.D., *Professor of Parasitology.*

William J. Hamilton, III, Ph.D., *Lecturer in Zoology.*

Robin C. Lenn, A.B., *Associate in Zoology.*

William M. Longhurst, Ph.D., *Lecturer in Zoology.*

Daniel E. Willard, A.B., *Associate in Zoology.*

## 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 88).

*Departmental Major Advisers.*—Mr. DuPraw, Mr. Jameson, Mr. Watt.

### Bachelor of Arts Major Program

(A) Lower Division Courses.—Zoology 1A and 1B; Chemistry 1A and 1B or 8.

† Absent on leave, 1964-1965.

(B) Upper Division Courses.—24 units of upper division courses in zoology (not more than 4 units of courses in the 190 series may be counted 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 an interdisciplinary major for students with professional orientation in the field of wildlife.

(A) Lower Division Courses.—Required: course 1A, 1B; Botany 1; Chemistry 1A, 8; Entomology 1; Mathematics 13. Recommended: Bacteriology 1; Geology 1A; Physics 2A; Mathematics 16B, 36, 41; Chemistry 5.

(B) Upper Division Courses.—At least 24 units, 12 of which must be in upper division zoology courses. Not more than 4 units of courses in the 190 series may be counted in satisfying the upper division course requirement.

Required: Genetics 100; Zoology 116.

Elective groups: 12 units of upper division electives including courses from at least four of the following groups.

*Group 1. Limnology and Oceanography.*—Zoology 140, 140L, 144.

*Group 2. Physiology, Nutrition, and Biochemistry.*—Zoology 142, 142L; Animal or Poultry Husbandry 105; Animal Husbandry 110; Biochemistry 101.

*Group 3. Biometry.*—Mathematics 105B, 109.

*Group 4. Parasitology and Bacteriology.*—Bacteriology 100, 104; Veterinary Microbiology 124.

*Group 5. Vertebrate Zoology.*—Zoology 133, 134, 106.

*Group 6. Ecology.*—Zoology 125, 125L; Botany 117.

*Honors and Honors Program* (see page 99).—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. For detailed information regarding graduate study, write to the Graduate Adviser, Department of Zoology.

#### 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. Hildebrand

Lecture—2 hours.

Prerequisite: course 1B.

Embryologic development of the vertebrates, including amphibian, chick, and mammal.

**100L. Vertebrate Embryology Laboratory. (2) I.**

Mr. Hildebrand

Laboratory—6 hours.

Prerequisite: course 100, which should be taken concurrently.

**103. Experimental Embryology. (2) II.**

Lecture—2 hours.

Prerequisite: course 100.

Mechanisms of growth and differentiation of embryonic, malignant and regenerating tissues.

**103L. Experimental Embryology Laboratory. (2) II.**

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. Principles of Microscopy. (3) II.**

Mr. DuPraw

Lecture—1 hour; laboratory—6 hours.

Prerequisite: course 1B.

History, theory and application of methods in microscopy, including sectioning and staining, phase contrast microscopy, fluorescence microscopy, photomicrography, autoradiography, and preparations for the electron microscope.

**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.

**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. Principles of Animal Resource Management. (3) I.**

Mr. Watt

Lecture—2 hours; laboratory—3 hours.

Prerequisite: course 1A; Mathematics 13, 16A.

Population dynamics and management of marine, freshwater, and terrestrial animal resources; analysis and solution of problems in maximization of animal resource production.

**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. \_\_\_\_\_  
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) I. 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. \_\_\_\_\_  
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. \_\_\_\_\_  
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. \_\_\_\_\_  
Lecture—2 hours.

Prerequisite: course 112 (may be taken concurrently); Chemistry 1A; Physics 2B. Recommended: Animal Physiology 100.

Comparison of the physiology of invertebrate organ systems.

**142L. Invertebrate Physiology Laboratory.** (2) II. \_\_\_\_\_  
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, 1964-1965.

**\*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

**202. Biomathematics. (3) II.** Mr. Watt  
 Lecture—2 hours; laboratory—3 hours.

Prerequisite: Mathematics 16B, 105A, and 105B or consent of the instructor.

Mathematical aspects of physiology, ecology, and epidemiology; development and testing of models, mathematical description of biological systems; measurement, analysis, simulation and optimization in biology.

Offered in odd-numbered years.

**\*223. Seminar in Fisheries Management. (2) II.** Mr. Watt  
 Seminar—2 hours.

Prerequisite: course 116; Mathematics 16B, 105B.

