SECTION TWO
Courses and Curricula
Officers of Administration
Index
b planator
Prerequisites waived at the open to freshmen. Courses open to freshmen and acceptable for units are in
Jr. open for given subjects 101-209, such as work basic to PE 109 and 119 are specified for professional courses.
The number of students in qualifying exams.
Courses not listed as special studies are independent and approved plans. Special study is for special honors in the department.
Courses are sequences, for example, Math 14 in the fall quarter, the student is at the one for the first 4, second quarter 5, etc.
The number of courses is limited (see page 25). The number of courses is limited (see page 25).

AEROSPACE
Kenneth W. White
The Department offers opportunities for completing degree in General Missionary. There are facilities.
Two-year programs are provided. Grants through...
VII. Courses and Curricula

EXPLANATORY NOTE

Prerequisites for courses should be noted carefully, although they are sometimes waived at the discretion of the instructor. Lower division courses (numbered 1–49) are open to freshmen and sophomores. In no department is a lower division course acceptable for upper division credit. Upper division courses (100–199) are ordinarily open to students who have completed at least one lower division course in the given subject, or two years of college work. Adequate preparation for graduate courses (200–299), subject to the instructor's approval, is normally 18 upper division units of work basic to the subject matter of the course. Professional courses for teachers (300–399) are specially designed for teachers or prospective teachers. These and other professional courses (400–499) are acceptable toward academic degrees only within the limitations prescribed by the various colleges or schools or the Graduate Division. The numbers 601 and 602 are reserved for special study undertaken by graduate students in preparing for the master's examination or the Doctor of Philosophy qualifying examination, respectively.

Courses numbered 199 are normally restricted to senior honor students. They are special study courses for advanced undergraduates desiring credit for supervised independent work. Admission to such courses requires adequate preparation and an approved plan of study. A student may receive a maximum of 5 units in any or all special study courses per quarter. Course numbers preceded by the letter H are special honors courses subject to such general restrictions as may be imposed by the department. Experimental courses introduced by the Board of Educational Development are listed with the suffix X.

Courses with double numbers (for example, English 1A–1B) are two-quarter sequences, beginning in the quarters indicated. Courses with triple numbers (for example, Mathematics 1A–1B–1C) are three-quarter sequences, normally beginning in the fall quarter. Except as noted, each course in a sequence is normally prerequisite to the one following, and a student may normally receive credit for completion of the first $\frac{1}{4}$, $\frac{2}{4}$, or $\frac{3}{4}$ of a sequence.

The number in parentheses following the course title indicates the credit value (see page 25); the abbreviation in parentheses indicates the quarter in which the course is offered, (Su) summer, (F) fall, (W) winter, (Sp) spring.

AEROSPACE STUDIES

(Department Office, 47 Harmon Gymnasium)


The Department of Aerospace Studies offers students in all academic categories the opportunity to qualify for commission in the United States Air Force while completing degree requirements within the University. Entering freshmen enroll in the General Military Course and complete their lower division requirements concurrently with their freshman and sophomore years. Such students are enrolled in the "four-year program" and as such are qualified to compete for Financial Assistance Grants throughout the duration of their enrollment. Entering freshmen begin their
Aerospace Studies program by enrollment in Aerospace Studies 1 during their first quarter of attendance. Those entering freshmen who desire consideration for full four-year Financial Assistance Grants should contact their high school counselors at the beginning of their final year in high school.

For those students who do not or cannot enroll in lower division General Military Course subjects during their first two years, “a two-year program” is offered. This program provides the transfer student and graduate student as well as others who have not completed the General Military Course the opportunity to compete for selection in the two-year AFROTC program. Students contemplating application for the two-year program must have two years of academic studies remaining in the University following the summer in which they intend to complete Aerospace Studies 22. Application for this program should be made in the October—January period preceding the summer training period. Those students interested in a flying career and those in scientific, engineering, management and other professional fields are especially encouraged to apply.

The curriculum is divided into the General Military Course and the Professional Officer Course. The General Military Course, World Military Systems, includes Aerospace Studies 1A–1B–1C (first year) and 21A–21B–21C (second year). These courses explore the causes of the present world conflict as they affect the security of the United States, and provide the student with a knowledge of existing military forces and the influence they exert in international relations and power balances. Aerospace Studies 22, Officer Basic Military Training, offered at an active Air Force base for six weeks, includes the same subject matter as the General Military Course and is substituted for it by two-year program students only.

The Professional Officer Course presents to the junior, in Growth and Development of Aerospace Power (Aerospace Studies 131A–131B–131C), the opportunity to learn much about the Air Force—its past, present, and future; its organization and functions; aerospace technology, its traditions and customs; and its justification for existence. To the senior, the Professional Officer (Aerospace Studies 141A–141B–141C) provides for an understanding of the professional concept of military duty, management principles and methods applicable to the duties of a junior officer, leadership required at the junior officer level, and the responsibility, authority and functions of the Air Force officer.

A scholarship program is open for competition among qualified four-year program students. These scholarships are awarded at all academic levels according to the student an opportunity to compete at each year of his program. Tuition, all fees and a book allowance as well as $50 monthly living allowance are paid to all recipients.

Students qualified for and desirous of flying training as an Air Force officer will be provided flying training without charge leading to the award of the Federal Aviation Association rating of Private Pilot during their final year of the AFROTC program.

Selection for the Professional Officer Course is based upon aptitude and interest in becoming an Air Force officer, potential for leadership and command, and is subject to the approval of the chairman of the department. The Air Force provides uniforms, texts and $50 per month for those students regularly enrolled in the program. For further details on enrollment, service commitments, deferment, enrollment procedures for students transferring from a four-year ROTC program at another school, etc., please contact the department staff.

Lower Division (General Military Course)

22. Officer Basic Military Training. (6)
Study of world military systems and basic leadership training, conducted each summer for six weeks at an active Air Force base. Course is required for students entering the Advanced Course, Aerospace Studies, who have not completed the General Military Course or equivalent active military service.

The AFROTC Staff (Su)
Upper Division (Professional Officer Course)


Two 1-/2-hour lecture and seminar meetings and one 1-hour laboratory per week. Prerequisite: course 1A–B–C and 21A–B–C or equivalent. Development and employment of airpower with emphasis on the problems of growth to its present stature as a prime security element of the armed forces; underlying and immediate causes of war, the nature of present warfare, and the principles of war to form a basis for understanding the organization, technological efforts, doctrine, and employment of modern military forces; space operations, including importance and development of the U.S. space program, vehicles, propulsion and power sources, guidance and control systems, problems in space exploration, and operations in space. The Staff, 131, (F); 131B (W); 131C (Sp)

132. Officer Advanced Military Training. (3)

Four weeks advanced officer training conducted at an active Air Force base for four-year program advanced cadets. Normally attended between junior and senior years. AFROTC Staff (Su)

141A–141B–141C. The Professional Officer. (3–3–3)

Prerequisite: course 131A–B–C. Leadership theory and techniques, individual and group behavior, problems in human relations, authority, responsibility and functions of junior officers and Air Force communications channels; problem solving, management principles and functions, and management tools, practices and controls; meaning of professionalism, professional responsibilities, the military justice system, and preparation for commissioned service.

Mr. Edwards, 141A (F); 141B (W); 141C (Sp)

142. Light Aircraft Operations. (3)

Prerequisite: designation by Commandant, AFROTC, or approval by instructor. Three 1-hour lecture and one 1-hour laboratory per week. Preparation for qualification as Federally-licensed Private Pilot. Studies cover Federal Aviation Regulations, basic meteorology for pilots, navigation by dead reckoning and piloting, radio and radio navigation, elementary aerodynamics and aircraft structures. The Staff (F)

AGRICULTURAL CHEMISTRY

Administered by an Interdepartmental Group

David L. Brink, Ph.D., Professor of Forestry.
Harold T. Gordon, Ph.D., Lecturer in Entomology.

Graduate Advisers: Mr. Brink, 145 Mulford Hall; Mr. Gordon, 110 Agriculture Hall.

Work in agricultural chemistry is available only at the graduate level. It is desirable that students have the equivalent of the bachelor's degree in chemistry from the University of California. Minor deficiencies may be removed by taking suitable courses after admission.

Study leading to the Ph.D. degree is offered by an interdepartmental group of agricultural chemists who are engaged in research. This field is open to students interested in the application of chemistry to agricultural problems. Courses may be taken in various departments in the College of Agricultural Sciences, the Department of Biochemistry in the College of Letters and Science, the College of Chemistry, and the School of Forestry and Conservation. Graduate research is directed by a member of the group whose activities most closely coincide with the interests of the student.

The following special fields are represented: insecticide chemistry and insect biochemistry in the Department of Entomology and Parasitology; soil chemistry and plant nutrition in the Department of Soils and Plant Nutrition; wood chemistry in the School of Forestry and Conservation; food chemistry and animal nutrition in the Department of Nutritional Sciences. In addition to his major field of specialization, each predoctoral student must take such courses in chemistry, biochemistry, and allied sciences as may be necessary to enable him to pass a qualifying examination in agricultural chemistry. For further details, consult the adviser.

Graduate Course

299. Research in Agricultural Chemistry. (1–12)

Agricultural Chemistry Group (Mr. Brink in charge) (Su, F, W, Sp)
Agricultural Economics is one of the majors under the Agricultural Sciences Curriculum in the College of Agricultural Sciences (see page 66), and is offered by the Department of Agricultural Economics. It consists of courses meeting general educational requirements and work in the major, including core courses taken by all students, and courses in one of five options, covering a particular area of specialization within the major. The options are: (1) agricultural business management, (2) agriculture in economic development, (3) marketing and trade, (4) natural resources economics, and (5) quantitative methods.

Undergraduate Major Requirements

**Humanities and Social Sciences**, 32 units as follows: English, speech, or comparative literature (8); principles of economics (8); additional social sciences (16).

**Physical Sciences and Mathematics**, 19 units as follows: mathematics (6)—3 units of calculus; 3 additional units of calculus or linear algebra; statistics (5); physical sciences (8).
Biological and Agricultural Sciences, 16 units as follows: Of the 16 units required, at least 8 are to be in agricultural sciences.

Major Field, 51 units as follows: A. Core requirements, 24 units, consisting of: accounting (4); economic analysis in agriculture (10); analysis of agricultural economics data (5); agricultural policy (5). B. Options, 27 units. One of the following options to be selected: 1. agricultural business management; 2. agriculture in economic development; 3. marketing and trade; 4. natural resources economics; 5. quantitative methods. In each option there are two required agricultural economics courses, plus four additional courses in the field of study—two of which must be selected from a restricted list.

Additional courses, 62 units.

Total units, 180.

Certain courses may be required in satisfaction of the above. The undergraduate adviser will provide this information and any other details about the major.

All students must maintain at least a C average in all upper division courses taken in agricultural economics. Those who do not maintain such an average may be required to withdraw from the major at any time.

Graduate Programs

Admission for graduate study in agricultural economics depends upon several criteria. The applicant must hold a valid degree (comparable to the bachelor's degree from the University of California) from a recognized institution and have a scholastic record that meets the University standards. While he need not have a B.S. degree in agricultural economics, he should have a broad preparation embracing the physical, biological, and social sciences. Courses in economic theory, statistical analysis, and mathematics through calculus are essential. Students who have not completed these requirements but are otherwise well qualified may be permitted to remove these deficiencies after admission.

Programs leading to the M.S. and Ph.D. degrees are offered. They provide for basic preparation in economic theory, quantitative analysis, and agricultural policy, along with opportunity for additional development in a field of emphasis selected by the student. Fields commonly chosen include agricultural statistics, marketing and trade, natural resources economics, policy, and agricultural economic development. Work in still other fields of special interest may be arranged. For further details, consult the graduate adviser.

Lower Division Course

23. World Agriculture. (4)

Two 1½-hour lectures per week. Survey of world agriculture, focusing on factors involved in growth and development. Interrelations among physical features and economic, political, and social factors. Institutions, technology, and international agencies. International trade in agricultural commodities.

Mr. Wallace (W)

Upper Division Courses

100A. Economic Analysis in Agriculture. (5)

Three 1½-hour lectures per week. Prerequisite: Economics 1 and 3, or equivalent. Application of economic principles to problems of agriculture: economic structure and aspects of American agriculture; analysis of demand, supply, production of agricultural products, with particular reference to the individual firm.

100B. Economic Analysis in Agriculture. (5)

Three 1½-hour lectures per week. Prerequisite: course 100A or equivalent. Application of economic principles to problems of agriculture: 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. (5)

Three 1½-hour lectures per week. Prerequisites: Statistics 2, Mathematics 16A, or equivalents. Evaluation and treatment of economic data in agriculture, with emphasis on methods of analyzing relations among economic variables.

110. Agricultural Finance. (4)

Two 1½-hour lectures per week. Prerequisite: Economics 1 or 3. Farmers' credit needs, methods of financing the agricultural industry, agencies supplying agricultural credit.

Mr. Thor (F)
112A—112B. Rural Sociology. (4—4)
Two 1 ½-hour lectures per week. Comparative rural social organization and institutions; social change in the rural environment; social aspects of agrarian reform and agricultural development. 112A focuses primarily on the United States. 112B is concerned mainly with foreign countries.
112A, Mr. McEntire (W), 112B, Mr. McEntire (Sp)

120. Agricultural Policy. (5)
Three 1 ½-hour lectures per week. Prerequisite: Economics 1 and 3. Analytical and historical treatment of economic problems, governmental policies and programs affecting American agriculture.
Mr. Fuller (W)

123. Agriculture in Economic Development. (5)
Three 1 ½-hour lectures per week. Prerequisite: course 100A and consent of instructor. Development of the agricultural sector; production, marketing, and institutional phases; the role of agriculture in development and the impact of development on agriculture; the transformation of traditional agriculture.
Mr. Coffey (W)

130. Agricultural Marketing. (4)
Two 1 ½-hour lectures per week. Prerequisite: Economics 1. Nature and function, organizational structure, and operation of agricultural markets. Prices, costs, and margins. Market information, regulation, and controls. Cooperative marketing.
Mr. Collins (W)

141. Management Operations. (5)
Three 1 ½-hour lectures per week. Prerequisite: course 100A and consent of instructor. Application of managerial economic theory; economic and institutional aspects of organization and management; planning, decision-making, and control processes.
Mr. Boles (Sp)

143. Regional Resources Development. (4)
Two 1 ½-hour lectures per week. Prerequisite: course 100A. Application of economic theory relating to rent, location, and interregional trade as they bear upon resource development and allocation; economic and institutional problems of land development and use; problems of regional planning for water resources development; transportation systems; the role of government in regional planning and development.
Mr. Schmitz (Sp)

156. Agricultural Economic Measurements. (4)
Two 1 ½-hour lectures per week. Prerequisite: courses 100A, 100B, and 106. Sources, collection of data, and analysis of selected measurements, including prices, employment, wages, production, and national income.
Mr. Lee (W)

160. Economic Analysis in Agricultural Marketing. (5)
Three 1 ½-hour lectures per week. Prerequisite: courses 100A, 100B, and 106. 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.
Mr. Clarke (Sp)

175. Economics of Natural Resources. (5)
Three 1 ½-hour lectures per week. Economic issues in public policy decisions affecting natural resources: economic evaluation of projects and programs; tenure of resources; development; conservation; taxation; location; analytical techniques; public policy formation and execution.

198. Directed Group Study. (1—5).
Selected topics in agricultural economics for advanced undergraduates.
The Staff (Mr. Boles in charge) (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1—5)
Limited to agricultural economics majors.
The Staff (Mr. Boles in charge) (Su, F, W, Sp)

Graduate Courses

200A—200B. Economics of Agricultural Production and Consumption. (5—5)
Three 1 ½-hour lectures per week. 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. Sequence, beginning (F).
200A, Mr. Hoos (F); 200B, Mr. Fuller (Sp)

210A—210B—210C. Quantitative Methods in Agricultural Economics. (5—2—2)
210A. Three 1 ½-hour lectures per week.
210B. Two 1 ½-hour lectures per week.
210C. Two 1 ½-hour lectures per week.
Measurement of economic aggregates; statistical estimation of economic relations; models and studies of intersectoral relations; recursive and independent equation systems; total economy, sector, and commodity models.
210A, Mr. Boles (W); 210B, Mr. Kuznets (F); 210C, Mr. Fuller (W)

220A—220B—220C. Agricultural Policy. (3—3—3)
Two 1 ½-hour lectures per week. Growth trends and cyclical variation in agriculture and the national economy; comparative income level and distribution; production trends, variations, and projections; changing organization and structure of agriculture in relation to the general economy. Political economy of agricultural policy; defining problems and policy objectives; economic analysis of policy objectives, program alternatives for their achievement, and program results. Sequence, beginning (F).
220A, Mr. Coffey (F); 220B, Mr. Coffey (W); 220C, Mr. Fuller (Sp)

222. National and World Policies for Agriculture (3)
One 2-hour lecture per week. National systems of policy formation, objectives, and programs; interrelations of national policies; instruments and institutions for reconciliations of conflicting national interests and objectives.

223. Seminar in Economic Development and Agriculture, (3)
One 2-hour lecture per week. The role of agriculture in economic development of selected foreign countries with emphasis on institutional conditions and government programs.
Mr. Kuznets (W)

230A—230B—230C. Agricultural Marketing Research. (3—3—3)
Two 1 ½-hour lectures per week. A seminar on the literature, current research problems, and methods of analysis in agricultural marketing. Sequence, beginning (F).
230A, Mr. Boles (W); 230B, Mr. Collins (W); 230C, Mr. Clarke (Sp)
*240A–240B–240C. Farm Management Research. (3–3–3)  
Two 11/2-hour lectures per week. A seminar on the literature, current research problems, and methods of analysis in farm management. Sequence, beginning (F).  
240A. ——— (F); 240B, Mr. Wallace (W); 240C. ——— (Sp)

270A–270B–270C. Natural Resources Economics Research. (2–3; 2–3; 2–3)  
One 2-hour lecture per week. Degree candidates in agricultural economics who are specializing in natural resource economics are expected to take 3 units. Also open to other qualified students in all departments, who may elect either the 2- or 3-unit basis. Seminar in the literature, current research, and methods of analysis in natural resource economics with emphasis on public policy and application of economics to special problems of public policy in natural resources. Sequence, beginning (F).  
270A. ——— (F); 270B, ——— (W); 270C, Mr. Wantrup (Sp)

290. Problems in Agricultural Economics Research (3)  
Two 1½-hour lectures per week. Identification and statement of research problems; formation of hypotheses; selection and employment of research methods; aggregation of research findings; derivation of policy implications. Mr. Lee (Sp)

298. Special Study for Graduate Students. (1–6)  
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 member of the staff with whom he works. The Staff (Mr. Sammet in charge) (Su, F, W, Sp)

299. Individual Research. (1–9)  
The Staff (Mr. Clarke in charge) (Su, F, W, Sp)

601. Individual Study for Master's Students. (1–8)  
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. Mr. Clarke in charge (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)  
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. Mr. Clarke (Su, F, W, Sp)

[AGRICULTURAL SCIENCE]

The undergraduate major in agricultural science is a combined offering of the teaching departments in the College of Agricultural Sciences. It is designed not only to accommodate students who wish to have a less specialized B.S. degree but also to provide a broad foundation for graduate study in various fields. It also serves those students who are interested in plant pathology, as well as those who have not yet chosen a specific area of study.

Undergraduate Major Requirements

**Humanities and Social Sciences**, 32 units as follows: economics (5); English, speech, or comparative literature (8); restricted electives (anthropology, classics, foreign languages, geography, history, philosophy, psychology, sociology, or additional English or speech) (19).

**Physical Sciences and Mathematics**, 38 units as follows: chemistry, including organic (20); mathematics (3); statistics (3); physics (12).

**Biological and Agricultural Sciences**, 39 units as follows: agricultural science (4); microbiology (4); biology (15); physiology (4); ecology (4); botany and/or zoology (8).

**Major Field**, 35 units as follows: agricultural economics (5); entomology (4); genetics (5); nutritional sciences (5); plant pathology (4); soil science or plant nutrition (4); additional courses in one of the above areas in the major field (8).

**Additional courses**, 36 units.

**Total units**, 180.

Certain courses may be required in satisfaction of the above. Inquire at the Dean's Office, College of Agricultural Sciences, 101 Giannini Hall, for information concerning advisers.

* Not to be given, 1968–69.
ANATOMY

For courses in Anatomy, see Physiology-Anatomy.

ANTHROPOLOGY

(Department Office, 232 Kroeber Hall)

William R. Bascom, Ph.D., Professor of Anthropology, Director of the Lowie Museum of Anthropology, and Curator of Primitive Art.

Gerald D. Berreman, Ph.D., Professor of Anthropology.

J. Desmond Clark, Ph.D., Professor of Anthropology and Curator of African Archaeology.

Elizabeth F. Colson, Ph.D., Professor of Anthropology.

George A. Devos, Ph.D., Professor of Anthropology.

George M. Foster, Ph.D., Professor of Anthropology and Curator of Mexican Archaeology.

John J. Gumperz, Ph.D., Professor of Anthropology.

Eugene A. Hammel, Ph.D., Professor of Anthropology.

Robert F. Heizer, Ph.D., Sc.D., Professor of Anthropology.

Theodore D. McCown, Ph.D., Professor of Anthropology, Curator of Physical Anthropology, and Director, Archaeological Research Facility.

David G. Mandelbaum, Ph.D., Professor of Anthropology and Curator of Ethnology.

John H. Rowe, Ph.D., Litt.D., Professor of Anthropology and Curator of South American Archaeology.

Sherwood L. Washburn, Ph.D., Professor of Anthropology.

Ronald L. Olson, Ph.D., Professor of Anthropology, Emeritus.

May N. Diaz, Ph.D., Associate Professor of Anthropology.

Alan Dundes, Ph.D., Associate Professor of Anthropology and Folklore.

John A. Graham, Ph.D., Associate Professor of Anthropology and Associate Curator of Middle American Archaeology.

Paul Kay, Ph.D., Associate Professor of Anthropology.

Laura Nader, Ph.D., Associate Professor of Anthropology.

Herbert P. Phillips, Ph.D., Associate Professor of Anthropology.

Jack M. Potter, Ph.D., Associate Professor of Anthropology.

James N. Anderson, Ph.D., Assistant Professor of Anthropology.

O. Brent Berlin, Ph.D., Assistant Professor of Anthropology.

Nelson H. H. Graburn, Ph.D., Assistant Professor of Anthropology.

Glynn Isaac, Ph.D., Assistant Professor of Anthropology.

Phyllis C. Jay, Ph.D., Assistant Professor of Anthropology.

Melvin L. Perlman, Ph.D., Assistant Professor of Anthropology.

Vincent M. Sarich, Ph.D., Assistant Professor of Anthropology.

William Simmons, Ph.D., Assistant Professor of Anthropology.

James A. Bennyhoff, Ph.D., Acting Assistant Professor of Anthropology.

William Geoghegan, Ph.D., Acting Assistant Professor of Anthropology.

Kenneth A. R. Kennedy, Ph.D., Visiting Assistant Professor of Anthropology.

Kenneth E. Knudson, Ph.D., Acting Assistant Professor of Anthropology.

Alan E. Mann, B.A., Acting Assistant Professor of Anthropology.

† On leave 1968–69.

** Appointment as Humanities Research Professor, fall, 1968–69.

*** Appointment as Arts and Science Professor, 1968–69.

‡ On leave fall, 1968–69.

§ In residence summer only, 1968–69.
Richard R. Randolph,§ Ph.D., Visiting Assistant Professor of Anthropology.
Robert J. Rodden, Ph.D., Lecturer in Anthropology.
George Shkurkin,¶ Acting Assistant Professor of Anthropology.

The Department of Anthropology offers students the opportunity to study man from the broadest historical and geographical perspective. Courses in the department offer knowledge of the physical nature of man as well as the social and cultural aspects of his behavior. Lower division courses are intended to give a general understanding of human evolution, prehistory, and the nature of human cultures, while upper division courses elaborate particular themes.

The anthropology major is designed to serve two purposes: to provide a general education in anthropology for students who are pursuing a liberal education; and to provide preparation for graduate work for students who wish to become professional anthropologists. A student who does not intend to do graduate work in anthropology may plan his program with considerable freedom, taking care only to fulfill the requirements listed below. A student who plans to go on to graduate study, either at Berkeley or at another institution, should plan his undergraduate program to meet graduate admission requirements. Each student should select a combination of courses to form a unified plan of study that meets his special intellectual interests. Departmental advisers should be consulted in planning the major.

The Major

Anthropology 1, 2, 3; Linguistics 20; Anthropology 141 and one course from each of the following groups: (I) 100, 102, 108; (II) 120, 122, 128A, 128B, 128C, 132; (III) 165A, 165B, 165C, Linguistics 105; (IV) any area course.

Also required are additional elective courses to complete, with the above, a total of 40 units of upper division courses in anthropology. Substitutions may be permitted among these additional elective courses of not more than 10 units in allied subjects approved by the department.

Honors Program. Students admitted to the honors program will include in their major program H198, and will write a senior thesis under the direction of a member of the staff (199).

Undergraduate students, both majors and nonmajors, seeking information or advice about their programs or about courses should inquire in Room 213 Kroeber Hall.

Preparation for Graduate Study

Admission to graduate status presupposes a background equivalent to the A.B. degree in anthropology at Berkeley. Although a very few students are admitted as M.A. candidates, the graduate program is oriented toward the doctorate, and most applicants who are accepted are Ph.D. candidates. Because of the numbers of students who wish advanced training, only a small percentage of applicants can expect to be accepted. Early applications (not later than January 2, 1968) increase the likelihood of acceptance.

In addition to preparation in general anthropology, applicants are urged to gain a background in foreign languages. Ph.D. candidates are required to pass reading examinations in two languages. Students who fail to pass at least one language examination by the end of the fall quarter are required to enroll in the appropriate language course.

The Graduate Major

The program for the Ph.D. degree is divided into three steps, as follows:

Step 1. This segment normally takes one year, during which the student begins

§ In residence summer only, 1968–69.
to narrow down his interests to particular topical and geographical fields of specialization. Social anthropologists take course 240A–240B, the introductory seminar in theory. They also frequently undertake supervised field research during the summer following their first three quarters, and write a report based upon this research. Students in other branches of anthropology take seminars or do laboratory or field research as recommended by their individual advisers.

Step II. During this period, which normally lasts from one to two years, the student attends seminars, carries out individual research projects related to his fields of specialization, and prepares for the Ph.D. Oral Qualifying Examination. With the successful passing of this examination, the student is advanced to candidacy for the Ph.D. degree.

Step III. The student undertakes research for his Ph.D. Dissertation under supervision of a three-man committee in charge of research and dissertation. With rare exceptions, the dissertation is based on the results of original field research, which normally requires a minimum of one year. The writing of the dissertation customarily requires an additional year. On completion of the research and approval of the dissertation by the committee, the student is awarded the Ph.D. degree.

For further information on requirements for the M.A. and Ph.D. degrees, please address correspondence to the Graduate Adviser, Department of Anthropology, University of California, Berkeley, California 94720.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. Introduction to Physical Anthropology. (5)
   Three 1-hour lectures and one 1-hour section meeting per week. Facts and problems of human evolution, fossil man, race and race differences.
   Mr. Mann (Su); Mr. Sarich (F); Miss Jay (W)

2. Introduction to Social and Cultural Anthropology. (5)
   Three 1-hour lectures and 1-hour section meeting per week. Structure and dynamics of culture.
   Mr. Randolph (Su); Mrs. Diaz, Mr. Simmons (Sp)

*45. Freshman Seminars. (2)
   One 2-hour meeting per week. Prerequisite: appropriate lower division lecture course (Anthropology 1, 2, or 3) completed or being taken concurrently. Limited to 12 freshman students per section. Discussion, substantial reading and written papers developing the salient problems which guide anthropological work.

Upper Division Courses

General prerequisite: junior standing or courses 1, 2, 3.

Undergraduate seminars: Certain upper division lecture courses are followed in the next quarter by an undergraduate seminar which provides an opportunity for more advanced work in the subject matter of the lecture course. Enrollment in these seminars is restricted to students who have received a grade of B or better in the antecedent lecture course and/or who have the instructor's permission. The undergraduate seminars are given as sections of Anthropology 195.

Class meetings: Unless otherwise noted, lecture courses meet for three lecture hours and one consultation hour per week.

Group I. Physical Anthropology and Primatology

100. Fossil Man. (5)
   Prerequisite: course 1 or equivalent. Origin and relationships of the extinct forms of mankind.
   Mr. McCown (Sp)

* Not to be given, 1968–69.

102. Adaptations in Human Populations. (5)
   Genetic, morphological, physiological, ecological and cultural factors are considered in detailed examinations of selected human populations so as to illustrate adaptive processes and problems in prehistoric and on-going human microevolution.
   Mr. Kennedy (Su); Mr. Sarich (W)

104L. Physical Anthropology Laboratory. (2)
   Two 2-hour meetings per week. Prerequisite: course 100, or 102, or 108 (may be taken concur-
128L. Old World Prehistory Laboratory. (5)

Five hours of class meetings and directed study per week. Prerequisite: 128A, 128B, or 128C (may be taken concurrently) and consent of instructor. May be repeated without duplication of credit with consent of instructor. Descriptive and analytical methods used in classification and discussion of prehistoric cultures of the Old World.

Mr. Clark (F); Mr. Isaac (W); Mr. Rodden (Sp)

130. Invention and Technology. (5)

Origin, history, and spread of fundamental inventions; illustrative material from the Lowie Museum of Anthropology.

Mr. Clark (W)

131. Science in Archaeology. (5)

Prerequisite: course 2. A survey of the application of techniques deriving from the physical and life sciences to the interpretation of archaeological materials.

Mr. Rodden (W)

132. Archaeology and Society. (5)

Archaeological research methods and their uses in the study of man's past.

Mr. Heizer (F)

*133. Field Course in Archaeological Method. (5)

One 1-hour lecture and one 8-hour (Saturday) field course meeting per week. Enrollment limited to eighteen students, admitted by consent of the instructor. With consent of the instructor, may be repeated without duplication of credit.

134. Archaeological Method. (5)

One 3-hour laboratory meeting with three hours of independent laboratory work required per week. Prerequisite: course 133 or consent of the instructor. With consent of the instructor, may be repeated without duplication of credit. Advanced field investigation, and guidance in preparation of materials for publication.

Mr. Heizer (W)

Group III. Social and Cultural Anthropology: Theory and Method

140. The Nature of Culture: An Introduction to Cultural Anthropology. (5)

Not open for credit to students who have taken Course 3. Advanced level introduction to cultural anthropology for nonmajors.

Mr. Dundes (F); Mr. Knudson (W)

141. Comparative Society. (5)

Prerequisite: course 3 or 140 or consent of the instructor. Theories of social structure, functional interrelationships of social institutions. Primary emphasis on non-Western societies.

Mr. DeVos (Su); Miss Nader (F); Mr. Gumperz (W); Mr. Hammell (Sp)

142. Kinship and Social Structure. (5)

Prerequisite: course 141. Comparison of kinship and family types throughout the world, techniques of kinship and structural analysis.

Mr. Graburn (F)

144. Social and Cultural Change. (5)

Theories of social and cultural change: social evolution, diffusion, acculturation, pattern dynamics, innovation, structural-functional approach to change. Illustrative materials from anthropological sources.

Mr. Potter (F)

* Not to be given, 1968-69.
146. Comparative Peasant Society. (5)
A comparative study of peasant society as a social type contrasted with primitive and industrial society. Mrs. Diaz (W)

148. Man's Ecological Relationships. (5)
Survey of theories, methods, and applications of the ecological perspective to cultural and physical attributes of human populations. Mr. Anderson (W)

149. Culture and Personality. (5)
Relationships of cultural, social, and personality factors in human behavior; personality in representative societies; techniques for studying culture-personality relations. Mr. Phillips (Su, F)

152. Anthropology in Modern Life. (5)
Anthropological theory and data applied to problems in such fields as medicine, agriculture, education, and international technical-aid programs. Mr. Foster (F)

*154. Marriage and the Family in Non-western Societies. (5)
Comparative analysis of types of conjugal unions and households in non-Western societies and how these change.

155. Economic Anthropology. (5)
Economic behavior in nonindustrial societies; its social and cultural setting, and its modern changes. Mr. Graburn (W)

156. Politics and Anthropology. (5)
Anthropological concepts relevant to the comparative analysis of political ethnography, Mr. Perlman (W)

157. Law and Anthropology. (5)
Comparative survey of the ethnography of law; methods and concepts relevant to the comparative analysis of the forms and functions of law. Miss Nader (F)

158. Religion and Anthropology. (5)
A consideration of the interplay between religious beliefs and institutions and other aspects of culture. Mr. Simmons (F)

159. The Forms of Folklore. (5)
A worldwide survey of the major and minor forms of folklore with special emphasis upon proverbs, riddles, superstitions, games, songs, and narratives. Mr. Dundes (W)

160. Narrative Folklore. (5)
The study of folktales, myths, legends, and other forms of verbal art; methods and theories of folklore. Mr. Bascom (Sp)

162. Art and Culture. (5)
Graphic and plastic arts and their relations to culture in nonliterate societies; illustrative material from the Lowie Museum of Anthropology. Mr. Graburn (Sp)

165A—165B—165C. Language, Culture, Society, and the Individual. (5—5—5)
Prerequisite: Linguistics 20.
165A: Language in society; social and linguistic aspects of verbal behavior, speech communities, language and social stratification, language, nation, and state. Mr. Gumperz (Su, F)
165B: Language in society; social and linguistic aspects of verbal behavior, speech communities, language and social stratification, language, nation, and state. Mrs. Geoghegan (W)
165C: Language and the individual; theories of linguistic performance, acquisition of linguistic competence and of performance styles, language and individual thought, hypersemantically language, relation of natural to formal languages. Mr. Kay (Su, Sp)

166. Advanced Survey of Social and Cultural Anthropology. (5)
Prerequisite: senior standing or consent of the instructor. Intended primarily for major students. Historical survey of anthropological theories, methods, and findings. Miss Colson (W)

An introduction to definition of research problems and design techniques for collection, analysis, and presentation of data. Mr. Perlman (W)

Historical survey of the cultures of the native peoples of the United States and Canada. Miss Colson (F)

*176. Indians of California. (5)
Survey of the cultures of the native people of California. Tribal divisions, arts, customs, archaeology. Miss Colson (F)

*178. Native Peoples of South America. (5)
Archaeology, ethnohistory and ethnography.

179. Contemporary Latin America. (5)
Emphasis on Iberian-Indian assimilation, African influences, development of folk-peasant societies, and the concept of "national" cultures. Mr. Foster (W)

180. Mexico and Central America. (5)
Ethnology of Indian and mestizo cultures with special emphasis on organizational behavior, belief systems, law, economics, kinship, language and communication. Mr. Berlin (Sp)

*182. Circumpolar Regions. (5)
A survey of Arctic cultures.

*183. European Peasant Societies. (5)
Representative groups considered in modern and historical perspective, stressing especially rural-urban relationships and the dynamics of change.

185. The Near East. (5)
Cultures of the contemporary Near East, with special emphasis upon Arab populations. Miss Nader (W)

186. Africa South of the Sahara. (5)
Traditional cultures and social institutions of Sub-Saharan Africa. Miss Colson (W)

188A—188B. South Asia. (5—5)
188A: Development of cultural traditions. Mr. Mandelbaum (Su, Sp)
188B: Social organization and social trends. Mr. Gumperz (W)

* Not to be given, 1968—69.
ANTHROPOLOGY / 151

*190A–190B. China. (5–5)
Chinese culture and society with emphasis on the village level.
190A: PreCommunist China.
190B: Communist China.
Mr. Foster (W)

191. Japan. (5)
Ethnological treatment of historic and modern Japanese culture. Mr. DeVos (W)

192. Southeast Asia. (5)
Races, languages, and cultures of Southeast Asian islands and mainland. Mr. Phillips (W); Mr. Geoghagan (Sp)

194. Pacific Islands. (5)
The peopling of the Pacific, Oceanian races and cultures. Mr. Knudson (F)

Group V. General Courses

195. Undergraduate Seminars. (5)
One 2-hour meeting and two consultation hours per week. Prerequisite: grade of B or better in an upper division course for which an associated seminar is scheduled, and/or consent of instructor. Enrollment limited. May be repeated without duplication of credit.

Some, but not all, lecture courses will be followed, usually in the next quarter, by a seminar providing an opportunity for advanced study of the subject matter, emphasizing reading and discussion. Mr. Graham (154) (F); Mr. Anderson (148), Miss Colson (175), Mr. Foster (152), Mr. Graburn (142); Mr. Knudson (194), Mr. Phillips (149) (W); Mr. DeVos (151), Mr. Graburn (155), Mr. Graham (124); Mr. Isaac (128B) (Sp)

H198. Preceptorial and Reading Course. (5)
Three hours of meetings and one consultation hour per week. Restricted to senior honor students. May be repeated without duplication of credit with consent of instructor. Systematic readings in the history of anthropology and in significant modern developments within the field.
Mr. Simmons (W); Miss Colson (Sp)

199. Special Study for Advanced Undergraduates. (2–5)
Individual conferences to be arranged. Restricted to senior honor students. The Staff (Su, F, W, Sp)

Graduate Seminars

General prerequisite: consent of the instructor.
Except where noted, all seminars meet formally two hours per week.

200. Physical Anthropology Seminars. (3)
a. Human evolution; b. genetic anthropology; c. primate behavior; d. additional seminars on special topics to be announced.
Mr. Kennedy (Su); Mr. Washburn, Mr. Benedict (F); Mr. Mann (W); Miss Jay, Mr. Sarich (Sp)

220. Archaeology Seminars. (3)
a. Western North America; b. Mesoamerica; c. archaeology and ethnology of South America; d. African prehistory; e. African protohistoric archeology; f. European and Near Eastern prehistory; g. method; h. additional seminars on special topics to be announced.
Mr. Isaac (Su); Mr. Rodden, Mr. Rowe (F); Mr. Clark, Mr. Graham, Mr. Rowe (W); Mr. Isaac (W)

One 2-hour lecture and two 2-hour section meetings per week. Required of all graduate students doing their principal work in social/cultural anthropology. Advanced survey of the major theoretical and empirical areas of social/cultural anthropology. Sequence beginning (F). Mr. Mandelbaum and Staff (F); Staff (W)

250. Seminars in Social and Cultural Anthropology. (3)
a. Culture and personality; b. deviancy; c. applied anthropology; d. economic anthropology; e. politics; f. religion; g. linguistic anthropology; h. art and culture; i. recent developments; j. ethnological field methods; k. theory of research; l. additional seminars on special topics to be announced.
Mr. Gumperz, Mr. Randolph (Su); Mr. Bascom, Mrs. Diaz, Mr. Gumperz, Mr. Knudson (F); Mr. Anderson, Mr. Benedict, Mr. Geoghagan, Mr. Kay, Mr. Simmons (W); Mr. DeVos, Mr. Foster, Mr. Gumperz, Mr. Hammel, Mr. Knudson, Mr. Perelman, Mr. Phillips (Sp)

251–252. Two-Quarter Seminars in Social and Cultural Anthropology. (3–3)
The following seminars extend over two consecutive quarters. A final grade will be assigned upon completion of both quarters work.
a. Kinship; b. social interaction; c. change; d. acculturation; e. peasant societies; f. urban cultures; g. culture structure; h. law; i. analysis of field data; j. additional seminars on special topics to be announced.
Sequence beginning (F)
Mr. DeVos, Miss Nader, Mr. Perelman

260. Folklore Seminars. (3)
a. Problems of folklore; b. psychology and folklore; c. North American Indian folklore; d. additional seminars on special topics to be announced.
Mr. Dundes (F); Mr. Bascom (W)

280. Area Studies Seminars. (3)
a. Contemporary Latin America; b. Africa south of the Sahara; c. South Asia; d. China; e. Japan; f. Southeast Asia; g. Oceania; h. additional seminars on special topics to be announced.
Mr. McCown (F); Miss Colson (W); Mr. Rowe (Sp)

295. History and Theory of Anthropology. (3)
Mr. McCown (F); Miss Colson (W); Mr. Rowe (Sp)

296A–296B. Supervised Research. (3–9; 3)
296A: Practice in original field research under staff supervision.
296B: Analysis and write-up of field materials.
Mr. Foster (F)

298. Directed Reading. (3)
Individual conferences to be arranged. Intended to provide directed reading in subject matter not covered in available seminar offerings; including the writing of a research report. The Staff (Su, F, W, Sp)
299. Directed Research. (3-9)
Individual conferences to be arranged. Intended to provide supervision in the preparation of an original research paper or dissertation.

The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with an adviser. Intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

Anthropology Seminar. (No credit)
Meetings for the presentation of original work by faculty, graduate students, and visiting anthropologists. Graduate students are expected to attend.

The Staff (F, W, Sp)

Museum of Anthropology
The Robert H. Lowie Museum is a major research facility which functions as an integrated component of the Department of Anthropology, and it serves a number of other departments as well. Members of several departments serve as curators, and the Museum’s collections are used for teaching and research over a wide range of scholarly disciplines. Founded in 1901 as the Museum of Anthropology, it was renamed in 1959 when it was moved to its present quarters in Kroeber Hall.

The 410,000 catalogued specimens include 225,000 archaeological and ethnological specimens from California, 90,000 from other parts of the Americas, 40,000 from Oceania, 40,000 from Europe, Asia, and Africa, and 10,000 entries of human skeletal material.

The Museum’s collections and research facilities are available for study in archaeology, ethnography, physical anthropology, and related subjects by graduate and undergraduate students and by visiting scholars. Qualified students in anthropology and other departments are encouraged to use its resources under faculty supervision for independent, original research. The Museum’s exhibition hall is utilized for instructional and educational purposes, particularly in connection with class work. The exhibits are open to the public daily from 10:00 a.m. to 5:00 p.m.

Those interested in the Museum facilities may address the Director, Robert H. Lowie Museum of Anthropology, 103 Kroeber Hall.

The Archaeological Research Facility
The Archaeological Research Facility replaced the University of California Archaeological Survey and constitutes a subunit of the Department of Anthropology. Its purpose is to provide means and facilities for research in archaeology, with no restriction as to area, for advanced students and staff. The files of the former Archaeological Survey are now under the supervision of the Archaeological Research Facility.

ARCHITECTURE
For information on courses and faculty in Architecture, see listing under Environmental Design: Architecture.