Analysis of fish population problems, including review of recent research. Offered in even-numbered years.

**290. Seminar. (1) I and II.** I. Mr. Rudd, II. Mr. Watt  
 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.

\* Not to be given, 1964-1965.

**293. Seminar in Invertebrate Zoology. (1) I.**

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. Rudd, Mr. Salt

Seminar—1 hour.

Prerequisite: course 125 or consent of the instructor.

Discussion of advanced topics in the field of animal ecology.

**295. Seminar in Limnology. (1) II.**

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.**

Seminar—1 hour.

Mr. Rudd, Mr. Hildebrand

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. (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, 1964-1965.

# INDEX

- Absence, leave of, 45  
Academic Senate, 12  
Accrediting of Schools (see Graduation from an accredited high school, 19)  
Activities, 46  
Administration of the University, 12  
Administrative officers  
    Davis, 10  
    general, 10  
    of the colleges and schools, 11  
Admission, 17-27  
    advanced standing, 21, 23, 92  
    applicants with bachelors' degrees, 24  
    application fee, 17  
    application for, 17-27  
    by examination, 20, 23  
    by removal of deficiencies, 20, 22  
    California residents, 19  
    College of Engineering, 25, 69-70  
    eligibility, notification of, 17  
    freshman standing, 19  
    from other countries, 24  
    graduate standing, 26  
    limited status, 24  
    out-of-state applicants, 22  
    preparation for, 18  
    School of Veterinary Medicine, 91  
    special status, 23  
    transcript of records for, 17  
    undergraduate status, 17  
    University-wide admissions, 17  
    with bachelors' degree, 24  
Advanced standing, 21, 23, 92  
    requirements, 21  
Advisers  
    for foreign students, 25  
    College of Agriculture, 49  
    College of Engineering, 70  
    College of Letters and Science, 81  
Aerospace engineering, 72  
Agricultural  
    business management, 51  
    chemistry, 101  
    economics, 52, 54, 103  
    education, 53, 108  
    engineering, 55, 73, 111  
    practices, 114  
    production, 54  
    skills, opportunities for acquiring, 49  
Agriculture  
    general, 55  
    special secondary credentials in, 97  
Agriculture, College of, 13, 48-67  
    honors, 50  
    minimum scholarship requirements, 40  
    requirements for bachelor of science degree, 50  
    study-list requirements, 49  
Agronomy, 55, 64, 115  
American history and literature, 86, 118  
American history and institutions, 39, 50, 70, 82, 92  
Anatomy, 119  
Animal husbandry, 55, 57, 120  
Animal physiology, 57, 124  
Animal science, 56  
Anthropology, 128  
Application fee, 17  
Applied science, 80, 133  
Approval of housing, 35  
Art, 137  
    dramatic, 165  
Arts, requirements for degree of Bachelor of, 82  
Associated Students, 46  
Athletic Association, Women's, 46  
Athletics, 46  
Attorney for The Regents, 9  
    in residence matters, 32  
Authority of instructors, 28  
Avian medicine, 143  
Awards, 33  
Bachelor of Arts degree, requirements for, 82  
Bachelor of Science degree, requirements for  
    in College of Agriculture, 50  
    in College of Engineering, 70  
    in College of Letters and Science, 81, 85  
    in School of Veterinary Medicine, 91  
Bacteriology, 144  
Biochemistry, 147  
Biological sciences, 84, 149  
Biophysics, 147  
Board and lodging, 35  
Botany, 151  
Brief leave of absence, 45  
Calendar, 6-8  
Candidacy for degrees, 39  
Change of college, major, or name, 45  
Chemical engineering, 71, 74  
Chemistry, 157  
    agricultural, 101  
Child development, 60  
Citizenship, required for teaching credentials, 96  
Civil engineering, 76  
Classics, 210  
Clubs and societies, 46  
College entrance examinations, 20, 23  
    Aptitude test dates for, 20  
Composition, English required, 38, 83  
Condition examination, 43  
Conduct and discipline, 44  
Constitution, course on, for teaching credentials, 96  
Correspondence instruction, 15  
Counseling Service, 37

- Courses, classification and numbering of, 99  
 Credentials, teaching, 96  
 Credit  
     and scholarship, 40  
     by examination, 42  
     for work taken in other colleges, 22  
     upon repetition of lower division course, 42  
     value of courses, 40  
 Curricula  
     preparation for, 18  
     survey of, 13  
 Curriculum (see various colleges)  
     graduate study and research, 95
- Dairy industry, plant management, 55  
 Deans of the colleges and schools, 11  
 Deficiencies, 20  
     admission, 20  
     in University courses, 42  
     removal of, 42  
 Degrees awarded, 14  
     dates of application for, 39  
     departmental major, 83  
     requirements for, 50, 70, 82, 85, 92  
 Dentistry, School of, 88  
 Design, 60, 246  
 Dietetics, 60  
 Discipline, 44  
 Discontinuance without notice, 45  
 Dismissal  
     for scholarship delinquency, 41  
     honorable, 45  
 Doctor of Veterinary Medicine, requirements for degree, 93  
 Dormitories, 35  
 Dramatic art, 165  
 Dramatic art and speech, 86
- Economics, 172  
     agricultural, 52, 54, 103  
 Education, 177  
     agricultural, curriculum in, 53  
     curricula for teaching credentials, 96  
     electrical engineering, 75  
 Employment, student, 34  
     agricultural and industrial placement service, 35  
     educational placement service, 34  
     part-time, 34  
 Engineering, 69, 180  
     aerospace, 72  
     agricultural, 55, 73, 111  
     chemical, 71, 74  
     civil, 76  
     electrical, 77  
     mechanical, 78  
 Engineering, College of, 69-80  
     admission to, 69  
     examination, 25, 70  
     graduate study, 80  
     minimum scholarship requirements, 41  
     program of study, 71, 72
- requirements for bachelor of science degree, 70  
 special requirements for admission to, 25, 69  
 study-list requirements, 70  
 English, 83, 85, 86, 89, 95, 194  
     composition, Subject A, 18, 38  
     examination for foreign students, 24, 27  
     requirement for admission, 19  
 Enology, 55, 59, 341  
 Enrollment limitation  
     in School of Veterinary Medicine, 91, 92  
     of out-of-state applicants, 22  
 Entomology, 58, 203  
 Entrance requirements, 17, 27  
 Examinations  
     admission by, 20, 23  
     American history and institutions, 39  
     condition or special, 42  
     credit by, 42  
     engineering, 25, 70  
     entrance, 20  
     final, 42  
     in English for foreign students, 24, 27  
     medical, required, 29  
     regulations concerning, 42  
     Subject A, 18, 38  
 Excuse for absence, 45  
 Expenses of students, 31  
 Extension, University, 15, 82  
 Extension courses, consent for, 28
- Faculty advisers (see Advisers)  
 Failures and conditions, 42  
 Farm experience, opportunities for, 49  
 Farm management (see Agricultural business management)  
 Fees  
     application, 17  
     condition examinations, 43  
     for Subject A course, 38  
     incidental, 31  
     late registration, 28  
     Memorial Union, 31  
     nonresident, 32  
     parking, 32  
     student body membership, 31  
     teaching credential, 96  
     tuition, 32  
 Fellowships, 33  
 Final examinations, regulations concerning, 42  
 Financial aids, 33  
 Foods, 60  
 Food science, 58  
 Food science and technology, 206  
 Food technology, 55, 206  
 Foreign languages, 83, 210  
     credit for foreign students, 25  
     Letters and Science, 83  
     requirement for admission, 20  
 Foreign literature in translation, 225