ART
(Department Office, 238 Kroeber Hall)
Darrell A. Amyx, Ph.D., Professor of Art, Curator of Classical Art, and Curator of Ancient Mediterranean Art, Lowie Museum of Anthropology (Chairman of the Department).
Elmer N. Bischoff, M.A., Professor of Art.
Jean V. Bony, Agrége, Professor of Art.
James Cahill, Ph.D., Professor of Art and Curator of Oriental Art (Vice-Chairman, History of Art).

* Appointment as Humanities Research Professor for the winter and spring quarters, 1968-69.
† On leave, fall quarter, 1968-69.
‡ On leave, spring quarter, 1968-69.
Herschel B. Chipp, Ph.D., Professor of Art and Curator of Modern Art (Acting Chairman, Fall, Winter, Spring, 1968–69)

Sidney Gordin, Professor of Art.

John C. Haley,† Professor of Art.

Walter W. Horn, Ph.D., Professor of Art.

Karl A. Kasten, M.A., Professor of Art.

Erle Loron,† Professor of Art.

James McCray, M.A., Professor of Art.

Richard O’Hanlon, Professor of Art.

Felix Ruvolo, Professor of Art.

Peter H. Selz,** Ph.D., Professor of Art and Director of the University Art Museum.

Otto J. Maenchen, Ph.D., D.F.A., Professor of Art, Emeritus.

Stephen C. Pepper, Ph.D., L.H.D., LL.D., Mills Professor of Intellectual and Moral Philosophy and Civil Polity, Emeritus.

Jacques Schnier, M.A., Professor of Art, Emeritus.

Peter H. Voulkos, M.F.A., Professor of Art and Design.

Glenn A. Wessels, M.A., Professor of Art, Emeritus.

Chiura Obata, Associate Professor of Art, Emeritus.

Robert Hartman, M.A., Associate Professor of Art.

Harold Paris, Associate Professor of Art.

Juergen Schulz, Ph.D., Associate Professor of Art and Associate Curator of Renaissance Art.

David Simpson, M.A., Associate Professor of Art.

David H. Wright,† Ph.D., Associate Professor of Art, Associate Curator of Medieval Art, and Associate Curator of Roman and Medieval Art, Lowie Museum of Anthropology.

Boyd G. Allen, M.A., Assistant Professor of Art.

Svetlana Alpers, Ph.D., Assistant Professor of Art and Assistant Curator of Baroque Art.

Guitty Azarpay, Ph.D., Assistant Professor of Art.

Jerrold Ballaine, M.F.A., Assistant Professor of Art.

Jacques de Caso, Ph.D., Assistant Professor of Art.

Robert Hudson, M.F.A., Assistant Professor of Art.

James Melchert,† M.A., M.F.A., Assistant Professor of Art.

George Miyasaka, M.F.A., Assistant Professor of Art.

Patrick Tidd,† M.A., Assistant Professor of Art.

L. D. Ettlinger, Ph.D., Visiting Professor of Art.


Werner Fuchs, Dr.Phil., Lecturer in Art.

Donald McCallum, M.A., Lecturer in Art.

Howard Saalman, Ph.D., Visiting Professor of Art.

Joanne Williams, M.A., Acting Assistant Professor of Art.

Major Programs

PRACTICE OF ART

Lower Division

Art 2A, 2B, 3, 14A, one of the following: Art 4, 14B (note that 2A is prerequisite to 2B; 2A-2B are prerequisite to 3 and 4, 14A is prerequisite to 14B), and two of the following: Art 1A, 1B, 1C, 1D.

† On sabbatical leave, fall quarter, 1968–69.
‡ On leave, winter quarter, 1968–69.
** Appointment as Humanities Research Professor for the fall quarter, 1968–69.
Upper Division 28 units of practice of art, 10 units of history of art, Art 120. Art 100 is required for transfer students who have not taken Art 2A at Berkeley.

It is a requirement for the major that the student complete at least 12 units of upper division practice of art courses under three instructors of the regular staff.

HISTORY OF ART

Lower Division Two of the following: Art 1A, 1B, 1C, 1D. Also Art 2A, and either Art 2B or 14A. One of the following: History 4A, 4B, 4C, 4D. Students planning graduate study in History of Art are urged to develop a reading knowledge of German and French or Italian as early as possible.

Upper Division 39 units, including six regular courses in the History of Art (other than H196 or 199). The remaining 9 units may be satisfied by other work in the History of Art, including appropriate related courses (as approved by the major adviser), or by courses in the Practice of Art.

In planning his program, the student will develop two of the following fields of specialization: Ancient, Medieval, Renaissance, Baroque, Modern, Oriental. One of these is to be emphasized, and the student will take at least three courses, normally including the appropriate sequence course. For the second period or field, he will take at least two courses normally including the appropriate sequence course.

One, but not both, fields of specialization should lie in the Renaissance-Baroque area. This requirement will normally be met by one of the following pairs of courses: 160A–B; 170A–B; 160B–170A; 166–170B.

Honors Program in the History of Art Qualified students (with a minimum grade-point average of 3.0, both overall and in upper division courses in the history of art) who wish to enter the honors program in the history of art should consult with their major adviser at the beginning of the senior year to formulate a Senior Honors Project, and to enroll in the honors course (H196).

Graduate Programs

The Department of Art offers programs of graduate study leading to the M.A. degree and the M.F.A. degree in painting and sculpture.

The Department of Art offers programs of graduate study leading to the M.A. and Ph.D. degrees in the history of art.

Further information concerning these programs may be obtained from the department office, 238 Kroeber Hall.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

History of Art

Three hours of lecture per week, one hour of section per week, and additional directed study.

1A. History of Ancient Mediterranean Art. (5) From the Stone Age to the end of the Roman Empire. Mr. Amyx (Su)

1B. Introduction to the History of Art: Painting. (5) Medieval, Renaissance and Modern. (Su); (F); Mr. de Caso (W); Mrs. Alpers (Sp)

1C. Introduction to the History of Art: Architecture and Sculpture. (5) Medieval, Renaissance and Modern. (Sp)

1D. History of Oriental Art. (5) The art of India, China, and Japan. Mrs. Williams (F)

Practice of Art

2A. Form in Drawing. (4) Three 3-hour studio classes per week. Introduction to the basic elements of form and their interrelationship. The Staff (Su, F, W, Sp)

2B. Form in Color. (4) Three 3-hour studio classes per week. Prerequisites: Art 2A. Introduction to color and its relationship to the other elements of form. The Staff (Su, F, W, Sp)

3. Composition in Life Drawing. (4) Three 3-hour studio classes per week. Prerequisites: Art 2A–2B. Introduction to the elements of form and their relationship to the human figure. The Staff (Su, F, W, Sp)
4. Materials of Painting. (4)
Three 3-hour studio classes per week. Prerequisite: Art 2A—2B. An exploration of the techniques and methods of painting.

Mr. Allen, Mr. Ballaine, Mr. Kasten (Su, F, W, Sp)

*10. An Introduction to Art. (4)
Three 1-hour lectures per week. Lectures illustrated with lantern slides. Open to nonmajors.

Mr. McCray (F)

14A—14B. Elements of Sculpture. (4-4)
Three 3-hour studio classes per week.

14A. Introduction to basic elements of volume design, using nonobjective and representational subject matter in three dimensions and relief.

The Staff (Su, F, W, Sp)

14B. Introduction to space design and materials, with construction in wood, metal, and plaster.

The Staff (Su, F, W, Sp)

Upper Division Courses

Practice of Art

The various courses in practice of art differ in content, use of materials, and type of subject matter, depending upon the individual artists of the charge. All but Art 100 and 120 may be repeated for credit.

It is a requirement for the major in practice of art that the student complete at least 12 units of upper division courses under three instructors of the regular staff. Students must have completed 20 units of lower division studio courses to enter upper division courses.

All studio courses are scheduled for three 3-hour periods per week.

100. Advanced Drawing and Composition. (4)
Required for transfer students in practice of art who have not had Art 2A. Should be taken during first quarter in residence. The Staff (Su, F, W, Sp)

102. Advanced Drawing and Painting. (4)
102A, Mr. Haley; 102B, Mr. Loran; 102C, Mr. McCray; 102D, Mr. Ruvolo; 102E, Mr. Kasten; 102F, Mr. Hartman.
102G, Mr. Bischoff; 102H, Mr. Allen; 102J, Mr. Miyasaki; 102K, Mr. Simpson; 102L, Mr. Tidd; 102M, Mr. Ballaine.

103. The Human Figure in Drawing. (4)
Principles of space drawing and composition using recognizable form.

Mr. Loran, Mr. Ruvolo

105. Mural Composition. (4)
Prerequisite: as above and upper division standing. Emphasis on wall painting offering work in a variety of media on an individual project basis.

Mr. Haley (F)

106. Practice in the Graphic Arts: Emphasis on Etching. (4)
Mr. Kasten, Mr. Miyasaki

107. Practice in the Graphic Arts: Emphasis on Lithography. (4)
Mr. Miyasaki, Mr. Tidd
140A-140B. Greek Art. (5-5)
Prerequisite: Art 1A.
140A. From 1100 to 450 B.C. (F)
140B. From 450 to 30 B.C. (W)

141. Aegean Art. (5)
Prerequisite: Art 1A. The art of Crete and Greece in the Bronze Age, with attention to connections with neighboring cultures. (Sp)

144. Roman Art. (5)
The art of Rome and of the Roman Empire, from its sources in the Republican era to the end of the Empire in the West. Mr. Fuchs (Su)

147. The Art of Western Asia. (5)
The art of the ancient Near East with emphasis on the art of Mesopotamia and Anatolia from the Neolithic period to the rise of Achaemenid Persia. Miss Azarpay (F)

148. Iranian Art. (5)
The art of Iran from the Bronze Age to the Muslim period with reference to the art of the Eurasian steppe belt. Miss Azarpay (W)

149. Central Asian Art. (5)
The art of the Central Asian states of Parthia, Khorezmia, Bactria and Sogdiana during the early Middle Ages (III century B.C. until the Muslim period). Miss Azarpay (Sp)

150A-150B. Medieval Art. (5-5)
150A. From Early Christian to Ottonian art (5)
Mr. Wright (F)
150B. Romanesque and Gothic art. (5)
Mr. Bony (W)

151. Early Christian Art. (5)
Medieval roots of medieval art. Mr. Horn (F)

*152. Germanic and Celtic Art. (5)
Northern roots of medieval art. Mr. Horn (W)

154. Byzantine Art. (5)
Prerequisite: reasonable background in Christian theology and in either medieval history or medieval art, and consent of the instructor. The development of specifically Byzantine characteristics before Iconoclasm, and their fruition in Middle Byzantine art; the influence of Byzantine art in Western Europe; later phases of Byzantine art and its spread in Eastern Europe. Mr. Wright (Sp)

157A-157B-157C. Romanesque and Gothic Architecture and Sculpture. (5-5-5)
157A. Romanesque Architecture. Mr. Bony (F)
157B. Gothic Architecture. Mr. Bony (W)
157C. Romanesque and Gothic Sculpture. Mr. Bony (F)

160A-160B. Italian Renaissance Art. (5-5)
160A. The Fifteenth Century. Mr. Schulz (F)
160B. The Sixteenth Century. Mr. Schulz (W)

*161. The Trecento. (5)
Italian painting and sculpture, 1260–1400. Mr. Schulz (Sp)

163. Michelangelo and Raphael. (5)
Prerequisite: Art 160B and consent of the instructor. Intensive study of the work of these two artists and their milieu. Mr. Schulz (Sp)

165. Italian Renaissance Architecture. (5)
Mr. Saalman (Su)

166. Northern Renaissance Art. (5)
Art in Northern Europe from Van Eyck to Brueghel. Mr. Ettingler (W)

170A-170B. Baroque Art. (5-5)
170A. Southern Baroque Art. Mrs. Alpers (F)
170B. Northern Baroque Art. Mrs. Alpers (W)

177. Eighteenth-Century Art. (5)
Mr. Ettingler (Sp)

180A-180B. Modern Art. (5-5)
180A. Art of the Nineteenth Century. Mr. de Caso (F)
180B. Art of the Twentieth Century. (Su); Mr. Chipp (Sp)

$184. Twentieth-Century Architecture. (5)

*185. Picasso and Cubism. (5)
Prerequisite: Art 180B and consent of the instructor. Limited to 25 students. The development of Cubism in painting and sculpture. Mr. Chipp (Sp)

186. Twentieth-Century Sculpture. (5)
Sculpture from Rodin to the present. Mr. Selz (Sp)

189. American Art. (5) (Su); (Sp)

SPECIAL STUDY COURSES

H196. Special Study for Honors Candidates in the History of Art. (1–5)
Prerequisite: senior standing and qualifying scholarship record (minimum 3.0 overall, and 3.0 upper division courses in the History of Art).
The Staff (Mrs. Alpers in charge) (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates in the History of Art. (1–5)
The Staff (Mrs. Alpers in charge) (Su, F, W, Sp)

Graduate Courses

Painting and Sculpture

General prerequisites for graduate courses in painting and sculpture: at least a B average in the undergraduate major in art. Also, admission to graduate seminar courses will be based upon a review of work done under at least three members of the regular faculty.

201A–201B–201C. Form in Painting. (4–4–4)
Experimental studio work emphasizing various aspects of form. Group criticism. The Staff (Mr. Allen in charge)

Emphasis upon original works; group discussion and criticism. Ancillary topics of a contemporary and historical nature will be introduced.
The Staff (Mr. Allen in charge)

* Not to be given, 1968–69.
$ Approved for one offering only, 1968–69.
211A–211B–211C. Form in Sculpture. (4–4–4)
Experimental studio work emphasizing various aspects of form. Group criticism.
The Staff (Mr. O'Hanlon in charge)

212A–212B–212C. Seminar in Sculpture. (4–4–4)
Emphasis upon original works; group discussion and criticism. Ancillary topics of a contemporary or historical nature will be introduced.
The Staff (Mr. O'Hanlon in charge)

220. Studio Seminar. (4)
Three hours of seminar per week. Analysis and comparison of creative work in painting and sculpture. The Staff (Mr. McCray in charge) (Su, F, W, Sp)

298. Special Study for Graduate Students. (2–6)
Restricted to exceptional projects. Staff approval required.

History of Art and Archaeology

General Prerequisite: graduate standing and consent of the instructor, including courses in the history of art and reading knowledge of languages as may be required.

Graduate seminars in the History of Art are normally extended through two successive quarters, meeting for two hours each week, counted as a work load of 3 units each quarter. Credit and grade will be given only upon completion of the full sequence. On rare occasions a seminar may meet intensively, for four hours each week, and be completed in one quarter, counting for 6 units. Art 225 is not considered a seminar.

225. Introduction to Research in the History of Art. (5)
A sequence of readings, discussions, museum trips, and reports designed for beginning graduate students.
Mr. Wright (F)

230A–230B. Seminar in Chinese Art. (3–3)
Mr. Cahill (F through W)

240A–240B. Seminar in Ancient Art. (3–3)
Mr. Seiz (W through Sp)

248A–248B. Seminar in the Art of Western and Central Asia. (3–3)
Miss Azarpay (W through Sp)

251A–251B. Seminar in Early Christian and Medieval Art. (3–3)
Mr. Horn (W through Sp)

254A–254B. Seminar in Early Medieval Art. (3–3)
Mr. Wright (W through Sp)

257A–257B. Seminar in Romanesque and Gothic Art. (3–3)
Mr. Bony (F through W)

260A–260B. Seminar in Renaissance Art. (3–3)
Mr. Schulz (F through W)

266A–266B. Seminar in Northern Renaissance Art. (3–3)
Mr. Seiz (W through Sp)

270A–270B. Seminar in Baroque Art. (3–3)
Mrs. Alpers (W through Sp)

601. Individual Study for Master's Students in the History of Art. (1–8)
Individual study for the comprehensive or language requirements in consultation with the graduate adviser. Units may not be used to meet either requirement. Enrollment is on a satisfactory/unsatisfactory basis.
The Staff (Mr. Bony in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students in the History of Art. (1–8)
Individual study, in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. degree. Units may not be used to meet either unit or residence requirements for the doctoral degree. Enrollment is on a satisfactory/unsatisfactory basis.
The Staff (Mr. Bony in charge) (Su, F, W, Sp)

Medieval Studies

Students interested in graduate programs in Medieval Studies are referred to the Committee for Medieval Studies Advisory to the Dean of the Graduate Division.

University Art Gallery

The University Art Gallery presents a regular schedule of exhibitions, including traveling shows and original art exhibitions of particular value to instruction and re-

* Not to be given, 1968–69.
search. Some of the exhibitions are organized by faculty members with the assistance of advanced students.

The Worth Ryder Art Gallery was established in 1960 in memory of the late Worth Ryder, artist and Professor Emeritus. It is located in Kroebker Hall as an adjunct to the teaching functions of the Department of Art, and provides a continuous program of contemporary painting and sculpture exhibitions.

The future University Art Museum scheduled for completion in 1969 will be one of the major university museums in this country. It will greatly expand the present operations, undertake an extensive acquisitions program, and play an active role in instruction. Interested students will find ample opportunity for experience in connoisseurship, organization of exhibitions, and conservation. Those interested in the activities of the Art Gallery or the Art Museum may address Professor Peter Selz, Director of the University Art Museum at 120 Building T-7.

**ASTRONOMY**

(Department Office, 601 Campbell Hall)

George B. Field, Ph.D., Professor of Astronomy.
Louis G. Henrey, Ph.D., Professor of Astronomy.
Ivan R. King, Ph.D., Professor of Astronomy, Chairman of the Department.
John G. Phillips, Ph.D., Professor of Astronomy.
Harold F. Weaver, Ph.D., Professor of Astronomy and Director of the Radio Astronomy Laboratory.
Sturla Einarsson, Ph.D., Professor of Astronomy Emeritus and Director of Leuschner Observatory, Emeritus.
Leland E. Cunningham, Ph.D., Associate Professor of Astronomy.
Hyron Spinrad, Ph.D., Associate Professor of Astronomy.
C. Stuart Bowyer, Ph.D., Assistant Professor of Astronomy.
John E. Gaustad, Ph.D., Assistant Professor of Astronomy.
Carl E. Heiles, Ph.D., Assistant Professor of Astronomy.
Leonard V. Kuhl, Ph.D., Assistant Professor of Astronomy.

Departmental Major Advisers: Mr. Henrey, Mr. Phillips.
Graduate Advisers: Mr. Field, Mr. King.

The Department of Astronomy offers undergraduate and graduate instruction in a wide variety of fields, including theoretical and observational astrophysics, radio astronomy and space science, galactic structure, spectroscopy and celestial mechanics.

A wide selection of instruments is available to students and staff at Berkeley. The principal observational facilities are the Leuschner Observatory, located 10 miles east of the campus, the Radio Astronomy Observatory at Hat Creek, and the Lick Observatory on Mount Hamilton. The Leuschner Observatory has a 20-inch and a 30-inch reflecting telescope available for photometric and spectroscopic studies. At Hat Creek two fully steerable paraboloidal antennas are in regular use. The first of these has a diameter of 85 feet and is used at frequencies below 15GHz; the second, 20 feet in diameter, is operated at frequencies below 100GHz. The Lick Observatory has a 20-inch astrograph, a 24-inch reflector and two 36-inch telescopes in addition to the 120-inch reflector. Additional smaller instruments are in operation. The Lick Observatory is a Universitywide research facility, offering research opportunities to all astronomers on the various University campuses and to qualified graduate students.

Additional equipment at Berkeley consists largely of measuring equipment for the reduction and analysis of observational material. Included are an astrophotometer, a blink comparator, a number of measuring engines and spectrocomparators, and direct-
intensity microphotometers. The University Computer Center is a major asset to theoretical work at Berkeley and is also used for a large portion of all data reduction. At present it is equipped with a CDC 6400 computer and an IBM 360/40.

The Major

During a student's first two undergraduate years he must, in addition to fulfilling certain specific requirements of the College of Letters and Science, pursue studies that will prepare him for future work in astronomy. Specifically, the department requires that during his first two years each student takes courses that will provide a thorough understanding of:

1. Basic principles of physics: mechanics, properties of matter, electricity and magnetism, heat, wave-motion, sound and light. (Physics 4A, 4B, 4C, 4D, 4E)
2. Basic mathematics: analytic geometry, differential and integral calculus. (Math. 1A, 1B, 1C, or 11A, 11B, followed by Math. 11C, 12A, 12B)

In addition, each student is urged to take foreign language courses that will enable him to gain a reading knowledge of any one (and preferably two) of the three languages, German, Russian and French.

The last two years, leading to the A.B. degree in Astronomy, are spent in more intensive work, primarily in the fields of astronomy, mathematics and physics. The specific plan of study to be followed by each student is to be worked out in consultation with the departmental adviser for the major, and must include at least 36 units of upper division work in astronomy and allied fields.

A. All astronomy majors are required to take Astronomy 127A–B–C–D.
B. The remainder of the student's courses will generally be chosen from the following list:

Mathematical Methods in Physics (Physics 104)
* Analytic Mechanics (Physics 105A–B)
* Electromagnetism and Optics (Physics 110A–B–C)
Modern Physics and Advanced Electrical Laboratory (Physics 111A–B–C)
* Introduction to Statistical and Thermal Physics (Physics 112)
Introductory Nuclear Physics (Physics 124)
Nuclear Physics (Physics 129A–B)
* Quantum Mechanics and Its Applications to Atomic Physics (Physics 137A–B–C)
Introduction to Plasma Physics (Physics 142)
Introduction to Linear Algebra (Math. 111)
* Advanced Calculus for the Applied Sciences (Math. 120A–B–C)
Numerical Analysis (Math. 128A–B)
Introduction to Atmospheric and Space Sciences (Atmos. and Space Sci. 150)
Physics of the Earth (Geology and Geophysics 122A–B)
Introduction to the Theory of Probability and Statistics (Stat. 100A–B–C)

Students of marked ability may well take certain graduate courses in astronomy during the senior year.

Honors Program  A student wishing to take part in the honors program in the Department of Astronomy may do so by enrolling in Astronomy H195 during his senior year, and in this course he will prepare an acceptable paper on some subject which he will choose in consultation with a staff member.

Graduate Programs

The M.A. Degree  The student working for an M.A. degree is required to take a minimum of 36 units in graduate and upper division undergraduate courses. At least 18 of

* Courses of particular value.
the 36 units must be in graduate astronomy courses. A comprehensive final examination in astronomy is required of every candidate.

The Ph.D. Degree There are no formal unit requirements for the Ph.D. degree. However, the student must pass both a preliminary comprehensive examination and an oral qualifying examination for admission to candidacy. The preliminary examination, covering topics in physics, mathematics and astronomy, is taken after two years of graduate course work. The qualifying examination, covering the student’s proposed thesis topic, is taken after successful completion of the preliminary examination, and normally within one year following successful completion of all formal courses. Prior to taking the qualifying examination, the student must demonstrate his ability to read two of the three foreign languages: French, German, Russian.

The purpose of the course program is to give the Ph.D. candidate a firm background at an advanced level of a wide range of subjects in modern astronomy and astrophysics. In consultation with the graduate adviser, the student selects certain graduate courses in astronomy, physics, and mathematics which conform to his educational goals.

Lower Division Course

1. Introduction to General Astronomy. (4)
Four 1-hour lectures and one 1-hour discussion section per week. General facts and principles of the science of astronomy. Not intended for advanced physical science majors.
Mr. Bowyer, Mr. Heiles (F, W, Sp, Su)

Upper Division Courses

Three 1-hour lectures and one 1-hour discussion section per week. Prerequisite: Physics 4E; Mathematics 2C or 12B. Introduction to the principal fields of modern astrophysical research. Intended primarily for majors in the physical sciences and engineering.
Mr. Phillips (Sp)

127A–127B. Three 1-hour lectures per week. Prerequisite: Physics 4A, 4B, 4C, 4D, 4E; Mathematics 2C or 12B. 127A: Spherical astronomy, instrumentation, celestial mechanics, solar system. 127B: Stellar magnitudes, colors, spectra, and motions; populations and distributions; variable stars; structure of the Milky Way and other galaxies; cosmology. Sequence beginning (F), Mr. Spinrad, Mr. Gaustad
127C–127D. Three 1½-hour lectures per week. 127C: Introductory astrophysics, spectrographs, photometry, stellar atmospheres, curve-of-growth, spectroscopic binaries. 127D: Eclipsing binaries, stellar structure and evolution, interstellar matter. Sequence beginning (F), Mr. Phillips

H195. Special Study for Honors Candidates. (2–5)
The Staff (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (2–5)
Restricted to senior honor students.
The Staff (F, W, Sp, Su)

Graduate Courses

215A–215B. Orbit Theory and Practice. (5–5)
Three 1-hour lectures and two 1-hour discussion sections per week. Prerequisite: courses 127A–127B–127C–127D and Physics 105A–105B (may be taken concurrently), or consent of instructor. May be taken by qualified seniors. Various orbit methods, reduction of observations, special perturbations, introduction to general perturbations.
Sequence beginning (W), Mr. Cunningham

216. Introduction to Nonstellar Astrophysics. (5)
Five 1-hour lectures per week. A survey of non-stellar astronomical phenomena, meant as an introduction to the special topics treated in 226, 226, 246 and 256. The basic radiation physics and observational techniques, with applications to interstellar dust clouds, shock waves, radio sources, and quasars.
Mr. Field (F)

Four 1-hour lectures per week. Theory of Stellar atmospheres and interpretation of stellar spectra. Radiative transfer; local thermodynamic equilibrium; model atmospheres; continuous spectra of sun and stars. Theory of line formation; stellar spectra and abundances. Special types of stars; stellar envelopes. (Replaces former 217A, E, F, respectively. Not open to students who have taken those courses prior to fall 1998.) Courses 217B and 217C may be taken by students who had courses designated in by those numbers 1966-67 or 1967-68.
Sequence course. Mr. Kuhi, 217A (F); Mr. Phillips 217B (W); Mr. Spinard 217C (Sp)

218A–218B–218C. Stellar Systems. (4–4–4)
Three 1-hour lectures and one 1-hour discussion section per week. Stellar types and populations; star clusters; interstellar material; galactic structure; stellar dynamics; galaxies.
Sequence course. Mr. Weaver, 218A (F); Mr. King, 218B (W); Mr. King, 218C (Sp)

219. Solar System Astrophysics. (5)
Mr. Spinrad (Sp)

Three 1-hour lectures and two 1-hour discussion sections per week. Prerequisite: Physics 105.
Sequence beginning (F), Mr. Cunningham
226. X-Ray Astronomy. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 216. Experimental evidence for X-ray emission from the sun, galactic and extragalactic sources. Possible mechanisms for X-ray emission. Instrumentation and methods, with special emphasis on parallels with optical astronomy. (Laboratory work will be required in connection with this aspect of the course.) Connections with related topics in high-energy astrophysics. Mr. Bowyer (Sp)

227A–227B–227C. Stellar Structure and Evolution. (4-4-4)
Three 1-hour lectures and one 1-hour discussion section per week. Physical processes in stellar interiors: gravitational equilibrium, modes of energy transport, thermonuclear sources of energy. The general facts of stellar evolution as deduced from theory; interpretation of observations. Theory of stellar pulsation. (Not open to students who have taken 227A–227B prior to fall, 1966. Courses 227A and 227B are not open to students who have taken 217B–217C in 1966–67 or 1967–68.)
Sequence beginning (W), Mr. Henney

236. Radio Astronomy. (5)
Five 1-hour lectures per week. Prerequisite: course 216. Comparison of radio and optical instrumentation and techniques. Detailed application of radiation physics to objects observed in the radio range, including emission nebulae, gas clouds, and relativistic plasmas, with application to current observations. (Not open to students who have taken Astronomy 235.)
Mr. Heiles (W)

*245. Satellite Theory. (5)
Three 1-hour lectures and two 1-hour discussion sections per week. Prerequisite: consent of instructor. The motion of natural and artificial satellites. Practical determination of their orbits and perturbations. Mr. Cunningham (F)

246. Infrared Astronomy. (3)
Three 1-hour lectures per week. Prerequisite: course 216. Instrumentation for infrared observations. Principles of molecular spectra; molecule formation. Molecular processes in space, with application to interstellar dust and proto-stars. Mr. Caustad (Sp)

256. Interstellar Gas Dynamics. (4)
Four 1-hour lectures per week. Prerequisite: courses 216. Theoretical study of the motion of interstellar matter under the action of gravitational, pressure, and magnetic forces. Steady-state configurations, perturbations, turbulence, and shock waves. Applications to spiral arms, interstellar clouds, spherical explosions, and formation of stars and galaxies. (Not open to students who have taken Astronomy 217D.)
Mr. Field (W)

(2–10, Su.)
Advanced instruction in observational and reduction techniques making use of the observing facilities of the Leuschner, Hat Creek and Lick Observatories, and the facilities of the Department of Astronomy and the Computer Center.
The Staff (Su)

292. Seminar. (2–5)
One 2-hour meeting per week. In addition to the weekly colloquium, the Department offers seminars in advanced topics, which are announced at the beginning of each quarter. These give the student an opportunity to go beyond the material offered in lecture courses.
The Staff (F, W, Sp)

299. Advanced Study and Research. (2–10)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirement for the doctoral degree. Must be taken on a satisfactory or unsatisfactory basis.
The Staff (F, W, Sp)
Further Information

Further information about the program, including a statement of the requirements for advancement to candidacy, is given in the Announcement of the Group in Atmospheric and Space Sciences, which is available on request from the Group Office.

Upper Division Course

Letters and Science List: for regulations governing this list, see page 80.

150. Introduction to Atmospheric and Space Sciences. (4)
Prerequisite: senior standing in the physical sciences or consent of the instructor. Observational data and physical theories of processes in the atmosphere and solar system resulting from the interactions of particles, fields, radiation and matter.

Mr. Wilcox (W)

Graduate Courses

210A-210B. Physics of the Upper Atmosphere. (4-4)
(Formerly Physics 239)
Prerequisite: Physics 121, Physics 110A-110B or Electrical Engineering 117A-117B. Structure and dynamics of the ionosphere as an equilibrium system; effects of turbulence; dynamics of the atmosphere as a plasma.

Mr. Silver (F, W)

Geomagnetism. (Geophysics 224.) (4) (Sp)

220A-220B. Energetic Particles and Magnetic Fields in Space. (4-4)
Prerequisite: graduate standing in atmospheric and space science or consent of instructor. The interactions of high energy particles and quanta with other matter. Methods of obtaining particle trajectories in magnetic fields. A description of galactic and extra-galactic cosmic radiation, solar particles and magnetically trapped radiation.

Mr. Anderson (F, W)

Solar System Astrophysics (Astronomy 219). (5) (Sp)

230. Origin of the Solar System. (3)
Prerequisite: graduate standing in atmospheric and space science or consent of instructor. A critical study of the boundary conditions, drawn from a variety of fields, for the origins of the chemical elements, the meteorites, and the solar system. Theories and models for these origins.

Mr. Reynolds (Sp)

290. Seminar. (2)
The Staff (Mr. Reynolds in charge) (F, W, Sp)

295. Research. (1-6)
The Staff (Mr. Reynolds in charge) (F, W, Sp)

299. Special Study for Graduate Students. (1-4)
The Staff (Mr. Reynolds in charge) (F, W, Sp)

BACTERIOLOGY AND IMMUNOLOGY

(Department Office, 3573 Life Sciences Building)

Michael Doudoroff, Ph.D., Professor of Bacteriology and of Molecular Biology.
Roger Y. Stanier, Ph.D., Professor of Bacteriology and of Molecular Biology.
Gunther S. Stent, Ph.D., Professor of Bacteriology and of Molecular Biology.
Leon Wofsy, Ph.D., Professor of Immunology (Chairman of the Department).
Phyllis B. Blair, Ph.D., Associate Professor of Immunology in Residence.
Alvin J. Clark, Ph.D., Associate Professor of Bacteriology and of Molecular Biology.
George D. Hegeman, Ph.D., Assistant Professor of Bacteriology.
Robert I. Mishell, M.D., Assistant Professor of Immunology.

H. Hugh Fudenberg, M.D., Professor of Medicine.
Mary L. Human, M.A., Lecturer in Bacteriology.
Anne H. Good, M.D., Ph.D., Lecturer in Immunology.

Departmental Major Advisers: Mrs. Blair, Mr. Hegeman
Graduate Adviser: Mr. Doudoroff

Students who are interested in the major in bacteriology are urged to consult with the major adviser concerning the specific courses to be taken as a basis for the major.

The Department of Bacteriology and Immunology offers an undergraduate major in bacteriology, and graduate training in both bacteriology and immunology. The undergraduate major, administered according to two plans, provides training in

†‡ On leave, winter and spring quarters, 1968-69.
bacteriology at the upper division level, on the basis of a preparation at the lower division level in general biology and physical science. Plan I is strongly recommended for all students who plan to undertake subsequent graduate work. Honor students with a special interest in immunology may arrange an individual major program in this area with the approval of the undergraduate adviser.

The Major

**PLAN I**

**Lower Division**
Chemistry 1A–1B–1C, 5; Chemistry 8A–8B, or 12A–12E; Chemistry 14; Mathematics 1A–1B–1C; Physics 6A–6B; Biology 1A–1B–1C.

**Upper Division**
Bacteriology 100A–100B, 101A–101B; Biochemistry 102, 102L. At least 7 additional units chosen from: Bacteriology 103, 202A–202B; Molecular Biology 110; Zoology 104, 155; Botany 100.

**PLAN II**

**Lower Division**
Chemistry 1A–1B–1C, 5, 8A–8B; Mathematics 16A–16B; Physics 6A–6B–6C; Biology 1A–1B–1C.

**Upper Division**
Bacteriology 102–102L; Biochemistry 102, 102L; Public Health 180A–180B. At least 9 additional units chosen from: Bacteriology 103; Molecular Biology 110 or Zoology 150 or Genetics 100A; Public Health 182, 182L; Zoology 104, 156.

**Honors Program**
All honor students majoring in bacteriology are eligible to enroll in the honors program. Students enrolled in the program must take at least 6 units of honors courses (H195 and/or H197), and must pass an oral examination at the end of their last quarter. Graduation with honors may be recommended for those who maintain their standing as honor students throughout their last two years, who satisfactorily complete the honors courses, and who pass the comprehensive examination. The honors program adviser will help plan each honor student's honors program individually, and his approval of their programs will be required. The honors program adviser is authorized to exempt such students from requirements concerning specific courses or sequences of courses in the major program. Students interested in enrolling in the program should consult the honors program adviser, Mr. Hegeman.

**Preparation for Graduate Study**
For the pursuit of graduate work in either bacteriology or immunology, the undergraduate training outlined under Plan I is minimal. Other courses strongly recommended as basic preparation for future graduate work are: Chemistry 109 or 110A–110B; Chemistry 112E (for students who have taken Chemistry 12E); Physics 6C. The foreign language requirement should be fulfilled by either French, German, Russian, or Japanese; German is recommended.

**The Graduate Program**

The Department offers the M.A. and Ph.D. degrees in bacteriology and immunology. Further information can be obtained from the graduate adviser in 3573 Life Sciences Building.

**Letters and Science List:** for regulations governing this list, see page 80.

**Upper Division Courses**

**100A–100B. General Bacteriology. (4–4)**
Two 1½-hour lectures and a 1-hour discussion per week. Prerequisites: Biology 1A–B–C, Chemistry 5 and 8, or 12; Biochemistry 102. 100A is prerequisite to 100B.

100A. An introduction to the biological properties of the bacteria. Mr. Stainer (W)

100B. Bacterial physiology and metabolism. Mr. Doudoroff, Mr. Hegeman (Sp)

**101A–101B. General Bacteriology Laboratory. (3–3)**
Three 3-hour laboratories per week. Prerequisites: course 100A–100B (may be taken concurrently). Laboratory experiments planned to accompany the lectures in course 100A–100B. Sequence, beginning (W). Mr. Stainer, Mrs. Human (W).

Mr. Hegeman, Mr. Doudoroff, Mrs. Human (Sp)
102. An Introduction to General Bacteriology. (4)

Two 1½-hour and one 1-hour lectures per week. Prerequisite: Biology 1A—B—C; Chemistry 1C and 8A—B. Not open to students who have credit in courses 100A—B.

Mr. Doudoroff (F)

102L. Bacteriology Laboratory. (4)

One 1-hour lecture per week and two 4-hour laboratories per week. Prerequisite: Course 102 (may be taken concurrently) or Course 100A. Experimental work to acquaint the student with the techniques of general bacteriology. Planned to accompany lectures in course 102.

Mrs. Human (F)

103. Introduction to Immunology and the Biology of Host-Parasite Interactions in Infectious Disease. (4)

Three 1-hour lectures per week. Prerequisite: Biology 1A—1B—1C; a course in bacteriology is recommended. The nature of the immune response; some aspects of microbial pathogenicity and host resistance.

Mr. Mishell (Sp)

195. Special Study for Advanced Undergraduates. (1–4)

Independent study and/or laboratory research. Prerequisite: background courses in chosen subjects; consent of instructor. The staff (F, W, Sp, Su)

H195. Independent Study. (3–5)

Open to students in their senior year who are enrolled in the Department of Bacteriology and Immunology honors program.

The Staff (F, W, Sp, Su)

H197. Research. (3–5)

Open to students in their senior year who are enrolled in the Department of Bacteriology and Immunology honors program. Laboratory research.

The Staff (F, W, Sp, Su)

Graduate Courses

202A—202B. Immunology. (4–3)

202A. Three 1-hour lectures per week. Prerequisite: Biochemistry 100B or the equivalent. The immune response; antibody-antigen reactions, structure and function of antibody molecules; the nature of antibody specificity; problems and theories of antibody biosynthesis.

Mr. Mishell, Mr. Wofsy (F)

202B. Two 1-hour lectures per week. Genetics of immunoglobulin formation; specific cellular reactivity; hypersensitivity tissue antigens; complement.

Mrs. Blair (W)

202C. Immunology-Immunochemistry Laboratory. (4)

Experimental methods of immunology and immunochemistry. Prerequisites: course 202A—202B, and consent of instructor; 202B may be taken concurrently. Laboratory, seminar, and discussion periods to be arranged. Students will select one or more projects involving a variety of techniques. The course may be taken in any of the three quarters; under special circumstances a student may arrange to take the course in more than one quarter and receive credit.

Mrs. Good, Mr. Wofsy (F, W, Sp)

*203. Microbial Metabolism. (3)

Prerequisite: Biochemistry 100B, or consent of instructor. Recommended: an elementary bacteriology course covering selected topics on the metabolism of microorganisms, with special emphasis on intermediary metabolism.

Mr. Hegeman (Sp)

*204. The Immunology of Normal and Neoplastic Tissues. (3)

Two 1-hour lectures and one lecture-demonstration period per week. Prerequisite: a course in biology; a course in genetics; and either a course in immunology or permission of the instructor. The humoral reaction; antigens of normal and neoplastic cells; immunogenetics of tissue transplantation.

Mrs. Blair (Sp)

206. Immunogenetics. (2)

Prerequisite: course 202A—202B, or consent of instructor. Reading and discussion on current problems of immunogenetics: analysis of complex loci in red blood cell systems and transplantation antigen; genetically controlled antigenic variation in microbes and viruses; genetics of immunoglobulins and antibody synthesis.

Mr. Fudenberg (Sp)

212. Seminar in Current Research. (1)

An introduction to the analysis of scientific literature. Required of all first-year graduate students in bacteriology and in immunology.

The Staff (F, W)

213. Seminar in Advanced Laboratory Methods. (2)

One 3-hour seminar per week. Prerequisite: graduate standing in bacteriology and immunology, and consent of instructor. An introduction to advanced general laboratory methods for first-year graduate students in bacteriology and immunology.

Mr. Hegeman (Sp)

216. Seminar in Tumor Immunology. (1)

Prerequisite: graduate standing in any biological science, and consent of instructor. A critical survey and discussion of current research on the immunology of neoplastic cells.

Mrs. Blair (F, W, Sp, Su)

601. Individual Study for Master's Students. (1–8)

Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (F, W, Sp, Su)

602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (F, W, Sp, Su)

* Not to be given, 1968–69.
|| To be offered in alternate years.
BIOCHEMISTRY

(Department Office, 401 Biochemistry Building)

Bruce N. Ames, Ph.D., Professor of Biochemistry.
Clinton E. Ballou, Ph.D., Professor of Biochemistry.
Horace A. Barker, Ph.D., Professor of Biochemistry.
Frederick H. Carpenter, Ph.D., Professor of Biochemistry.
R. David Cole, Ph.D., Professor of Biochemistry.
Charles A. Dekker, Ph.D., Professor of Biochemistry.
Daniel E. Koshland, Jr., Ph.D., Professor of Biochemistry.
John B. Neibands, Ph.D., Professor of Biochemistry.
Jesse C. Rabinowitz, Ph.D., Professor of Biochemistry.
Howard K. Schachman, Ph.D., Professor of Biochemistry and of Molecular Biology.
Esmond E. Snell, Ph.D., Professor of Biochemistry.
Wendell M. Stanley, Ph.D., Professor of Biochemistry and of Molecular Biology and Director of the Virus Laboratory.
William Z. Hassid, Ph.D., Professor of Biochemistry, Emeritus.
Allan C. Wilson, Ph.D., Associate Professor of Biochemistry.
Jack F. Kirsch, Ph.D., Assistant Professor of Biochemistry.
Stuart M. Linn, Assistant Professor of Biochemistry.
Thomas A. Steitz, Ph.D., Assistant Professor of Biochemistry.
Raymond C. Valentine, Ph.D., Assistant Professor of Biochemistry.

Michael J. Chamberlin, Ph.D., Assistant Professor of Molecular Biology.
C. Arthur Knight, Ph.D., Professor of Molecular Biology.

Departmental Major Advisers: Mr. Dekker, Mr. Koshland, Mr. Rabinowitz, Mr. Wilson.
Graduate Advisers: Mr. Carpenter, Mr. Cole.

The Undergraduate Major The department offers two programs for the major: Plan I, which is designed especially for students expecting to pursue graduate study in biochemistry, and Plan II, a program for students who do not expect to continue beyond the Bachelor of Arts degree. Students in Plan I may elect the honors program.

The Major

Lower Division Plan I: Chemistry 4A—4B—4C (or 1A—1B—1C and 5); Chemistry 12A—12B, 14; Mathematics 1A—1B—1C; Physics 4A—4B—4C; Biology 1A—1B.
Plan II: Chemistry 4A—4B—4C (or 1A—1B—1C and 5); Chemistry 8A—8B, 14; Mathematics 16A—16B; Physics 6A—6B—6C; Biology 1A—1B—1C.
Recommended: Plan I: An additional course in biological science, Physics 4D—4E, a course in statistics, a reading knowledge of German and of one other foreign language.

Upper Division Plan I: Biochemistry 100A—100B—100C; Biochemistry 101A—101B—101C; Biochemistry 197; Chemistry 109 (or 110A—110B); Chemistry 112; Restricted elective (3 units).
Plan II: Biochemistry 100A—100B—100C; Biochemistry 101A—101B—101C; Biochemistry 197; Chemistry 109; Restricted electives (8 units).
Recommended: Plans I and II: additional courses in biochemistry and in allied subjects, chosen in accordance with a plan approved by the departmental adviser.

Honors Program A student who is enrolled in the major under Plan I and who has

† On leave, 1968—69.
a grade-point average of at least 3.0 in courses acceptable in the major may elect the honors program at any time not later than the first quarter of the senior year. In addition to the courses prescribed under the Plan I major, the student in this program will be required to complete 4 units in course 180 and to write a thesis based on his research. Certain graduate biochemistry courses will be open to these students on approval of the instructor and adviser. To remain in the honors program a student must maintain a grade-point average of at least 3.0 in biochemistry courses and in those courses acceptable in the major.

Graduate Study

The department offers the M.A. degree (under either Plan I or Plan II as described in Chapter III of this catalogue), and the Ph.D. degree. For information concerning the requirements for either of these degrees consult a graduate adviser in the department.

Letters and Science List: for regulations governing this list, see page 80.

20. Current Topics in Biochemistry. (1)
One 1-hour lectures per week. Prerequisite: sophomore standing or consent of the instructor. A course intended primarily to acquaint potential biochemistry majors with developments in this area. Typical topics include: genetic code, regulation of biochemical processes, molecular action of vitamins and hormones, biochemistry of evolution, mechanism of catalysis in living systems, membrane processes.

The Staff (Mr. Dekker in charge) (W)

Upper Division Courses

100A—100B—100C. General Biochemistry. (3–3–3)
Three 1-hour lectures per week. Prerequisite: a course each in organic chemistry, physical chemistry and biology, or consent of the instructor. Designed for biochemistry majors. Lectures on the chemical and physical factors concerned in life processes, including the chemistry, function, degradation, and biosynthesis of major cellular constituents; enzymatic catalysis; energy metabolism; and control of metabolic processes. (100A: Structure and Function; 100B: Catalysis, Kinetics and Energetics, including the chemistry, function, degradation, and biosynthesis of major cellular constituents; enzymatic catalysis; energy metabolism; and control of metabolic processes. (100A: Structure and Function; 100B: Catalysis, Kinetics and Energetics, including certain aspects of Carbohydrate Metabolism; 100C: Metabolism and Metabolic Control.) Sequence, beginning in the fall.

Mr. Carpenter (F); Mr. Koshland (W); Mr. Snell (Sp)

One 1-hour lecture and two 3-hour laboratories per week. Prerequisite: Chemistry 5 and course 100A—100B—100C (may be taken concurrently), or consent of the instructor. Laboratory experiments planned to accompany the lectures in course 100A—100B—100C. Sequence, beginning in the fall.

Mr. Cole (F); Mr. Mr. Cole, Mr. Valentine (W); Mr. Valentine (Sp)

102. A Survey of the Principles of Biochemistry. (4)
Three 1½-hour lectures per week. Prerequisite: a course in organic chemistry. Recommended: courses in physical chemistry and biology. Designed for non-biochemistry majors. Not open for credit to students who have credit in courses 100A—100B—100C or equivalent.

(Su), Mr. Neilands, Mr. Wilson (F, Sp)

102L. Biochemistry Laboratory. (5)
Two 1-hour laboratories and three 3-hour laboratories per week. Prerequisite: Chemistry 5 and course 102 (may be taken concurrently). Not open for credit to students who have credit in course 101A—101B—101C or equivalent. Experimental work to acquaint students with the properties of biological materials, the action of enzymes, and the use of specific techniques for laboratory work in biochemistry. Planned to accompany lectures in course 102.

(Su); Mr. Dekker (F); Mr. Barker (Sp)

180. Research. (2–4)
Prerequisite: courses 100A and 101A with grade of B or higher and consent of major adviser. Research topics for advanced students under the direction of a member of the staff.

The Staff (Mr. Rabinowitz in charge) (F, W, Sp, Su)

197. Proseminar. (1)
Prerequisite: courses 100A—100B and 101A—101B. Seminar, for biochemistry majors, based on the biochemical literature.

Mr. Valentine (Sp)

199. Special Study for Undergraduate Students. (2)
Reading and conference, under the direction of a member of the staff, for senior students in biochemistry with honor standing.

The Staff (Mr. Dekker in charge) (F, W, Sp, Su)

Graduate Courses

Courses 201 to 222, intended to acquaint graduate students with recent advances in biochemistry, are also open to senior students with honor standing by consent of the instructor.

201A–201B–201C. Advanced Biochemical Laboratory Methods. (4–4–4)
One 1-hour lecture and three 3-hour laboratories per week. Prerequisite: graduate standing in biochemistry, and consent of the instructor. (201A: General Laboratory Techniques; 201B: Advanced Methods; 201C: Enzyme Chemistry Laboratory.) Sequence, beginning in the fall. Mr. Ames, Mr. Rabinowitz, Mr. Steitz (F, W, Sp)
BIOCHEMISTRY; BIOLOGY / 167

of enzymes. Topics covered include model systems, consideration of various means of catalysis available under physiological conditions, and appropriate aspects of enzymatic kinetics and energetics.

Mr. Kirsch (F)

*222. Plant Biochemistry. (3)

Three 1-hour lectures per week. Prerequisite: course 102 or 100A—100B—100C. Lectures on the chemistry of important plant constituents and on processes such as photosynthesis, respiration and metabolism.

M. Ballard (W)

280. Research. (3—12)

Thesis research for graduate students majoring in biochemistry. Students must enroll for not less than 3 units, except by special permission of the chairman of the department.

The Staff (Mr. Carpenter in charge) (F, W, Sp, Su)

290. Seminar. (1)

Graduate student seminar in biochemistry dealing with various topics which differ from year to year. The program for 1968—69 will include several sections each quarter, each emphasizing a different subject.

Mr. Dekker, Mr. Kirsch, Mr. Snell (W) Mr. Barker, Mr. Carpenter, Mr. Koshland, Mr. Neillands (Sp)

299. Special Study for Graduate Students. (2—4)

Reading and conference for properly qualified graduate students in biochemistry under the direction of a member of the staff.

The Staff (Mr. Carpenter in charge) (F, W, Sp, Su)

602. Individual Study for Doctoral Students. (1—8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

BIOLOGY

Herbert G. Baker, Ph.D., Professor of Botany and Director of the Botanical Garden.

Roderic B. Park, Ph.D., Professor of Botany.

Henry Rubin, Ph.D., Professor of Molecular Biology.

Gunther S. Stent, Ph.D., Professor of Molecular Biology (Member of Biology 1 Committee).

Paul Licht, Ph.D., Associate Professor of Zoology.

William Z. Liddicker, Jr., Ph.D., Associate Professor of Zoology and Associate Curator of Mammals, Museum of Vertebrate Zoology.

Oscar H. Paris, Ph.D., Associate Professor of Zoology.

Carl W. Birky, Jr., Ph.D., Assistant Professor of Zoology.

Russell L. Jones, Ph.D., Assistant Professor of Botany.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1A—1B. General Biology. (5—5—5)

Three 1-hour lectures and one 3-hour laboratory section per week with an additional discussion section.

* Not to be given, 1968—69.
Contemporary Natural Science (See Natural Science 1A–1B–1C). (4–4–4)
Sequence, beginning in the fall.

11A–11B. Introduction to the Science of Living Organisms. (4–4)
Three 1-hour lectures, one 3-hour laboratory per week. For students not majoring in biological science. An introductory course in biology which presents and illustrates the main facts and principles of organization, functions, heredity, and evolution of plants and animals, and introduces the student to the methods of the life sciences. Sequence, beginning in the fall. Both parts must be completed to receive credit toward natural science requirement of the College of Letters and Science.
Mr. Birky (in charge), Mr. Jones (F); Mr. Jones (in charge), Mr. Birky (W)

Biology 11A–11B is jointly administered by the departments of Botany and Zoology.

150. General Ecology. (4)
Three 1-hour lectures, one 1-hour conference per week. Prerequisite: Biology 1A–1B–1C or 11A–11B; or Contemporary Natural Science 1A–1B–1C; or an introductory college level course in each of botany and zoology. An introduction to the principles of ecology, stressing the structure and dynamics of natural communities on both regional and local bases, and the historical and contemporary influences of man. Mr. Lidicker (in charge), Mr. Baker (F)

Biology 150 is jointly administered by the departments of Botany and Zoology.

250. Tropical Biology—an Ecological Approach. (8)
Eight to ten 1-hour lectures and 22 hours of laboratory and field work per week. Prerequisite: graduate status in a biological discipline and a course in general ecology. Evolution and dynamics of tropical biota, their relationships to tropical environments; and intensive field course in Costa Rica offered in cooperation with the Organization for Tropical Studies; travel and subsistence fellowships available from O.T.S. Feb.–Mar.; July–Aug. Biology 250 is sponsored by the Graduate Council.
See Mr. Baker for details

### BOARD OF EDUCATIONAL DEVELOPMENT
Paul M. Bertrand Augst, Ph.D., Associate Professor of French.
James L. Jarrett, Ph.D., Professor of Education.
John L. Kelley, Ph.D., Professor of Mathematics (Chairman of the Board).
Sheldon Korchin, Ph.D., Professor of Psychology.
Hans Mark, Ph.D., Professor of Nuclear Engineering.
Thomas F. Parkinson, Ph.D., Professor of English.
Neil J. Smelser, Ph.D., Professor of Sociology.

For further information on the Board of Educational Development, see page 106.

### 0 Bibliography 1X. How to Use the University of California Library. (2)
Three-quarters of an hour of lecture and three-quarters of an hour of discussion per week. Students will learn how to approach the U.C. Library's resources in a systematic way to meet their needs, via lecture, section, problem sets and examinations. They will also be taught how to build on this foundation for future independent research.
Mr. Held (in charge) (F, W, Sp)

### BOTANY
(Department Office, 2017 Life Sciences Building)
Herbert G. Baker, Ph.D., Professor of Botany and Director of the Botanical Garden.
Lincoln Constance, Ph.D., Professor of Botany and Director of the University Herbarium.
Ralph Emerson, Ph.D., Professor of Botany (Chairman of the Department).
Adriance S. Foster, Sc.D., Professor of Botany, Emeritus.
William A. Jensen, Ph.D., Professor of Botany.
Leonard Machlis, Ph.D., Professor of Botany.
George F. Papenfuss,† Ph.D., Professor of Botany and Curator of Algal Collections.
Roderic B. Park, Ph.D., Professor of Botany.
Johannes Proskauer,‡ Ph.D., D.Sc., Professor of Botany.
Lee Bonar, Ph.D., Professor of Botany and Curator of Mycological Collections, Emeritus.

† Approved for two years only, 1968–69, 1969–70.
‡ On leave, fall quarter, 1968–69.
Herbert L. Mason, Ph.D., Professor of Botany and Director of the University Herbarium, Emeritus.

Daniel Branton, ** Ph.D., Associate Professor of Botany.

Watson M. Laetsch,† Ph.D., Associate Professor of Botany.

Robert Ornduff, Ph.D., ** Associate Professor of Botany and Associate Curator of Seed Plants and Director of the Jepson Herbarium and Library.

Russell L. Jones, Ph.D., Assistant Professor of Botany.

John A. West, Ph.D., Assistant Professor of Botany.


Departmental Major Advisers: Mr. West (Su.); Mr. Constance (F, W. Sp.).

The Department of Botany at Berkeley seeks, through a series of required courses and informal meetings and seminars, to give the undergraduate a broad base for future studies in the plant sciences. The program also allows a student sufficient latitude to do advanced course work or faculty-sponsored research in an area of special interest. Biology 1A–1B–1C, required of all students, presents the principles involved in the activities of plants and animals. Subsequently, the student majoring in botany takes courses (Botany 100, 105, 110, and 120) which acquaint him with the various plant groups, their biology, morphology, phylogeny, and classification. During the time he is taking these botany courses and related biology courses in other departments, the student is advised to complete his work in the physical sciences. This will allow him to proceed normally to biochemistry (Biochemistry 102) and plant physiology (Botany 140).

The Major

Lower Division  Biology 1A–1B–1C; Chemistry 1A–1B, 8A–8B; two additional quarters of chemistry (from 1C, 5, or 14) or calculus (Mathematics 1A–1B–1C or 16A–16B) or Physics 6A–6B–6C.

Upper Division  Biochemistry 102; Botany 100, 105, 110, 120, 140; Genetics 100A or Zoology 150. Additional courses in botany or approved courses in related departments to complete a minimum of 36 upper division units. Recommended: Biochemistry 102L.

Honors Program—Senior honor students desiring to pursue a specific research problem should seek the advice and sponsorship of individual faculty members and then enroll with the major adviser in Botany 199. Qualified undergraduates may also enroll in graduate courses with consent of the major adviser. Prospective honors candidates should consult with the major adviser.

Preparation for Graduate Study  Those students interested in graduate study in botany at Berkeley or elsewhere are strongly advised to gain a background in foreign languages: Ph.D. candidates are usually required to pass reading examinations in two foreign languages (ordinarily selected from French, German, and Russian) before taking the oral qualifying examination. (Alternative methods for fulfilling this requirement exist; for a detailed statement request information from the graduate adviser.) Students interested in physiological, biochemical, or biophysical botany should take all of the physics, chemistry, and mathematics listed as options under lower division above and also Biochemistry 102L.

The Graduate Major

Graduate training leading to the degrees Master of Arts and Doctor of Philosophy is offered in the field of botany as represented by the experience, interests, and compe-
tence of the faculty. The graduate program is based upon a sound and broad foundation in the natural sciences. Studies in specialized fields are designed to prepare students for careers either in teaching and research at the college or university level or in research in basic or applied botany in university, government, or industrial laboratories. Graduate students should have had or must complete the required, or equivalent, courses which compose the undergraduate major. Exceptions to this requirement may be made by the faculty. All new students must take the two-quarter sequence in current research (Botany 280A-280B) during their first year of residence after which they are expected to arrange for a major professor who will direct their doctoral research. Students are expected to demonstrate a reading knowledge of one foreign language (see above, Preparation for Graduate Study) soon after their arrival and of the other one within a year. After Botany 280, enrollment in the graduate seminar (Botany 290) is required on the average of every other quarter in which the student is registered, not including the summer quarter. Beyond these requirements, a student's further course work will be planned with an advisory committee assigned to the student during his first quarter and, when established, with his major professor. As soon as the required courses and the language examinations are passed, a student is expected to arrange for his qualifying examination. If passed, the student will then devote almost full time to his doctoral research.

Students should note that faculty of the Department of Botany are members of several graduate groups described in appropriate bulletins of the Graduate Division. Students may enroll in such group programs with a faculty member of Botany as their major professor.

For further details on the requirements for the M.A. and the Ph.D. degrees, as well as the facilities available for graduate study in botany, please consult the graduate advisers.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

10. Plant Biology. (4)
Three 1-hour lectures per week and one laboratory-demonstration period per week. Open without prerequisite to all students and designed for those not specializing in the biological sciences. Emphasis of the course is placed on the fundamental concepts of biology as illustrated by the structure and function of plants.

Mr. J. B. Jensen (F); Mr. Papenfuss (Sp)

11. An Evolutionary Survey of the Plant Kingdom.
(4)
Three 1-hour lectures and one 3-hour laboratory period per week. Open without prerequisite to all students and designed for those not specializing in the biological sciences. Emphasis will be on the structure, life histories, reproductive mechanisms, and relationships of the major groups of plants.

Mr. W. A. Jensen (Su); Mr. F. D. LeVine (Sp)

Upper Division Courses

100. Comparative Morphology of Algae and Fungi. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: Biology 1A-1B-1C.

Mr. J. B. Jensen (W)

104. Marine Botany. (8)
Full-time study at Bodega Marine Laboratory in first half of summer quarter, including lectures, laboratories, field work and special problems, with emphasis upon marine algae. Prerequisite: Biology 1A-1B-1C or Biology 11A-11B.

Mr. West (Su)

105. Comparative Morphology of Archegoniates. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: Biology 1A-1B-1C. Structure, reproduction, and relationships of bryophytes and lower vascular plants.

Mr. Papenfuss (Sp)

110. Comparative Morphology of Seed Plants. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 105.

115. Plants and Man. (3)
Three 1-hour lectures per week. Prerequisite: a course of high school or college biology or botany, or consent of instructor. Man's selection and use of plants for his own purposes and the interrelation between the evolution of domesticated plants and the cultural evolution of man.

Mr. Baker (F)

115L. Plants and Man, Laboratory. (1)
One 3-hour laboratory per week. Prerequisite: the same as for course 115. Laboratory, demonstration, discussion sections and field trips. To accompany course 115. If taken must be concurrent with course 115.

1 Arrangements must be made well in advance for a place in the class and for personal accommodations. Inquiries regarding details are to be addressed to: The Director, Bodega Marine Laboratory, P.O. Box 247, Bodega Bay, California 94923.
120. Taxonomy of Seed Plants. (4)

Two 1-hour lectures and two 3-hour laboratories per week plus field work. Prerequisite: Biology 1A–1B–1C. A survey of the spermatophytes, with lectures on phylogeny and classification; laboratory and field work with collection and identification practices.
(Su); (W)

124. Field Course in Plant Taxonomy and Ecology. (8)

Full-time study in the first half of the summer quarter at the University of California Field Station at Sagehen Creek, near Truckee, California. Prerequisite: a background in biology. The taxonomic aspects include a brief survey of the flowering plants with practice in identification. The ecological aspects include studies of physiological tolerances of plants and the nature of limiting factors of the environment as they influence patterns of distribution. Acceptable in place of course 120 for the major.1
(Su)

125. The California Flora. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Open without prerequisite to all students. The course will emphasize the relation of California plants to soils, climate, and geological history. The use of keys and an examination of the native and introduced members of the state's flora will take place in the laboratory.
Mr. Constance (Sp)

130. Plant Cytology. (5)

Three 1-hour lectures and two 3-hour laboratories per week. Prerequisite: Biology 1A–1B–1C. A survey of morphology, biochemical and genetical information on cell function, reproduction and development.

140. Plant Physiology. (5)

Three 1-hour lectures and two 3-hour laboratories per week. Prerequisite: Biology 1A–1B–1C, Chemistry 8A–8B, Biochemistry 102. A study of the physiology of higher plants, with emphasis on mineral nutrition, transport phenomena, and developmental aspects of growth.

142. General Plant Physiology. (4)

Three 1-hour lectures and one 1-hour demonstration/discussion period per week. Prerequisite: Biology 1A–1B–1C. A study of mineral nutrition, water relations, metabolism and development of higher plants. It is recommended that students needing laboratory experience such as those studying for the secondary teaching credential take course 140.

154. Plant Ecology. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: Biology 1A–1B–1C. The structure, development, and history of the vegetation of selected regions of the world and the energetics and nutrient flow in ecosystems. Recommended to be taken in the senior year. Given in alternate years.
Mr. Baker (W)

H195. Special Study for Honors Candidates. (1–6)

Prerequisite: restricted to junior and senior botany majors. Staff (Mr. W. A. Jensen in charge) (Su); (Mr. Constance in charge) (F, W, Sp)

199. Special Study for Senior Honor Students. (1–5)

Staff (Mr. W. A. Jensen in charge) (Su); (Mr. Constance in charge) (F, W, Sp)

Graduate Courses

201. Biology of Lower Fungi. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 100. Comparative studies of the morphology, development, physiology, reproduction, and significance of Myxomycetes and Phycomycetes. Mr. Emerson (W)


Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 201. Comparative studies of the morphology, development, physiology, genetics, and significance of the Ascomycetes and Fungi Imperfecti. (Sp)

203. Biology of Basidiomycetes. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 201. Comparative study of the morphology, development, physiology, genetics, and significance of the Basidiomycetes. Special emphasis will be placed on the morphogenesis of fleshy fungi. Given in alternate years.

204. Algology. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 100. A survey of the golden-brown and green algae. Given in alternate years.

Mr. West (W)

205. Algology. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 100. A survey of the blue-green, brown and red algae. Given in alternate years.

Mr. Papenfuss (Sp)

206A–206B. Bryology. (4–2)

206A. Two 1-hour lectures and two 3-hour laboratories per week.
206B. One 1-hour lecture and one 3-hour laboratory per week.
Prerequisite: course 105. A general treatment of the morphology and relationships of the bryophytes. Given in alternate years.

Mr. Proskauer (F, W)

212. Plant Anatomy. (5)

Three 1-hour lectures and two 3-hour laboratories per week. Prerequisite: courses 105, 110, or consent of the instructor. Comparative structure and growth of the meristems; development and structure of important cell types, tissues, and tissue systems; comparative anatomy of stem, root, and leaf. Emphasis is placed upon the anatomy of gymnosperms and angiosperms.

Mr. W. A. Jensen (W)

229. Advanced Taxonomy. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. Prerequisite: courses 120, 212. A survey of the morphological approaches, research tools, and literature basic to the classification of flowering plants. Mr. Constance (F)

*206A–206B. Bryology. From 4 to 2

1 Arrangements must be made well in advance for a place in the class and for personal accommodations. Inquiries regarding details are to be addressed to the Department of Botany, University of California, Berkeley, California 94720.

* Not to be given, 1968–69.
222. Plant Biosystematics. (4)  
Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. **Prerequisite:** course 120. A study of the biometrical, cytological, and experimental bases of biosystematics, the morphological patterns resulting from various evolutionary processes, and the taxonomic problems they pose. (Sp)

*224. Evolutionary Ecology. (4)  
Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. **Prerequisite:** courses 110, 140, and consent of instructor in charge. Intensive reading and analysis of the classical and recent literature in the field of plant physiology. Designed for candidates for the Ph.D. in the area of plant physiology. Given in alternate years. (F, W, Sp)

242. Physiology of Lower Plants. (4)  
Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. **Prerequisite:** course 110 and 140, or consent of the instructor. An intensive treatment of selected topics on the physiology of algae, fungi, and bryophytes. Mr. A. Jensen (W)

*244. Physiology of Higher Plants. (4)  
Two 1-hour lectures and two 3-hour laboratories per week. **Prerequisite:** course 140 or consent of instructor. An intensive treatment of selected topics on the physiology of vascular plants. Mr. Jones (W)

*246. Experimental Plant Morphology. (4)  
Two 1-hour lectures and two 3-hour laboratories per week. **Prerequisite:** courses 110 and 140. Lectures and discussions analyzing the concepts of plant development. The laboratory will include basic techniques utilized in the experimental control of growth, differentiation, morphogenesis, and senescence of vascular plants and will consist of independent projects. Given in alternate years. Mr. Laetsch (Sp)

248. Biochemical and Biophysical Approaches to Plant Physiology. (4)  
Two 1-hour lectures and two 3-hour laboratories per week. **Prerequisite:** course 140 and Physics 6A–6B–6C. The role of advanced research techniques in elucidating physiological processes. Mr. Park (Sp)

249A–249B–249C. Advanced Plant Physiology. (4–4–4)  
Meetings with the faculty for an evening of discussion every two to three weeks. **Prerequisite:** courses 110, 140, and consent of instructor in charge. Intensive reading and analysis of the classical and recent literature in the field of plant physiology. Designed for candidates for the Ph.D. in the area of plant physiology. Given in alternate years. (F, W, Sp)

280A–280B. Seminar in Current Research. (0–0)  
Lectures by members of the faculty on current research interests. Required of all graduate students during their first year of graduate study at Berkeley. Sequence beginning (F).

The Staff (Mr. Emerson in charge) (F, W)

290. Seminar. (2)  
One 1-hour meeting per week. Advance study in various fields of botany. Topics will be announced in advance of each quarter. Consent of instructor required. Enrollment in more than one section permitted. The Staff (F, W, Sp)

299. Research. (1–12)  
Graduate student research. Staff (F, W, Sp, Su)

431. Techniques of Electron Microscopy for Biologists. (3)  
One 1-hour lecture and two 3-hour laboratories per week. **Prerequisite:** graduate standing, approval of major professor, and consent of instructor. The purpose of this course is to prepare graduate students in the biological sciences to use electron microscopy in their research. (F)

602. Individual Study for Doctoral Students. (1–8)  
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or resident requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)

Botany Colloquium. (0)  
One 1-hour meeting per week. Meetings for the presentation of original work by the faculty, visiting lecturers, and graduate students. Staff (Su, in charge) (F, W, Sp)

Botanical Garden  
The Department of Botany has maintained a Botanical Garden since 1892, and from 1925 onward it has been located in Strawberry Canyon. It includes a fenced area of approximately twenty acres in a valley that, by reason of its slope toward the Pacific Ocean, enjoys a reduction in the climatic extremes of the Berkeley Hills. The Garden provides opportunities for research with living plants, supplies teaching material, and offers botanical instruction for the interested public. The Garden contains greenhouses, a lathhouse, and associated facilities, and approximately fourteen acres of outdoor space are cultivated. Its collections are especially rich in succulents, South Amer-
American, South African, European and Australian plants. An Economic Plant Collection and a California Native Area are also being developed. Experimental work is carried out in the greenhouses and in an experimental area that provides full facilities for the culture of population samples outdoors.

**Herbaria**

The University Herbarium contains over 1,350,000 plant specimens representative of the floras of the world. It is especially rich in seed-plant collections from western North America (the W. H. Brewer Geological Survey material, T. S. and K. Brandegee, H. M. Hall, H. L. Mason, I. W. Clokey, J. P. Tracy, H. E. Parks collections), South America (primarily Andean elements collected under the auspices of the University Botanical Garden), and the Pacific Basin (collections amassed by E. D. Merrill). In addition to the seed-plant collections, the University Herbarium houses extensive collections of algae (150,000 specimens, including the algological collections by Setchell, Gardner, Papenfuss, and Silva), fungi (105,000 accessions including collections by H. E. Parks, J. P. Tracy, C. R. Quick, Lee Bonar, and T. T. McCabe), lichens (10,000 accessions), bryophytes (30,000 accessions including early collections by M. A. Howe), and ferns (35,000 accessions including types of many of the species described by E. B. Copeland).

The Jepson Herbarium, endowed by the late Professor Willis L. Jepson and maintained by the terms of the bequest as a separate herbarium, specializes exclusively in the flora of California and adjacent areas.

These collections form a foundation for basic research in systematic botany (including anatomical and morphological investigations), ecology, phytogeography, and evolution not only for the faculty, staff, and students in botany at the University but also, through an annual flow of about 150 visiting scholars and 10,000 specimens loaned, for biologists throughout the United States and in other countries. In addition to this primary role in basic research, the collections in the herbaria comprise an invaluable source of material for instruction and for information for paleontologists, anthropologists, chemists, conservationists, entomologists, geneticists, pathologists, zoologists and others in more distantly related disciplines.
Sidney S. Hoos, Ph.D., Professor of Business Administration, of Agricultural Economics, and of Economics.
Roy W. Jastram, Ph.D., Professor of Business Administration.
Van Dusen Kennedy, Ph.D., Professor of Industrial Relations.
Clark Kerr, Ph.D., LL.D., Professor of Industrial Relations.
Choh-Ming Li,† Ph.D., Professor of Business Administration.
Thomas A. Marschak, Ph.D., Professor of Business Administration.
Maurice Moonitz, Ph.D., C.P.A., Professor of Accounting.
Frederic P. Morrissey, J Ph.D., Professor of Business Administration.
Lee E. Preston, Jr., Ph. D., Professor of Business Administration.
David A. Revzan,‡ Ph.D., Professor of Business Administration.
George Strauss, Ph.D., Professor of Business Administration.
Lawrence L. Vance, C.P.A., Ph.D., Professor of Accounting.
William J. Vatter, C.P.A., Ph.D., Professor of Business Administration.
Dow Votaw, LL.B., M.B.A., Professor of Business Administration.
Paul F. Wendt, Ph.D., Professor of Finance.
John T. Wheeler, Ph.D., Professor of Business Administration.
Ira B. Cross, Ph.D., LL.D., Flood Professor of Economics, Emeritus.
Delbert J. Duncan, Ph.D., Professor of Marketing, Emeritus.
Ewald T. Grether, Ph.D., LL.D., ekon dr. (hon.c.), Flood Professor of Economics, Emeritus.

Charles C. Staehling, C.P.A., M.S., Professor of Accounting, Emeritus.
Catherine DeMotte Quire, Ph.D., Assistant Professor of Accounting, Emeritus.
Wayne S. Boutell, C.P.A., Ph.D., Associate Professor of Business Administration.
Louis P. Bucklin, Ph.D., Associate Professor of Business Administration.
James M. Carman, Ph.D., Associate Professor of Business Administration.
Alan R. Cerf, C.P.A., Ph.D., Associate Professor of Business Administration.
Robert C. Goshay, Ph.D., Associate Professor of Business Administration.
Austin C. Hoggatt, Ph.D., Associate Professor of Business Administration.
C. Bartlett McGuire, M.A., Associate Professor of Business Administration.
F. Theodore Malm, Ph.D., Associate Professor of Business Administration.
Raymond E. Miles, Ph.D., Associate Professor of Business Administration.
Francesco M. Nicosia, Ph.D., Dottore in Economia e Commercio, Associate Professor of Business Administration.

Gordon Pye, Ph.D., Associate Professor of Business Administration.
Jack D. Rogers, Ph.D., Associate Professor of Business Administration.
Albert H. Schaaf, Ph.D., Associate Professor of Business Administration.
Milo W. Smith, J.D., Associate Professor of Business Law.
Wallace F. Smith, Ph.D., Associate Professor of Business Administration.
George J. Staubs, C.P.A., Ph.D., Associate Professor of Business Administration.
Willard I. Zangwill, Ph.D., Associate Professor of Business Administration.
Richard M. Bailey, D.B.A., Assistant Professor of Business Administration.
Roger A. Dickinson, Ph.D., Assistant Professor of Business Administration.
Edwin M. Epstein, LL.B., M.A., Assistant Professor of Business Administration.
Ronald S. Graybeal, Ph.D., Assistant Professor of Business Administration.

Undergraduate Curriculum

Lower Division

Students may complete basic lower division courses in the College of Letters and Science or its equivalent at other institutions, or they may elect to complete lower division work in one of the colleges of applied sciences. Counselors in the School of Business Administration will assist lower division students in selecting courses prerequisite to upper division courses. Detailed information on lower division preparation is available in the ANNOUNCEMENT OF THE SCHOOL OF BUSINESS ADMINISTRATION.

Courses which are required in Business Administration are:

100—The Price System and Business Enterprise
101—Business Fluctuations and Forecasting
110—Legal Environment of Business
130—Financial Management
150—Organizational Behavior and Industrial Relations

And, at least three of the following courses:

111—Social and Political Environment of Business
160—Marketing
190—Introduction to Organization and Decision
Beyond these requirements, additional courses within a subject matter field must be taken. Advisers will assist students in the selection of these courses.

The following subject matter fields are available:

- Accounting
- Administration and Policy
- Finance
- Organizational Behavior and Industrial Relations
- Managerial Economics
- Marketing
- Operations Research
- Production Management
- Real Estate and Urban Land Economics
- Risk and Insurance
- Transportation

Courses in other departments of the University are acceptable, together with the courses in business administration, for fulfilling the requirements of the field of emphasis. Students may present subject matter fields to the Associate Dean of the School of Business Administration for approval which are constituted from courses offered in other departments. Some possibilities are:

- Economics
- Agricultural Economics
- Forestry
- Public Administration
- Journalism

Preparation for Graduate Study

Admission to the Graduate School of Business Administration requires evidence of superior scholarship and an acceptable bachelor's degree. In evaluating applications, maturity, demonstrated capacity for leadership, and intellectual activity of a higher order are taken into account.

The Graduate Program

The master's degree requires a minimum residence of three quarters for those with a B.S. degree in Business Administration from the University of California or another institution of acceptable standing. A minimum of six quarters (the first three quarters composed of special core courses) is required for students with no previous work in business administration. The core courses include basic work in quantitative methods (economic analysis, quantitative decision models and techniques, statistics, accounting), legal, social, and political environment of business, finance, marketing, production, and industrial relations. All graduate students must maintain a B average in all courses taken since receipt of the Bachelor's degree and must pass a comprehensive examination. Details of the requirements for the M.S., M.B.A., and Ph.D. degrees are found in the Announcement of the Graduate School of Business Administration.

Lower Division Courses

1. Principles of Accounting I. (5)
   (Formerly numbered 1A)
   Two 1½-hour lectures and 3 hours of laboratories per week. Prerequisite: at least sophomore standing. Basic accounting data, records, and statements with their external and managerial uses and limitations. The laboratory work includes programming and solution of accounting problems using an electronic computer. The Staff (Mr. Anton in charge) (Su, F, W, Sp)

2. Principles of Accounting II. (5)
   (Formerly numbered 1B)
   Two 1½-hour lectures and 3 hours of laboratories per week. Prerequisite: course 1. Cost accounting and other managerial accounting methods, special statements, and special problems of various forms of business organizations. The computer application is continued in the laboratory. The Staff (Mr. Anton in charge) (Su, F, W, Sp)

10. General Accounting. (5)
   Three 1½-hour meetings per week. Prerequisite: at least sophomore standing in any department of the University. Not open to students who have taken or are planning to take courses 1 and 2. Accounting principles and procedures with emphasis on managerial and decision-making aspects. Preparation and interpretation of financial statements.
   The Staff (Mr. Anton in charge) (F, Sp)

Upper Division Courses

Prerequisite: Economics 1–3, Statistics 2 or equivalent, Mathematics 16A or equivalent and junior standing except where special provision has been made for students in certain curricula.

100. The Price System and Business Enterprise. (5)
   Three 1½-hour lectures per week. Prerequisite: Economics 1–3, Mathematics 16A. Not open to students who have taken Economics 100A. Economic analysis applicable to the problems of business enterprises with emphasis on the determination of
the level of prices, outputs, and inputs; effects of the state of the competitive environment on business and government policies.

Mr. Sandor, Mr. Graybeal, Mr. Roberts, Mr. Doyle (Su, F, W, Sp)

101. Business Fluctuations and Forecasting. (5)
Three 1 1/2-hour lectures per week. Prerequisite: courses 100 and Statistics 2 or 20. Not open to students who have taken Economics 100B. Analysis of the operation of our enterprise system with emphasis on the factors responsible for economic instability; analysis of public and business policies which are necessary as a result of business fluctuations.

Mr. Goldner, Mr. Bailey, —— (Su, F, W, Sp)

102. Advanced Managerial Economics. (5)
Three 1 1/2-hour lectures per week. Prerequisite: courses 100 and 101. Advanced analysis of the theory and practice of decision making in business firms, utilizing the concepts and techniques of managerial economics.

(Sp)

103. Theory and Models of Economic Forecasting. (5)
Three 1 1/2-hour lectures per week. Prerequisite: courses 100 and 101. Theory and analysis of the long-run and short-run forecasts of business activity for the economy.

(W)

110. Legal Environment of Business. (5)
(Formerly numbered 118)
Three 1 1/2-hour lectures per week. An analysis of the law and the legal process, emphasizing the nature and functions of law, legal reasoning and the operation of law within the U.S. federal system, followed by a discussion of the legal problems pertaining to contracts and related topics, business associations, and the impact of law on economic enterprise.

Mr. Epstein, Mr. Kennedy, Mr. Sethi (Su, F, W, Sp)

111. Social and Political Environment of Business. (5)
Three 1 1/2-hour lectures per week. Prerequisite: senior standing. Study of the evolution of American business in the context of its changing political and social environment. Analysis of the origins of the American business creed, the concept of social responsibility of business, and the expanding role of the corporation.

Mr. Epstein, Mr. Kennedy, Mr. Sethi (Su, F, W, Sp)

114. Legal Aspects of Business Transactions. (5)
Three 1 1/2-hour lectures per week. Prerequisite: course 110. A review of the legal implication of certain common business transactions and situations, including problems arising in sales, installment buying, inventory financing, obtaining and extending credit, negotiable instruments, and insolvency, with emphasis on the Uniform Commercial Code.

Mr. M. Smith (W)

115. Legal Aspects of Real Estate. (5)
(Formerly numbered 106)
Three 1 1/2-hour lectures per week. Prerequisite: course 110; recommended, course 180. The law affecting ownership and use of real property; transfers, titles; development rights and the regulation thereof in the public interest.

(F)

117. Law, Government and Economic Enterprise. (5)
Three 1 1/2-hour lectures per week. An analysis of the impact of law upon American economic enter-prise and the role of government participation in the operation of our business community. Discussion of current problems in the fields of unfair competition, securities regulations, pricing and marketing, and taxation.

Mr. Conant (F, Sp)

120. Industrial Accounting. (3)
Three 1-hour lectures per week. Prerequisite: primarily for students in engineering departments. Not open to students enrolled in the Schools of Business Administration. Not open to students who have taken courses 1 and 2. Accounting and its uses in analyzing, planning, and controlling the operations of industrial enterprises.

The Staff (Mr. Anton in charge) (F, Sp)

120L. Industrial Accounting Laboratory. (1)
One 2-hour laboratory per week. Prerequisite: course 120 (may be taken concurrently). Laboratory exercises in industrial accounting. Supervised case studies or field trips.

The Staff (Mr. Anton in charge) (F, Sp)

121. Financial Accounting I. (5)
(Formerly numbered 121A)
Two 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: course 2. Required of those specializing in accounting. Theory of accounts and its application. Special emphasis on asset valuation and determination of periodic profit.

Mr. Cerf, Mr. Greenball, Mr. Staubus, —— (Su, F, W, Sp)

122. Financial Accounting II. (5)
(Formerly numbered 121B)
Two 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: course 121 with a grade not lower than C. Required of those specializing in accounting. Continuation of course 121. Accounting for the general business corporation. Discussion of funds flows and analysis of financial statements.

Mr. Cerf, Mr. Greenball, —— (Su, F, W, Sp)

123. Problems of Financial Reporting. (5)
(Formerly numbered 126)
Two 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: course 122. Consolidated statements, funds statements, index numbers in accounting, special problems.

Mr. Moonitz (F)

124. Cost Accounting. (5)
(Formerly numbered 122)
Two 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: course 2; course 121 is recommended. Principles of cost compilation and cost accounting techniques, including cost control devices and managerial use and analysis of cost accounting data; primary emphasis on industrial applications. Mr. Anton, Mr. Boutell (Su, F, W, Sp)

126. Auditing. (5)
(Formerly numbered 123)
Two 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: course 121. Completion of course 122 strongly recommended. Concepts and procedures for verification of financial records together with the ethical, legal, and other professional aspects of auditing.

Mr. Boutell, Mr. Vance, —— (Su, F, Sp)
127. Accounting Systems for Management
Information and Control. (5)
(Formerly numbered 124)
Two 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: courses 122 and 124. The study of accounting systems, including computer-oriented systems, with an emphasis on the information and control functions of the management decision-making process. Mr. Boutell (Su, W)

128. Income Taxation. (5)
Two 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: course 121 or consent of instructor. Determination of taxable income, sources of law, rates and returns, personal and corporation taxes and tax planning.
Mr. Cerf, Mr. M. Smith (F, W, Sp)

129. Field Study in Accounting. (5)
To be arranged. Prerequisite: course 122 or equivalent or consent of instructor. A planned program of exposure to actual accounting practice designed to broaden students' perspective of the concepts and theory of accounting. Assignment to specific corporations, CPA firms, or government agencies for orientation and work experience. Research report based on the field study required.
The Staff (Mr. Vance in charge) (Su, F, W, Sp)

130. Financial Management. (5)
(Formerly numbered 131)
Three 1½-hour lectures per week. Prerequisite: course 2 and 100. Analysis and management of the flow of funds through an enterprise. Cash management, source and application of funds, term loans, types and sources of long term capital. Introduction to the supply of investment funds and the organization of capital markets.
Mr. Carter (Su, F, W, Sp)

133. Investments. (5)
Three 1½-hour lectures per week. Prerequisite: course 130 or by permission of instructor. Sources and demand for investment capital, operations of security markets, determination of investment policy, and procedures for analysis of securities.

137. Economics of Insurance. (5)
Three 1½-hour lectures per week. An introduction to the underlying principles of insurance, followed by a descriptive and analytical study of the practices in the more important branches of the insurance business. Mr. Goshay, Mr. Holland (F, W, Sp)

138. Contemporary Problems of Insurance. (5)
Three 1½-hour lectures per week. Prerequisite: course 137. Selected topics of current interest in insurance: specialized topics in life insurance, corporate risk management, and social insurance.
Mr. Holland (W)

140. Introduction to Production Management. (5)
Two 1½-hour lectures and one 1-hour laboratory per week. Management problems related to the specification and control of standards with respect to products, processes, equipment, and jobs; elementary models for scheduling, maintenance, and inventory control procedures; relation of these problems to motivation, incentives, and cost control.
Mr. Rogers (Su, F, W, Sp)

141. Planning of Production Facilities. (5)
Two 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: course 140. Economic aspects of the design and establishment of industrial facilities. Special problems of equipment selection and replacement; plant location, scale of operations and layouts, line-balancing and waiting line analysis, systems for maintenance and reliability; applications of linear programming to production planning; materials-handling and other ancillary systems.

142. Production Control Systems. (5)
Two 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: course 140. Development and operation of systems for production control, with special emphasis upon comprehensive problems: inventory management under uncertain demand conditions; special problems of scheduling operations in job shops planning activities in uncertain seasonal and other demand fluctuations; use of CPM, PERT and simulations; distribution analysis and quality control.