- Foreign Students  
admission from foreign schools, 24  
admission to the Graduate Division, 26,  
27  
advisers for, 25  
American history and institutions for,  
39  
examination in English for, 24, 27  
health insurance, 29, 37  
language credit in mother tongue, 25
- Forestry (see Preforestry)
- Fraternities, 36
- French, 83, 95, 211
- General agriculture, 55
- General elementary credentials, 96-98
- General home economics, 61
- General secondary credentials, 96-98
- General soil science, 67
- Genetics, 58, 64, 226  
animal science, 58  
plant science, 64
- Geography, 229
- Geology, 233
- German, 83, 214
- Government, of the University, 12  
student self-government, 44
- Grade points, 40
- Grades of scholarship, 40
- Graduate courses, prerequisites for, 100
- Graduate degrees, 15
- Graduate Division, 95-98  
admission to, 26
- Graduate fellowships and scholarships, 33
- Graduate Study, 80, 95  
applied science, 80  
Veterinary Medicine, 91
- Grants-in-Aid, 33
- Greek, 89, 217
- Group majors, 84, 86
- Gymnasium, uses of 29
- Health certificate, for teaching credentials, 96
- Health Insurance  
foreign students, 29  
supplementary, 29, 37
- Health service, 36
- High school, matriculation units in relation to University units, 19  
program required for admission, 19
- History, 237  
American, for graduation, 39, 50, 70,  
82, 85, 91, 92  
for admission, 19  
of the University, 12
- Home economics, 59, 246
- Honorable dismissal, 45
- Honors, 45  
list, 89  
with bachelor's degree, 50, 70, 89
- Honors Program  
American history and literature, 87
- Honor Spirit, 44  
at graduation, agriculture, 50
- Household science (see Home Economics)
- Housing, 35
- Humanistic-social studies, 79, 83  
engineering, 79
- Humanities, 83
- Incidental fee, 31
- Individual group majors, 84, 86
- Instructors, authority to exclude students, 28
- Insurance, health, 29, 37
- Intercampus transfer, 18
- Interdepartmental majors, 85
- International agricultural development, 61, 252
- International Club, 46
- International relations, 87
- Irrigation, 55, 253
- Irrigation science, 62
- Italian, 84, 218
- Junior Year Abroad, 46
- Laboratory science, for admission, 20
- Landscape horticulture, 55, 64, 256
- Languages  
credit in, for a foreign student, 25  
foreign, for admission, 20
- Late admission and registration, 17, 28
- Latin, 84, 219
- Law, School of, 13
- Leave of absence, and honorable dismissal, 45
- Legal (see Prelegal, 88)
- Letters and Science, College of, 14, 81-90  
breadth requirements, 82, 85  
faculty advisers, 81  
honors with the bachelor's degree, 90  
honor students, 89  
list of courses, 88  
majors for degrees, 84, 86  
requirements for degrees in, 82, 85  
minimum scholarship requirements, 40  
study-list regulations, 81
- Library, 37
- Limitation of enrollment  
in the School of Veterinary Medicine, 91  
of out-of-state applicants, for admission, 22
- Limited status, 24
- List of courses, Letters and Science, 88
- Living accommodations, 35
- Loans, 33
- Location of campus, 13
- Lodging and board, 35
- Majors  
change of, 45, 81  
individual group, 84, 86  
in the College of Agriculture, 50-67  
in the College of Letters and Science, 84, 86  
in the Graduate Division, 95

- Mathematics, 260  
 required for admission, 19  
 requirement for bachelor of arts degree, 84  
 requirement for bachelor of science degree, 85
- Matriculation, credit, 19  
 examinations, 20, 23, 25, 70
- Mechanical engineering, 78
- Medical and physical examination required, 29
- Medical technology, 88
- Medicine, Surgery, and Clinics, 269
- Medicine, School of, 88
- Memorial Union fee, 31
- Microbiology (see *Bacteriology*, 144)
- Military science, 29, 273
- Minimum undergraduate scholarship requirements, 40
- Morphology and taxonomy, 153, 283, 314, 350
- Music, 84, 276
- Natural science requirement, 83, 85
- Nematology, 84, 283
- Nonresident students  
 admission of, 22, 23, 24  
 status determined, 32  
 tuition fee for, 32
- Nutrition, 61, 249, 284
- Officers, administrative, 10
- Optometry, School of, 88
- Oriental languages, 89, 285
- Out-of-state applicants, 22
- Parasitology (see *Entomology*, 58, 203)
- Park Administration, 64, 258
- Parking fee, 32
- Passing and nonpassing grades, 40, 79
- Pathology, 286
- Pedology and soil survey (see *Soil science*, 67)
- Pest control, 56
- Pharmacy, School of, 88
- Philosophy, 86, 288
- Physical education, 29, 86, 292
- Physical examination required, 29
- Physical sciences, 84, 86, 87
- Physical therapy, 88
- Physics, 84, 86, 88, 297
- Physiological sciences, 302
- Physiology, 84, 86, 88, 344  
 animal, 57  
 plant, 304
- Placement service, 34
- Plant  
 morphology, 153, 283, 314, 350  
 nematology, 283  
 nutrition and soil fertility, 56, 332  
 pathology, 64, 286  
 physiology, 304  
 science, 63  
 taxonomy, 153, 283, 314, 350
- Political science, 84, 86, 88, 306
- Pomology, 56, 64, 313
- Poultry husbandry, 56, 58, 316
- Preforestry, 65
- Preparation for University curricula, 18
- Preveterinary medicine, 65  
 curriculum, 65, 93
- Prizes, 34
- Probation, 41
- Professional undergraduate schools, admission to, 88  
 dental, 88  
 legal, 88  
 medicine, 88  
 medical technology, 88  
 nursing, 88  
 optometry, 88  
 pharmacy, 88  
 physical therapy, 88  
 presocial welfare, 88  
 preurban and regional planning, 88
- Psychology, 84, 86, 88, 319
- Public Health, 29
- Range management, 56, 66, 324
- Reading development, 38
- Readmission, 27  
 after dismissal, 41
- Reexaminations (see *final examinations*, 42)
- Refunds of fees, 32
- Regents of the University, 9
- Register, failure to, 28
- Registration  
 by proxy, 28  
 late, 28  
 routine of, 28
- Removal of deficiencies, 42
- Repetition of course for higher grade (see *Removal of deficiencies*, 42)
- Reports of student grades, 40
- Requirements  
 for admission, 17-27  
 for degrees (see under the various colleges)  
 for out-of-state applicants, 22
- Research, graduate, 95
- Reserve Officers' Training Corps, 29
- Residence halls, 35
- Residence, rules governing, 32
- Russian, 84, 88, 220
- Scholarship, grades of, 40  
 minimum requirements of, 40  
 requirements for admission, 19, 23
- Scholarships, 33
- Science, requirements for degree of Bachelor of, 50, 70, 85, 92
- Sciences (see under the various departments)  
 for admission, 20
- Selective service, 37
- Self-government of students, 45
- Self-support of students, 34
- Senate, Academic, 12
- Site and Growth, Davis campus, 13
- Social science, 83, 84
- Sociology, 84, 86, 88, 326