150. Organizational Behavior. (5)
Four class hours per week. A general descriptive and analytical study of organizations from the behavioral science point of view. Problems of motivation, leadership, morale, social structure, group networks, communications, hierarchy and control in complex organizations. The interaction between technology and human behavior. Discussion of alternate theoretical models.
Mr. Miles, Mr. Malm, Mr. Matthews, Mr. Strauss (Su, F, W, Sp)

151. Management of Human Resources. (5)
Four hour lectures per week. Prerequisite: course 150 or permission of the instructor. The designs of systems of rewards, assessment, and manpower development. The interaction of selection, placement, training, personnel evaluation, and career ladders within an on-going organization. Role of the staff manager. Introduction of change. Implications of behavioral research for management problems and policies.
Mr. Strauss (F, W, Sp)

152. Collective Bargaining Systems. (5)
Four class hours per week. Prerequisite: course 154 or Economics 150. The nature, institutions and processes of collective bargaining. Analysis of labor-management issues and their economic and political significance. Comparative analyses of industrial relations systems in major industries and in other countries.
Mr. Kennedy (W)

153. Labor Law. (5)
Four class hours per week. Prerequisite: course 154 or Economics 150. A study of federal and state laws and court decisions affecting hours, wages, strikes, boycotts, picketing, union recognition and operation, legality of collective agreements, etc.
Mr. Davison (Su, W)

154. Industrial Relations. (5)
(Formerly numbered 150)
Four class hours per week. Students will not receive credit for both Economics 150 and course 154. An analysis of manual, white collar and professional employee relations: Background and functioning of employee and employer organizations. Wage and manpower policy issues. Collective bargaining, income security and other problems of public policy.
Mr. Strauss (Su, F, W, Sp)

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* Not to be given, 1968-69.
160. Marketing. (5) Three 1 1/2-hour lectures per week. The evolution of markets and marketing; market structure, organization and behavior; marketing functions; pricing and price policy; marketing cost and efficiency; public and private regulation. Mr. Dickinson
Mr. Bucklin, Mr. Rothberg (Su, F, W, Sp)

161. Industrial Procurement. (5) (Formerly numbered 145) Three 1 1/2-hour lectures per week. Prerequisite: course 160 or 160G. The interaction of buyer and seller in a non-ultimate consumer environment. The problems met in purchasing by industrial organizations and governments; major buying policies; vendor selection; quantity and quality determination; and relation of buying price, production cost, and selling price.
Mr. Dickinson (W)

162. Retailing. (5) Three 1 1/2-hour lectures per week. Prerequisite: course 160 or 160G. History and development of retail management types; geographical structure of retail trade, assortments of goods and services; store management; government regulations.
Mr. Dickinson (F, Sp)

163. Advertising. (5) Three 1 1/2-hour lectures per week. Prerequisite: course 160. Basic concepts and functions of advertising in the economy; consumer motivation; problems in utilizing advertising and measuring its effectiveness.
Mr. Myers, Mr. Hoggatt (F, W)

165. Marketing Management. (5) Three 1 1/2-hour lectures per week. Prerequisite: course 160. Analysis of marketing functions primarily in manufacturing firms including product selection, pricing and sales administration; development of marketing organization within the firm.
Mr. Carman (Su, W, Sp)

166. Wholesaling. (5) Three 1 1/2-hour lectures per week. Prerequisite: course 160. The meaning and importance of wholesaling; its place in the marketing structure; functions of wholesaling; the agency structure of wholesaling; internal managerial aspects; government regulations; trends and costs, profits, and efficiency.
Mr. Revzan (F)

169. Marketing Policies and Problems. (5) Three 1 1/2-hour lectures per week. Prerequisite: Senior standing with Marketing as a field of emphasis. Analysis of special topics in marketing including geographical market structures, price policy, agricultural marketing and other topics. Course may be repeated for credit. Mr. Preston, Mr. Revzan (W, Sp)

170. Physical Distribution and Transportation Management. (5) Three 1 1/2-hour lectures per week. Problems in transportation of persons and physical distribution of goods. Provision of transportation facilities by government and transportation services by professional and private carriers. Analysis of governmental subsidies and regulations.
— (W)

174. Contemporary Problems in Transportation. (5) (Formerly numbered 179) Three 1 1/2-hour lectures per week. Selected topics of current interest in transportation: new developments in transportation legislation and policy; the shifting demand for transportation; innovation in analysis and technology; urban transport problems.

175A–175B. Survey of Operations Research. (5-5) Four hours per week. Prerequisite: Mathematics 16A–16B, Statistics 16 or equivalent; courses 107G and 108G or equivalent for graduate students. 175A prerequisite to 175B. Topics as in 175A–175B treated at a somewhat lower mathematical level. Credit will not be given for both 175A–175B and 176A–176B.
Mr. Koenigsberg (F, Sp)

176A–176B. Introduction to Operations Research. (5-5) (Formerly numbered 175–176) Four hours per week. Prerequisite: Mathematics 11A–11B, 12A–12B or equivalent; Mathematics 11C or 111 or equivalent; or consent of the instructor. 176A and Statistics 134 prerequisite to 176B. Introduction to the analytic techniques and models of operations research and management science with applications to business problems. Linear programming: computational aspects and economic interpretation of solutions. Deterministic dynamic programming. Credit will not be given for both 176A–176B and 175A–175B.
Mr. Zangwill, Mr. Saigal (F, Sp)

177. Computers and Modern Organizations: Theory and Application. (5) Two 2-hour meetings per week. Prerequisite: A course in programming or familiarity with one computer language. A survey course concerned with the importance of computers in organizations including small groups, universities, firms, government and society at large. Topics include history of development of computers, characterization of scientific versus business problems, information storage and retrieval, compilers, problem-oriented languages, simulation models, current developments in computer systems.
Mr. Hoggatt (F)

180. Introduction to Real Estate and Urban Land Economics. (5) Three 1 1/2-hour lectures per week. The nature of real property; market analysis; construction, cycles; mortgage lending; equity investment; real estate administration; metropolitan growth; urban land utilization; real property valuation; public policies.
Mr. Goldner, Mr. Smith, Mr. Schaaf (Su, F, W, Sp)

181. Valuation of Real Property. (5) Three 1 1/2-hour lectures per week. Prerequisite: course 180. Critical examination of appraisal concepts and methods; the role of value estimates in private land-use and real estate investment decisions and in the implementation of public policies affecting urban development.
Mr. W. Smith (Sp)

183. The Management of Real Estate Resources. (5) Three 1 1/2-hour lectures per week. Prerequisite: course 180. Real estate debt and equity financing; mortgage market structure; effects of credit on demand; equity investment criteria; locational decisions; public policies in real estate finance and urban development.
Mr. Schaaf (W)
185. Introduction to International Business. (5)
Four and one-half hours per week. Prerequisite: Economics 190A or equivalent and senior standing. A survey involving environmental, economic, political, and social constraints on doing business abroad; effects of overseas business investments on domestic and foreign economies; foreign market analysis and operational strategy of a firm; management problems and development potential of international operations.
Mr. Sethi (Su, F, W)

190. Introduction to Organization and Decision. (5)
Two 1½-hour lectures and one 1½-hour laboratory per week. Normative models of rational behavior under uncertainty; games and the analysis of conflict in organizations; computer simulation of organizational behavior; approaches to organization design.
Mr. Harsanyi, Mr. Marschak, Mr. Hoggatt, Mr. McGuire (Su, F, W, Sp)

198A—198B—198C—198D. Directed Group Study. (1–5)
The Staff (Mr. Boutell in charge) (Su, F, W, Sp)

199A—199B—199C—199D. Special Study for Advanced Undergraduates. (1–5)
The Staff (Mr. Boutell in charge) (Su, F, W, Sp)

First-Year Courses for Graduate Students

*100G. Quantitative Methods and Their Use in Business Operation. (8)
Ten hours of class meeting per week. The development of statistical data and its use in managing a business enterprise; the economic theory of the firm and the place and use of quantitative methods in applying theory to business operations; the relation between the individual firm and the economy as a whole.

101G. Economic Analysis for Business Decisions I. (4)
Four hours of class meeting per week. Economic analysis applicable to the problems of business and operation of our enterprise system; the determination of prices, input and outputs; effects of the state of the competitive environment on business policies.
Mr. Alhadeff, Mr. Pye (Su, F, W, Sp)

102G. Economic Analysis for Business Decisions II. (4)
Three hours of class meeting per week. Prerequisite: course 101G. Factors responsible for economic instability; analysis of public and business policies resulting from business fluctuations.
Mr. Doyle, Mr. Alhadeff, Mr. Bailey (Su, F, W, Sp)

107G. Quantitative Analysis For Business Decisions I. (4)
Three 1½-hour lectures per week. Uses of formal models, models of the decision problem, rational choice under uncertainty, linear and nonlinear programming, multistage problems.
Mr. Sándor, Mr. Roberts (Su, F, W, Sp)

108G. Quantitative Analysis For Business Decisions II. (4)
Three 1½-hour lectures per week. Prerequisite: course 107G. Continuation of course 107G. The application of statistical methods in managerial and business problems.
Mr. Carman, Mr. Sándor, Mr. Roberts (W, Sp)

111G. Legal, Political and Social Environment of Business. (4)
Three 1-hour lectures per week. A study of basic ideas, concepts, attitudes, roles and institutions in our society that characterize the legal, political and social framework within which the business system operates.
Mr. Conant, Mr. Epstein, Mr. Votaw (Su, F, W, Sp)

120G. Accounting I. (4)
Four hours of lecture per week. Prerequisite: open only to students enrolled in the Graduate School of Business Administration. The measurement and recording of financial events. The reporting and analysis of these events.
Mr. Greenball, Mr. Staubs (Su, F, W, Sp)

121G. Accounting II. (4)
Three hours of lecture per week. Prerequisite: course 120G or the equivalent. Open only to students enrolled in the Graduate School of Business Administration. The measurement and recording of cost data. Financial planning.
Mr. Greenball, Mr. Staubs, Mr. Vatter (Su, F, W)

122G. Financial Accounting. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 121G or equivalent. Not open to students who have taken course 122. Intensive study of the theory of the accounts and its application; valuation of assets and liabilities, income determination, selected problems and readings in various phases of accounting; financial accounting problems of corporations.
Mr. Cerf (Sp)

130G. Financial Policies of Business. (4)
Ten 1-hour meetings per week. Prerequisite: course 121G or equivalent. Business finance, with emphasis upon financial problems and policies of corporations; the role of commercial banks, institutional and other investors in supplying funds for corporations.
Mr. Fitch (Su, F, W, Sp)

140G. Production Organization and Management. (4)
Two 1-hour lectures and one 1½-hour laboratory per week. Prerequisite: graduate status or consent of instructor. Managerial organization and its application to the production area. Use of analytical and quantitative methods to deal with managerial problems related to the design and standardization of products, processes and jobs. Models to establish and control the efficiency of operations, including programming, scheduling, purchase and handling of materials, selection and maintenance of equipment, and cost control.
Mr. Rogers (Su, F, W, Sp)

150G. Organizational Behavior. (4)
Three 1-hour lectures per week. A general descriptive and analytical study of organizations from the behavioral science point of view. Problems of motivation, leadership, morale, social structure, group networks, communications, hierarchy and control in complex organizations. The interaction between technology and human behavior. Discussion of alternate theoretical models.
Mr. Strauss (Su, F, W, Sp)

* Not to be given, 1968–69.
of the theory and practice of cost analysis, cost control and cost determination. The application of mathematical and statistical analysis to cost problems.—— Mr. Vatter, ——— (F, P)

225. Seminar in Controllership II. (4)
(Formerly numbered 223B)
Two 1 1/2-hour sessions per week. *Prerequisite: course 224 or consent of instructor. The nature and scope of controllership as related to organization, policy, planning, and control. Attention is given to various aspects of financial controls which serve to implement managerial objectives including budgeting, capital expenditure control, and computerized management control systems. ——— Mr. Vatter (W)

226. Auditing Practice and Problems I. (4)
(Formerly numbered 223A)
Two 1 1/2-hour sessions per week. *Prerequisite: course 126 or equivalent. Historical background of the auditing function; development of auditing standards; application of statistical sampling theory to auditing. ——— Mr. Wheeler (W)

227. Auditing Practice and Problems II. (4)
(Formerly numbered 223B)
Two 1 1/2-hour sessions per week. *Prerequisite: course 226. Seminar in current professional problems in auditing; student research. ——— Mr. Vance (Sp)

228. Seminar in Income Taxation. (4)
(Formerly numbered 228A—228B)
Two 1 1/2-hour sessions per week. *Prerequisite: course 128 or equivalent. Professional study of tax accounting practice, corporation tax problems, and administrative procedure. ——— Mr. M. Smith (F, Sp)

(Formerly numbered 234)
Three hours of meetings per week. *Prerequisite: course 130G or equivalent. Financial policies of the firm, working capital management, fixed asset investment, capital budgeting, cost of capital determination, capital structure, dividend policy and taxation, aspects of financial decision and merger problems. ——— Mr. Peterson (Su, F, W, Sp)

232. Money Markets and Financial Institutions. (4)
Three hours of meetings per week. Structure and operations of the Federal Reserve System commercial bank and nonbank financial institutions. Impact of monetary policy and of public regulation. Portfolio composition and market behavior of financial intermediaries. Organization and functions of money markets. The structure of yields on financial assets and the influence of financial intermediaries and monetary policy. ——— Mr. Fitch, Mr. Alhadeff, Mr. Einzig (Su, F, W)

233. Securities Markets and Investment Policies. (4)
Three hours of meetings per week. Structure and operation of securities markets. Relationships between security prices, business cycles, and money market developments. Consideration of individual and institutional investment policies and principles of security analysis. ——— Mr. Babcock, Mr. Fitch, Mr. Carter, ——— Mr. Wendt (Su, W, Sp)

* Not to be offered, 1968-69.
234. Seminar in Business Finance. (4)
Three hours of meetings per week. Prerequisite: course 230 and consent of instructor.
Mr. Peterson, (W, Sp)

235. Seminar in Financial Intermediaries and Money and Capital Markets. (4)
Three hours of meetings per week. Prerequisite: course 232 or permission of instructor.
Mr. Eye (W, Sp)

236. Seminar in Investments. (4)
Three hours of meetings per week. Prerequisite: course 233.
Mr. Wendt, Mr. Babcock, (W, Sp)

237. Risk and Insurance. (4)
Three hours of meetings per week. Prerequisite: course 137 or equivalent; permission of instructor.
This course provides an overview of the historical, economic, mathematical-actuarial, social, and managerial foundations of the risk insurance field.
Mr. Goshay (W)

238. Facilities Planning and Production Control. (4)
Two 1/2-hour meetings and one 1-hour laboratory per week. Prerequisite: course 140G or equivalent.
Design of production systems, plant location, size and layout decisions, equipment decisions, line balancing models, waiting line applications to production planning problems. Operation of production systems—scheduling of materials, manpower and machines into, through, and out of the production facility.
Mr. Goshay (Sp)

242. Production Programming. (4)
Two 2-hour sessions per week. Prerequisite: course 241 or consent of the instructor. Programming methods and their application to production management areas of process selection, output determination, facilities design, project planning, and scheduling of operations. While primary emphasis is placed upon analysis of deterministic linear systems, problem solving approaches for less restricted cases are also considered.
Mr. Rogers (W)

243. Analysis for Production Management. (4)
Two 2-hour sessions per week. Prerequisite: consent of instructor. Students are expected to have some demonstrated competence in mathematical and statistical analysis. Examination of the nature and content of methods of quantitative analysis employed in production management decision making. Probabilistic models and statistical methods are developed for designing inventory systems, executing "statistical" quality control plans, choosing among equipment alternatives, organizing service, maintenance operations, etc.
Mr. Rogers (Sp)

248. Seminar in Production Management. (4)
Two 2-hour sessions per week. Prerequisite: two courses (140G and one other) and consent of instructor. Selected topics from production theory; application of quantitative methods to current production problems. Integration of production planning within the overall objectives of the firm; problems of formulating and executing production policy decisions. Students will work individually or in teams, to prepare case studies which apply production theory to current problems in local industry.
Mr. Richartz (Sp)

255. Seminar in Manpower Economics and Labor Markets. (4)
(Formerly numbered 255A)
Three hours of class per week. Prerequisite: two industrial relations courses and consent of instructor. Manpower and labor market economics. Dynamics of the labor force, manpower policies, employment and unemployment. Analysis of wage and salary determination and labor market behavior of occupational groups; production and clerical workers, managerial and professional workers. Problems of wage and income policies of the firm, union and the national economy.
Mr. Garbarino (F)

256. Seminar in Collective Bargaining. (4)
Three hours per week. Prerequisite: course 152 or the equivalent. Open to a limited number of senior students with consent of instructor. Studies of the bargaining process; the legal and factual basis of collective bargaining; the provisions of collective agreements; administration of agreements; including negotiation and arbitration of grievances; processes of disputes settlement; influence of the larger environment.
Mr. Kennedy (Sp)

257. Seminar in Human Behavior in Organizations. (4)
Three hours of class per week. The study of the management and development of human resources. Study and discussion of research findings relating the effective utilization of individuals and work groups in a wide variety of organizations. Deals with questions relating to employee selection, motivation, morale, leadership, development, and compensation.
Mr. Miles (F, W)

(Formerly numbered 255B)
Three hours of class per week. Labor-management relations in modern industrial society. Goals and objectives of enterprises and unions. Contemporary issues in collective bargaining and governmental regulation. Relations between labor, industry and government in Western Europe, Asia and developing countries.
Mr. Myers, Mr. Nicosia (Su, F, W)

260. Marketing Analysis and Management I. (4)
Three hours of meetings per week. Prerequisite: course 160G or equivalent. Concepts of marketing strategy and planning; macro and micro demand analysis; location problems; buying processes of household and industrial consumer; promotion management, including advertising and personal selling.
Mr. Myers, Mr. Nicosia (Su, F, W)

261. Marketing Analysis and Management II. (4)
Three hours of meetings per week. Prerequisite: course 160G or equivalent. Product and price policies; management of the marketing organization; sales management, control and analysis; integration of the marketing program.
Mr. Bucklin (W, Sp)

262. Retailing Policies and Problems. (4)
Three hours of meetings per week. Prerequisite: course 160 or 160G, 162, or equivalent. Case studies of executive determination of organizational structure; nature and scope of policies; merchandising policies; advertising and sales promotion; personnel management; operating policies; accounting and control policies; and general management problems. Study of the nature of competition at the retail level.
Mr. Dickinson (W)
264. Communication Processes in Marketing. (4)
Three hours of meetings per week. Prerequisite: course 160C or 260 or equivalent, or consent of instructor. Behavior of household and organizational buyers; communications research; systemic analysis of mass behavior and communication processes.
Mr. Nicosia (Su, F, W)

266. Marketing Organization. (4)
Three hours of meetings per week. Prerequisite: three quarter courses in marketing or consent of instructor. Meanings and evolutionary aspects of marketing organization; marketing organization at the wholesale and retail levels and of the marketing channel; spatial aspects; general marketing strategy at each level and throughout the channel; specializations and integration of marketing organization; problems of "orderly" marketing. Mr. Revzan (Sp)

268. Marketing Research. (4)
Three hours of meetings per week. Prerequisite: course 108G, or equivalent. Nature and significance of marketing research; development of marketing research methods; investigation and analysis of specific marketing research problems, including class research projects, the presentation of research results; evaluation of the effectiveness of marketing research.
Mr. Nicosia (Su, F, W)

269. Seminar in Marketing. (4)
Three hours of meetings per week. May be repeated for credit. Prerequisite: open to M.B.A. candidates with a minimum of three quarter courses in marketing; other candidates with the express consent of instructor. Seminar treatment of selected topics in marketing including review of the marketing literature; marketing organization; marketing functions; prices and price policies; area structure; cost and efficiency; public and private regulation.
Mr. Nicosia, Mr. Grether, Mr. Revzan (Su, F, W, Sp)

270. Transportation Management. (4)
Three hours of class per week. Problems in the management of transportation undertakings. Cost analysis and rate structure. Promotion and restriction by governmental agencies.
Mr. Carter (Su)

274. Seminar in Transportation. (4)
(Formerly numbered 279)
Three hours of class per week. Mr. Carter (Sp)

275. Seminar in Operations Research. (4)
Two 2-hour meetings per week. Prerequisite: courses 277A-277B-277C. May be taken concurrently with course 277C in some cases. Applications and more detailed treatment of topics covered in 277A-277B-277C. Instructor and student interest will determine topics and applications treated. A research paper will be prepared by the students, dealing with an application of the techniques learned to a concrete problem.
Mr. Churchman, Mr. Saigal (Sp)

276. Philosophy of Management Science. (4)
This seminar is essentially a study of models for measuring the values of objectives and a critical discussion of the problems involved. An emphasis is placed on the basic philosophical issues involved in the evaluation of system performance.
Mr. Churchman (F)

277A–277B–277C. Topics in Operations Research. (4-4-4)
277A (formerly numbered 277). Three hours per week. Prerequisite: course 176A–176B or equivalent. Inventory theory, including optimality of (S, s) policies. Stochastic dynamic programming: general results and applications.
Mr. Zangwill, Mr. Saigal (F, W)

277B (formerly numbered 278). Three hours per week. Prerequisite: course 277A. Continuation of course 277A. Topics in queuing theory, renewal theory, and Markov processes: general results and applications to decision problems.
Mr. Zangwill, Mr. Saigal (F, W)

277C. Three hours per week. Prerequisite: course 277B or consent of instructor. Continuation of course 277B. Advanced topics in programming, including decomposition algorithms, generalized linear programming, stochastic programming, branch and bound techniques. Topics in graph theory. Applications.
Mr. Zangwill, Mr. Saigal (W, Sp)

278A–278B. Economic Models for Organization Design. (4-4)
Three hours per week each course. Prerequisite: course 293, Economics 202A–202B, Statistics 134 or consent of instructor. 278A prerequisite to 278B. Problems in the design and comparison of economic systems. Adjustment processes in economics and in teams. The technology of information required in economic systems; models of computation, communication, search and memory. Lectures and discussion of student research on suggested problems.
Mr. Marschak, Mr. McGuire (F, W)

278C. Economic Models for Organization Design. (4-4)
Three hours per week each course. Prerequisite: consent of instructor. 278A prerequisite to 278B. Continuation of 278A. Advanced topics in programming, including decomposition algorithms, generalized linear programming, stochastic programming, branch and bound techniques. Topics in graph theory. Applications.
Mr. Zangwill, Mr. Saigal (W, Sp)

280. Real Estate and Urban Land Economics. (4)
Two 1 1/2-hour meetings per week. Intensive review of literature in the theory of land utilization, urban growth and real estate market behavior; property rights and valuation; residential and non-residential markets; construction, debt and equity financing; public controls and policies.
Mr. Schaar, Mr. W. Smith (Su, F, W)

Three hours per week. Prerequisite: course 280 or consent of the instructor. Urban development and the national economy; the interaction of business institutions and public agencies in the performance of urban functions; determinants of land-use patterns; economic aspects of property rights; unmet housing needs.
Mr. W. Smith (W)

284. Seminar in Real Estate and Urban Land Economics. (4)
(Formerly numbered 289)
Two 1 1/2-hour meetings per week. Prerequisite: course 280 or consent of the instructor. Analysis of selected problems and special studies; cases in residential and non-residential development and financing, urban redevelopment, real estate taxation, mortgage market developments, equity investment, valuation, and zoning.
Mr. Wendt (W, Sp)

(Formerly numbered 261A)
Two 2-hour meetings per week. Prerequisite: Economics 190A, or equivalent. Tools of international economic theory applicable to problems of international business; commercial and financial policies for the multinational firm in industrial and developing countries.
268. Theory and Policy in International Business II. (4)
(Formerly numbered 281B) Two 2-hour meetings per week. Prerequisite: course 285 or equivalent. Internal operation of the multinational firm; supplemented by case studies, designed to develop problem-solving skills, taking into account the different business environments, as well as to identify analytical problems such as location for multinational firms, etc. Mr. McGuire, Mr. Marschak. (Su, W)

287. International Financial Management. (4) Two 2-hour meetings per week. Prerequisite: course 232 or equivalent. Financial aspects of establishing and managing operations abroad including the international monetary system and its operation; foreign exchange markets; sources of funds, domestic and foreign; taxation and financial control problems; and case studies. Mr. Holton (W, Sp)

289. Seminar in International Business. (4) (Formerly numbered 286) Two 1½-hour meetings per week. Prerequisite: course 286 or consent of the instructor. Seminar techniques will be applied to some of the following topics: International cartel arrangements and commodity agreements: stabilization and factor movement effects, and market structures. Comparative studies of regionalized world markets; characteristics of organization, the state of development of their economies and political and social institutions, and the effects of international business. Mr. Holton. (Su, W, Sp)

290. Organization and Decision. (4) Three-hour lecture and 1½-hour laboratory per week. Prerequisite: primarily for students at the master's level. Problems in the design of organizations, mainly based on normative models of rational individual behavior under uncertainty. Games and the study of conflict in organizations. Relevance of experimentation and computer simulation to organization design. Mr. Marschak, Mr. Harsanyi (Su, F, W, Sp)

291. Seminar in Organization Theory I. (4) One 2-hour meeting per week. Restricted to Ph.D. students. An extensive analysis of the development and antecedents of organization theory, including a thorough review of the literature in the field and an introduction to the basic aspects of individual behavior, decision theory, communications, small group analysis, and complex organizations. Mr. Wheeler. (F)

292. Seminar in Organization Theory II. (4) One 2-hour meeting per week. Prerequisite: course 291. Restricted to Ph.D. students. The critical analysis of models and research in individual behavior, small group studies and the sociology of complex organizations. Specific emphasis will be placed on the decision and implementation of experimental and descriptive studies of organization. Mr. Strauss. (W)

293. Seminar in Organization Theory III. (4) One 2-hour meeting per week. Prerequisite: course 291 and Mathematics 290A-290B or equivalent. Restricted to Ph.D. students. The formulation of normative models of individual and group decision-making under conditions of risk and uncertainty. The development of normative and descriptive models of organizations. Mr. McGuire, Mr. Marschak. (Sp)

294. Seminar in Business Policy. (4) (Formerly numbered 291) Fifteen 2-hour meetings per quarter. A study of business problems and the formulation of policies to meet these problems from the viewpoint of a top-management executive committee. The objective is to develop skill in the formulation of policy in particular functions and for enterprises as a whole. Mr. Jastram (F, Sp)

295. Business Research Methods. (4) (Formerly numbered 297) Two 1½-hour meetings per week. Meaning of research and scientific methods. Forms of scientific method applicable to business research. Types of business research problems, and available types of materials. Actual research procedure, and application by student to his Business Administration research project. Mr. Jastram (Su, F, W, Sp)

296. Special Topics in Business Administration. (4) (Formerly numbered 298) Two 2-hour meetings per week. Prerequisite: graduate standing. Advanced study in various fields of business administration. Topics will vary from year to year and will be announced at the beginning of each quarter. The Staff (Su, F, W, Sp)

298. Seminar in Business Administration. (4) Hours to be arranged. Prerequisite: admission to the Ph.D. program in business administration and permission of instructor. An analysis of important issues in the respective subject areas. Intensive work in preparing and presenting the results of these analyses, with special attention to methods of inquiry applicable to the various subject areas for Ph.D. specialization. The Staff (Su, F, W, Sp)

299. Individual Research in Business Problems. (1-6) The Staff (Mr. Vance in charge) (Su, F, W, Sp)

601. Individual Study for Master's Students. (1-8) Individual study for the comprehensive or language requirements in conjunction with a minor field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mr. Vance in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Candidates. (1-8) Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. and other doctoral degrees. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mr. Garbarino in charge) (Su, F, W, Sp)

IDS 175. A Nontechnical Introduction to Operations Research. (4) (See Interdepartmental Studies for the complete description of this course)
CELL PHYSIOLOGY

(Department Office, 251 Hilgard Hall)

Daniel I. Arnon, Ph.D., Professor of Cell Physiology (Chairman of the Department).

Bob B. Buchanan, Ph.D., Lecturer in Cell Physiology.

Ulrich Gehring, Ph.D., Lecturer in Cell Physiology.

Graduate Adviser: Mr. Arnon.

The Department of Cell Physiology, in the College of Agricultural Sciences, offers no undergraduate instruction, but provides facilities and accepts graduate students for research leading to the M.S. and Ph.D. degrees in three graduate curricula: biophysics, comparative biochemistry, and plant physiology. For further details, consult the graduate adviser.

Graduate Courses

199. Research. (1–12)

Prerequisite: consent of the instructor.

Mr. Arnon, Mr. Buchanan, Mr. Gehring (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

Mr. Arnon, Mr. Buchanan, Mr. Gehring (Su, F, W, Sp)

CHEMICAL ENGINEERING

(Department Office, 201 Gilman Hall)

LeRoy A. Bromley, Ph.D., Professor of Chemical Engineering.

Donald N. Hanson, Ph.D., Professor of Chemical Engineering.

David N. Lyon, Ph.D., Professor of Chemical Engineering.

Eugene E. Petersen, Ph.D., Professor of Chemical Engineering.

Robert L. Pigford, Ph.D., Professor of Chemical Engineering.

John M. Prausnitz, Ph.D., Professor of Chemical Engineering.

Charles W. Tobias, Ph.D., Professor of Chemical Engineering (Chairman of the Department).

Theodore Vermeulen, Ph.D., Professor of Chemical Engineering.

Charles R. Wilke, Ph.D., Professor of Chemical Engineering.

Alan S. Foss, Ph.D., Associate Professor of Chemical Engineering (Vice-Chairman of the Department).

Simon L. Goren, D.Eng., Associate Professor of Chemical Engineering.

Edward A. Grens, Ph.D., Associate Professor of Chemical Engineering.

C. Judson King, Sc.D., Associate Professor of Chemical Engineering (Vice-Chairman of the Department).

John S. Newman, Ph.D., Associate Professor of Chemical Engineering.

Michael C. Williams, Ph.D., Associate Professor of Chemical Engineering.

Alexis T. Bell, Sc.D., Assistant Professor of Chemical Engineering.

Robert P. Merrill, Sc.D., Assistant Professor of Chemical Engineering.

E. Morse Blue, M.S., Lecturer in Chemical Engineering.

Gerhard Klein, M.S., Lecturer in Chemical Engineering.

Scott Lynn, Ph.D., Acting Professor of Chemical Engineering.
The College of Chemistry offers a major in chemical engineering leading to the B.S. degree. The program equips the student for professional work in development, design, and operation of chemical processes and of process equipment. It prepares him for employment in the organic chemical, petroleum, inorganic chemical, electrochemical, biochemical, nuclear, aerospace, or related industries. Students with high scholastic attainment are well prepared to enter graduate programs leading to advanced degrees in chemical engineering or in related scientific and engineering fields. The curriculum is accredited by the American Institute of Chemical Engineers.

High School Preparation
High school students should prepare for college courses in mathematics, chemistry, and physics by completing—as a part of, or in addition to, the courses normally offered for admission to the University—four years of high school mathematics, including intermediate algebra, trigonometry, and analytic geometry, a year of chemistry, and a year of physics.

Chemical Engineering Major

Satisfaction of the American History and Institutions requirement (see page 30), Twenty-seven units in the humanities and social sciences, chosen from a list provided by the College of Chemistry. One course from English 1A, Speech 1A, Comparative Literature 1A, or Dramatic Arts 1A (with a grade of C— or better), at least one course in a social science, and at least one course in fine arts, literature, or philosophy must be included.

Honors Program
A junior or senior honor student (one who has a B average or better overall) has special privileges. With approval of the Dean of the College he may:

1. Receive course credit for nonlaboratory courses on a credit-by-examination basis.
2. Take Chemical Engineering 199H, Research for Advanced Undergraduates, in which he may engage in research under the direction of a faculty member. Research fields presently under investigation include phase equilibria, cryogenics, catalysis and reactor design, electrochemical processes, interfacial phenomena, heat and mass transfer, dynamics and control, optimization, hydrodynamics, biochemical processes, and many others.

At the discretion of the Committee on Honors of the college the student may be awarded honors at graduation and this award designated in his diploma: The B.S. with Honors or Highest Honors. Students will not ordinarily be recommended for such awards unless they have engaged in undergraduate research or other advanced work approved by the Committee on Honors.
Graduate Study

Students interested in graduate study are invited to write to the Department of Chemical Engineering for information.

Upper Division Courses

Stated prerequisites for each course indicate the desirable background level. Students majoring in other engineering or physical science fields should consult the instructor to determine whether they have acquired sufficient preparation.

140. Introduction to Chemical Engineering. (3)

Two 1-hour lectures and one 1-hour discussion per week. Prerequisite: Chemistry 14 (which may be taken concurrently). The student is advised to attend computer center programming sessions. Material and energy balances. Properties of gases, liquids, solids, and solutions useful in solving industrial problems. Use of thermodynamic concepts. Numerical and graphical calculations.

Mr. Hansen (Su); Mr. Pigford (F); Mr. Bromley (W); Mr. Hansen (Sp)

141A–141B. Chemical Engineering Thermodynamics. (4-4)

Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: course 140 with a grade of C or higher, Chemistry 14. Sequence beginning (F, W)

141A. Thermodynamic principles with applications to flow problems, phase behavior of pure substances, power cycles, refrigeration and gas liquefaction. Calculation of thermodynamic properties of fluids. Mr. Petersen (F); Mr. Fraunzitz (W)

141B. Prerequisite: course 141A. Thermodynamics of multicomponent systems. Phase equilibria for mixtures. Chemical equilibria for homogeneous and heterogeneous systems. Estimation methods for thermodynamic properties.

Mr. Redlich (W, Sp)

142. Chemical Kinetics of Industrial Processes. (4)

Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: course 141B or Chemistry 114H, Chemistry 110B, Chemistry 112E. Analysis and prediction of rates of chemical conversion in pure and non-flow processes, including catalytic systems.

Mr. Merrill (F); Mr. Petersen (Sp)

145. Industrial Kinetics Laboratory. (3)

Three 3-hour laboratories (including one 1-hour lecture period) per week. Prerequisite: course 142 with a grade of C or higher, course 150A, or consent of instructor. Planning and conducting of bench-scale experiments relating chemical engineering to processing conditions.

Mr. Vermeulen (Sp)

146. Principles of Electrochemical Processes. (3)

Three 1-hour lectures per week. Prerequisite: courses 141B, 150B or consent of instructor. Principles and application of electrochemical equilibrium, kinetics, and transport processes. Technical electrolysis and electrochemical energy conversion.

Mr. Tobias (F)

150A–150B. Chemical Engineering Unit Operations. (4-4)

Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: course 140 with a grade of C or higher, Chemistry 14, or consent of instructor. Sequence beginning in the winter and spring.

150A. Elementary fluid mechanics, heat transfer, and mass transfer, and their application to chemical engineering problems.

Mr. Bell (W); Mr. Lyon (Sp)

150B. Application of mass transfer to separation processes. Design principles for equilibrium stage and counter-current differential contacting operations including gas absorption distillation, and solvent extraction. Mr. Bromley (F); Mr. Bell (Sp)

151A–151B. Unit Operations Laboratory. (4-4)

Four 3-hour laboratories per week. Prerequisite: course 150A, Chemistry 111A, English 1A or Speech 1A (or Speech 40) with grade of C or higher. Sequence beginning each quarter.

151A. Experiments in fluid mechanics, heat transfer, and mass transfer. Emphasis on investigation of basic relationships important in engineering. Experimental design, analysis of results, and preparation of engineering reports are stressed.

(Su); Mr. Hanson, Mr. Lynn, Mr. Lyon, Mr. Bell (F); Mr. Green, Mr. Hanson, Mr. Petersen (W); Mr. Bromley, Mr. Merrill, Mr. Williams (Sp)

151B. Prerequisite: course 150B. Experiments in mass transfer, simultaneous heat and mass transfer, vaporization and condensation, and separation techniques.

(141A-141B, 150A, 150B) with grade of C or higher.

Mr. Hanson, Mr. Lynn, Mr. Lyon, Mr. Bell (F); Mr. Green, Mr. Hanson, Mr. Petersen (W); Mr. Bromley, Mr. Merrill, Mr. Williams (Sp)

155. Chemical Engineering Unit Operations. (3)

Three 1-hour lectures per week. Prerequisite: course 150A, 150B (may be taken concurrently). Production and separation of particulate systems in force and flow fields. Dust and mist collection, sedimentation, crystallization, and coagulation processes.

Mr. Goren (F)

156. Fundamentals of Transport Phenomena. (3)

Three 1-hour lectures per week. Prerequisite: course 150B. The differential equations of momentum, energy, and mass transfer applied to laminar and turbulent flow and to interphase transfer.

Mr. Williams (W)

160. Chemical Process Design. (4)

Three 1-hour lectures and one 3-hour computation period per week. Prerequisite: courses 141A-141B, 150A-150B. Design principles for chemical processing equipment. Design of integrated chemical processes with emphasis upon economic considerations.

Mr. Blue (W); Mr. Oldershaw (Sp)

162. Dynamics and Control of Chemical Processes. (4)

Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 150A, 150B, 142. The unsteady behavior of industrial chemical process units; methods and theory of their control. Laboratory testing of process control systems and measurement of process dynamics.

Mr. Poss (Sp)
165. Selection and Evaluation of Chemical Processes. (3)

One 1-hour lecture and two 3-hour computation periods per week. Prerequisite: course 160. Development and discussion of a series of realistic cases involving the engineering of chemical processes. Selection and synthesis of a process and process elements. Identification and evaluation of process modifications and alternatives.

Mr. King, Mr. Lynn (Sp)

195. Special Topics. (3-4)

Three or four 1-hour lectures per week. Prerequisite: consent of instructor. Lectures on special topics.

The Staff (Mr. Tobias in charge) (F, W, Sp)

196. Special Laboratory Study. (2-5)

Prerequisite: consent of instructor. Special laboratory work for advanced students.

The Staff (Mr. Tobias in charge) (Su, F, W, Sp)

197. Individual Study for Advanced Undergraduates. (2-5)

Prerequisite: consent of instructor. Independent study on theoretical or computational problems.

The Staff (Mr. Tobias in charge) (Su, F, W, Sp)

199H. Research for Advanced Undergraduates. (3-5)

Prerequisite: consent of instructor. Students with honors standing may prosecute original research under the direction of one of the members of the staff.

The Staff (Mr. Petersen in charge) (Su, F, W, Sp)

Graduate Courses

230. Theoretical Methods in Chemical Engineering. (3)

Three 1-hour lectures per week. Prerequisite: Mathematics 2A or equivalent; open to senior honor students with consent of the instructor. Mathematical formulation and solution of problems drawn from the fields of heat and mass transfer, fluid mechanics, and reaction kinetics employing vector calculus, ordinary differential equations, Laplace transforms, and partial differential equations. Mr. Newman (F)

231. Analysis of Chemical Engineering Problems. (3)

Three 1-hour lectures per week. Prerequisite: course 230 or equivalent. Continuation of course 230. Solution of complex chemical engineering problems employing calculus of variations, boundary value problems, integral equations, and approximate methods.

Mr. Goren (W)

232. Computational Methods in Chemical Engineering. (3)

Three 1-hour lectures per week. Prerequisite: course 230. Open to senior honor students with consent of instructor. Introduction to modern computational methods for treatment of problems not amenable to analytic solutions. Application of numerical techniques to chemical engineering calculations with emphasis on computer methods.

Mr. Greens (Sp)

240. Phase Equilibria. (3)

Three 1-hour lectures per week. Prerequisite: graduate standing. Molecular thermodynamics of multicomponent systems with applications to separation operations. Equilibrium properties of pure and mixed fluids.

Mr. Prausnitz (F)

241. Applications of Statistical Mechanics. (2)

Two 1-hour lectures per week. Prerequisite: course 240 and consent of instructor. Principles of statistical mechanics with emphasis on configurational properties of fluids. Introduction to statistical theories of gases, liquids, polymers and surfaces with applications to separation operations.

Mr. Prausnitz (Sp)

*243. Cryogenic Engineering. (3)

Three 1-hour lectures per week. Prerequisite: course 141B and 150A or equivalent. Low-temperature refrigeration principles and applications; gas purification, liquefaction and separation; magnetic, thermoelectric and von Ettingshausen cooling; transport properties of materials at low temperatures; cryogenic techniques in chemical processes.

Mr. Lyon (W)

244. Applied Chemical Kinetics. (3)

Three 1-hour lectures per week. Prerequisite: course 142 or equivalent, or consent of instructor. Collision theory and transition state calculations, chain reactions and free radical mechanisms, adsorption phenomena, Langmuir-Hinshelwood kinetics, description of selected systems of industrial importance.

Mr. Merrill (W)

*245. Catalysis. (2)

Two 1-hour lectures per week. Prerequisite: course 224 or Chemistry 219, or consent of instructor. Fundamentals of catalytic systems with emphasis on current theoretical progress. Catalysis by metals, semiconductors, and oxides emphasizing the correlations between solid state properties and catalytic activity.

Mr. Merrill (Sp)

246. Principles of Electrochemical Engineering. (3)

Three 1-hour lectures per week. Prerequisite: graduate standing, or courses 141B, 156 and 146. Electrode processes in electrolysis and in galvanic cells. Charge and mass transfer in ionic media. Criteria of scale-up.

Mr. Tobias (Sp)

*247. Chemical Reaction Analysis. (3)

Three 1-hour lectures per week. Prerequisite: courses 230 and 244, or consent of instructor. Principles of chemical kinetic processes and physical mechanisms and how they interact to govern the apparent behavior of chemically reactive systems. Particular emphasis on catalytic reactions. Application to the analysis and design of fixed and fluidized bed reactors.

Mr. Petersen (W)

249. Biochemical Engineering. (3)

Three 1-hour lectures per week. Prerequisite: Bacteriology 2; Chemistry 110B, 112E; course 150B; or consent of instructor. Application of chemical engineering principles to the processing of biological and biochemical materials. Design of systems for cultivation of microorganisms and for the separation and purification of biological products.

Mr. Tobias (Sp)

250. Mass Transfer. (3)

Three 1-hour lectures per week. Prerequisite: graduate standing or consent of instructor. Diffusion in gases and liquids. Mechanism and models of mass transfer in laminar and turbulent systems across fixed and free interfaces. Interactions between heat and mass transfer. High transfer rates. Simultaneous chemical reaction. Mixing efficiencies. Mr. Lynn (W)

* Not to be given, 1968-69.

CHEMICAL ENGINEERING
251. Separation Processes. (3)
Three 1-hour lectures per week. Prerequisite: a comprehensive background in chemical engineering, primarily for advanced graduate students. Current and advanced study in chemical engineering, for graduate students. Current and advanced study in chemical engineering, primarily for advanced graduate students. Current and advanced study in chemical engineering, primarily for advanced graduate students. Current and advanced study in chemical engineering, primarily for advanced graduate students.

Mr. King, Mr. Lynn (Sp)

259. Special Topics in Chemical Engineering. (1-4)
Prerequisite: Open to properly qualified graduate students. Current and advanced study in chemical engineering, for graduate students. Current and advanced study in chemical engineering, for graduate students. Current and advanced study in chemical engineering, for graduate students. Current and advanced study in chemical engineering, for graduate students. Current and advanced study in chemical engineering, for graduate students. Current and advanced study in chemical engineering, for graduate students.

Mr. Petersen (F)

295C. Air Pollution Control. (2) Mr. Newman (F, W, Sp)
295D. Electrochemical Energy Conversion. (2) Mr. Tobias (W)
295E. Mass and Heat Transfer. (2) Mr. King (W)
295F. Topics in the Control of Chemical Processes. (2) Mr. Foss (F)
295G. Process Stimulation. (3) Mr. Grens (F)
295H. Kinetic Theory of Transport Processes. (2) Mr. Goren (Sp)
295J. Electrical Separation Techniques. (2) Mr. Hanson (W)
295K. Chemical Process Synthesis. (2) Mr. King (F)
295L. Molecular and Continuum Rheology. (3) Mr. Williams (W)
295M. Optical Methods in Chemical Engineering Research. (2) Mr. Muller (F)
295N. Polymer Science and Technology. (3) Mr. Williams (F)
295P. Mass Transfer and Chemical Kinetics. (3) Mr. Pigford (F)
295S. Application of Electric Discharges to Chemical Reactions. (3) Mr. Bell (F, Sp)
295T. Chemical Reactor Engineering. (2) Mr. Vermeulen (W)
295W. Engineering Analysis of Microbial Processes. (2) Mr. Wilke (W)

296. Special Study for Graduate Students in Chemical Engineering. (1-6)
Prerequisite: consent of instructor. Special laboratory and theoretical studies.

The Staff (Mr. Prausnitz in charge) (Su, F, W, Sp)

298. Seminar in Chemical Engineering. (1-6)
Prerequisite: open to properly qualified graduate students with consent of instructor. Lectures, reports, and discussions on current research in chemical engineering. Several sections are offered each quarter.

The Staff (Mr. Tobias in charge) (Su, F, W, Sp)

299. Research in Chemical Engineering. (1-12)
The Staff (Mr. Tobias in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the major field adviser for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

Mr. Prausnitz (Su, F, W, Sp)

Colloquium and Graduate Seminar. (No credit)

Members of the instructing staff and graduate students meet once a week to discuss investigations presented by invited speakers and Ph.D. candidates in the department.

| CHEMISTRY |
| (Department Office, 419 Latimer Hall) |
| Leo Brewer, Ph.D., Professor of Chemistry and Associate Director of the Lawrence Radiation Laboratory. |

* Not to be given, 1968-60.
Melvin Calvin, Ph.D., Sc.D., Professor of Chemistry, Associate Director of the Lawrence Radiation Laboratory, and Director of the Chemical Biodynamics Laboratory.

James Cason, Jr., Ph.D., Professor of Chemistry.

Robert E. Connick, Ph.D., Professor of Chemistry.

Burris B. Cunningham, Ph.D., Professor of Chemistry.

William G. Dauben, Ph.D., Professor of Chemistry.

William D. Gwinn, Ph.D., Professor of Chemistry.

Frederick R. Jensen,† Ph.D., Professor of Chemistry.

Harold S. Johnston, Ph.D., Sc.D., Professor of Chemistry.

William L. Jolly, Ph.D., Professor of Chemistry.

George Jura, Ph.D., Professor of Chemistry.

Bruce H. Mahan, ** Ph.D., Professor of Chemistry.

Rollie J. Myers, Ph.D., Professor of Chemistry.

Donald S. Noyce, Ph.D., Professor of Chemistry.

Isadore Perlman, Ph.D., Professor of Chemistry and Associate Director of the Lawrence Radiation Laboratory.

William L. Jolly, Ph.D., Professor of Chemistry.

Norman E. Phillips, Ph.D., Professor of Chemistry.

Robert E. Powell, Ph.D., Professor of Chemistry.

George C. Pimentel, Ph.D., Professor of Chemistry (Chairman of the Department).

Henry Rapoport, Ph.D., Professor of Chemistry.

John O. Rasmussen, † Ph.D., Professor of Chemistry.

Glenn T. Seaborg, † Ph.D., Sc.D., LL.D., Professor of Chemistry.

David A. Shirley, Ph.D., Professor of Chemistry.

Kenneth Street, Jr., Ph.D., Professor of Chemistry.

Andrew Streitwieser, Jr., t Ph.D., Professor of Chemistry (Vice-Chairman of the Department).

William F. Giauque, Ph.D., Sc.D., LL.D., Professor of Chemistry, Emeritus.

Joel H. Hildebrand, Ph.D., Sc.D., LL.D., Professor of Chemistry, Emeritus.

Charles W. Porter, Ph.D., Professor of Chemistry, Emeritus.

Andrew Streitwieser, Jr., † Ph.D., Professor of Chemistry (Vice-Chairman of the Department).

David H. Templeton, Ph.D., Professor of Chemistry.

Ignacio Tinoco, Ph.D., Professor of Chemistry.

William F. Giauque, Ph.D., Sc.D., LL.D., Professor of Chemistry, Emeritus.

Joel H. Hildebrand, Ph.D., Sc.D., LL.D., Professor of Chemistry, Emeritus.

Joseph Cerny, Ph.D., Associate Professor of Chemistry.

Robert A. Harris, † Ph.D., Associate Professor of Chemistry.

John E. Hearst, † Ph.D., Associate Professor of Chemistry.

Samuel S. Markowitz, Ph.D., Associate Professor of Chemistry.

C. Bradley Moore, Ph.D., Associate Professor of Chemistry.

Kenneth Sauer, Ph.D., Associate Professor of Chemistry.

Gabor A. Somorjai, Ph.D., Associate Professor of Chemistry.

Herbert L. Strauss, Ph.D., Associate Professor of Chemistry.

R. Peter Frosch, Ph.D., Assistant Professor of Chemistry.

Charles B. Harris, Ph.D., Assistant Professor of Chemistry.

Clayton H. Heathcock, Ph.D., Assistant Professor of Chemistry.

Ronald R. Herm, Ph.D., Assistant Professor of Chemistry.

George L. Kenyon, Ph.D., Assistant Professor of Chemistry.

W. Martin McClain, Ph.D., Assistant Professor of Chemistry.

Kenneth N. Raymond, Ph.D., Assistant Professor of Chemistry.

Himan Sternlicht, Ph.D., Assistant Professor of Chemistry.

Peter L. Timms, † Ph.D., Assistant Professor of Chemistry.

† On leave, 1968–69.

†‡ On leave, winter and spring quarters, 1968–69.

** Appointment in the Miller Institute for Basic Research in Science, 1968–69.
High School Preparation  High school students should prepare for college courses in mathematics, chemistry, and physics by completing—as a part of, or in addition to, the courses normally offered for admission to the University—four years of high school mathematics, including intermediate algebra, trigonometry, and analytic geometry, a year of chemistry, and a year of physics.

Choice of College  A student can complete a major in chemistry in either the College of Chemistry (B.S. degree) or the College of Letters and Science (A.B. degree). Both curricula are approved by the American Chemical Society, and either is a satisfactory foundation for a career in chemical industry, for the teaching of chemistry, or, if completed with high academic standing, for graduate work in chemistry. The curriculum in the College of Chemistry permits the student to emphasize advanced course work in chemistry and other sciences, and is generally chosen by those who are already fairly certain that chemistry is the core of their professional interest. The curriculum in the College of Letters and Science is designed for those who wish to combine a moderate specialization in chemistry with a more extensive program in the humanities and social sciences.

Chemistry Major in the College of Chemistry

The requirements for a B.S. degree in the College of Chemistry, with a chemistry major, are: a total of 180 quarter units. Mathematics: 11A, 11B, 11C, 12A. (For students without high school analytic geometry, Mathematics: 1A, 1B, 1C replaces Mathematics 11A, 11B. Mathematics 12B may be taken in place of Mathematics 11C). Physics: 4A, 4B, 4C, 4D, 4E. Chemistry: 1A, 1B, 1C, 5 (or 4A, 4B, 4C); 12A, 12B, 14, 104A, 104B, 110A, 110B, 111A, 111B, 112, and a choice of one of 105, 106, 107, or 123 and 124. At least 25 additional units in upper division chemistry and allied subjects; 12 or more of these should be chemistry courses, although exceptions can be made for coherent programs in an interdisciplinary area.

Satisfaction of the American History and Institutions requirement (see page 30). A reading knowledge of scientific German equivalent to that provided by German 2. Twenty-seven units in the humanities and social sciences, chosen from a list provided by the College of Chemistry. One course from English 1A, Speech 1A, Comparative Literature 1A, or Dramatic Arts 1A (with a grade of C− or better), at least one course in a social science, and at least one course in fine arts, literature, or philosophy must be included.

Chemistry Major in the College of Letters and Science

The requirements for the A.B. degree in the College of Letters and Science with a chemistry major are:

A total of 180 quarter units, including the major and College requirements. Mathematics: 11A, 11B, 11C, or equivalent. Students who wish to be certified to the American Chemical Society as having taken an approved curriculum must take also Mathematics 12A or 12B. Physics: 4A, 4B, 4C, 4D, 4E. Chemistry: 1A, 1B, 1C, 5 (or 4A, 4B, 4C); 12A, 12B, 14, 104A, 110A, 110B, 112, and a choice of 105, 106, 107, or 111A–111B. (For students who wish to be certified to the American Chemical Society, this must be 111A–111B.)

Enough additional units in upper division chemistry and allied subjects to make a total of 30.
In addition to the requirements for the major in chemistry, students in the College of Letters and Science must fulfill the requirement in American History and Institutions; the College unit requirements (180 units, of which at least 162 units including a minimum of 54 upper division units must be chosen from the Letters and Science List of Courses unless they are part of the major; except for honor students, a maximum of 45 upper division units may be in one department) and the breadth requirements, including two courses in reading and composition, the fourth course in a foreign language (for students who wish to be certified to the American Chemical Society, this should be German), four courses in natural science (including at least one course in physical science, which may be chemistry, and at least one course in biological science), four courses in social sciences, and four courses in humanities. For lists of the courses which may be offered in fulfillment of these requirements, and for a complete statement of the requirements in the College of Letters and Science, the ANNOUNCEMENT OF THE COLLEGE OF LETTERS AND SCIENCE must be consulted.

Letters and Science Major Advisers: Mr. Markowitz, Mr. Sauer.

California Teaching Credential (Secondary)

The teaching major in chemistry is identical with the Letters and Science chemistry major. The teaching minor in chemistry consists of 30 units in chemistry, chosen from courses in the Letters and Science chemistry major. For further information, see the ANNOUNCEMENT OF THE SCHOOL OF EDUCATION.

Honors Program

A junior or senior honor student (one who has a B average or better overall) has special privileges. He may, with approval of the dean of his College:

1. Receive course credit for nonlaboratory courses on a "Credit-by-Examination" basis.

2. Take Chemistry 199H, Research for Advanced Undergraduates. In this course he can prosecute original research in a field which is currently under investigation by graduate students and faculty members of the department. These fields include physical-chemical studies of substances at very high and very low temperatures, rates and mechanisms of reactions (both organic and inorganic), spectroscopic investigations in all areas, magnetic and electric properties of matter, quantum chemistry, radiochemical tracer techniques in various branches of chemistry, nuclear reactions and nuclear spectroscopy, and structures of natural products of biological interest.

At the discretion of the Committee on Honors of the student’s college, he may be awarded honors at graduation and this award designated in his diploma: the B.S. with Honors or Highest Honors, the A.B. with Distinction or Great Distinction in the honors program. Students will not ordinarily be recommended for such awards unless they have engaged in undergraduate research or other advanced work approved by the Committee on Honors.

Graduate Study in Chemistry

Students interested in graduate study are invited to write to the Chairman of the Department of Chemistry for information.

Lower Division Courses

1A–1B–1C. General Chemistry. (4–4–4)

Two 1-hour lectures and two 3-hour laboratories per week, part of the laboratory time being devoted to quiz and discussion. Prerequisite: high school chemistry or consent of instructor. Stoichiometry, ideal gases, equilibrium (solubility, acids and bases), thermochromy, nuclear chemistry; electrical cells, imperfect gases, atomic structure, chemical bonding; periodic table, descriptive chemistry, transition metals, introductory organic chemistry, qualitative analysis. Three-quarter sequence beginning (Su, F, Sp). The Staff (Mr. Pimentel, Mr. Markowitz, Mr. Powell in charge)
Contemporary Natural Science (Natural Science)
1A–1B–1C).
(4–4–4)
Sequence beginning (F), Mr. Karplus,
Mr. Rapoport, Mr. Jensen

4A–4B–4C. General Chemistry and Quantitative
Analysis. (5–5–5)
Three 1-hour lectures and two 3-hour laboratories
per week. Prerequisite: course 1C with grade of C
or higher. The principles and techniques of volumetric,
gravimetric, potentiometric and colorimetric
methods of analysis, and ion exchange separation.
Mr. Cunningham, Mr. Koch (Su, F, W, Sp)

8A–8B. Survey of Organic Chemistry. (4–4)
Two 1%-hour lectures and one 3-hour laboratory
per week. Prerequisite: course 1A–1B or 4A–4B.
Intended for students not majoring in chemistry
and not planning to take additional courses in organic
chemistry with a more quantitative emphasis than
course 1A–1B–1C, and lays more stress on the appli­
cations of thermodynamics and quantum mechanics.
Laboratory emphasizes quantitative work.
Three-quarter sequence beginning (F),
Mr. Myers, Mr. Frosh

5. Quantitative Analysis. (4)
Two 1-hour lectures and two 3-hour laboratories
per week. Prerequisite: course 1C with grade of C
or higher. The principles and techniques of volumetic,
gravimetric, potentiometric and colorimetric
methods of analysis, and ion exchange separation.
Mr. Cunningham, Mr. Koch (Su, F, W, Sp)

Two 1%-hour lectures and two 3-hour laboratories
per week. Prerequisite: course 1C or 4C, with
grade of C or better. For students whose major is
chemistry or a closely related field such as biochemis­
try or chemical engineering. (12A and 12B: pri­
marily concerned with the chemistry of simple fun­
tional groups, the laboratory takes up synthesis of
aliphatic and aromatic compounds; 112: emphasizes
the chemistry of multifunctional and heterocyclic
compounds, in the laboratory emphasis is on iden­
tification of organic compounds.)
Three-quarter sequence beginning (Su, F, Sp)
Mr. Calvin, Mrs. Jorgenson, Mr. Rapoport
12A: (Su, F, Sp); 12B: (F, W); 112: (W, Sp)

Two 1%-hour lectures per week. Prerequisite:
course 12A taken at Berkeley, with grade C
or better. Intended for students in chemical engineering
at Berkeley, but open to others with consent of
the instructor. The lecture part of courses 12B–112.
Two-quarter sequence beginning (F, W).

14. Chemical Thermodynamics. (3)
Three 1-hour lectures per week. Prerequisite:
course 1C or 4C, and at least one course in calculus.
Introduction to chemical thermodynamics. Colligative
properties and simple chemical equilibria.
Mr. Cerny, Mr. Lyon, Mr. O’Konski, Mr. Sauer,
Mr. Sternlicht, Mr. Street, Mr. Vermeulen
(Su, F, W, Sp)

49. Current Problems in Physical Science. (9)
Prerequisite: course 1C or 4C, consent of the
instructor and of the adviser. Limited to 10 sopho­
more students. Seminars covering current research
in the physical sciences.
The Staff (Mr. Pimentel in charge) (Su)

Upper Division Courses

104A–104B. Advanced Inorganic Chemistry. (3–3)
Three 1-hour lectures per week. Prerequisite:
course 14. (104A, nonmetals; 104B, metals.)
Two-quarter sequence beginning
(F) Mr. Powell, (W) Mr. Jolly

105. Advanced Quantitative Analysis. (5)
Two 1-hour lectures and three 3-hour laboratories
per week. Prerequisite: course 5 or 4C, 104A.
Mr. Cunningham (F); Mr. Orlemann (Sp)

106. Inorganic Synthesis. (5)
Two 1-hour lectures and two 4%-hour laboratories
per week. Prerequisite: course 5 or 4C, 104A.
Mr. Jolly (F); Mr. Cunningham (W)

107. Inorganic Reactions. (5)
Two 1-hour lectures and three 3-hour laboratories
per week. Prerequisite: course 5 or 4C, 104A. Kinetic
and thermodynamic studies of some inorganic
reactions.
Mr. Conrick (W, Sp)

109. Survey of Physical Chemistry. (3)
Three 1-hour lectures per week. Prerequisite:
course 14. Emphasis is on topics of interest to stu­
dents of the biological sciences.
----------- (Su); Mr. Tinoco (W)

110A–110B. Physical Chemistry. (3–3)
Three 1-hour lectures per week. Prerequisite:
110A, course 14, Physics 4D; 110B, Physics 4E.
(110A: Molecular spectroscopy and other physical
methods for determining molecular structure; 110B:
Dynamic properties of chemical systems: reaction
kinetics, electrochemistry. Introduction to statistical
mechanics.) Two-quarter sequence beginning (Su,
F, W, Sp).
Mr. Cerny, Mr. C. B. Harris, Mr. O’Konski,
Mr. Sauer, Mr. Sternlicht, Mr. Templeton

111A–111B. Physical Chemistry Laboratory. (3–3)
One 1-hour lecture and two 3-hour laboratories
per week. Prerequisite: course 14 with a grade of C
or higher, 110A, which may be taken concurrently,
or 109 with the consent of instructor. Two-quarter
sequence beginning (Su, F, W, Mr. Gwinn, Mr.
Juna, Mr. Moore, Mr. Somorjai, Mr. Wang. 111A:
(Su, F, W); 111B: (Su, W, Sp).

114H. Advanced Chemical Thermodynamics. (3)
Three 1-hour lectures per week. Prerequisite:
course 110B and honors standing. A rigorous presen­
tation of classical thermodynamics. Equilibria in­
volving real gases and real solutions. Application of
tabulated thermodynamic data. Systems involving
intensive variables besides pressure and temperature.
Mr. Brewer, Mr. Phillips (F, Sp)
117H. Quantum Mechanics. (3)
Three 1-hour lectures per week. Prerequisite: course 110B and honors standing. Some familiarity with linear algebra and differential equations is desirable. Elementary principles of quantum mechanics with application to atoms and molecules.

Mr. Moore (F); Mr. McClain (Sp)

121. Molecular Structure and Molecular Spectroscopy. (3)
Three 1-hour lectures per week. Prerequisite: course 110B. The interpretation of spectra of polyatomic molecules. The effect of molecular symmetry on infrared and Raman spectra. Radiofrequency spectroscopy; molecular magnetic, quadrupole, electron spin, and microwave spectroscopy.

(SU); Mr. Herman (W)

123. Nuclear Chemistry. (3)
Three 1-hour lectures per week. Prerequisite: senior standing.

Mr. Perlman (W)

124. Nuclear Chemistry Laboratory. (3)
One 1½-hour lecture and one 4½-hour laboratory per week. Prerequisite: course 123 and consent of the instructor. Laboratory experiments and independent projects giving both nuclear and chemical principles. Radioactive decay and beta-gamma ray detection. Secular equilibrium, decay schemes, interactions of gamma rays with matter, fission, ion exchange, nuclear activation analysis, chemical effects of nuclear transformations.

Mr. Markowitz (Sp)

*125. Chemical Spectroscopy Laboratory. (3)
One 1-hour lecture and two 3-hour laboratories per week. Prerequisite: course 111B.

127. Physical Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 112 and 110B, or consent of instructor. A reading knowledge of German is recommended. Applications of modern theoretical concepts to the chemical and physical properties of organic compounds.

Mr. Streitwieser (F)

One 1-hour lecture and three 3-hour laboratories per week. Prerequisite: course 5 or 4B, 112; reading knowledge of German or consent of instructor. Emphasis is on physical methods of identification of organic compounds. Mr. Heathcock (F, W); Mr. Dauben (Sp)

129. Organic Chemistry—Synthetic Methods. (4)
Three 3-hour laboratories per week. Prerequisite: course 128, a reading knowledge of German, and consent of the instructor.

Mr. Dauben (F); Mr. Cason (W)

149A—149B. Current Problems in Physical Science. (9–9)
149A. Prerequisite: course 49, consent of instructor and adviser. Limited to 10 junior students. Independent laboratory research on one of a group of related topics in physical sciences. Seminars and lectures to relate problems to each other. The Staff (Mr. Pimentel in charge) (Su)

149B. Prerequisite: course 149A, consent of instructor and adviser. Limited to 8 senior students. Individual research in physical or biological science in collaboration with a faculty member of the student’s choice. The Staff (Mr. Pimentel in charge) (Su)

*195. Special Topics. (3)
Three 1-hour lectures per week. Prerequisite: consent of the instructor. Special topics will be offered from time to time. Examples are: heterogeneous equilibria, chemistry of surfaces and solids, X-ray crystallography.

The Staff (Mr. Johnston in charge)

196. Chemical Preparations. (2–5)
Prerequisite: course 111B and at least one of courses 105, 106, 107, or 129; consent of the instructor and consent of the adviser. Special laboratory work for advanced undergraduates.

The Staff (Mr. Johnston in charge) (Su, F, W, Sp)

197. Individual Study for Advanced Undergraduates. (1–3)
Any properly qualified student who wishes to pursue a problem of his own choice, through reading or nonlaboratory study, may do so if his proposed project is acceptable to the member of the staff with whom he works.

The Staff (Mr. Johnston in charge) (Su, F, W, Sp)

Graduate Courses

206A–206B. Organic Chemistry. (3–3)
Prerequisite: course 127.

Two 1½-hour lectures per week. The applications to synthetic studies of current knowledge of reaction mechanism, molecular structure, and steric factors. The chemistry of polycyclic compounds. Mr. Noyce (W), Mr. Cason (Sp)

208. Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 206B. Kinetics and mechanism of organic reactions, mechanisms of rearrangements. — (Sp)

Mr. Dauben (W)

209. Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 206B. The chemistry of polycyclic compounds of biological interest, with emphasis on steroids and related compounds. Mr. Dauben (W)

216A–216B. Statistical Mechanics. (3–3)
Three 1-hour lectures per week. Prerequisite: course 114H, and an introduction to quantum mechanics (which may be taken concurrently). Open to senior honor students with consent of instructor. Two-quarter sequence beginning (W).

216A. Principles and applications of statistical mechanics: ensemble theory, statistical thermodynamics of ideal and real gases, solids, and chemical equilibrium.

* Not to be given, 1968–69.

172A–172B. Advanced Quantum Mechanics. (4–4)
Prerequisite: courses 117A or 117B or equivalent. Interaction of quantum mechanics with field theory. Quantum field theory and applications for advanced study.

The Staff (Mr. Johnston in charge) (Su, F, W, Sp)

3–4 hours per week.

195. Special Topics. (3)
Three 1-hour lectures per week. Prerequisite: consent of the instructor. Special topics will be offered from time to time. Examples are: heterogeneous equilibria, chemistry of surfaces and solids, X-ray crystallography.

The Staff (Mr. Johnston in charge)

196. Chemical Preparations. (2–5)
Prerequisite: course 111B and at least one of courses 105, 106, 107, or 129; consent of the instructor and consent of the adviser. Special laboratory work for advanced undergraduates.

The Staff (Mr. Johnston in charge) (Su, F, W, Sp)

197. Individual Study for Advanced Undergraduates. (1–3)
Any properly qualified student who wishes to pursue a problem of his own choice, through reading or nonlaboratory study, may do so if his proposed project is acceptable to the member of the staff with whom he works.

The Staff (Mr. Johnston in charge) (Su, F, W, Sp)

Graduate Courses

206A–206B. Organic Chemistry. (3–3)
Prerequisite: course 127.

Two 1½-hour lectures per week. The applications to synthetic studies of current knowledge of reaction mechanism, molecular structure, and steric factors. The chemistry of polycyclic compounds. Mr. Noyce (W), Mr. Cason (Sp)

208. Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 206B. Kinetics and mechanism of organic reactions, mechanisms of rearrangements. — (Sp)

Mr. Dauben (W)

209. Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 206B. The chemistry of polycyclic compounds of biological interest, with emphasis on steroids and related compounds. Mr. Dauben (W)

216A–216B. Statistical Mechanics. (3–3)
Three 1-hour lectures per week. Prerequisite: course 114H, and an introduction to quantum mechanics (which may be taken concurrently). Open to senior honor students with consent of instructor. Two-quarter sequence beginning (W).

216A. Principles and applications of statistical mechanics: ensemble theory, statistical thermodynamics of ideal and real gases, solids, and chemical equilibrium.

* Not to be given, 1968–69.
216B. Topics chosen from among the following: liquids, solutions, light-scattering, polymeric systems, spectral line shapes, quantum statistics, phase transitions, transport properties.

Mr. Shirley

217A–217B. Advanced Quantum Mechanics. (3-3)

Three 1-hour lectures per week. Prerequisite: course 117H or equivalent. Matrix and group theory methods in quantum mechanics. Interaction of molecules with fields. Molecular orbital theory. Two-quarter sequence beginning (W, Sp).

Mr. Gwinn

219. Chemical Kinetics. (3)

Three 1-hour lectures per week. Prerequisite: course 114H. Course 117H or equivalent is desirable. Open to senior honor students, including those without prerequisites, by consent of instructor. Theory of elementary reactions: activated complex theory and collision theory. Treatment of data and deduction of mechanisms of complex reactions.

Mr. Johnston

223A–223B. Advanced Nuclear Chemistry. (3-3)

Three 1-hour lectures per week. Prerequisite: course 123 and introductory quantum mechanics (which may be taken concurrently). Two-quarter sequence beginning (Sp), continuing (F).

Mr. Struble

295. Special Topics. (1-3)

From time to time, lecture series are offered on topics of current interest. The following have been offered recently: collision processes, hydrocarbon ions, flames, empirical spectra-structure correlation.

The Staff (Mr. Pimentel in charge) (Su, F, W, Sp)

288. Seminars for Graduate Students. (1–3)

Besides the weekly research conference of the College of Chemistry and weekly seminars on topics of interest in organic, physical, nuclear, and inorganic chemistry, there are as a rule seminars on specific fields of research. The following have been offered recently: spectroscopy, biophysical chemistry, nuclear magnetic and electron spin resonance. Seminars will be announced at the beginning of each quarter.

The Staff (Mr. Pimentel in charge) (F, W, Sp)

299. Research for Graduate Students. (1–9)

The facilities of the laboratory are available at all times to graduate students pursuing original investigations toward an advanced degree at this University. Such work is ordinarily in collaboration with a member of the staff. Credit is determined by the graduate adviser.

The Staff (Mr. Pimentel in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Mr. Pimentel in charge) (F, W, Sp)

CITY AND REGIONAL PLANNING

(For information on courses and faculty in City and Regional Planning, see listing under Environmental Design: City and Regional Planning)

CLASSICS

(Department Office, 5303 Dwinelle Hall)

John K. Anderson, M.A., Professor of Classical Archaeology and Associate Curator of Classical Archaeology, Lowie Museum of Anthropology.

William S. Anderson, Ph.D., Professor of Latin and of Comparative Literature.

Joseph Fontenrose, Ph.D., Professor of Classics.

Arthur E. Gordon, Ph.D., Professor of Latin.

W. Kendrick Pritchett, Ph.D., Professor of Greek and Curator of Classical Epigraphy, Lowie Museum of Anthropology (Chairman of the Department).

Thomas G. Rosenmeyer, Ph.D., Professor of Greek and of Comparative Literature.

William M. Green, Ph.D., Professor of Latin, Emeritus.

Ivan M. Linforth, Ph.D., Professor of Classical Archaeology, Emeritus.

Louis Alexander MacKay, M.A., Professor of Latin, Emeritus.

H. R. W. Smith, Ph.D., Professor of Latin and Classical Archaeology and Associate Curator of Classical Archaeology, Emeritus.

Elroy L. Bundy, Ph.D., Associate Professor of Classics and of Comparative Literature.

P. D. A. Garnsey, D.Phil., Assistant Professor of Latin.

Crawford H. Greenewalt, Ph.D., Assistant Professor of Classical Archaeology.

1+ On leave, fall and winter quarters, 1968–69.

1+ On leave, winter and spring quarters, 1969.
The Department of Classics offers a complete undergraduate and graduate program in Greek and Latin languages, literatures, and civilizations. It groups its courses of instruction under the headings of Greek, Latin, and Classics. The object of the Greek and Latin courses is to teach students how to read the great works of ancient literature in the original languages, and to acquaint the students with the achievements of classical civilization. The undergraduate courses in Classics require no knowledge of Greek and Latin. The graduate courses, all of which are designated Classics, are advanced courses in Greek, Latin, and Classical Archaeology, all requiring knowledge of one or both of the languages. The purpose of the undergraduate courses called Classics is to give the student instruction in Greek and Roman civilization in all its phases—literature (read in translation), mythology, religion, government, and archaeology.

The Majors

The Department of Classics offers three undergraduate majors: Greek, Latin, and Classical Languages.

**Major in Greek**  Greek 1–2 or 1A–1B–1C; 40A–40B (may be taken concurrently with upper division courses); 100, 101, 102, 103; 12 units chosen from other upper division Greek courses; 8 units chosen either from additional upper division courses in Greek or from recommended upper division courses. Recommended: courses in Classics, Latin, Sanskrit (see Linguistics), Art 140A–140B, 141, History 110A–110B.

**Major in Latin**  Latin 1A, 1B, 1C, 2, or equivalent; 9A–9B (may be taken concurrently with upper division courses); 104, 105, 106, 107; 12 units chosen from other upper division Latin courses; 8 units chosen either from additional upper division courses in Latin or from recommended upper division courses. Recommended: courses in Classics, Sanskrit (see Linguistics), Art 144, History 111A–111B.

**The Major in Classical Languages**  Greek 1–2 or 1A–1B–1C; Latin 1A, 1B, 1C, 2, or equivalent; Greek 40A–40B or Latin 9A–9B (may be taken concurrently with upper division courses); Greek 100, 101, 102, 103; Latin 104, 105, 106, 107; one additional 4-unit course chosen from Greek 115, 120, Latin 145, 150. Recommended: courses in Classics, Sanskrit (see Linguistics), Art 140A, 140B, 141, 144, History 110A–110B, 111A–111B.

* Appointment as Humanities Research Professor, fall quarter, 1968–69.
** Appointment as Humanities Research Professor, winter quarter, 1968–69.
† On leave, fall quarter, 1968.
Honors Program  Greek: (a) the major program, including Greek 150A-150B and at least one part of both Greek 115 and Greek 120; (b) three quarters of Greek H195 taken during the senior year. Latin: (a) the major program, including Latin 109 and at least one part of both Latin 145 and 150; (b) three quarters of Latin H195 taken during the senior year. Classical Languages: (a) the major program; (b) at least two courses chosen from Greek 115, Greek 120, Latin 145, Latin 150; (c) either Greek 150A or Latin 109; (d) three quarters of either Greek H195 or Latin H195 taken during the senior year.

Students in the honors program must have a grade-point average of at least 3.0 in all courses undertaken in the Department of Classics.

Intercollegiate Center for Classical Studies in Rome. There will be an opportunity for some Classics Majors to attend the Intercollegiate Classical Center at Rome. This is an intercollegiate program for classical undergraduates. All students interested in this program should consult the Major Adviser.

Preparation for Graduate Study  To enter upon graduate study in Classics the student should complete the major in Greek or Latin or Classical Languages (or a satisfactory equivalent). He is strongly advised also to have an adequate reading knowledge of French and German, since he must pass examinations in both for the Ph.D. degree, and in one of them (or in Italian, which is also recommended) for the M.A. degree; furthermore, without both French and German he will be greatly handicapped in graduate study of classical subjects (and he will find Italian very useful too). The prospective graduate student in Classics should also take upper division prose composition in both languages (Greek 150A–150B and Latin 109): he will need competence in both Greek and Latin composition for the Ph.D. qualifying examinations.

The Graduate Major  The Master of Arts degree may be taken in Greek, Latin, Classics (each under Plan B: a program of 36 units in graduate and advanced undergraduate courses, and a series of examinations), or Classical Archaeology (under Plan A: a program of 30 units of graduate and advanced undergraduate courses, and a dissertation).

The Doctor of Philosophy degree may be taken in Classics or Classical Archaeology. Whatever the graduate student's principal interest—literature, history, archaeology, or other subjects—he should take a broad program and acquaint himself with every field of classical study. He must read widely in Greek and Latin authors and in Greek and Roman history, since both M.A. and Ph.D. qualifying examinations require an extensive knowledge of literature and history. He is especially advised to enter courses in epigraphy, paleography, comparative grammar, and Greek dialects when they are offered, since the interval between offerings of each is at least three years. The graduate program is varied from year to year so that in a normal period of graduate study the student may take courses in several fields and periods. For details of the M.A. and Ph.D. programs consult the graduate adviser for Classics (Greek, Latin) in 5220 Dwinelle Hall, for Classical Archaeology in 5212 Dwinelle Hall.

Letters and Science List: for regulations governing this list, see page 80.

Classics  Courses that do not require a knowledge of Greek or Latin. Courses in this group are designated Classics 10A, Classics 10B, etc.)

10A–10B–10C. Ancient Greek and Roman Civilization. (4-4)
Three 1-hour lectures and one 1-hour section meeting per week. Against a background of Greek and Roman history the reading of several literary masterpieces, in whole or in part, in translation.
10A. Hellenic Civilization. Mr. McCall (Su)
10B. Hellenistic Civilization. Mr. Johnson (F)
10C. Roman Civilization. Mr. Johnson (Sp)
17A-17B-17C. Elementary Course in Classical Archaeology. (4-4-4)
Three 1-hour lectures and one 1-hour section meeting per week. 17B or 17C may be taken first.

17A. The development of Greek Civilization from the Late Bronze Age to 700 B.C. as illustrated by the monuments.
Mr. J. K. Anderson, Mr. Greenewalt (F)
17B. Monuments of Greek civilization 700-300 B.C., with particular reference to the life of the citizen.
Mr. J. K. Anderson (W)
17C. Monuments of western civilization from the Hellenistic Age to the Age of the Antonines, with particular reference to urban development and provincial organization.
Mr. J. K. Anderson (Sp)

*28. The Classic Myths. (5)
Three 1½-hour lectures per week. A study of the Greek, Roman, and Norse myths and legends that have an important place in European and American Literature and art.

34. Epic Poetry: Homer and Vergil. (4)
Three 1-hour lectures per week. Lectures on the Greek and Roman epics with reading of Iliad, Odyssey, and Aeneid.
Mr. Witke (Su, F)

35. Greek Tragedy. (4)
Three 1-hour lectures per week. Lectures on Greek tragic drama with readings of plays of Aeschylus, Sophocles, and Euripides.
Mr. Gurney (Sp)

36. Plato: Selected Dialogues. (4)
Three 1-hour lectures per week. Lectures on the form and content of Plato's Dialogues.
Mr. Rabinowitz (Sp)

Upper Division Courses

100A-100B-100C. Greek and Latin Literature in Translation. (4-4-4)
Three 1-hour lectures per week. Enrollment limited. 100B or 100C may be taken first.

100A. Greek literature to 300 B.C.
Mr. Rosenmeyer (F)
100B. Hellenistic literature and Latin literature of the Roman Republic.
Mr. W. S. Anderson (W)
100C. Latin literature under the Roman Empire.
Mr. Avotins (Sp)

138. The Greek and Roman Historians. (4)
Three 1-hour lectures per week. The five historians Herodotus, Thucydides, Polybius, Livy, and Tacitus, in English translation; their intellectual background, documentary sources, and philosophy of history.
Mr. Pritchett (Sp)

140. Homer and History. (4)
Two 2-hour lectures per week. An archaeological investigation of the civilizations represented in the Homeric poems.
Mr. Hooker (Sp)

170A-170B-170C-170D-170E-170F. Classical Archaeology. (4-4-4-4-4)
Three 1-hour lecture and discussion sessions per week. The later parts may be taken before the earlier. 170A. Greek Vase-Painting from 700 B.C. to Exekias.
Mr. J. K. Anderson (Sp)
170B. Greek Red-figured Vase-Painting.
170C. Greek Sculpture in the Sixth and Fifth Centuries B.C.
Mr. Greenewalt (F)
170D. Greek Sculpture in the Fourth Century B.C. and Hellenistic Period.
170E. Survey of Greek Architecture.
170F. Aspects of Roman Art.

175A-175B. Greek Cities and Sanctuaries. (4-4)
Three 1-hour lectures per week. 175A is not prerequisite to 175B.
175A. Ancient Greek sanctuaries.
175B. Topography and monuments of Athens.
Mr. Stroud (W)

176. Ancient Greek Religion. (4)
Three 1-hour lectures per week; individual conferences to be arranged. The worship of the gods in ancient Greece; cults and religious ideas.
Mr. Fontenrose (Sp)

178. Mythology. (5)
Three 1½-hour lectures per week. Prerequisite: a course in myths or folklore or advanced standing in a classical language. An introduction to the study of mythology based upon Greek mythology and its relations to Near-Eastern and Indo-European mythologies.

185. Political and Social Thought of the Ancient Greeks. (4)
Three 1-hour lectures per week. Greek ideas about society and the state, from Homer to Aristotle.

199. Special Study for Advanced Undergraduates. (1-5)
Restricted to senior honor students.
Mr. Johnson (in charge) (Su, F, W, Sp)

Greek

Duplication of Credit
Unit credit will not be allowed for a foreign language course which duplicates any of the first four units of secondary school credit in the language or courses completed in another institution of collegiate grade. The first unit of secondary school credit in a language is considered to be equivalent to the first quarter course in college; each successive unit of credit in the same language is equal to one additional course in a sequence of four quarter courses in college.

Lower Division Courses

(Courses in this group are designated Greek 1, Greek 2, etc.)

1. Greek for Beginners. (6)
Five 1-hour class meetings per week. First part of two-part course in elementary Greek.
Mr. Keenan (W)

2. Greek for Beginners. (6)
Four 1-hour class meetings per week. Second part of two-part course in elementary Greek.
Mr. Avotins (Sp)

1A-1B-1C. Greek for Beginners. (4-4-4)
Three 1-hour class meetings per week. Three-part course in elementary Greek equivalent to Greek 1-2.
Mr. Avotins (Sp)

* Not to be given, 1968-69.
40A–40B. Greek Prose Composition, First Course. (3–3)
Three 1-hour class meetings per week. Prerequisite: Greek 1–2 or 1A–1B–1C. An introduction to the writing of Attic Greek prose. This course may not be offered in satisfaction of the foreign language requirement in the College of Letters and Science.
Mr. Keenan (Sp)

Upper Division Courses

100. Xenophon. Anabasis. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 100.
Mr. Stroud (Su); Mr. Fritchett (F)

101. Homer. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 100.
Mr. Hooker (W)

102. Plato. Apology and Crito. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 100.
Mr. Avotins (F)

103. Drama. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 100.
Mr. Bundy (Sp)

115. Senior Course in Greek Poetry. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 103.
115A. Aristophanes. Mr. Johnson (Sp)
115B. Sophocles. Mr. Fontenrose (Su)
115C. Aeschylus. Mr. Fontenrose (Su)
115D. Lyric Poetry. Reading of poems of Pindar, Bacchylides, Sappho, and others. Mr. Bundy (F)
115E. Theocritus. Mr. Rosenmeyer (W)

120. Senior Course in Greek Prose Authors. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 103.
120A. Demosthenes. Mr. Johnson (Sp)
120B. Herodotus. Mr. Stroud (F)
120D. Attic Orators. Mr. Stroud (Su)
120E. Plato’s Republic. Mr. Fontenrose (W)

§125. The Greek New Testament. (4)
Two 1½-hour class meetings per week. Readings in the Gospels and Epistles in Greek. Prerequisite: Greek 100.
Mr. Fontenrose (Sp)

§139. Greek Political Institutions. (4)
Three 1-hour lectures per week. Study of Greek texts which elucidate the development of Greek political institutions.
Mr. Stroud

§149. Homer: Problems of Style and Development. (4)
Two 1½-hour class meetings per week. Prerequisite: Greek 101.
Mr. Kirk (Sp)

150A–150B. Advanced Greek Prose Composition. (3–3)
Three 1-hour class meetings per week. Prerequisite: Greek 40A–40B. Advanced instruction in the writing of Attic Greek prose.
Mr. Bundy (W); Mr. Hooker (Sp)

166. Greek Verse Composition. (1)
One 1-hour class per week.
Mr. Hooker (Sp)

H195. Honors Course in Greek. (3)
One 1-hour meeting for discussion and recitation per week. Advanced and independent study for senior honor students in Greek. Special study; over three terms of a philosophical, a historical, and a literary text. Writing of a thesis before end of the third term.
Staff (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students.
Staff (Su, F, W, Sp)

Latin

Duplication of Credit  Unit credit will not be allowed for a foreign language course which duplicates any of the first four units of secondary school credit in the language or courses completed in another institution of collegiate grade. The first unit of secondary school credit in a language is considered to be equivalent to the first quarter course in college; each successive unit of credit in the same language is equal to one additional course in a sequence of four quarter courses in college.

Lower Division Courses

(Courses in this group are designated Latin 1A, 1B, 1C, Latin 2)

1A–1B–1C. Latin for Beginners. (4–4–4)
Three 1-hour class meetings per week. Three-part course in elementary Latin.
Mr. Johnson (in charge) (Su, F, W, Sp)

§2N. Elementary Latin (Special Purpose). (5)
Elementary Latin. Continuation of Latin 1.
Three 1-hour class meetings per week.
Mr. Rowell (Su)

Three 1½-hour class meetings per week.

2. Latin Readings: Cicero and Catullus. (5)
Three 1-hour class meetings per week. Selections from the orations of Cicero and the poems of Catullus.
Mr. Garnsey (F); Mr. Murgia (F, Sp); Mr. Avotins (W)

9A–9B. Latin Composition. (3–3)
Three 1-hour class meetings per week. Prerequisite: Latin 2. First course in the writing of Latin prose. This course may not be offered toward satisfaction of the foreign language requirement in the College of Letters and Science.
Mr. Murgia (F, W)

15. The Latin Workshop. (15)
Five 2-hour lectures and 15 hours of laboratory and tutorial instruction per week. Prerequisite: senior standing with a 3.00 grade-point average, or graduate standing, or instructor’s permission. Designed primarily for prospective and beginning graduate students wishing to complete as early as possible the

* Not to be given, 1968–69.
§ Approved for one offering only.
‡ Approved for two offerings only, summer and fall, 1968–69.
Lectures, discussions, drills, and tutorial sessions on Latin requirement for doctoral work in Comparative Latin 2 and enroll directly in Latin 104 or 106.