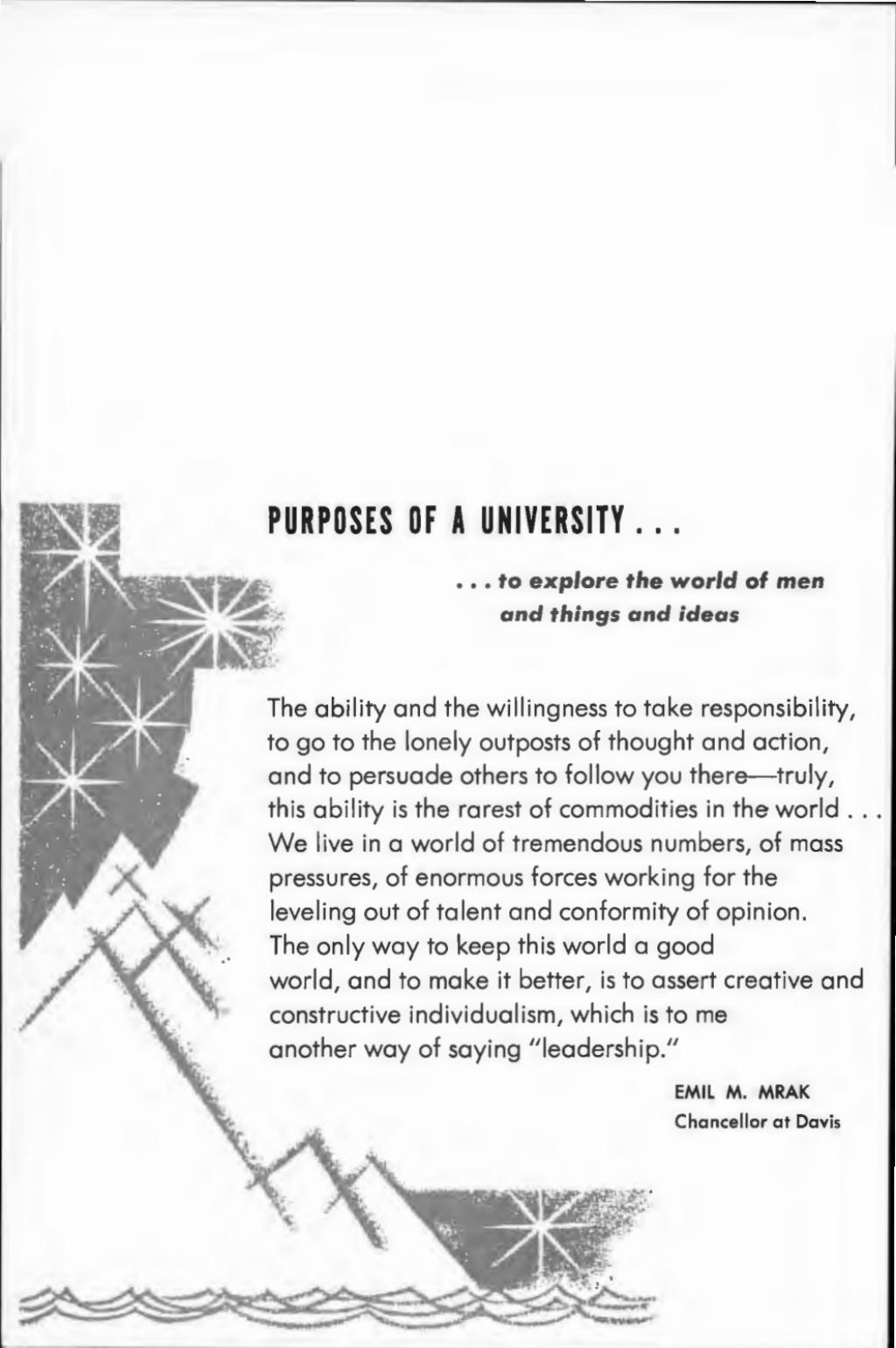
- Soil science, 67, 332  
Soils and plant nutrition, 332  
Spanish, 84, 86, 88, 221  
Special  
    elementary credential, 96  
    examinations (see Credit by examination, 42)  
    secondary credentials, 96  
    students, 23  
Speech, 84, 88, 170  
Staff, administrative, 10  
Student  
    activities, 46  
    clubs and societies, 46  
    conduct and discipline, 44  
    employment, 34  
    expenses, 31  
    health service, 36  
    publications, 46  
    responsibility for materials submitted in satisfaction of course requirements, 45  
    Welfare Council, 44  
Study habits, 38  
Study-list regulations, 28, 49, 70, 81  
Subject A, 18, 38, 336  
    in the College of Agriculture, 50  
    in the College of Engineering, 70  
    in the College of Letters and Science, 82, 85  
    in the School of Veterinary Medicine, 92  
Summer sessions, 15, 82  
Supplementary health insurance, 29, 37  
Survey of curricula, 13  
Symbols used, 100  
Teacher education, 96  
    credentials, 96  
    curricula, 96  
    requirements, general and specific, 96  
Textile science, 61  
Transcript of record, 46  
    for admission, 17  
Tuition, 32  
Undergraduate curricula, 13  
Units of work and credit, 40  
University extension, 15, 82  
University of California, 12  
    Davis campus, 13  
    library, 37  
    requirements, (see under various colleges)  
University-wide Admissions, 17  
Vaccination required, 18, 29  
Vegetable crops, 56, 64, 337  
Veterans affairs, 35  
Veterinary curriculum, 93  
Veterinary medicine (see Medicine, Surgery, and Clinics, 269)  
Veterinary Medicine, School of, 91-94  
    admission to, 91  
    curriculum, 93  
    enrollment limitation in, 91  
    graduate study, 93  
    minimum scholarship requirements, 40  
    plan of study, 93  
    requirements for degrees in, 92  
    selection of applicants for, 91  
Veterinary microbiology, 339  
Viticulture and enology, 55, 56, 64, 341  
Welfare Council, 44  
Wildlife, 345  
Women's Athletic Association, 46  
Year courses, classification and numbering of, 99  
Zoology, 84, 86, 88, 344