Mr. Johnson (in charge) (Su)

Upper Division Courses

104. Vergil. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 2. Mr. Fontenrose (Su); Mr. W. S. Anderson (F); Mr. Avotins (W); Mr. Nagler (Sp)

105. Livy. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 2. Mr. Gordon (F)

106. Horace: Odes and Epodes. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 2. Mr. Witke (Su); Mr. Gordon (W)

107. Cicero. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 2. Reading of a philosophical essay. Mr. Murgia (Sp)

109. Advanced Latin Composition. (3)
Three 1-hour class meetings per week. Prerequisite: Latin 2A—2B. Advanced instruction in the writing of Latin prose. Mr. Johnson (F)

139. Roman Political Institutions. (4)
Three 1-hour lectures per week. Study of Latin texts which elucidate the development of Roman political institutions. Mr. Garnsey (W)

145. Senior Course in Latin Poetry. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 2A—2B. Advanced class dealing with both the script and the language of the Linear B tablets. Selected texts will be read and discussed and there will be an introduction to the linguistic and archaeological background. Mr. Johnson (W)

150. Senior Course in Latin Prose Authors. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 2A—2B. Practice in the writing of Latin verse in various meters. Mr. Johnson (W)

166. Latin Verse Composition. (1)
One 1-hour class meeting per week. Prerequisite: Latin 2A—2B. Mr. Johnson (W)

H195. Honors Course in Latin. (3)
One 1-hour meeting for discussion and recitation per week. Advanced and independent study for senior honor students in Latin. Special study over three terms of a philosophical, a historical, and a literary text. Writing of a thesis before end of the third term. Staff (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1—5)
Restricted to senior honor students. Staff (Su, F, W, Sp)

Classics

Graduate Courses

For new students: Classics 200A is prerequisite to all other graduate courses in Greek, without special permission. Classics 200B is prerequisite to all other graduate courses in Latin, without special permission.

200A—200B. Proseminar. (4—4)
Two 1/2-hour class meetings per week. An introduction to the general literature of classical philology, to methods of research, and to textual criticism. 200A. Proseminar to Greek. Mr. Hooker (Sp). 200B. Proseminar to Latin. Mr. Murgia (W)

*210A—*210B. Homer. (4—4)
Two 1/2-hour class meetings per week. 210B may be taken before 210A with the permission of the instructor. Archaeological background, language, meter, and questions of oral poetry.

212. Early Lyric Poets. (4)
Two 1/2-hour class meetings per week. Seminar in Pindar and Bacchylides. Mr. Bundy (F)

213B. Sophocles. (4)
Two 1/2-hour class meetings per week. Mr. Rosenmeyer (Sp)

215. Seminar in Greek History. (4)
215A. Herodotus. Mr. Stroud (Su); Mr. Keenan (F)
215B. Thucydides. Mr. Fritchett (W)
215C. Aristotle's Constitution of Athens. Mr. Keenan (F)
215D. Greek Epigraphy. Mr. Fritchett (W)

216. Greek Philosophy. (4)
Two 1/2-hour class meetings per week. Mr. Johnson (W)

*216A. Presocratics. (4)
Two 1/2-hour class meetings per week.

*216B. Plato. (4)
Two 1/2-hour class meetings per week.

*216C. Aristotle. (4)
Two 1/2-hour class meetings per week.

*223. Introduction to Linear B. (4)
A course dealing with both the script and the language of the Linear B tablets. Selected texts will be read and discussed and there will be an introduction to the linguistic and archaeological background.

*230B. Terence. (4)
Two 1/2 hours of class meeting per week.

*231. Lucretius. (4)
Two 1/2-hour class meetings per week.

234B. Horace: Odes and Epodes. (4)
Two 1/2-hour class meetings per week. Mr. W. S. Anderson (Sp)

234C. Ovid. (4)
Two 1/2-hour class meetings per week.

*236A. Horace: Satires and Epistles. (4)
Two 1/2-hour class meetings per week.

* Not to be given, 1968—69.
*236B. Juvenal and Persius. (4)
Two 1½-hour class meetings per week.

*237B. Suetonius. (4)
Two 1½ hours of class meetings per week.

238B. Petronius. (4)
Two 1½-hour class meetings per week.

238D. Pliny: Letters. (4)
Two 1½-hour class meetings per week.

239A. Lucan. (4)
Two 1½-hour class meetings per week.

240. Latin Epigraphy. (4)
Three hours of class per week. Mr. Hooker (W)

*245A—245B. Latin Literature of the Middle Ages. (4–4)
One 2- to 3-hour class meeting per week.

*245A. Latin Literature of the Early Middle Ages, 500–900 A.D. Special attention will be given to the classical tradition and its influence.

*245B. Latin Literature of the High Middle Ages, 900–1300 A.D. Study of the evolution of mediæval style with special attention to lyrical and satirical poetry.

246. Roman Society and Roman Law. (4)
Two 1½-hour class meetings per week. The social, legal, and administrative background to the literary sources for the Roman Empire.

270A—270B—270C. Seminar in Classical Archaeology. (4–4–4)
Two 1½-hour class meetings per week. Advanced study of ancient Greek art objects and sites.

270A. Mr. J. K. Anderson (F)
270B. Mr. J. K. Anderson (W)

*270C.

289. Special Study. (2–8)
Prerequisite: completion of qualifying examination for the Ph.D. degree. This course is normally reserved for students writing the doctoral dissertation.

Staff (Su, F, W, Sp)

299. Special Study. (1–5)
Special individual study for qualified graduate students.

Staff (Su, F, W, Sp)

16. Latin for Graduate Students, First Course.
(No credit) (F, W, Sp)

26. Latin for Graduate Students, Second Course.
(No credit) (F, W, Sp)

601. Individual Study for Master's Candidates. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Candidates. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)

Related Courses in Other Departments
For courses in Sanskrit see Department of Linguistics.

Readings in Mediaeval Latin (English 210A–210B). (5–5) (Sp)

Mr. Jones (Sp)

The Mediaeval Mind (English 270). (5)

Mr. Jones (F, W)

IDS 181. Introduction to Thomas Aquinas' Summa Theologiae. (4)

IDS 281. Critical Moments in the Evolution of Mediaeval Thought. (4)

See Interdepartmental Studies for the complete descriptions of these courses.

Mediaeval Studies Students who are interested in specializing in mediaeval studies should consult Chapter III of this catalogue, in which the Committee for Mediaeval Studies is described.
The undergraduate major in the Department of Comparative Literature is based on the theory that responsible literary criticism requires both a serious knowledge of at least one national literature and the close study of literary masterpieces written in more than one language, place, and time. It offers the student an opportunity (1) to develop his ability to read literature critically and responsibly, (2) to study one literature in depth and at least one other in areas immediately relevant to his aims and interests, (3) to acquire a broader sense of literary history and tradition than may be derived from the study of a single literature, and (4) to prepare himself for the methodical investigation of problems involving more than one literature. The junior course (CL 100) is designed to introduce the student to a variety of fundamental approaches to literature and to encourage him to formulate his own critical standards. The senior course (CL 190) is designed to permit the student to apply the principles studied in the junior course and to undertake a research project involving the comparative examination of one author from each of the literatures which he has studied separately in the preceding quarters. The specific requirements for the A.B. with a major in comparative literature are listed below.

The Major

Lower Division There are no specific lower division requirements beyond those of the College of Letters and Science, but the following courses are recommended: 2 quarters from Comparative Literature 41A–41B–41C, as much work as possible in

Upper Division

at least one quarter of German literature, at least one quarter of French literature, at least one quarter of Italian literature, at least one quarter of Latin literature, and at least four quarters in one of the following two courses: Classics 11A–11B (Elementary Latin) and Classics 11C–11D (Intermediate Latin). Honors Program

The primary criterion for admission to honors is a minimum grade-point average of 3.5 in all courses leading up to the major, and for honors thesis work, a grade of B or better in each course. A student majoring in comparative literature may elect to write a senior honors thesis. All courses taken for the major and approved for honors must be at least 3 units each. Honors theses are written under the direction of the student's advisor with the consent of the chair of the Department of Comparative Literature. Teacher Training: consult Miss Richardson.

The Graduate Major

The Master of Arts degree in comparative literature is designed for graduates with training in languages and literatures who wish to specialize in a single area. It is not limited to students in the Graduate Division. A minimum of 30 units in addition to the required courses in the major is needed. A written comprehensive examination is required. The Ph.D. degree is obtained by extending the training in the Master of Arts field and the successful completion of a research project leading to the writing of a dissertation.
at least one foreign language (note that candidates for the A.B. with honors must work in both a vernacular foreign language and in Greek or Latin), and Classics 10A–10B.

**Upper Division** A minimum of 45 approved upper division units in literature, including (1) CL 100 in the junior year and a section of CL 190 in the senior year, (2) at least four courses totaling not fewer than 18 units in one literature read in the original language and with emphasis on the classic works of that literature, (3) at least two courses totaling not fewer than 8 units in another literature read in the original language, and (4) at least two courses in classical Greek and Latin in translation to be selected from the offerings of the Department of Classics, or Latin 104 or higher or Greek 101 and one additional upper division Greek course (students who have completed Classics 10A–10B and are not candidates for honors may substitute 8 units of upper division electives in the Department of Comparative Literature or in any literature for this requirement). Note that, although only two literatures (for example, English—French) are required for the A.B. degree, an adequately prepared student may find it advantageous to work in three literatures (for example, English—French—Latin).

**Honors Program**

The principal purpose of the honors program is to develop in qualified students the ability to do original literary work of scholarly integrity. The award of the A.B. with honors is not automatic. Although successful completion of the program outlined below insures the candidate's eligibility, the recommendation is made by the Committee on Honors and Prizes in Comparative Literature after evaluation of both the honors thesis and the candidate's total performance.

A student who has attained junior standing may be admitted to the honors program if (1) he has accumulated at least a 3.00 grade-point average, (2) has completed at least 16 upper division units in literature, including Comparative Literature 100 or the equivalent, and (3) is prepared to do upper division work in both one vernacular foreign language and either classical Greek or Latin before graduation (note that students who satisfy this requirement with Greek must complete two courses beyond Greek 100). Attention is called to the special honors course (H196), which is designed to allow students who have completed H1A–H1B with distinction to prepare for honors throughout their entire undergraduate career.

In addition to the requirements for the regular program outlined above, a candidate for the A.B. with honors in comparative literature must (1) accumulate at least a 3.2 grade-point average by the time of his graduation, (2) do upper division work in both a vernacular foreign language and either classical Latin or classical Greek including two courses beyond Greek 100, (3) demonstrate, through either examination or course work, a sense of the historical development of his principal literature, and (4) earn a grade of B or higher for the writing of an honors thesis in Comparative Literature H198. Students interested in the honors program are urged to consult an adviser in the Department of Comparative Literature at their earliest opportunity.

**The Graduate Program**

The M.A. in comparative literature normally prepares the student for doctoral work at Berkeley or, when taken in conjunction with the appropriate teaching credential, leads to teaching at the high school or junior college level. The Ph.D. program prepares students for teaching and research in English and the ancient and modern foreign languages and literatures; it is especially designed to encourage research involving the study of literary documents in more than one language. Additional information may be sought from the instructor in charge of graduate studies in the Department of Comparative Literature.
Undergraduate Preparation  Students interested in the graduate program in Comparative Literature at Berkeley are advised that strong undergraduate preparation in foreign languages will speed up their work on the graduate level. A reading knowledge of two foreign languages is required for the M.A., and a reading knowledge of four foreign languages (including both Greek or Latin and French or German or Russian) is required for the Ph.D.

Requirements for the M.A. Degree  A minimum of 36 approved graduate and upper division units including (1) at least 18 graduate units, (2) at least one introductory graduate course and one graduate seminar in Comparative Literature, and (3) work in at least two separate ancient or modern literatures (for example, English and Italian), one of which must be studied in depth and the other in areas relevant to the student’s aims and interests. The required course work in individual literatures depends upon the student’s previous training but must include at least two courses (totaling not fewer than 8 units) in the minor literatures and three courses (totaling not fewer than 10 units and including two or more graduate courses) in the major literature. Courses on foreign literature in English translation may not normally be counted in satisfaction of the requirements listed above. The first year of graduate study is usually spent preparing for the M.A. written examination on a list of approved texts selected by the student in consultation with his adviser, but students working in Oriental or Near Eastern literatures should expect to spend at least two additional quarters preparing for the degree.

Requirements for the Ph.D. Degree  There is no formal course requirement beyond the M.A. Each student has the responsibility of preparing himself, in consultation with his adviser, for the written and oral doctoral qualifying examination on (1) the development of one literature with heavy emphasis on one period of specialization and (2) two additional literatures in only one period each. After consultation with his adviser, a student may request to be examined on only two literatures if the examination covers the development of both in addition to the period or periods of specialization. In either case, the comparative questions are usually limited to the period or periods of specialization, and all the texts presented must have been read in their original linguistic form. The qualifying doctoral examination may not be taken until all four foreign-language reading requirements have been satisfied. There is a final oral examination on the dissertation and its immediate area.

Lower Division Courses

1A—1B. English Composition in Connection with the Reading of World Literature. (4-4)

Three 1-hour lectures and discussion periods and one tutorial meeting per week. Prerequisite: Subject A examination or course. 1A or equivalent course is prerequisite to 1B. Expository writing based on analysis of selected masterpieces of ancient and modern literature. The Staff (Mrs. Clubb in charge) (Su)

The Staff (Miss Richardson in charge) (F, W, Sp)

H1A—H1B. English Composition in Connection with the Reading of World Literature: Honors Section. (4-4)

Three 1-hour lectures and discussion periods and one tutorial meeting per week. Prerequisite: (a) Subject A examination, (b) a 3.00 grade-point average in high school English, (c) a reading knowledge of an ancient or modern foreign language, and (d) permission of the instructor in charge of Comparative Literature 1A—1B. Credit and grade will be assigned upon completion of the full sequence. The honors section is limited to 10 qualified freshmen who meet as a group for round-table discussion and attend weekly tutorial sessions. In addition to the core reading, individual assignments provide each student with opportunity to exploit his linguistic and literary training. Mr. Alter, Mr. Augst, Mr. Coolidge, Mr. Nagler (F, W)

41A—410. Introduction to Literary Forms. (4-4-4-4)

Two 1½-hour lectures and one 1-hour meeting per week. Comparative study of Eastern and Western literary masterpieces of world literature.

41A. Forms of the Epic. Mr. Witke (Sp)

41B. Forms of the Novel. Miss Rosenberg (F)

41C. Forms of the Drama. Mr. Prescott (Su, W)

41D. Forms of the Lyric. Mr. Momaday (Su)

Upper Division Courses

Group I: Unrestricted Courses

(Open to all students in the upper division; enrollment not limited.)

* Not to be given, 1968–69.

§ Approved for one offering only, summer, 1968.
10. The Classical Tradition in Western Literature. (4)
Three 1-hour lecture periods per week. Examination of selected aspects of the Greco-Roman tradition and their relevance to the study of later literature.
Mr. Nagler (Sp)

112A—112B. Introduction to Modern Greek. (5-5)
Three 1½-hour class meetings per week. Prerequisite: two years of classical Greek at college, including a course on Homer and a course on either Plato or a dramatist (Greek 101 and either 102 or 103 at Berkeley satisfy this requirement). Modern Greek pronunciation, vocabulary, morphology, and syntax studied in comparison with Attic Greek; reading of selections of progressive length and complexity.

120. The Biblical Tradition in Western Literature. (4)
Three 1-hour lecture periods per week. Examination of selected aspects of the Biblical tradition and their relevance to the study of later literature.
Mr. Coolidge (Sp)

140A—140B. The Literature of the Middle Ages. (4-4)
Three 1-hour lecture periods per week. Examination of representative aspects of the Eastern and Western Middle Ages through the comparative study of literary masterpieces. 140A, the early Middle Ages; 140B, the later Middle Ages.
Mr. Renoir (W)

151A—151B. The Literature of the Renaissance in Western Europe. (4-4)
Three 1-hour lecture periods per week. Not open to students who have received credit for course 141. Ramifications of the Renaissance movement in the West European countries, with special reference to Italy, including discussions of the different phases of the movement and the contributions of various great writers to it.
Mrs. Clibb (W)

155. Trends in Contemporary Literature. (4)
Three 1-hour lecture periods per week. Examination of selected works illustrating the current state of literature in the United States and abroad.
Mr. Momaday, Mr. Prescott, Mr. Cohn, Miss Korpan, Mr. Larson (Su, F, W)

160. Western Literary Crosscurrents in Twentieth-Century China. (4)
Three 1-hour lecture periods per week. The impact of western literature on modern China and China's response in literary theory, movements, and creation.
——— (Sp)

178. Introduction to Modern Greek Literature. (5)
Three 1½-hour class meetings per week. Prerequisite: course 112A—112B or equivalent knowledge of Classical and Modern Greek. Reading and analysis of selected masterpieces of Greek literature from the Byzantine Period to the present.
——— (Sp)

Group II: Restricted Courses

(Designed primarily for students whose major subject is comparative literature; sections limited to fifteen students each.)

190. Introduction to Comparative Literature. (4)
Three 1-hour lecture periods and one tutorial meeting per week. Prerequisite: at least four quarters in one foreign language and at least two quarters in lower division or upper division literature. Selected critical and literary texts from classical antiquity to the present, read in English and one foreign language. Emphasis on principles of literary comparison and analysis.
Miss Richardson, Mr. Alter, Mr. Augst, Mr. Johannesson, Mr. Larson, Mrs. Clibb (Su, F, W, Sp)

The Junior Course

190A. Comparison of Authors: English, French, German. (4)
Three 1-hour lecture periods and discussion periods per week. Prerequisite: course 100 or equivalent, and at least four quarters in upper division literature, including at least one quarter in French or German. Comparison of three important authors, English, French, German; one foreign author must be read in the original language; examination and substantial comparative paper required.
Mrs. Cohn, Miss Korpan, Mr. Larson (Su, F, W)

190B. Comparison of Authors: English, French, Latin. (4)
Three 1-hour lecture periods and discussion periods per week. Prerequisite: course 100 or equivalent, and at least four quarters in upper division literature, including at least one quarter in French or Latin. Comparison of three important authors, English, French, Latin; one foreign author must be read in the original language; examination and substantial comparative paper required.
Mr. Bundy (Sp)

190C. Comparison of Authors: English, French, Spanish. (4)
Three 1-hour lecture periods and discussion periods per week. Prerequisite: course 100 or equivalent, and at least four quarters in upper division literature, including at least one quarter in French or Spanish. Comparison of three important authors, English, French, Spanish; one foreign author must be read in the original language; examination and substantial comparative paper required.
Mr. Murillo (W)

190D. Comparison of Authors: Unlisted Literatures. (4)
Three 1-hour lecture periods and discussion periods per week. Prerequisite: course 100 or equivalent, and at least four quarters in upper division literature, including at least one quarter in Spanish or Italian. Comparison of three important authors, English, Spanish, Italian; one foreign author must be read in the original language; examination and substantial comparative paper required.
Mrs. Clibb (W)

* Not to be given 1968-69.
read in the original languages. Substantial comparative paper required.

The Staff (Mrs. Clubb in charge) (Su)
(Miss Richardson in charge) (F, W, Sp)

Tutorial Courses

H196. Special Honors. (1)
Prerequisite: Comparative Literature H1A–H1B with a grade of B or higher, and permission of the instructor in charge of undergraduate studies in Comparative Literature. Weekly tutorial meetings including oral and written reports on a reading list designed to give a focal point to the work done in separate courses in literature and to lead to the writing of an honors thesis in Comparative Literature H198. May be repeated each quarter until the senior year.

The Staff (Mrs. Clubb in charge) (Su)
(Miss Richardson in charge) (F, W, Sp)

H198. Honors Course. (1–4)
Prerequisite: honors standing, 12 units in upper division literature courses including course 100 or the equivalent, and a knowledge of a vernacular foreign language and either Greek or Latin. Preparation and writing of an honors thesis under the supervision of a member of the faculty.

The Staff (Mrs. Clubb in charge) (Su)
(Miss Richardson in charge) (F, W, Sp)

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students.

The Staff (Mrs. Clubb in charge) (Su)
(Mr. Prescott in charge) (F, W, Sp)

Graduate Courses

Introductory Graduate Courses

200. Methods of Study in Comparative Literature. (4)
Two 1½-hour meetings per week. Approaches to the study of relationships among literatures, and to analysis of genres, types, motifs, recurring figures, style, and metrics toward definition of periods and movements. The student will write a brief paper illustrating each of the methods presented.

Mr. Ramsey (F)

202A. Approaches to Epic Poetry. (4)
Two 1½-hour lectures and discussion periods per week. Prerequisite: admission to graduate standing in Comparative Literature; advanced undergraduates may be admitted with consent of instructor. Application of the methods of Comparative Literature to the study of epic poetry.

Mr. Duggan, Mr. Nagler (Sp)

202B. Approaches to Lyric Poetry. (4)
Two 1½-hour lectures and discussion periods per week. Prerequisite: admission to graduate standing in Comparative Literature; advanced undergraduates may be admitted with consent of instructor. Application of the methods of Comparative Literature to the study of lyric poetry.

Mr. Duggan, Mr. Bundy (Sp, W)

202C. Approaches to the Novel. (4)
Two 1½-hour lectures and discussion periods per week. Prerequisite: admission to graduate standing in Comparative Literature; advanced undergraduates may be admitted with consent of instructor. Application of the methods of Comparative Literature to the study of prose narrative.

Mr. Johannesson (F)

*202D. Approaches to Dramatic Literature. (4)
Two 1½-hour lectures and discussion periods per week. Prerequisite: admission to graduate standing in comparative literature; advanced undergraduates may be admitted with consent of instructor. Application of the methods of Comparative Literature to the study of dramatic literature.

F)

203A–203B. Materials and Techniques of Literary Scholarship. (1–1)
One 2-hour lecture and discussion period per other week. Prerequisite: admission to graduate standing in comparative literature. Readings in selected primary and secondary texts central to the study of comparative literature. Required of all candidates for the M.A. degree, normally taken during the first year of residence.

The Staff (Mr. Renoir in charge) (F, W)

Graduate Seminars

204A–204B. Studies in Relations Between Classical and Modern Literatures. (4–4)
One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages, at least one of which must be either Greek or Latin. 204A is not prerequisite to 204B. Comparative investigation of a topic in Western literature involving the study of classical and post-classical documents. Topics for 1968–69:

204A. New Comedy and its Renaissance Descendants.
Mr. Anderson (F)
204B. The Byzantine Epic and Its Tradition.
Mr. Alexander (W)

210A–210B. Studies in Medieval Literature. (4–4)
One 3-hour lecture and discussion period per week. Prerequisite: preparation in two medieval languages. 210A is not prerequisite to 210B. Comparative investigation of a topic in Western literature between the fifth century and the fourteenth.

210A. The Patristic Tradition. Mr. Alexander (W)
210B. The Grail in Arthurian Literature.
Mr. Spahr (Sp)

*215A–215B. Studies in Renaissance Literature. (4–4)
One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages. 215A is not prerequisite to 215B. Comparative investigation of a topic in Western literature in the Renaissance period. Topic for 1968–69:

Renaissance Tragedy.
Mr. Coolidge (Sp)

*220A–220B. Studies in Neo-classical Literature. (4–4)
One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages. 220A is not prerequisite to 220B. Comparative investigation of a topic in Western literature between the end of the Renaissance and the beginning of the nineteenth century. Topic for 1968–69:

Classical Decorum and Metaphysical Wit.
Mr. Coolidge (F)

225A–225B. Studies in Symbolist and Modern Literature. (4–4)
One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages. 225A is not prerequisite to 225B. Comparative

* Not to be given, 1968–69.
tive investigation of a topic in Western literature between the end of the Neoclassical period and the beginning of the contemporary period. Topic for 1968-69: The Symbolist Movement in European Literature. Mr. Ramsey (W)

230A—*230B. Studies in Oriental-Western Literary Relations. (4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages, one of which must be Oriental. 230A is not prerequisite to 230B. May be repeated for credit. Comparative investigation of a literary topic requiring the study of both Oriental and Western documents. Topics and texts will vary from year to year. Topic for 1968-69: China. Mr. Chen (W)

231A—*231B. Studies in Relations Between Near-Eastern and Western Literatures. (4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages, one of which must be Near-Eastern. Comparative investigation of a literary topic requiring the investigation of both Near-Eastern and Western documents. Topic for 1968-69: Maqama Literature. Miss Rosenberg (Sp)

*235A—*235B. Studies in Linguistics and Comparative Literature. (4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages and Linguistics 105 or equivalent knowledge of linguistics. 235A is not prerequisite to 235B. Application of modern linguistic methods to the comparative study of literature. Topic for 1968-69: Computer Processing of Literary Texts. Mr. Augst (W)

240A—240B—240C. Problems in Comparative Literature. (4-4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages. Investigation of a problem in the comparative study of literature. Topics for 1968-69: Modes of Poetry. Mr. Bundy (Sp); Chaucer and the Rhetorical Tradition. Miss Richardson (W); Satire. Mr. Witke (W); Platonic Tradition in Literature Mr. Rosenmeyer (W, Sp)

245A—245B. Studies in Contemporary Literature. (4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages. 245A is not prerequisite to 245B. Comparative investigation of a topic in contemporary Western literature. Topics for 1968-69: Surrealism Mr. Augst (W); The Literature of Allusion Mr. Alter (Sp); The Anti-Novel. Miss Korpan (F)

250A—250B. Studies in Critical Theory. (4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages. 250A is not prerequisite to 250B. Comparative investigation of a topic in the theory of literary criticism. Topic for 1968-69: Spitzer Groce and Collingwood: Problems in Literary Theory. Miss Korpan (Sp)

255A—*255B—*255C. Comparative Byzantine Studies. (4-4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages, one of which must be Greek. Comparative investigation of a topic in Byzantine literature. Topic for 1968-69: The Byzantine Epic and Its Tradition. Mr. Alexander (Sp)

*260A—*260B—*260C. Translation Workshop. (4-4-4)

One 3-hour lecture and discussion period per week. Prerequisite: preparation in two foreign languages. A grade of A in 260B is normally prerequisite to admission to 260C. Comparative examination of ancient and modern theories of translation in connection with practice in the literary translation of texts of increasing complexity; students admitted to 260C will undertake a sustained translation project in either English or a foreign language. Topic for 1968-69: —. Mr. Alter (W)

Graduate Tutorial Courses

298. Special Study. (1–5)

Primarily for students engaged in preliminary exploration of a restricted field, investigation leading to the writing of a report. May not be substituted for available seminars. The Staff (Mrs. Clubb in charge) (Su, F, W, Sp)

299. Directed Research. (5–10)

Normally reserved for students directly engaged on the doctoral dissertation. The Staff (Mrs. Clubb in charge) (Su, F, W, Sp)

601. Individual Study for Master's Students. (1–8)

Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mrs. Clubb in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mrs. Clubb in charge) (Su, F, W, Sp)

Teachers' Course

*300. Problems in Teaching Comparative Literature in Secondary School. (4)

Prerequisite: senior or graduate standing and course work in three literatures, two of which must be studied in the original languages, or consent of instructor. Examination of the proper function of ancient and modern literary masterpieces in the secondary school curriculum in the light of modern educational theories, and study of methods of teaching these works. Miss Richardson (Sp)

*360. Methods of Teaching Literature and English Composition. (1)

One 2-hour lecture per week. Prerequisite: appointment as a teaching assistant or consent of instructor. Discussion of approaches to teaching composition at the college level in relation to the reading of masterpieces of literature. Designed primarily for teaching assistants in the freshman composition course. Miss Richardson (F)

* Not to be given, 1968-69.
**COMPUTER SCIENCE**

(Department Office, 201 Campbell Hall)

Martin H. Graham, Ph.D., Professor of Computer Science and Associate Director of the Computer Center.

William Kahan, Ph.D., Professor of Computer Science.

Derrick H. Lehmer, Ph.D., Professor of Computer Science and of Mathematics.

Michael A. Harrison, Ph.D., Associate Professor of Computer Science.

Beresford N. Parlett, Ph.D., Associate Professor of Computer Science.

Stephen A. Cook, Ph.D., Assistant Professor of Computer Science and of Mathematics.

Butler W. Lampson, Assistant Professor of Computer Science and of Electrical Engineering.

The major in computer science offers the undergraduate at Berkeley a background in digital computing together with special courses designed to prepare the undergraduate for a career in computing or further study in computer science. Emphasis may be made in one of three directions:

1. Applications of computers to the physical and social sciences (e.g., scientific calculations, simulation, information retrieval)

2. Programming and computer systems (e.g., design and implementation of compilers and assemblers, machine organization)

3. Theory of formal languages and automata

**Preparation for Graduate Study**

For details about the graduate program please contact the departmental office.

_Letters and Science List:_ for regulations governing this list, see page 80.

**Lower Division Courses**

1. **Computers and Data Processing. (4)**

Two 1-hour lectures and one 2-hour problem session per week. A survey course for students not planning further study in computer science. Topics selected from automatic data processing, structure of simple computers, automatic control, pattern recognition, algorithmic languages and their use in problem-solving. 1 and 2 may not both be taken for credit.

2. **Elementary Computer Programming. (4)**

Three 1-hour lectures and one 1-hour problem session per week. Computers and their logical structure, binary arithmetic, codes, programming languages, problem-solving by machine. Introductory course for students wishing to study computing. Course 2 and Engineering 1 may not both be taken for credit. In general course 2 will cater to Letters and Science students and Engineering 1 will cater to Engineering students.

**Upper Division Courses**

**102. Introductory Computer Programming. (4)**

Three hours of lecture and one 1-hour problem session per week. Introductory course for upper division or graduate students interested in computer programming. Thorough study of a compiler language (FORTRAN, ALGOL) and various applications. Students may not receive credit for course 102 and any of Engineering 1, Engineering 101, or course 2.

**103. Programming Techniques. (4)**

Three hours of lecture per week. Prerequisites: course 2 or equivalent. Basic methods of nonnumeric programming: machine language, number representations, floating-point numbers, arrays, pointers, lists, stacks, trees, searching, sorting, recursion, binding of variables, input/output, assemblers and loaders, macros, conditional assembly. Representation and parsing of expressions. Course 103 and Electrical Engineering 153 may not both be taken for credit.

§ Approved for one offering only, 1968-69.
§106. Algorithmic Languages and Compilers. (4)

Three hours of lecture per week. Prerequisite: course 2 or equivalent. Assembly systems, method of storage allocation, structure of languages, study of a particular language such as ALGOL; theory of compilers. Course 106 and Electrical Engineering 154 may not both be taken for credit. Mr. Lampson (Sp)

§107. Introduction to Combinatorics. (4)

Three hours of lecture per week. Prerequisite: Mathematics 1C. Fundamental concepts, connectedness, path problems including Euler paths and Hamiltonian circuits. Chromatic graphs, coloring problems, critical graphs, coloration polynomials. Theorem of Ramsey. Acceptable for mathematics majors. Mr. Lehmer (F)

§108. Graph Theory. (4)

Three hours of lecture per week. Prerequisite: Mathematics 1C. Fundamental concepts, connectedness, path problems including Euler paths and Hamiltonian circuits. Chromatic graphs, coloring problems, critical graphs, coloration polynomials. Theorem of Ramsey. Acceptable for mathematics majors. Mr. Lehmer (F)

§112. Introduction to Mathematical Theory of Machines. (4)

Three hours of lecture per week. Prerequisite: Mathematics 113A. Turing machines, computable functions, unsolvability of the halting problem. Finite state machines, regular sets, construction of the semi-group of a machine. Prime decomposition theorem for finite state machines. Decomposition of group machines. Survey of other automata. Acceptable for mathematics majors. Mr. Cook (F)

Graduate Courses

§204A–204B. Theory of Machines. (4)

Three hours of lecture per week. Prerequisite for 204A, Mathematics 250A; for 204B, course 204A. 204A. Turing machines and other computer models with an eye toward developing a theory of the computational complexity of functions. Topics include introduction to computability theory, study of classes of functions defined by computation time and storage requirements.

Mr. Cook (W)

204B. Important families of automata and their properties. Relevant applications to programming. Finite semigroups and application to the decomposition of finite state machines. Mr. Harrison (Sp)

§205. Theory of Formal Languages. (4)

Three hours of lecture per week. Prerequisite: course 112. Introduction to context free languages. Undecidability results. Applications to programming.

206A–206B–206C. Programming Languages and Systems. (4-4-4)

Three hours of lecture per week. Prerequisite: for 206A, course 106; for 206B, course 206A; for 206C, course 206B.

206A. Software design and implementation; translators for artificial languages; operating systems for general, time-shared, and specialized applications. A survey of significant work with examples.

Mr. Lampson (F)

206B. Operating system design; scheduling, storage allocation, input-output. (a) Monitors and batch-processing systems, (b) time-sharing systems, (c) real-time systems. Mr. Lampson (W)

206C. Programming applications: (a) pattern recognition, (b) natural language translation, (c) question answering systems, (d) game playing programs, (e) problem-solving and learning systems, (f) mechanical mathematics. Mr. Lampson (Sp)

§215A–215B. Digital Computers in Experimental Systems. (4-4)

Three hours of lecture per week. Prerequisite: permission of instructor. A detailed study will be made of one or more experimental systems which intimately involve the use of digital computers. The specific systems will be chosen according to the interests of the class from such fields as biology, physics, psychology.

Mr. Graham (W)

§270. Special Topics in Numerical Analysis. (2-8)

Prerequisite: consent of instructor (since required preparation depends on the topic). Advanced work in special areas. Course may be repeated with different sections for credit.

270A. Initial Value Problems.

270B. Boundary Problems.

270C. Matrix Computations.

270D. Applications of Functional Analysis.

270E. Approximation of Functions.

270F. Implementation of Algorithms.

Mr. Parlett, (F, W, Sp)

290. Seminars. (2-8)

One 2-hour lecture per week. Prerequisite: consent of instructor. Topics in programming systems, languages, numerical analysis, machine organization, computational complexity and topics to be announced.

The Staff (Su, F, W, Sp)

295. Reading Course for Graduate Students. (2-8)

By appointment. Prerequisite: consent of instructor. Investigation of special problems under the direction of members of the department.

The Staff (Su, F, W, Sp)

299. Individual Research. (2-8)

By appointment. Prerequisite: consent of instructor. Intended for candidates for the Ph. D.

The Staff (Su, F, W, Sp)

IDS 105. Elements of Digital Computers. (4)

See Interdepartmental Studies for the complete description of this course.

* To be offered when there is a demand and an instructor is available.

§ To be offered one year only, 1968-69.
CRIMINOLOGY

(Department Office, 101 Haviland Hall)

Bernard L. Diamond, M.D., Professor of Criminology and of Law.
Caleb Foote, M.A., LL.B., Professor of Criminology and of Law.
Joseph D. Lohman, M.A., Professor of Criminology (Chairman of the Department).
Theodore R. Sarbin, Ph.D., Professor of Criminology and of Psychology.
Arthur H. Sherry, A.B., LL.B., Professor of Criminology and of Law.
Leslie T. Wilkins, Professor of Criminology.
Paul L. Kirk, Ph.D., Professor of Criminalistics, Emeritus.
Caleb Foote, M.A., LL.B., Professor of Criminology and of Law.
Orlando W. Wilson, A.B., Professor of Criminology, Emeritus.
M. Edwin O'Neill, M.S., Associate Professor of Criminalistics.
James T. Carey, Ph.D., Assistant Professor of Criminology.
Robert M. Fisher, Ph.D., Assistant Professor of Criminology.
Richard R. Korn, Ph.D., Assistant Professor of Criminology.
Brian P. Parker, D.Crim., Assistant Professor of Criminology.
Herman Schwendinger, Ph.D., Assistant Professor of Criminology.

Nathan Adler, Ph.D., Lecturer in Criminology and in Psychology.
Fariborz Amini, M.D., Visiting Lecturer in Criminology and Law
Seymour Boorstein, M.D., Visiting Lecturer in Criminology.
Herbert Bloomer, Ph.D., Professor of Sociology.
Milton Feldstein, M.A., Visiting Lecturer in Criminalistics.
John D. Holstrom, A.B., Lecturer in Criminology.
Gordon E. Misner, D.Crim., Visiting Associate Professor of Criminology.

The requirements for admission to the School of Criminology are listed (on page 84). The requirements for the Bachelor of Arts and the Bachelor of Science degrees are listed in the ANNOUNCEMENT OF THE SCHOOL OF CRIMINOLOGY.


Upper Division Courses

100A-100B. Introduction to Criminology. (4-4)
Four and one-half hours per week. A survey of criminological theory and practice, causes of delinquency and criminal behavior, institutions and processes of law enforcement, the administration of criminal justice, theories and current practices in correctional treatment and crime prevention.

101A-101B. Principles of Criminal Investigation. (4-4)
101A. Four and one-half hours per week. Organization and functions of investigative agencies, basic considerations in the investigation of crime, collection and preservation of physical evidence, elements of legal proof in the submission of evidence, investigation of specific offenses.

101B. Three lecture hours and three laboratory hours. Basic concepts in the identification of persons, theory of dermatoglyphics and other criteria, investigation and identification of questioned documents.

102A-102B-102C. The Etiology of Crime. (4-4-4)
102A. Sociological. Four lecture hours. Social factors and processes in criminal and delinquent behavior; regional, cultural, institutional and group variables; personal and group alienation; social-psychological conditions of criminal careers and organized crime.

102B. Psychological. Four and one-half lecture hours. Psychological factors and processes in criminal and delinquent behavior, components of normal and abnormal personality, methods of personality measurement and clinical diagnosis.

102C. Psychiatric. Four lecture hours. Psychopathology and psychodynamics of the psychoses, psychoneuroses, and character disorders; mental disorders in relation to crime and delinquency.

Mr. O'Neill (F)
Mr. O'Neill (W)
Mr. O'Neill (W)
104A—104B. The Correctional and Penal System. (4-4)

Four and one-half lecture hours. Organization and function of institutions and non-institutional services in the correctional rehabilitation of criminal and juvenile offenders, contemporary philosophies and methods in the treatment of adult criminals and juvenile delinquents. 104A (Su, W) Mr. Fisher; 104B (Sp) Mr. Korn

105A—105B. Fundamentals of Police Administration. (4-4)

Four lecture hours. The police as a functional aspect of the system of criminal justice; principles of organization and personnel management; line, staff and auxiliary functions; modus operandi of arrest and detention; political controls and limitations on authority and jurisdiction; professionalization of the police. Sequence beginning (F). 105A (Su, W) Mr. Misner; 105B (Sp) Mr. Misner

106. The Criminal Self and Criminal Careers. (4)

Four lecture hours. Prerequisite: 102A. The development of criminal self-conceptions, social-psychological processes of group alienation and individual estrangement, maturation and professionalization in the development of criminal careers; selected case studies. Mr. Carey (F)

108. History of Crime and its Treatment. (4)

Four lecture hours. Perspectives and methods in the study and control of crime, the evaluation of correctional philosophies and programs, eighteenth- and nineteenth-century schools of criminology, contemporary correctional practices and their philosophical antecedents. (W)

109. Theories of Criminal Causation. (4)

Four and one-half lecture hours. The major criminological theories, comparison and analysis of their assumptions and methodologies, particularistic, eclectic and integrated approaches, current theoretical contributions. Mr. Korn (W)

*110. Comparative Criminology and the Administration of Criminal Justice. (4)

Four and one-half lecture hours. Comparative survey of the police, the courts, and the correctional systems in selected countries; an examination of the cross-cultural and cross-national uniformities and diversities as they give rise to and sustain crime.

111. Scientific Methodology. (4)

Four and one-half lecture hours. Criminalistics majors must take 111L concurrently. An exploration of the systems presently in use by the physical and social sciences for the purposes of identifying groups and characterizing individuals. Discussion of the probabilistic nature of all such systems and the elements of data evaluation employed. Mr. Parker (F)

111L. Scientific Methodology: Laboratory. (3)

Six laboratory hours. Mr. Lohman (F)

*112. Organized Crime and the Professional Criminal. (4)

Four lecture hours. A systematic analysis of criminal associations in their various manifestations, informal types of cliques and mobs and formal organizations of industry and area-wide racketeers, the professional criminal as a social type, varieties and modus operandi of professional criminals.

113. Forensic Medicine in Criminology. (4)

Four lecture hours. Prerequisite: 100 or 101 or consent of instructor. Pathological changes in death and their significance of poisons, their recognition, and untoward effects. Effect of impact of criminal actions upon the human body; physical, chemical and other traumatic influences. Survey of body fluids, tissues, different classes of poisons, their recognition, and untoward effects. Pathological changes in death and their significance in criminology.

114. Prevention and Control of Crime in Metropolitan Areas. (4)

Four and one-half lecture hours. Crime in relation to the development of metropolitan areas, incongruent patterns of criminal activity and police organization, demographic and ecological factors in the incidence and distribution of crime and delinquency, considerations of policy and planning. Mr. Lohman (Sp)

115A—115B. The Criminal Law in Action. (4-4)

Four lecture hours. Prerequisite: senior standing. Basic concepts of the criminal law, their origin and development in Anglo-American jurisdictions; constitutional limitations on the police power; the administrative processes of law enforcement; modern criminal procedure. Sequence beginning (F). Mr. Sherry (F, W)


Four lecture hours. Prerequisite: senior standing. Constitutional and procedural restraints on law enforcement, their purpose and implementation; Federal and state relationships in the administration of criminal justice. Mr. Fisher (F)

117. The Prison Community. (4)

Four lecture hours. Effects of informal inmate social interaction, types of formal prison organization, latent effects of inmate culture and prisonization, antithetical processes of socialization, types of group controls, authoritarian and permissive. Mr. Fisher (Sp)

118A. The Alcoholic and the Narcotic Addict. (4)

Four and one-half lecture hours. Prerequisite: 102A—102B—102C or comparable courses in sociology and psychology. Psychopathology of sexual deviation; developmental theories of sexual abnormality; legal, social, psychological and moral problems associated with sexual and character disorders. Mr. Adler (Sp)

118B. Sexual Offenders and Character Disorders. (4)

Four and one-half lecture hours. Prerequisite: 102A—102B—102C or comparable courses in sociology and psychology. Psychopathology of sexual deviation; developmental theories of sexual abnormality; legal, social, psychological and moral problems associated with sexual and character disorders. Mr. Adler (W)

119. Ethnic Tension and Conflict in Relation to Law Enforcement. (4)

Four and one-half lecture hours. Race and cultural differences as a factor in differential law enforcement; variations in punitive sanctions, double standards as modus operandi, symbolic reactions of tension and conflict, positive and negative factors in the control of ethnic hostilities. Mr. Carey (F)

* Not to be given, 1968—69.
121. White-Collar Crime. (4)
Four and one-half lecture hours. An examination of the extent and character of white-collar crime, with special emphasis upon political and financial variables as differentiating conditions.

122. Organization and Administration of the Juvenile Court. (4)
Four lecture hours. A consideration of the origins and development of the juvenile court; comparison of juvenile and criminal procedures with particular emphasis upon the decision-making process.

123. Groups, Crowds and Gangs. (4)
Four lecture hours. An examination of group dynamics and their relation to antisocial acts, especially to fighting gangs, mobs and mass disturbances as a condition of the violation of legal norms, and their implications for the law enforcement and corrective functions.

Mr. Fisher (W)

124. Nonconformist Cultures. (4)
Four and one-half lecture hours. An analysis of varieties of crime generating contemporary subcultures. Societal norms and legal structures, including the police, the courts and the correctional systems, are examined as they relate to deviant subcultures.

Mr. Korn (W)

125. Group Psychotherapy in Correctional Institutions. (4)
Four lecture hours. An analysis of alternative techniques of group therapy as currently employed in penal practice.

Mr. Wilkins (Su)

126. Law Enforcement Policies and Social Structure. (4)
Four lecture hours. Prerequisite: senior standing. An examination of law enforcement systems in relation to the incidence and distribution of economic and social power, class structure, ecological patterns, subcultural developments in the community and in the police, and problems of professionalization.

Mr. Fisher (Sp)

127. Law and Discretion in Criminal Sentencing. (4)
Four and one-half lecture hours. Legal and constitutional factors, the principle of the rule of law and the ethical goals of the criminal law as limitations upon judicial and administrative discretion in fixing sentence and determining release on parole.

Mr. Parker (W, Sp)

128. Social and Historical Origins of Major Theories of Criminal Behavior. (4)
Four lecture hours. Study and analysis of the interaction between social relations at given historical periods and the development of general theories of criminal behavior.

Mr. Schwindemer (F)

130. Some Basic Criminological Research Operations. (4)
Four lecture hours. Prerequisite: admission to the School with completion of courses listed under Social Science Emphasis (See School of Criminology, Chapter V). This course is designed to provide a general introduction to research methods of special relevance to criminology. Topics dealt with will include: general statistical data collection and interpretation of published data; sampling methods; questionnaire and schedule design; interviewing for research.

Mr. Wilkins (Su)

131. An Approach to Systems Theory in Relation to Problems in Criminology. (4)
Four lecture hours. Prerequisite: admission to the School with completion of courses listed under Social Science Emphasis (See School of Criminology, Chapter V). This course is designed to familiarize students with the language of systems and information theory. Illustrations of applications are taken from operations research. The importance of the "model" is stressed, and exercises are given in the design of algorithms.

132. Evaluation of Penal Measures. (4)
Four lecture hours. Prerequisite: admission to the School with completion of courses listed under Social Science Emphasis (See School of Criminology, Chapter V). A review of the various attempts which have been made to assess the effectiveness of the deterrent and "treatment" effects of penal measures available to the courts. The methods discussed are limited to those related to this field and are developed in some detail.

133. Prediction Methods in Criminology. (4)
Four lecture hours. Prerequisite: admission to the School with completion of courses listed under Social Science Emphasis (See School of Criminology, Chapter V). The limitations of prediction methods will be discussed together with some of the technical and moral problems involved in the approaches. A critical analysis is developed of the work in this field. Ways in which prediction methods may be developed and extended to provide a more satisfactory framework will be considered.

151A–151B. Microanalytic Concepts. (5–5)
One lecture hour and 9 laboratory hours. Prerequisites: 111 and 111L; Chemistry 5, 12A–12B and 112, with grade of C (112 may be taken concurrently). Form and substantive pattern analyses by means of chemical and physical methods and techniques with relation to forensic purposes. Sequence, beginning (W).

Mr. Parker (W, Sp)

152. Forensic Aspects of Separation and Purification. (5)
Two lecture hours and 6 laboratory hours. Prerequisites: 111 and 111L; Chemistry 5, 12A–12B and 112, with grade of C (112 may be taken concurrently). Principles of isolating physical constituents of samples.

Mr. Parker (F)

Two lecture hours and 7 laboratory hours. Prerequisites: 151A–151B. Instrumental approaches to identification and characterization. Sequence, beginning (W).

Mr. Parker (W, Sp)

154. Physiological Concepts. (5)
One lecture hour and 9 laboratory hours. Prerequisite: 151A–151B. Application of biochemical and immunological principles in the area of physiological material.

Mr. Kirk (F)

155. Comparative Evidence and Evaluation. (5)
Two lecture hours and 6 laboratory hours. Prerequisite: 101A or 101B. Comparative studies of gross and microscopic characteristics of various types of physical evidence, interpretation and evaluation as investigative aids and legal proof.

Mr. O'Neill (Sp)

* Not to be given, 1968–69.
I. The requirements for admission to the

*163. Problems and Procedures in Criminal Interrogation. (5)

Three lecture hours and 2 laboratory hours. Survey of historical and contemporary methods of interrogation including techniques for detection of deception, psychological and physiological variables in subject response, evaluation of responses and of instrumental techniques.

Mr. Parker (Sp)


Four and one-half lecture hours. Social dimensions of juvenile delinquency, its nature, amount and distribution, comparison and analysis of agencies of control and correction, the role of the police and the courts, individual, group and community oriented programs of treatment and prevention.

Mr. Fisher (Su); Mr. Carey (W)

190. Field Studies in Criminology. (2-5)

Individual conferences. Supervised research and field studies in specific aspects of the etiology of crime, law enforcement, criminalistics, and corrections.

The Staff (Su, F, W, Sp)

199. Research and Special Study for Advanced Undergraduates. (2-5)

Individual conferences. The Staff (Su, F, W, Sp)

Graduate Courses

The requirements for admission to the Graduate Division are listed on page 33. For requirements for the Master of Criminology and the Doctor of Criminology are listed in the ANNOUNCEMENT OF THE SCHOOL OF CRIMINOLOGY.

200A–200B–200C. Core Seminar in Criminology. (5–5–5)

One 3-hour seminar and 1 hour discussion. Designed for graduate students with little preparation in criminology, the seminar integrates into one course subjects taught in separate undergraduate courses: etiology of crime, corrections, law enforcement and criminalistics. Provides for intensive study as well as an examination of the interrelationships of different aspects of criminological research. Sequence, beginning (F) and (Su).

200A (Su) Mr. Fisher; (F) Mr. Platt.
200B (W) Mr. Platt; 200C (Sp) Mr. Platt.


One 3-hour seminar. 262 or 263 must be taken concurrently. Prerequisites: 102B, 102C or equivalent courses in abnormal psychology and consent of instructor. Theory and technique of counseling and psychotherapy, emphasis will be upon treatment of individuals with social problems, character disorders, and "acting out" behavior. Sequence, beginning (F). All parts must be completed. In-progress grades will be given. Dr. Boorstein (F, W, Sp)

262. Counseling and Psychotherapy: Field Work. (2–6)

Individual conferences, May be repeated for credit. In-progress grades will be given.

Dr. Diamond (F, W, Sp)

263. Community Psychiatry: Field Work. (2–6)

Individual conferences, May be repeated for credit. In-progress grades will be given.

Dr. Diamond (F, W, Sp)

266A–266B. Seminar in Social Psychological Approaches to the Study of Crime. (2–2)

One 2-hour seminar. Emphasis will be on psychological models of deviant conduct with discussion of current research and theories. Credit and grade will be awarded upon completion of the full sequence.

267. Instruments of Discovery in Criminal Research. (3)

One 3-hour seminar. A view and analysis of methodology as a means of stimulating theoretical concept formation, as well as testing of interrelated theorems about crime. Introduction to and study of a variety of methods of concept formation that aid in discovery of new empirical uniformities.

Mr. Schwendinger (Sp)

269. Social Action, Policy, and Research. (3)

One 3-hour seminar. Students are advised to have taken 131. Difficulties in communication between research, policy and action personnel are recognized and explored. Research strategy, problems of developing models which answer administrative questions, and related ethical questions will be discussed.

Mr. Schwendinger (Sp)

269. Research Methods for Students Preparing Theses. (3)

One 3-hour seminar. Admission by consent of instructor. Limited to 10 students. Students in the initial stages of thesis preparation will present their outlines for critique by the class. Emphasis will be on methodology, and each proposal will be considered in detail with regard to design of samples, questionnaires, type of analysis and inferences which may be drawn.

Mr. Wilkins (Su, Sp); Mr. Schwendinger (F, W)

275. Seminar in Scientific Evidence. (2)

One 2-hour seminar. May be repeated for credit. Topics to vary. (F, W, Sp)

276. Advanced Forensic Toxicology. (4)

One 2-hour seminar and 4 laboratory hours.

Mr. Parker (F)

277. Advanced Forensic Instrumentation. (4)

One 2-hour seminar and 4 laboratory hours.

Mr. Parker (W)

*278. Advanced Comparative Evidence and Evaluation. (4)

One 2-hour seminar and 4 laboratory hours.

* Not to be given, 1968–69.
279. The Role of Scientific Evidence in the Administration of Justice. (3)
One 3-hour seminar. Advanced study of operational concepts of investigative, legal, and scientific professions as affecting discovery, preservation, and examination of physical tracings from negligent or criminal events. The specific advantages and limitations of scientific interpretations.

280. Crime and the Political Process. (3)
One 3-hour seminar. The nature and sources of criminal-political power, ecological aspects of criminal-political organization, reciprocal relations of organized crime and political parties, political functions of criminal groups, political crimes.
Mr. Lohman (W)

*281. Latent Functions in Law Enforcement and Corrections. (3)
One 3-hour seminar. Ambivalence in the social processes of the law, the courts and corrections is evaluated; empirical analysis of latent and manifest functions; identification of crimogenic and otherwise abortive characteristics of the institutions of criminal justice.

*284. Seminar in Community Approaches to Delinquency and Crime. (3)
One 3-hour seminar. Advanced study of the organization and operation of delinquency and crime prevention groups in the urban community.

285. Seminar in Problems of Criminal Responsibility. (3)
One 3-hour seminar. Current problems of criminal responsibility; an historic review of legal concepts and contemporary theological, philosophical, and behavioral science aspects; contemporary ideas of individual responsibility.
Dr. Diamond (F)

286. Problems of Action Research in Criminology. (3)
One 3-hour seminar. Prerequisite: consent of instructor. An examination of current research and investigation in criminology as they are employed in the modification of techniques of crime prevention and control. Problems in the application of research findings to established institutional structures will be addressed.

Mr. Carey (Sp)

*287. Seminar in Quantitative Methods in Criminology. (3)
One 3-hour seminar.

288. Seminar in the History of the Discipline of Criminology. (3)
One 3-hour seminar.

DEMOGRAPHY

(Department Office, 201 Building T-8)

Nathan Keyfitz, Ph.D., Professor of Demography.
Judith B. Davis, Ph.D., Associate Professor of Demography (Chairman of Department).

The study of demography deals with the determinants and consequences of population growth, and with both the biological structure and social characteristics of human populations. It is closely related to other social science fields such as economics and

* Not to be given 1968-69.
sociology, as well as to the biological sciences. It also involves the tools of statistics and mathematics. The demography department at Berkeley focuses on the pertinent elements of kindred disciplines on the study of population, building the curriculum in an integrated fashion around a core of demographic knowledge.

**Preparation for Graduate Study**

Students usually elect to concentrate on demography only at the graduate level, and may enter the field from a diversity of undergraduate majors in the social and biological sciences or in mathematics and statistics. All students, as part of their undergraduate prerequisites, are expected to have completed a year of college-level economics, mathematics, sociology or demography, statistics, and biology. Deficiencies in these areas may be remedied after admission to graduate standing.

**Graduate Programs**

The Department of Demography offers work leading to the M.A. and Ph.D. degrees in demography. Typical areas of specialization include population theory, mathematical demography, fertility, mortality, the labor force, historical demography, population distribution and ecology, and urban demography. Further information is available from the graduate adviser in 201 Building T-8.

**Graduate Courses**

Prerequisites for graduate courses: one year each of college-level mathematics and statistics, or the consent of the instructor. Additional prerequisites for individual courses are indicated in conjunction with the course listing.

* 200. Contemporary Demographic Theory. (3)

Three 1-hour lectures per week. Introduction to modern theory of causes, components, and effects of population change. Main topics: transition theory, economic and sociological reasoning applied to population, logic of stable and quasi-stable population analysis, demographic aspects of human evolution. (F)

210. History of Demographic Theory and Analysis. (3)

Three 1-hour lectures per week. Brief critical history of population theories, including pre-Malthusian reasoning, Malthusian doctrine, Marxist views, optimum population theory, and the demographic assumptions underlying social and economic policies in the nineteenth and early twentieth centuries. Mr. Keyfitz (F)

210A—210B. Basic Methods of Demographic Analysis. (4—4)

Three 1-hour lectures and one 2-hour laboratory per week.

210A. Prerequisite: Mathematics 1A—1B—1C, Statistics 100A—100B—100C or equivalents. Introduction to statistical and mathematical procedures in population analysis. Gathering, processing and evaluating registration and census data. Procedures of mortality and fertility analysis, population projections and estimation. (F)

210B. Prerequisite: Demography 210A. Mathematics of stable populations, internal migration estimates, measurement of social characteristics and population distribution, record-matching, data banks. (W)

212A—212B. Techniques of Demographic Survey and Field Studies. (3—3)

Two 1-hour lectures and one 2-hour laboratory per week.

212A. Prerequisite: Mathematics 1A—1B—1C or equivalent. It is recommended that students will have taken Statistics 166. Basic survey techniques as applied to the study of fertility, morbidity, labor-force participation, marital history. Includes schedule construction, survey sampling, measurement, sampling and nonsampling errors. Critical review of major demographic surveys.

212B. Prerequisite Demography 212A. Techniques of data analysis; student research projects. (W)

217. Mathematical Demography for Advanced Students. (3)

One 2-hour lecture and one 2-hour laboratory per week. Prerequisite: Demography 210A—210B, Statistics 203A—203B—203C or consent of instructor. Use of computers for standardization, life table construction, intrinsic rates, projections, multiple decrement tables, period and cohort rates, the study of migration. Application of stochastic models to demographic research problems. Mr. Keyfitz (Sp)

220. Human Fertility. (3)

Three 1-hour lectures per week. Prerequisite: Demography 210A—210B or consent of instructor. Measurement techniques applied to the determination of levels, trends, and differences in fertility. Factors determining these aspects including age at marriage, time within unions, birth control, and fetal mortality. Effect of fertility on population growth and structure. Fertility control programs. Mrs. Davis (W)

* Not to be given, 1968-69.
** To be offered in alternate years.
11270. Population Policy. (3)

Three 1-hour lectures per week. Prerequisite: Demography 210A—210B or consent of instructor. Review of main population policy problems. Trends in fertility, mortality, migration, and economic development. Contemporary world issues in population and industrialization. Mrs. Davis (Sp).

11284. Comparative Demography of Latin America. (3)

Three 1-hour lectures per week. Prerequisite: Demography 210A—210B, 220 or 230, and 240 or 244, or consent of instructor. History of demographic development of Latin America and biological and economic development in Latin America. Population characteristics. Projections for areas of variable size. (Sp)

291. Professional Preparation: Research. (3—6)

The Staff (Su, F, W, Sp)

292. Seminars. (2—3)

Topics: (a) Population Theory, (b) Statistical and Mathematical Applications in Demography, (c) Human Mortality, (d) Population Distribution and Migration, (e) Methods and Topics in Historical Demography, (f) Population Policy, (g) Additional seminars on special topics to be announced. The Staff (Su, F, W, Sp)

299. Directed Advanced Research (leading to Ph.D.). (3—12)

The Staff (Su, F, W, Sp)

300. Professional Preparation: Teaching. (3)

The Staff (Su, F, W, Sp)

602. Individual Study. (1—8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the M.A. and Ph.D. May not be used for unit or residence requirements for either the masters or doctoral degrees. Must be taken on a satisfactory-unsatisfactory basis. The Staff (Su, F, W, Sp)

* Not to be given, 1968—69.

II To be offered in alternate years.
DESIGN

For information on courses and faculty in Design, see listing under Environmental Design: Design.

DRAMATIC ART

(Department Office, 120 Dwinelle Annex)

Travis Bogard, Ph.D., Professor of Dramatic Art.
Robert W. Goldsby, M.F.A., Professor of Dramatic Art.
Fred Orin Harris, M.F.A., Professor of Dramatic Art, Emeritus.
Henry May, B.A., Professor of Dramatic Art (Chairman of the Department).
William I. Oliver, Ph.D., Professor of Dramatic Art.
Marvin Rosenberg, Ph.D., Professor of Dramatic Art.
Carroll B. Wilson, Ph.D., Professor of Dramatic Art and Speech.
N. Joseph Calarco, Ph.D., Assistant Professor of Dramatic Art.
Toshiro Ogawa, B.A., Assistant Professor of Dramatic Art.
Dunbar H. Ogden, III, Ph.D., Assistant Professor of Dramatic Art.
E. Kerrigan Prescott, Ph.D., Assistant Professor of Dramatic Art and Comparative Literature.
Jean H. Bazemore, M.A., Associate in Dramatic Art.
Henrietta G. Harris, M.A., Lecturer in Dramatic Art.
George Ulnic, B.A., Lecturer in Dramatic Art.

The Major

Lower Division  Dramatic Art 10, 20, 45A–45B, and 49.

Upper Division  45 units of upper division courses in the Department of Dramatic Art including: 120, 160A, 181; 10 units chosen from courses 122, 123, 124, 125, 126, 127, 128; at least one and not more than 5 units of 190. All candidates for the A.B. degree with a major in Dramatic Art are required to include Physical Education 12 (Theatrical Fencing) in their major programs. Physical Education 12 (Basic Stage Movement) is strongly recommended.

Honors Program  Majors in the Department of Dramatic Art with an overall grade-point average in the University of 3.0 may apply for admission to the honors program. Application should be made through a departmental major adviser not later than the end of the student’s junior year. A student accepted in the honors program will include in his program course H195A, intensive critical study of problems of dramatic literature, acting, playwriting, directing, or designing; and H195B, development of studies begun in H195A, either under circumstances of actual theatrical production or as a senior thesis. H195A may be substituted in the major program for Dramatic Art 181.

The University Theatre  Under the direction of the Department of Dramatic Art, the University Theatre offers a major and workshop series of play productions, extending into the laboratory of stage practice the theories of dramatic literature, criticism, and production studied in the departmental curriculum. These programs are selected so as to present to the University community distinguished dramas of all times and countries. Participation is open to all registered students, majors or nonmajors, interested in acting, design, or stagecraft. Unit credit (49, 190, 290) may be earned by work in production. For further information, inquire at the office of the Department of Dramatic Art.

* On leave in residence fall, winter and spring quarters, 1968–69.
** Appointment as Humanities Research Professor, 1968–69.
Preparation for Graduate Study The background of a student undertaking work toward an M.A. degree should approximate the undergraduate major in the Department of Dramatic Art at Berkeley. Deficiencies will be determined by means of a diagnostic examination upon entrance and must be made up immediately.

Graduate Programs

Requirements for the M.A. Degree Thirty-six units of upper division and graduate work of which 18 must be in graduate courses in the Department of Dramatic Art including: 220, 290 or 299, and at least one seminar in dramatic literature; one course, upper division or graduate, in either acting, directing, or design; French or German reading examination; 90-minute comprehensive oral examination on dramatic literature, criticism, and theatre history.

Requirements for the Ph.D. Degree The M.A. degree is advised for most graduate students, but it is not a prerequisite for the Ph.D. degree. During his term of study, the Ph.D. candidate must pass three language examinations (including French or German), the third of which may also be satisfied with course work, and he must satisfactorily complete the doctoral qualifying examination, the direction of a major production, and a dissertation. Admission to candidacy for the Ph.D. degree will be recommended by the Department only after the candidate has given satisfactory evidence of both his scholarly and directorial abilities.

For further details on the requirements for the M.A. and Ph.D. degrees, consult Chapter III of this catalogue, and the Department Office in 120 Dwinelle Annex.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1A–1B. English Composition in Connection with Reading of Dramatic Literature. (5–5) Prerequisite: Subject A, examination or course. Dramatic Art 1A is prerequisite to 1B. Expository writing based on analysis of masterpieces of dramatic literature and related expository works.

1A: One 1-hour lecture and two 1-hour sections per week.
   Mrs. Bazemore, (Su*, F, W*, Sp)  
1B: One 1-hour lecture and two 1-hour sections per week.
   Mrs. Bazemore, (Su*, F, W, Sp*)

10. Theory of Acting: Resources. (5) Five 1-hour lectures per week. A study of physical, psychological, and spiritual resources for acting.
   Miss H. Harris, (Su, F, W, Sp)

11A: Five 1-hour lectures per week. Prerequisite: Course 10 or consent of instructor. The fundamentals of stage speech and movement.
   Miss H. Harris (Su*, F, W, Sp*)  
11B: Three 1-hour lectures and two 1-hour sections per week. Prerequisite: Course 11A. Approaches to characterization.
   Miss H. Harris (Su*, F*, W, Sp)

20. Introduction to Dramatic Literature. (5) Three 1-hour lectures and two 1-hour sections per week. A study of masterworks of theater from the Greek classic period to the present.
   Mr. Bucky (W)

*39. Introduction to Playwriting. (5) Three 1-hour lectures per week.
   Mr. Calarco (Sp)

40A–40B. Twentieth-Century World Theatre. (5–5) Three 1-hour lectures and one 3-hour laboratory per week. Course 40A is not prerequisite to 40B. A survey of the characteristic forms of the major contemporary theatrical modes.
   Mr. Bucky, 40A (W); 40B (Sp)

45A–45B. Introduction to Theatre. (5–5) Three 1-hour lectures and one 3-hour laboratory per week. Course 45A is not prerequisite to 45B. The elements of stage practice.
   Mr. Ulnic, 45A (Su, F, W, Sp); 45B (Su*, F, W, Sp)

49. University Theatre. (1) To be arranged. Prerequisite: consent of instructor. May be repeated for credit.
   The Staff (Mr. May in charge) (Su, F, W, Sp)

Upper Division Courses

110. Advanced Theory of Acting. (5) Three 1-hour lectures and two 1-hour laboratories per week. Prerequisites: courses 10, 11A–11B, and junior standing, or consent of instructor.
   (F, W, Sp)

111. Theory of Acting Styles. (5–5–5) Three 1-hour lectures and two 1-hour laboratories per week. Prerequisites: courses 110 and 112 (may be taken concurrently), and consent of instructor.
   111A. Acting in Classical Styles. (F)
   111B. Acting in Renaissance Styles.
   Mr. Prescott (F)

111C. Acting in Major Modes 1700–1900. (F)
   Mr. Prescott (Sp)
Three 1-hour lectures and two 1-hour laboratories per week. Prerequisite: courses 10, 11A—11B, and consent of instructor. Miss H. Harris (F, Sp)

120. Dramatic Theory. (5)
Three 1-hour lectures per week. Prerequisite: junior standing. Major documents of dramatic criticism and theory, studied in historical sequence and related to analysis of important plays.
Mr. Calarco (Su*, F, W, Sp*)

122. Dramatic Literature of Western Civilization: the Ancient Greek Drama. (5)
Five 1-hour lectures per week. Mr. Calarco (F)

123. Dramatic Literature of Western Civilization: the Drama from Menander to Marlowe. (5)
Five 1-hour lectures per week. Mr. Proctor (Sp)

124. Dramatic Literature of Western Civilization: British Drama from 1590-1642. (5)
Five 1-hour lectures per week. Mr. Calarco (W)

125. Dramatic Literature of Western Civilization: Continental Drama, 1500-1700; British Restoration Drama. (5)
Five 1-hour lectures per week. Mr. Oliver (Sp)

126. Dramatic Literature of Western Civilization: European Drama, 1700-1850. (5)
Five 1-hour lectures per week. Mr. Lyons (F)

127. Dramatic Literature of Western Civilization: European Drama, 1850-1918. (5)
Five 1-hour lectures per week. Mr. Calarco (W)

128. Dramatic Literature of Western Civilization: European and American Drama, 1918 to Present. (5)
Five 1-hour lectures per week. Mr. Lyons (Sp)

139A-139B—139C. Playwriting. (5-5-5)
Three 1-hour lectures per week. Prerequisite: courses 39A-39B or consent of instructor. Practice in the fundamentals of dramatic composition. Group readings and discussion of written work.
Sequence, beginning (F). Mr. Rosenberg (F, W, Sp)

145. History of the American Theatre. (4)
Five 1-hour lectures per week. The development of the American theatre from Colonial times to the twentieth century.
Mr. Wilson (F)

150A-150B. History of Theatre. (5-5)
Five 1-hour lectures per week. The development of theatrical production in its cultural background, including the theatre building and stage, scenery and scene design, costume, acting, and directing.
150A. The beginning to 1700. (W*)
150B. 1700 to the present. (Sp*)

154A-154B. Theory of Stage Costume. (5-5)
Three 1-hour lectures and two 1-hour laboratories per week. Mr. May, 154A (Sp); 154B (Sp*)

155A-155B. Theory of Design for the Theatre. (5-5)
Three 1½-hour lectures per week. Prerequisite: 155A is prerequisite to 155B. Sequence beginning (F) Mr. May

156. Theory of Lighting Design. (5)
Three 1-hour lectures and two 1-hour laboratories per week. Mr. Ogawa (F, W*, Sp, Su)

160A-160B. Theory of Directing. (5-5)
Three 1½-hour lectures per week. Mr. Goldsby (W)
160A. Prerequisite: junior standing and consent of instructor.
160B. Prerequisite: 160A or consent of instructor. (Sp)

161. Advanced Directing. (5)
Three 1½-hour lectures and two 1½-hour laboratories per week. Prerequisite: course 160A, 160B, and consent of instructor. Mr. Oliver (Sp)

181. Senior Proseminar. (5)
To be arranged. Prerequisite: junior standing and consent of instructor. May be repeated for credit.
The Staff (Mr. May in charge) (Su, F, W, Sp)

H195A. Honors Course. (5)
To be arranged. Prerequisite: candidacy for honors in the Department of Dramatic Art. Seminar leading to the preparation of a research paper on a single aspect of the theatre.
The Staff (Mr. May in charge) (Su, F, W, Sp)

H195B. Honors Course. (5)
To be arranged. Prerequisite: completion of H195A with an honors grade. Development of subject studied in H195A either as a bachelor's thesis or a laboratory project in acting, directing, playwriting, or design.
The Staff (Mr. May in charge) (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1-5)
To be arranged. Prerequisite: 12 or more units in the Department of Dramatic Art with an average grade of not less than B. Reading and conference. Restricted to senior honor students.
The Staff (Mr. May in charge) (Su, F, W, Sp)

Graduate Courses

210. Advanced Acting. (5)
Five 1-hour lectures per week. Prerequisite: course 110, one section of course 111, and consent of instructor. (F)

220. Theatre Research. (4)
Two 1½-hour lectures per week. An introduction to bibliographical methods and materials for theater research projects.
Mr. Rosenberg, Mr. Lyons, Mr. Calarco

* Not to be given, 1968-69.
220A. Readings in Classical Theatre. (1) One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. (W*)
220B. Seminar in Classical Theatre. (4) Two 1½-hour lectures per week. Prerequisite: course 220A. Mr. Rosenberg (W)

223A. Readings in the Theatre of Shakespeare. (1) One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Rosenberg (F)
223B. Seminar in the Theatre of Shakespeare. (4) Two 1½-hour lectures per week. Prerequisite: course 223A. Mr. Wilson (W)

224A–224B. Studies in French Theatre.
224A. Readings in French Theatre. (1) One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Goldsby (W)
224B. Seminar in French Theatre. (4) Two 1½-hour lectures per week. Prerequisite: course 224A. Mr. Goldsby (Sp)

Readings and seminar in one of the following: German, Russian and East European, Italian, Scandinavian, or Spanish theatre. May be repeated for credit.
225A. Readings. (1) One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Prescott (W)
225B. Seminar. (4) Two 1½-hour lectures per week. Prerequisite: course 225A. Mr. Wilson (Sp)

226. Studies in Dramatic Genre. (5)
Two 1½-hour lectures per week. Prerequisite: course 220; may be taken concurrently. Seminar in one of the major dramatic genres: tragedy, comedy, melodrama, farce. (F)

227A–227B. Realism in Twentieth-Century Drama.
Readings and seminar in realism in twentieth-century drama.
227A. Readings. (1) One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Wilson (W)
227B. Seminar. (4) Two 1½-hour lectures per week. Prerequisite: course 227A. Mr. Oliver (W)

228A–228B. Antirealistic Trends in Twentieth-Century Drama.
Readings and seminar in antirealistic trends in twentieth-century drama.
228A. Readings. (1) One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Oliver (F)
228B. Seminar (4) Two 1½-hour lectures per week. Prerequisite: course 228A. Mr. Oliver (W)

229A. Readings in the American Theatre. (1) One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Wilson (W)
229B. Seminar in the American Theatre. (4) Two 1½-hour lectures per week. Prerequisite: course 229A. Mr. Wilson (Sp)

239A–239B. Advanced Playwriting. (5–5)
Three 1½-hour lectures per week. Prerequisite: consent of instructor; not open to undergraduates. Mr. Rosenberg (W*, Sp*)

255. Advanced Design for the Theatre. (5)
Three 1½-hour lectures per week. Prerequisite: open to qualified seniors with consent of instructor. Mr. May (Su, F)

256A. Lighting Design. (5)
Three 1-hour lectures and two 1½-hour laboratories per week. Prerequisite: open to qualified seniors with consent of instructor. Mr. Ogawa (W)

256B. Theory of Contemporary Stage Techniques. (5)
Three 1½-hour lectures per week. Prerequisite: open to qualified seniors with consent of instructor. Mr. Ogawa (Sp)

260. Advanced Directing. (5)
Two 1½-hour lectures and three 1½-hour laboratories per week. Prerequisite: 160A–B, 161 (or the equivalent) and consent of instructor. Not open to undergraduates. May be repeated once for credit. Mr. Oliver, Mr. Bucky (W, Sp)

261. Advanced Directing. (5)
Two 1½-hour lectures and three 1½-hour laboratories per week. Prerequisite: course 160A–B, 161, two quarters of 260 and consent of instructor. Mr. Bucky (F)

290. Theatre Laboratory. (1–6)
To be arranged. Prerequisite: graduate standing. Advanced practice in theatre design, lighting, playwriting, and acting. May be repeated for credit. The Staff (Mr. May in charge) (Su, F, W)

293. Theatre Laboratory. (1–6)
To be arranged. Prerequisite: consent of instructor. Advanced practice in play directing. May be repeated for credit. The Staff (Mr. May in charge) (Su, F, W)

295. Special Studies. (6)
To be arranged. Prerequisite: consent of instructor. Advanced directorial practice for students engaged in doctoral play production program. The Staff (Mr. May in charge) (Su, F, W)

298. Special Studies. (5–10)
To be arranged. Reserved for students engaged in work on their doctoral dissertations. The Staff (Mr. May in charge) (Su, F, W)

299. Special Studies. (1–6)
To be arranged. Prerequisite: not open to practice of acting, directing, design, or playwriting. May be repeated for credit. The Staff (Mr. May in charge) (Su, F, W)

601. Individual Study for Master's Students. (1–8)
Prerequisite: may not be taken by students who have not completed the 36-units course requirement for the M.A. degree. Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mr. May in charge) (Su, F, W)
602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Mr. May in charge) (Su, F, W, Sp)

Related Courses in Other Departments

Form in Drawing (Art 2A).
The Classic Myths (Classics 28).
Greek Tragedy (Classics 35).
Mythology (Classics 178).
Drama (Classics: Greek 103).
Roman Comedy (Classics: Latin 145A).

Historic Costume (Design 146A–146B).
Shakespeare (English 117A–117B, 117E).
The English Drama to 1603 (English 114A).
The English Drama, 1603–1700, (English 114B).

British and American Drama, 1860 to the Present (English 114C).

Modern French Drama (French 115A–115B).
The Seventeenth Century (French 120A–120B).

Nineteenth-Century German Drama (German 115A–115B).
Twentieth-Century German Drama (German 121A–121B).

DUTCH

For courses in the Dutch language and literature see listing under Department of German.

ECONOMICS

(Department Office, 250 Barrows Hall)

Joe S. Bain, Jr., Ph.D., Professor of Economics.
George F. Breake, Ph.D., Professor of Economics (Vice-Chairman of the Department).
Carlo M. Cipolla, Laurea, Professor of Economics for summer and fall quarters.
Malcolm M. Davison, J.D., Ph.D., Professor of Economics and of Business Administration.
Gerard Debreu, † D.Sc., Professor of Economics.
Albert Fishlow, † Ph.D., Professor of Economics.
David Gale, Ph.D., Professor of Economics, and Mathematics, and of Industrial Engineering.
Robert A. Gordon, Ph.D., Professor of Economics.
Gregory Grossman, Ph.D., Professor of Economics.
Bent Hansen, Ph.D., Professor of Economics.
John C. Harsanyi, Ph.D., Professor of Business Administration and Economics.
Charles J. Hitch, M.A., LL.D. (hon.), D.Sc. (hon.), Professor of Economics.
Sidney S. Hoos, Ph.D., Professor of Economics, Agricultural Economics, and of Business Administration.

Italian Literature of the Eighteenth Century (Italian 114).
Italian Literature of the Twentieth Century (Italian 116A).
Introduction to Opera (Music 128A).
Survey of Chinese Vernacular Literature (Oriental Languages 172).
Basic Stage Movement (Physical Education 12).
Theatrical Fencing (Physical Education 12).
Rhythmic Basis of Dance and Allied Arts (Physical Education 12).
The History of Scandinavian Drama up to 1900 (Scandinavian 106).
The Plays of Ibsen (Scandinavian 107).
Strindberg and His Writings (Scandinavian 108).

Scandinavian Drama of the Twentieth Century (Scandinavian 109).
Chekhov (Slavic 134C).
The Russian Drama from the Seventeenth Century to the Twentieth (Slavic 135).
The Polish Theater (Slavic 156).

Modern Peninsular Drama: from the Romantic Movement to the Present (Spanish 105).
The Spanish Drama of the Sixteenth and Seventeenth Centuries (Spanish 109A–109B).

† On leave, 1968–69.
The following courses are required for admission to the major: (1) Economics 1 and 3, or Economics 1 with a grade of A or B; (2) Statistics 2 or an equivalent course in statistics. A grade-point average of 2.0 or better in all college courses and in all economics courses taken to date is also required. It is strongly recommended that students intending to major in economics take Mathematics 1A–1B–1C before the end of their sophomore year.

The requirements for the major include 40 quarter units in upper division or graduate economics courses, other than Economics 103A–103B. The 40 units must include:

(1) either Economics 100A–100B or Economics 101A–101B (economic theory), and (2) Economics 112A or 112B or 113 (economic history). These required courses must be completed prior to the senior year. The remaining courses included in the 40-unit requirement shall be selected by the student with the advice and approval of a departmental major adviser. They must include a “sequence” of at least two upper division courses in the same field of economics, or an equivalent combination of upper division and graduate courses, as approved by a major adviser. (Economics 130 or 135 may not be offered as part of the “sequence” requirement.) Statistics 131 and 131L together with Economics 240 will satisfy the “sequence” requirement; Economics 112A–112B will satisfy it provided that Economics 113 is also taken.

It is strongly recommended (1) that students majoring or intending to major in economics fulfill the Economics 100A–100B (or Economics 101A–101B) requirement, wholly or in part, during the sophomore year; (2) that economics majors take Economics 100C in the junior year; (3) that students who contemplate taking graduate work in economics satisfy the theory requirement by taking Economics 101A–101B, and therefore its mathematical prerequisites; and (4) that all economics majors elect upper division courses in related social sciences.

Except under extraordinary circumstances, no more than two courses in economics and business administration combined may be taken in any one quarter.

The Honors Program

The honors program of the Department of Economics is devised to give interested and qualified students special opportunities for development of breadth and depth in their departmental major work. Students with a grade-point average of 3.0 or better, both overall and in their course work in economics are eligible to enter the program in the winter quarter of the junior year. The program is based first on Economics H195A–H195B–H195C, an honors seminar emphasizing independent reading and research, which is offered in the winter and spring quarters of the junior year and the fall quarter of the senior year; and second on Economics H196A–H196B, an honors thesis seminar for which students prepare honors theses under the direction of a member of the department. Honors students thought to be eligible for awards of Distinction or Great Distinction in the honors program will be allowed to take an oral examination at the end of the last quarter of the senior year. Honors candidates must take at least 30 units of upper division or graduate courses in economics in addition to Economics H195 and H196.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. Economic Issues and Institutions. (5)
   Three lectures and two section meetings per week. Study of selected current issues of economic policy, such as the unemployment problem and the proper functions of government.
   The Staff (Su, F, W)

3. Elementary Economic Analysis. (4)
   One lecture and three section meetings per week. Prerequisite: Economics 1. Introduction to the theory of resource allocation and the determination of the level of the national product.
   The Staff (Su, W, Sp)

Upper Division Courses

Prerequisite: Economics 103A–103B, junior standing. For all other courses, unless otherwise specified in the individual course description, any one of the following: (1) Economics 1 and 3; (2) Economics 1 with a grade of A or B; (3) Economics 103A. Students who complete 103A or 103B may not receive credit for Economics 3.

100A–100B. Economic Analysis and Economic Policy. (5–5)
   Four and one-half hours per week. Credit will not be given for both 100A and 101A or for both 100B and 101B.
   100A. Analysis of price determination in a market economy, problems of economic efficiency, competition and monopoly.
   100B. Analysis of problems of economic stability, economic progress and the foreign economic relations of the United States.
   The Staff (Su, F, W, Sp)

100C. Quantitative Data and Methods. (5)
   Four and one-half hours per week. Prerequisite: Statistics 2 and 100A. An introduction to the
sources and uses of economic data, illustrated by
typical empirical studies. Recommended for eco-
nomics majors in the junior year.

Four and one-half hours per week. Prerequisite: four quarters of undergraduate mathematics and statistics. Recommended for majors. Topics as in 100A–100B, with emphasis on rigorous analysis and use of more powerful theoretical tools. Credit will not be given for both 100A and 101A or for both 100B and 101B.

101A, Mr. Dixit (F); 101B, Mr. Douglas (W)

102. Capital and Economic Growth. (5)
Four and one-half hours per week. Prerequisite: course 100A or 101A and 100B or 101B. Production over time, capital, and interest. Theories of economic growth in advanced economies. Mr. Douglas (F)

103A–103B. Introduction to Economic Principles, Institutions and Policies. (4–4)
Four hours per week. Prerequisite: junior standing. Analysis of determinants of prices, income and employment, with applications. Primarily for non-majors, does not count toward upper division requirement for majors.

Mr. Levy (F, W)

104. History of Economic Doctrine. (5)
Four and one-half hours per week. The classical school and its antecedents, through Adam Smith and down to Keynes. Historical and doctrinal analysis.

Mr. Breit (Su); — (W)

106. Economics of Marxism. (5)
Four and one-half hours per week. The economic thought of Marx and his followers.

(W)

110. Economic Development. (5)
Four and one-half hours per week. Theories of economic development and of under-development; historical aspects; policies for achieving development in poor countries; favorable conditions for development in rich countries. Mr. Bergman (F, Sp)

112A–112B. Economic History of Europe. (5–5)
Four and one-half hours per week.

112A. A view of the relevant economic and social developments in Western Europe from the eleventh to the seventeenth century that paved the way for the Industrial Revolution.

Mr. Cipolla (Su, F)

112B. A general survey of the economic history of Europe, beginning with the Industrial Revolution and ending with World War I.

Mr. Roehl (Su); — (W)

113. Economic History of the United States. (5)
Four and one-half hours per week. Survey of trends in main components of the American economy; emphasis on factors making for economic growth and on the analysis of economic problems and policies in their historical setting.

Mr. Sutch (F); Mr. Landauer (Sp)

114. Economic Development and Problems of Latin America. (5)
Four and one-half hours per week. Evolution of Latin-American economies in terms of basic institutions and international influences; standards of living; problems of monocoeonomies; land tenure systems; problems of improving agricultural methods; foreign investment; industrialization and related problems.

Mrs. Thorp (W)

115. Economic Development and Problems of the Far East. (5)
Four and one-half hours per week. Prospects and problems of economic development in the economies of China, India, Pakistan, Japan, and Southeast Asia; resource allocation and economic organization in these economies.

Four and one-half hours per week. Economic organization and institutions, and their impact on economic variables. Models of economic systems; studies of actual economies.

118A–118B. Economics of the Soviet Union and Eastern Europe. (5–5)
Four and one-half hours per week. Prerequisite: 118A or consent of instructor is prerequisite to 118B.

118A. The Soviet economy: growth, institutions and problems. Mr. Grossman (W, Sp)
118B. The Soviet economy (advanced topics); other East European economies; the Communist bloc as a whole. Mr. Grossman (W)

121A–121B. Industrial Organization. (5–5)
Four and one-half hours per week. The organization and structure of industries and their markets in the American economy; competitive behavior, price policy and market performance in such industries. Problems of public policy; maintaining competition, control of prices in regulated industries.

Mr. Miller (F, W)

130. Government Finance. (5)
Four and one-half hours per week. Budget-making, expenditures, public debt, taxation, and fiscal policy at federal, state and local levels. Primarily for students not majoring in economics.

Mr. Davison (Su, W)

131. Economics of Public Finance. (5)
Four and one-half hours per week. Prerequisite: 100A or 101A and 100B or 101B. Analysis of the incidence and effects of taxation, government expenditure programs, and public debt operations.

Mr. Hensin (W)

135. Money and Banking. (4)
Four hours of lecture and discussion per week. Commercial banks, the Federal Reserve and the supply of money; monetary theory and monetary policy in the American economy. A survey of the field. Primarily for non-majors.

(F, Sp)

136. Monetary Theory and The Banking System. (5)
Four and one-half hours per week. Prerequisite: 100A or 101A. The monetary economy, survey of monetary, interest and income theory; commercial and central banks, the Treasury, and the supply of money.

Mr. Lerner (W)

137. Aggregative Economic Policy. (5)
Four and one-half hours per week. Prerequisite: 131 or 136. Analysis of problems of policy for economic stability and growth.