## **Administrative Bulletins of the University of California 1964-1965**

The administrative bulletins of the University of California present information concerning the colleges, schools, and departments of the University. Copies of general bulletins and other information concerning instruction may be obtained from the following:

- Registrar, University of California, Berkeley, Berkeley 94720.
- Registrar, University of California, Davis, Davis 95616.
- Office of Admissions, University of California, Irvine, Irvine 92650.
- Registrar, University of California, Los Angeles, Los Angeles 90024.
- Registrar, University of California, Riverside, Riverside 92502.
- Registrar, University of California, San Diego, La Jolla 92038.
- Registrar, University of California, Santa Barbara, Santa Barbara 93018.
- Office of Admissions, University of California, Santa Cruz, Santa Cruz 95060.

The bulletins of the schools and colleges at the University of California, San Francisco Medical Center, San Francisco 94122, may be obtained by contacting the deans in charge.



## PURPOSES OF A UNIVERSITY . . .

*... to explore the world of men  
and things and ideas*

The ability and the willingness to take responsibility, to go to the lonely outposts of thought and action, and to persuade others to follow you there—truly, this ability is the rarest of commodities in the world . . . We live in a world of tremendous numbers, of mass pressures, of enormous forces working for the leveling out of talent and conformity of opinion. The only way to keep this world a good world, and to make it better, is to assert creative and constructive individualism, which is to me another way of saying “leadership.”

EMIL M. MRAK  
Chancellor at Davis