Mr. Lerner (Sp)

* Not to be given, 1968–69.
150. Labor Economics. (5)
Four and one-half hours per week. The social background of labor legislation and trade unionism. Students will not receive credit for both course 150 and Business Administration 150. ———-(F)

*152. Comparative Labor Economics. (5)
Four and one-half hours per week. Comparative survey of American and foreign labor movements. Course 150 is not prerequisite to course 152. ———-(F, Sp)

153. Wage Theory and Policy. (5)
Four and one-half hours per week. Theoretical and empirical analysis of wage and employment problems, at both the micro- and macroeconomics level; national wage and manpower policy. ———-(W)

185. Economics of Health, Education and Welfare. (5)
Four and one-half hours per week. An analysis of the theories underlying social insurance and social insurance legislation throughout the world. Mrs. Gordon (Sp)

188. Population and Economic Development. (5)
Four and one-half hours per week. Social and economic consequences of population change, with special reference to economic opportunities, employment, investment, and problems of international trade; population trends, theories and problems, methods of measurement and forecasting. Population and migration problems in economic development. ———-(Sp)

190A–190B. International Economic Relations. (5–5)
Four and one-half hours per week. Prerequisite: 100A or 101A and 100B or 101B. Sequence beginning:
190A. Theory of international trade, monetary relations, and finance. Mr. Nadel (F)
190B. International economic policies. Mr. Nadel (F)
H195A–B195B–H195C. Honors Seminar. (2–2–2)
Average of 1 1/2 hours per week, distributed between individual conferences and periodic seminar meetings. (Normally taken by honors students in the winter and spring quarters of the junior year and the fall quarter of the senior year.) Independent reading and research, and seminar discussions, with some attention to research methods. Mr. Miller, H195A (W), H195B (Sp), H195C Mr. Bain (F)

H196A–H196B. Honors Thesis Seminar. (5–5)
Average of 4 1/2 hours per week, distributed between individual conferences and seminar meetings. Normally taken by honors students in the winter and spring quarters of the senior year.) Preparation (research and writing) of an honors thesis, seminar discussions. Mr. Rolph (W, Sp)

99. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students. The Staff

Graduate Courses

Admission to graduate courses requires, where indicated, the consent of the instructor. Undergraduate courses are not prerequisite to graduate courses except where indicated.

Three hours per week.
200A. Microeconomics: the behavior of firms and households, and the determination of prices and resource allocation patterns in a decentralized economy. Mr. Akerlof (F)
200B. Macroeconomics: determination of national income, employment, price level, growth, distribution. ———-(F)

*201A–201B. History of Economic Thought. (5–5)
Three hours per week. Analysis of the relationships between historical conditions, economic theory, and economic policy from the Greeks to modern times.

Three hours per week.
202A. Prerequisite: admission to department's Ph.D. program, or consent of instructor. The theory of the firm, partial equilibrium analysis of prices and output determination under competition and other market structures; capital theory.
Mr. Marschak, Mr. McFadden (W)
202B. Prerequisite: 202A, or consent of instructor. The theory of consumer behavior, general equilibrium under perfect competition; welfare economics and the efficiency of competitive equilibrium.
Mr. Hall, Mr. McFadden (Sp)
202C. Prerequisite: admission to department's Ph.D. program, or consent of instructor. Aggregative analysis of levels and rates and growth of income, output, prices and wages.
Mr. Hansen (F), Mr. Lerner (Sp)

206. Linear Models in Economic Theory. (5)
Three hours per week. Prerequisite: course 202A–202B, Mathematics 104A–104B–104C. An introduction to linear programming and input-output analysis.
Mr. Dixit (F, W)

207A–207B. Mathematical Economics. (5–5)
Three hours per week. Prerequisite: Mathematics 104A, Mathematics 111, and one quarter of upper division probability. Mathematical analysis of economic theory. The problems treated involve as wide a range of mathematical techniques and of economic topics as possible, including theories of utility, personal probability, value, games, growth, stability and dynamic programming.
Sequence beginning 207A, Mr. Dixit (W); 207B, Mr. McFadden (Sp)

208. Mathematical Economics Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Dixit (Sp)

Three hours per week. Not all parts will be offered each year. The history requirement may be satisfied by taking any one of the following courses:
210A. The rise of capitalism. Mr. Roehl (W)

* Not to be given 1968–69.
210B. The industrial revolution in Europe. Mr. Cipolla (F)

210C. Economic growth of the United States. Mr. Fishlow (Sp)

210D. Economic growth in follower countries.

211. Economic History Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Roehl (Su, W)

Three hours per week.
216A. Prerequisite: course 116 or consent of instructor. Economic systems. Mr. Ward (Sp)
216B. Prerequisite: course 118A. Economies of the Soviet Union and Eastern Europe. Mr. Grossman (Sp)
216C. Prerequisite: consent of instructor. Economy of Communist China.

Three hours per week. Prerequisite: course 206. Credit and grade will be awarded upon completion of the full sequence. The theory of national economic planning and investigation of selected national economic programs for growth and development in the light of modern theoretical and statistical tools.
Sequence beginning 217A, Mr. Radner, Mr. Hansen (W, Sp); 217B, Mr. Dixit (Sp)

221A–221B. Industrial Organization. (5–5)
Three hours per week. The organization and structure of the American enterprise economy, with special reference to manufacturing and processing industries. Competitive behavior, price policy, and workability of competition in such industries. Public policies affecting competition and monopoly.
Sequence beginning 221A, Mr. Bain (F); 221B, Mr. Bain (W)

222. Economic Analysis of Public Services. (5)
Three hours per week. Economic behavior of public agencies and criteria for selection and operation of public services. Special attention to transportation, water and other natural resources, and metropolitan government.
Mr. Bain (W)

223. Industrial Organization Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.

Two hours per week. Prerequisite: credit and grade will be awarded upon completion of the full sequence. Public finance and taxation theory; public debt and fiscal policy; public policy with respect to taxation.
230A, Mr. Rolph (F); 230B, Mr. Break (W); 230C, Mr. Rolph and Mr. Break (Sp)

231. Public Finance Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Break (W)

233. Dynamic Aggregative Economics. (5)
Three hours per week. A systematic review of the recent theories of growth and cyclical fluctuation.
Mr. Hall (F)

234. Monetary Theory. (5)
Three hours per week. Analysis of monetary theory and institutions.
Mr. Douglas (Sp)

235. International Monetary Economics. (5)
Three hours per week. A systematic survey of the theory of international finance and a review of recent and current problems affecting the international monetary system.
Mr. Lerner (W)

236. Aggregative Economic Policy. (5)
Three hours per week. A systematic survey of monetary, fiscal and other policies concerned with economic stability and growth.
Mr. Gordon (Sp)

237. Applied Aspects of Economic Growth and Stability. (5)
Three hours per week. An empirical approach to problems of economic growth and stability.
Mr. Gordon (W)

238. Monetary Economics Seminar. (3–5)
Two or three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Sutch (W); Mr. Douglas (Sp)

240. Introduction to Econometrics. (5)
Three hours per week. Prerequisite: Statistics 131B or equivalent. Problems in the application of statistical methods in economics, illustrated by a representative selection of empirical studies.
Mr. Zarembka (F), Mr. Sutch (Sp)

241A–241B. Econometrics. (5–5)
Three hours per week. Prerequisite: Statistics 135B or equivalent and one course in linear algebra.
Sequence beginning 241A, Mr. Hall (W); 241B, Mr. Rosenberg (Sp)

242. Econometrics Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Hall (F); Mr. McFadden (W); Mr. Rothenberg (Sp)

250A–250B–250C. Advanced Labor Economics. (3–3–3)
Two hours per week. Prerequisite: credit and grade will be awarded upon completion of full sequence. Analysis of labor market behavior.
250A, (F); 250B, (W); 250C, (Sp)

251. Labor Economics Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Ullman (F)

Three hours per week. Theory of economic change; applications to the development of underdeveloped economies; relation of such theories to general economic theory. Institutional patterns of development; population problems, changes in resource and product composition.
Sequence beginning 280A, Mr. Bergsman (F); 280B, Mr. Akerlof (W); 280C

* Not to be given 1968–69.
281. Economic Development Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Hansen (W); Mr. Fishlow (Sp)

288. Population and Economic Development. (5)
Three hours per week. Population and migration problems in economic development.

290A–290B. International Economics. (5–5)
Three hours per week. The world economy as a general equilibrium system; growth, short-run disturbances, and adjustment in the balance of payments of member countries; restrictions, welfare, and policy.
Sequence beginning 290A, Mr. Zarembka (W); 290B, Mr. Letiche (Sp)

291. International Economics Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. May be repeated for credit.
Mr. Letiche (W, Sp)

296. Advanced Topics in Economics. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Topics of different sections to be announced annually. May be repeated for credit. Sec. 1: history of money in western Europe, Mr. Cipolla (Su); Sec. 2: economic development, Mr. Buttrick (Su); Sec. 3: monetary theory, Mr. Nadel (F); Sec. 4: economic development, Mr. Hansen (Sp); Sec. 5: nonmarket decision-making, Mr. Ward (Sp).

298. Research. (1–9)
Open to candidates for the Ph.D. degree who have passed the qualifying examination and who are engaged in research for the thesis, and in special cases, with consent of the instructor in charge, to graduate students who desire to do special work in a particular field.
The Staff (F, W, Sp, Su)

299. Individual Study. (3–5)
The Staff (F, W, Sp, Su)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory-unsatisfactory basis.

EDUCATION

(Department Office, 1501 Tolman Hall)

Charles S. Benson, Ph.D., Professor of Education.
Eli M. Bower, Ed.D., Professor of Education.
Harold D. Carter, Ph.D., Professor of Education.
Thomas Bentley Edwards, Ph.D., Professor of Education.
Robert M. Gagné, Ph.D., Professor of Education.
Paul A. Heist, Ph.D., Professor of Education.
James L. Jarrett, Ed.D., Professor of Education.
Frederic Lilge, Ph.D., Professor of Education.
Walter D. Loban, Ph.D., Professor of Education.
Jack London, Ph.D., Professor of Education.
Fred L. Medsker, Ed.D., Professor of Education.
Joh U. Michaelis, Ph.D., Professor of Education.
Cecil Parker, Ed.D., Professor of Education.
Theodore L. Reller, Ph.D., Professor of Education (Chairman of the Department).
Arden K. Buddell, Ed.D., Professor of Education.
Lloyd F. Scott, Ph.D., Professor of Education and Coordinator of Elementary Laboratory Schools.

Lawrence H. Stewart, * ** Ed.D., Professor of Education.
William C. Stone, Ed.D., Professor of Education and Head of Teacher Education.
Chester Swanson, Ph.D., Professor of Education.
Edna W. Bailey, Ph.D., Professor of Education, Emeritus.
William A. Brownell, Ph.D., LL.D., Professor of Education, Emeritus.
Guy T. Buswell, Ph.D., LL.D., Professor of Education, Emeritus.
A. C. Gilbert, Ph.D., Professor of Education, Emeritus.

* Not to be given 1968–69.
** On leave 1968–69.
¶ In residence winter and spring quarters only, 1968–69.
Merton E. Hill, Ed.D., Professor of Education, Emeritus.
Mary C. Jones, Ph.D., Professor of Education, Emeritus.
George C. Kyte, Ed.D., Professor of Education, Emeritus.
Edgar L. Morphet, Ph.D., Professor of Education, Emeritus.
John C. Hurst, Ph.D., Associate Professor of Education.
Geraldine Joncich, Ed.D., Associate Professor of Education.
S. E. Torsten Lund, Ph.D., Associate Professor of Education.
Richard D. Mosher, Ph.D., Associate Professor of Education.
William D. Rohwer, Jr., Ph.D., Associate Professor of Education.
Robert B. Ruddell, Ed.D., Associate Professor of Education.
H. Dale Tillery, Ph.D., Associate Professor of Education and Associate Director of the Junior College Leadership Program.
William A. Watts, Ph.D., Associate Professor of Education.
Staten W. Webster, Ph.D., Associate Professor of Education.
Alan B. Wilson, Ph.D., Associate Professor of Education.
David L. Elliott, Ed.D., Assistant Professor of Education.
James W. Guthrie, Ph.D., Assistant Professor of Education.
Nadine M. Lambert, Ph.D., Assistant Professor of Education.
C. Marshall Lowe, Ph.D., Assistant Professor of Education.
Lawrence F. Lowery, Ed.D., Assistant Professor of Education.
Leonard A. Marascuilo, Ph.D., Assistant Professor of Education.
John L. Morris, Ed.D., Assistant Professor of Education.
Theodore W. Parsons, Jr., Ph.D., Assistant Professor of Education.
William D. Rohwer, Jr., Ph.D., Assistant Professor of Education.
William A. Watts, Ph.D., Assistant Professor of Education.

Paul R. Ammon, B.A., Acting Assistant Professor of Education.
Enoch Dumas, Ed.D., Lecturer in Education, Associate Head of Teacher Education, and Supervisor of Teacher Education (Elementary).
Glen H. Grant, Ed.D., Lecturer in Education.
Ann M. Heiss, Ed.D., Lecturer in Education.
Barbara Kirk, M.A., Lecturer in Education.
George H. Kyme, Ph.D., Lecturer in Education and Music and Supervisor of Teacher Education (Music).
Mark C. Luca, Ph.D., Lecturer in Education and Supervisor of Teacher Education (Art).
Harry M. McPherson, Ed.D., Lecturer in Education.
John David Miller, M.S., Acting Assistant Professor of Education.
Douglas A. Penfield, Ph.D., Lecturer in Education, summer quarter only.
Karl E. Schevill, Ph.D., Lecturer in Education, Associate Head of Teacher Education, and Supervisor of Teacher Education (Foreign Languages).
Paul T. Takagi, Ph.D., Lecturer in Education.

J. Oswaldo Asturias, M.A., Supervisor of Teacher Education (Foreign Languages).
Neva Aubin, M.A., Supervisor of Teacher Education (Elementary).
Chester H. Case, M.A., Supervisor of Teacher Education (Junior College).
Marilyn H. Cuthbert, M.A., Supervisor of Teacher Education (Elementary).
Edmund J. Farrell, M.A., Supervisor of Teacher Education (English).
James R. Gray, M.A., Supervisor of Teacher Education (English).

†† In residence spring quarter only, 1968-69.
Margaret C. Jackson, M.A., Supervisor of Teacher Education (Foreign Languages).
Kenneth S. Lane, B.A., Supervisor of Teacher Education (English).
Constance C. L’Aventure, A.B., Supervisor of Teacher Education (Social Science).
Jens L. Lund, M.A., Supervisor of Teacher Education (Mathematics).
Eugene McCreary, M.A., Supervisor of Teacher Education (Social Science).
Grace M. Maertins, M.A., Supervisor of Teacher Education (English).
Arnold R. Pagano, M.A., Supervisor of Teacher Education (Science).
Gérard A. Poirier, Ph.D., Supervisor of Teacher Education (Foreign Languages).
Leo R. Ruth, M.A., Supervisor of Teacher Education (English).
Philip J. Sinnott, M.A., Supervisor of Teacher Education (Elementary).
Harry B. Stehr, Jr., M.A., Supervisor of Teacher Education (Social Science).
Alvin H. Thompson, Ed.D., Supervisor of Teacher Education (English).

For details of the credential and degree programs please see the ANNOUNCEMENT OF THE SCHOOL OF EDUCATION.

Upper Division Courses

110. Learning and The Learner. (3)
Two 1-hour lectures per week. General introduction to educational psychology; primarily for teaching credential candidates. Mr. Ammon (Su, F, Sp); Mr. Hurst (F, W, Sp); Mr. A. Jensen (W); Mr. Rohwer (Sp)

118. Orientation to Educational Statistics. (3)
Two 2-hour lectures per week. This course covers the same material as courses 119A and 119B, but at a verbal level only. Students who take 118 cannot enroll for course 219.

119A. Introduction to Educational Statistics. (3)
Two 2-hour lectures per week. Prerequisite: consent of instructor. Introduction to probability; frequency and probability distributions; descriptive measures of central tendency and variability; sampling; point estimation and interval estimation.

119B. Foundations of Educational Statistics. (3)
Two 3-hour lectures per week. Prerequisite: courses 110A and consent of instructor. Introduction to statistical inference and hypothesis testing, t-test, F-test; one-way analysis of variance; simple correlation and regression; simple chi-square tests of independence and homogeneity.

130. The School in America. (3)
One 3-hour lecture, or two 1-hour lectures, or three 1-hour lectures per week. Development and operation of the school as a social institution; current problems; roles of school personnel, relations to other social agencies; professional and legal aspects of teaching.

131. The Elementary School Curriculum. (3-3-3-3-3)

131A. Arithmetic.
Two 1-hour lectures per week. Prerequisite: consent of instructor.

131B. Music.
Two 1-hour lectures per week. Prerequisite: consent of instructor.

131C. Reading and Language Arts.
Two 1-hour lectures per week. Prerequisite: consent of instructor.

131D. Social Sciences.
Two 1-hour lectures per week. Prerequisite: consent of instructor.

131E. Foreign Languages.
Two 1-hour lectures per week. Prerequisite: consent of instructor.

131F. Science.
One 1-hour lecture and one 1-hour laboratory per week. Prerequisite: consent of instructor and one year of laboratory science.

131H. Art.
One 3-hour lecture per week. Prerequisite: consent of instructor.

170. Introduction to Adult Education. (3)
Two 1-hour lectures per week. The role of adult education in an industrial society.

191. Experimental Courses. (3)
191A. American Education—A Psychosociological Evaluation.
Two 1-hour lectures per week. Prerequisite: consent of instructor. Solutions to selected problems in American education will be considered in the light of psychological, sociological, philosophical, and historical perspectives.

192. Social Foundations of Education. (3)
Two 1-hour lectures per week. A study of the historical and contemporary relations of education and society, and of schools and colleges as social systems, from the perspectives of the social sciences.

193. Psychological Foundations of Education. (3)
Two 1-hour lectures per week.

* Not to be given, 1968-69.
194. Humanistic Foundations of Education. (3)
Two 1 1/2-hour lectures per week. A history of educational thought with concentration on the epistemological, logical, and ethical foundations of major educational theories from Plato to the present.  
(SU; Mr. Jarrett (F, Sp); Mr. Lilge (W))

199. Special Study for Advanced Students. (1-3)
Prerequisite: restricted to advanced honor students. The Staff (Su, F, W, Sp)

Graduate Courses
Graduate course numbers which end in 0-4 are introductory courses; numbers which end in 5-9 are advanced courses.

211A-211B. Proseminar in Educational Psychology. (3-3)
Two 1 1/2-hour seminars per week. Lectures and discussions with staff covering concepts related to and areas of contemporary research.
211A, Mr. Rohwer (F); 211B, Mr. Ammon (W)

212. Education and the Psychology of Learning. (3-3-3)
Two 1 1/2-hour lectures per week.
212A. The Learning Process. Prerequisite: courses 119A, 119B, and 193, or equivalents. Mr. A. Jensen (F)
212B. The Psychology of Reading. (F)
212C. Topics in Education and Psychology of Learning. Prerequisite: course 212A or equivalent. Topics vary; suggested topics: social psychology of the classroom; programmed instruction; human variability and classroom learning; learning theories; theories of reading; social class influences on learning.

213. Educational Measurement and Evaluation. (3-3-3-3)
One 2-hour lecture and one 2-hour laboratory per week.
213A. Standard Tests in Education. Mr. Carter (F, W)
213B. Informal Classroom Evaluation. Prerequisite: consent of instructor. Mrs. Lambert (F)
213C. Individual Appraisal. Prerequisite: course 213A and consent of instructor. Theories of intelligence and the history and techniques of individual appraisal. Supervised practice in administration and scoring of contemporary tests of intelligence. Mrs. Lambert (W)
213D. Individual Appraisal. Prerequisite: course 213C and consent of instructor. Theories of intelligence and the history and techniques of individual appraisal. Supervised practice in administration and scoring of contemporary tests of intelligence. Mrs. Lambert (Sp)

214. Human Development and Education. (3-3-3)
Two 1 1/2-hour lectures per week.
214A. Cognitive Development. Prerequisite: courses 193, 119A and 119B or equivalent. Mr. Ammon (Su, W)
214B. Social and Emotional Development. Prerequisite: courses 193, 119A and 119B or equivalents. Mr. Watts (Sp)
214C. Mental Health. Prerequisite: course 193 or equivalent.

215. Education of Exceptional Children. (3-3)
215A. The Exceptional Child. Two 1 1/2-hour lectures and one 1-hour of field work per week. Prerequisite: course 193 or equivalent.  
(SU; Mr. Carter (F, Sp); Mr. Kaiser (W)

215B. Advanced Topics of Exceptional Children. Two 1 1/2-hour seminars and one 1-hour of field work per week. Prerequisite: consent of instructor. Topics vary; suggested topics: gifted children, learning disabilities, cerebral palsied children, speech defects and disorders, etc. Topic: (F) to be announced. Mr. Bower (F)

216. Advanced Educational Psychology. (3-3-3)
216A. Advanced Study in Learning. One 2-hour seminar and one 1-hour discussion per week. Prerequisite: course 219, and course 212A or 212B or 212C or equivalent, and consent of instructor. Topics vary; suggested topics: learning theory, social class influences on learning, theories of reading, programmed instruction and teaching machines. Topics: (Su) motivation; (W) school subject learning; (Sp) to be announced. Mr. Farley (Su); Mr. Gagné, Mr. Rohwer (W); Mr. A. Jensen (Sp)

216B. Principles and Theories of Psychological Measurement. Two 1 1/2-hour seminars per week. Prerequisite: courses 119A, 119B and consent of instructor. Topics vary; suggested topics: advanced research in formal and informal tests, evaluation and appraisal. Topic: theory and practice of psychological testing. Mr. Carter (Sp)

216C. Advanced Studies in Development. Two 1 1/2-hour seminars per week. Prerequisite: courses 219, 214A or 214B, or equivalents, and consent of instructor. Topics vary; suggested topics: advanced work in language, intellectual, social, emotional, and physical development. Topics: (F, Sp) to be announced; (W) development and evaluation of psychological constructs. Mr. Watts (F); Mr. Hurst (W); Mr. Ammon (Sp)

217A. Experimental Education. (3)
One 3-hour seminar and one 3-hour laboratory per week. Prerequisite: courses 119A and 119B. Student teams complete eight classical experiments utilizing modern electronic instruments such as: teaching machines, memory drums, ortho-rater, chronoscope, 6-channel Grass Polygraphs, ophthalmoscope, tachistoscope, eye-movement camera, language master, Semi-graph visual speech analyzer, delayed feedback recorder, etc.

217B. Experimental Education. (3)
One 3-hour seminar and one 3-hour laboratory per week. Prerequisite: courses 217A, 219, topic on analysis of variance recommended; 290B, topic on experimental research design. Student is expected to design and complete an original advanced laboratory project.

219. Advanced Topics in Educational Statistics. (3)
Two 2-hour lectures per week. Prerequisite: courses 119A and 119B. Topics vary; suggested topics: correlation and regression; analysis of variance; nonparametric methods; sampling surveys; scaling; factor analysis; experimental design. Topics: (F) multivariate analysis and nonparametrics; (W) factor analysis I, (Sp) factor analysis II, sample surveys, and analysis of variance. Mr. Marascuilo (F); Mr. Kaiser (W); Mr. Kaiser, Mr. Marascuilo, (Sp)

* Not to be given, 1968-69.
220A. Philosophy of Education: An Introduction. (3)
One 2-hour lecture and one 1-hour conference per week. Axiology, ethics, political philosophy, religion, psychiatry, and aesthetics as they relate to education. Mr. Mosier (W)

220B. Philosophy of Education: An Introduction. (3)
One 2-hour lecture and one 1-hour conference per week. Epistemology, logic and theory of signs as they relate to education. Mr. Mosier (F, Sp)

221A. History of Educational Thought. (3)
One 2-hour lecture and one 1-hour conference per week. The development of educational thought with special reference to the processes of teaching and learning. Mr. Mosier (W)

221B. History of Educational Thought. (3)
One 2-hour lecture and one 1-hour conference per week. The development of educational thought with special reference to philosophical analysis and the techniques of inquiry. Mr. Mosier (Sp)

221C. History of American Education. (3)
Two 1½-hour lectures per week. Social and intellectual history of American education from the colonial period to the Civil War. Mr. Jarrett (W); Mr. Lilge (Sp)

221D. History of American Education. (3)
Two 1½-hour lectures per week. Social and intellectual history of American education since the Civil War, with emphasis upon the Progressive Education Movement and the evolution of the American university. Mr. Carter (Sp)

222A. Comparative Education: An Introduction. (3)
Two 1½-hour lectures per week. Comparative methods and theories in the humanities and the social sciences applicable to the study of educational systems in various countries. Mr. Mosier (Sp)

222B. Comparative Education: an Introduction. (3)
Two 1½-hour lectures per week. Case studies of the contemporary relationships of education to economic, political, and social development in selected Asian, African, European or Latin-American societies. Mr. Mosier (Sp)

223. Sociology of Education. (3)
Two 1½-hour lectures per week. The organizational structure of educational institutions, the processes of control and socialization within schools, and the function of schools in society. Mr. Mosier (Sp)

224. Anthropology of Education. (3)
One 2-hour seminar and one 1-hour conference per week. Theories of the relations of socialization to culture, institutions of education in a cross-cultural perspective; content and processes of education as presented in the ethnographic literature. Topics: (F) Theories and perspectives; (W) Sec. 1, culture and community; Sec. 2, seminar in cultural transmission; (Sp) methodology of research. Mr. Parsons (F, W, Sp)

225. Philosophy of Education: Advanced Study. (3)
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor. Topics vary; suggested topics: the scientific movement in education. Mr. Jarrett (W); Mr. Lilge (Sp)

226. History of Education: Advanced Study. (3)
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor. The historical and contemporary study of educational systems within selected societies. 227A. Russia and Eastern Europe. Mr. Lilge (Sp) 227B. Western Europe. Mr. Lilge (W) 227C. Asia. 227D. Latin America. 227E. Africa.

228. Sociology of Education: Advanced Study. (3)
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor. Perspectives of contemporary sociology applied to selected topics in education. Mr. London (Sp)

229. Economics and Politics of Education: Advanced Study. (3)
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor. An analysis of intergovernmental relations in education, with special attention to the consequences for the economy of changes in structure of school government. Mr. A. Ruddell (W)

230. Curriculum Developments. (3-3-3-3-3-3-3-3-3-3)
One 2-hour seminar and one 1-hour conference per week. Critical analyses of curriculum innovations. 230A. Reading. Prerequisite: consent of instructor. Mr. B. Ruddell (W) 230B. Speaking, Listening, and Writing. Prerequisite: consent of instructor. Mr. Loban (Sp) 230C. Literature. Prerequisite: consent of instructor. Critical analysis of the literature curriculum. Mr. A. Ruddell (W) 230D. Mathematics. Prerequisite: consent of instructor. Mr. A. Ruddell (W) 230E. Social Sciences. Prerequisite: consent of instructor. Mr. A. Ruddell (W) 230F. Science. Prerequisite: teaching credential and Physics 11A—11B or Zoology 11A—11B, or consent of instructor. Mr. Lowery (F); Mr. Miller (W) 230G. Foreign Languages. Prerequisite: consent of instructor. Mr. Schevill (Sp) 230H. Art. Prerequisite: consent of instructor. Mr. Kyme (Sp) 230I. Music. Prerequisite: consent of instructor. Mr. Kyme (Sp)

231. Research in Curriculum and Instruction. (3-3-3-3-3-3-3-3-3-3)
One 2-hour seminar and one 1-hour conference per week. Critical analyses of research in the subject areas.
232 / EDUCATION

231A. Reading.
Prerequisite: consent of instructor.
Mr. R. Ruddell (Su); ——— (F)

231B. Speaking, Listening, and Writing.
Prerequisite: course 230B.
Mr. R. Ruddell (W)

231C. Literature.
Prerequisite: course 230C.
Mr. Lohan (F)

231D. Mathematics.
Prerequisite: consent of instructor.
Mr. A. Ruddell (Sp)

231E. Social Sciences.
Prerequisite: consent of instructor.
Mr. Michaelis (W)

231F. Science.
Prerequisite: courses 110A and 110B or equivalent; course 230F recommended; and consent of instructor.
Mr. Lowery (Sp)

*231G. Foreign Languages.
Prerequisite: consent of instructor.

231H. Art.
Prerequisite: consent of instructor. Mr. Luca (W)

231I. Music.
Prerequisite: consent of instructor. Mr. Kyme (W)

231J. Linguistics in Language Arts.
Prerequisite: English 110A—110B or English 205, or consent of instructor. Mr. R. Ruddell (Sp)

232. Preschool Programs. (3)
One 2-hour seminar and one 1-hour conference per week. Critical consideration of programs for the preschool child in terms of the home and social background. Topics: (Su) to be announced; (F) critical analyses of recent innovations; (Sp) critical analyses of research. ———(Su), Mr. Elliott (F, Sp)

235. Theory and Practice in Curriculum and Instruction. (3—3—3—3—3)
235A. Curriculum Planning: Bases for Decisions. One 2-hour seminar and one 1-hour conference per week. Bases for making public school curriculum decisions. Mr. Parker (F, Sp)

235B. Curriculum Planning: Theories, Principles, and Practices. Two 1½-hour seminars per week. Theories, principles and practices of operational techniques for public school curriculum planning. Mr. Parker (Su, W)

235C. Supervision of Instruction. One 2-hour seminar and one 1-hour conference per week. Prerequisite: teaching credential, two years of teaching experience, and consent of instructor. Research into the supervisor—teacher relationships, and practice with classroom visits, faculty meetings, and individual conferences will provide the basis for criticism and analysis of supervisory techniques. Mr. Edwards (W, Sp)

235D. Logic of Instruction. Two 1½-hour lectures per week. A consideration of the teaching act in terms of definition, explanation, induction, and deduction. The role of logic in the teaching of thinking. Semantic analyses of the language of the classroom. Mr. Mosier (F)

236. Advanced Studies in Elementary and Secondary Education. (3—3—3—3)
One 2-hour seminar and one 1-hour conference per week.

236A. The Elementary School.
Prerequisite: consent of instructor. Advanced studies of topics and problems in elementary education. Mr. Elliott (W)

*236B. The Junior High School.
Research on early adolescence and studies of junior high schools will be related to instruction and a curriculum sequentially linked to elementary and high school education.

236C. The Secondary School.
Prerequisite: teaching credential, two years of teaching experience, and consent of instructor. Organization of subjects suitable for adolescent learning will be examined with reference to the principles worked out in course 235A.
Mr. Edwards (F, Sp)

236D. Current Trends and Issues.
Prerequisite: consent of instructor. Critical consideration of current issues and trends in the public schools.
Sec. 1. Elementary schools. Mr. Michaelis (Su, F)
Sec. 2. Secondary schools.
Mr. Lund, Mr. Webster (W)

238. In-Service Education. (3)
One 2-hour seminar and one 1-hour conference per week. Theories, procedures, practices, and evaluation of in-service education for public school personnel. Mr. Parker (W)

240. Student Personnel and Counseling Psychology. (3—3—3—3)
One 2-hour lecture and one 2-hour laboratory per week. Primarily for students working for graduate degrees in this field for the pupil counseling credential. Mr. Russell (Su, F)

240A. Principles and Theories of Guidance.
Prerequisite: consent of instructor. Development and scope of guidance work as a profession; critical analysis of basic philosophies, ethics, and professional responsibilities. Mr. Morris (F)

240B. Theoretical Foundations of Counseling.
Prerequisite: consent of instructor. Portent theoretical and empirical developments in the social sciences for counseling theories and practices. Mr. Lowe (F)

240C. Environmental Factors in Counsellee Adjustment.
Prerequisite: consent of instructor. Theories of interaction of environmental and personal factors in the counseling process. Analysis of theories of career development. Sources and interpretation of vocational data. Mr. Morris (Su, W)

240D. Group Guidance.
Prerequisite: consent of instructor. Group procedures in counseling and personnel work. Theory, function, and operation of group guidance activities in an educational setting. Mr. Morris (Su, Sp)

240E. Individual Appraisal in Counseling.
Prerequisite: courses 118, 119A, 213A, and consent of instructor. Theory and practice of psychological appraisal of counseling. Emphasis upon utilization of appraisal data. (Sp)

245. Advanced Counseling. (3—3)
Three 1-hour seminars per week.

245A. Counseling Theory.
Prerequisite: courses 240A and 240B. Counseling theories and schools of counseling. Intensive examination of counseling techniques and related research. Mr. Lowe (W)

245B. Case Analysis.
Prerequisite: course 245A. Illustration of counsel—

* Not to be given 1968—69.
ing theories and principles through intensive case analysis, evaluation of counseling.

Mr. Lowe (Su, Sp)

249. Special Problems in Counseling Theory and Research. (3)

One 2-hour seminar and one 1-hour conference per week. Prerequisite: courses 240A and 240B. Designed to develop special areas of interdisciplinary research and theory which bear on problems of current interest and significance to the counseling field.

250. Public School Organization and Administration. (3)

One 3-hour seminar per week. A survey of theory, research, policies and practices relating to the organization and administration of public education. Enrollment restricted to students not majoring in administration.

Mr. Swanson (F)

251. Foundations of Educational Administration. (3—3—3)

One 3-hour seminar per week. Prerequisite: consent of instructor.

251A. Education and Government.

Educational policy-making and administration in federal, state, and local governments; intergovernmental relations in education; the role of the courts in the conduct of education.

Mr. Reller (Su); Mr. Guthrie (F)

251B. The Administration of School Personnel, Educational Programs, and School Plant Programs. Policies and procedures in the administration of professional and classified personnel, student personnel services, programs of instruction, and school plant programs and facilities.

Mr. Swanson (W)

251C. School Finance and Business Services.

Financial support of programs in public education and their economic significance; the development and administration of school budgets.

Mr. Benson, Mr. J. Jensen (Sp)

252. Administration of the Individual School. (3)

One 3-hour seminar per week. Prerequisite: consent of instructor. Principles and practices in the organization and administration of the elementary and secondary school.

Mr. Edwards (F)

255. The Theory of Organization and Administration of Education. (3)

Two 1½-hour seminars per week. Prerequisite: courses 251A, 251B, 251C, or consent of instructor. An intensive study of selected approaches to the theoretical analysis of administration in educational organization.

Mr. Guthrie (Su); — (F)

256. Economics of Education and Educational Planning. (3)

Two 1½-hour seminars per week. Prerequisite: consent of instructor. Measurement of the returns from education; educational implications of manpower analysis; techniques of national educational planning; and the relation between education and economic growth in underdeveloped countries.

Mr. Benson (Sp)

257. Education and Government. (3–3–3)

One 3-hour seminar per week. Prerequisite: course 251A or consent of instructor.

257A. Educational Policy Making in the United States.

Topics vary; suggested topics: political and other factors influencing educational policy making, and the formulation of laws; the historical development of federalism in education; public opinion, community conflict, and voting in school districts; community power and school board behavior.

Topics: (Su, W, Sp) to be announced.

Mr. Guthrie (Su, W, Sp)

237B. Education and The Law.

Nature and functions of law in educational administration; legal principles and issues relative to education; techniques of legal research; the interpretation of developments in school law.

(3)

Mr. Swanson (W)

257C. Comparative Educational Administration.

The styles and functions of educational administration in various types of government systems and political cultures.

Mr. Reller (Su); — (W)


One 3-hour seminar per week. Prerequisite: courses 251A, 251B, 251C, or the equivalent, and consent of instructor.

258A Administration of Instructional Programs and Services.

Theories, policies, and practices relative to the administration of the program of instruction and auxiliary services in the public schools. (F, Sp) to be announced.

Mr. Swanson (F, Sp)

258B. Personnel Administration in Public Education.

Theories, policies, and practices relative to educational personnel. Topic: (W) to be announced.

Mr. Swanson (W)

258C. Finance and Business Administration of Public Education.

An analysis of the theory and practice of finance of education. Consideration will be given to finance policies, sources of revenue, and to expenditure policies at the local, state, and national levels. In certain quarters, the emphasis will be on various aspects of school business administration.

Mr. Kelley (Su); Mr. Benson (W)

258D. Special Problems in Educational Administration.

Topics vary; suggested topics: school plant planning and administration; school-community relations, studies, and surveys; administration of vocational education; administration of education in metropolitan areas. Topic: (Sp) surveys and field studies. The theory, techniques, procedures and results of field surveys and field studies will be considered. Field study will be made in an operating school district.

Mr. Swanson (Sp)

260. The Junior College. (3)

One 2-hour laboratory per week; one 1-hour conference per week. Nature and role of the junior college in American society; a consideration of purposes, curriculum, student characteristics, and implications for instruction and student personnel.

Mr. Case (F, W)

260L. The Junior College Laboratory. (2)

One 2-hour laboratory per week. Conferences and observations pertaining to curriculum and instruction in junior colleges. Must be taken concurrently with course 260.

Mr. Case (F, W)

* Not to be given 1968–69.
261. Higher Education in The United States. (3)
One 3-hour seminar per week. Prerequisite: master's degree or equivalent, or consent of instructor. An intensive study of critical problems and major issues in the development of American higher education. — (Su, F, Sp); Mr. Heist (W)

264. College Teaching. (3)
One 2-hour seminar per week and one 1-hour conference. Prerequisite: master's degree or equivalent, or consent of instructor. An attempt to develop a typology of college teaching styles, and to describe and demonstrate some of the instructional techniques and procedures commonly found in higher education classrooms.

268. Advanced Study in Higher Education. (3-3-3-3-3-3-3)
Prerequisite: course 261.
268A. The Student in Higher Education.
One 3-hour seminar per week. Intensive study of research on student characteristics, cultures, performance, and impact of educational institutions.
Mr. Heist (F, Sp)
268B. The Curriculum of Higher Education.
One 2-hour seminar and one 1-hour laboratory per week. Nature and development of educational programs in general, liberal, professional and graduate education.
(W)
268C. The Administration of Higher Education.
One 3-hour seminar per week. Prerequisite: consent of instructor. The government, organization, and administration of colleges and universities; the relevance of organizational and administrative theory in other fields to institutions of higher education. — (Su, F, W)
268D. Teacher Education.
One 2-hour seminar and one 1-hour laboratory per week; (Su), three 1-hour seminars per week. Prerequisite: courses 261 and 268A. Intensive study of the research and problems in the education of teachers. — (Su, F, W)
268E. Problems in Junior College Administration.
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor. Intensive study of selected problems related to junior college administration and organization.
Mr. Tillery (F, Sp)
268F. Financing Higher Education.
Two 1-hour seminars per week. Prerequisite: consent of instructor. The government, organization, and administration of colleges and universities; the relevance of organizational and administrative theory in other fields to institutions of higher education. — (Su, F, W)

270. Problems in Adult Education. (3)
One 3-hour seminar per week. Prerequisite: consent of instructor. Topics vary; suggested topics: students, curriculum, administration, financing, leadership, teacher training, education and aging.
Mr. Takagi (F); Mr. London (Sp)

275. Advanced Study in Adult Education. (3-3-3)
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor.
275A. Sociology of Adult Education.
A study of the social forces which create and mold various designs of adult education in an industrial society.
Mr. Takagi (Sp)
275B. Problems of Work and Leisure.
The relationships of work and leisure to the continuing education of adults.
Mr. London (W)
275C. Community Development.
An examination of community development programs in the developing countries and the United States. — (F); Mr. Parsons (Sp)

290A. Methodology of Educational Research: Survey. (3)
Two 2-hour seminars per week. Prerequisite: consent of instructor. The methodology of social research in education—the logic of design, analysis, and inference—and a survey of data-collected techniques, with emphasis upon non-experimental investigations. — (Su); Mr. Hansen (F), Mr. Takagi (W), Mr. Watts (Sp)

290B. Topics in Methodology of Educational Research. (3)
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor. Topics vary each quarter; suggested topics: techniques of social and observational research in education; techniques of experimental and psychological research in education; methods in the history of education.
Topics: (Su) techniques and problems of evaluation. — (F, W, Sp) to be announced.

291. Experimental Courses. (3)
291A. The Media in Education. One 2-hour lecture and one 1-hour conference per week. Prerequisite: consent of instructor. A survey of new developments in media on the educational process, administration and curriculum planning, with evaluation of current research and theory. — (Su, W, Sp)
291B. Problems in the Education of Disadvantaged Learners. One 3-hour seminar per week. Prerequisite: consent of instructor. A study of the subculture of poverty and of the learning problems of disadvantaged students. Attention also will be devoted to research and related educational programs.
Mr. Webster (F)
291C. Educational Problems in Urban Areas. One 3-hour seminar per week. Prerequisite: consent of instructor. Consideration will be given to de facto school segregation; disadvantaged learners, school and ethnic minority group relations; education in suburbia; teachers in inner-city schools; and job retraining and basic education programs.
Mr. Webster (Sp)

295. Special Topics in Education. (3)
One 3-hour seminar per week. (Su only, two 1-hour seminars per week.) Sections of this course will deal with the exploration of new subject matter in education. Topics will vary from quarter to quarter. Topics: (Su) diversity in the education of young children; (F) mass communications, education, and politics; (W) Sec. 1, behavioral sciences and educational research; Sec. 2, mass communications, education, and politics; (Sp) Sec. 1, curriculum as a field of inquiry; Sec. 2, to be announced.
Mr. Elliott, Sec. 1, — (Su); — (F);
Mr. Elliott, Sec. 1, Mr. Miller, Sec. 2 (Sp)

* Not to be given 1968-69.
§ Approved for two years only, 1968-69, 1969-70.

280. Experimental Courses. (3)
280A. Psychology. One 2-hour seminar per week. Prerequisite: consent of instructor. A survey of new developments in media on the educational process, administration and curriculum planning, with evaluation of current research and theory. — (Su, W, Sp)
280B. Experimental Courses. (3)
280C. Experimental Courses. (3)
280D. Experimental Courses. (3)
280E. Experimental Courses. (3)
280F. Experimental Courses. (3)

199. Special Studies. (1-0-3)
Prerequisite: consent of instructor. Open to special studies in unusual programs.

268A. Special Study in Higher Education. (3)
Prerequisite: consent of instructor. Open to special studies in unusual programs.
296. Special Study. (1—4)
Prerequisite: consent of instructor and graduate adviser. Open to qualified graduate students who wish to pursue special studies and research under the direction of a member of the staff.
296A. Educational Administration.
The Staff (Su, F, W, Sp)
296B. Counseling Psychology.
The Staff (Su, F, W, Sp)
296C. Curriculum and Instruction.
The Staff (Su, F, W, Sp)
296D. Educational Psychology.
The Staff (Su, F, W, Sp)
296E. Higher Education.
The Staff (Su, F, W, Sp)
296F. Social and Humanistic Foundations.
The Staff (Su, F, W, Sp)

One 2-hour seminar and one 1-hour conference per week. Required of all master's and doctor's candidates in connection with seminar papers and dissertations.
298A. Educational Administration.
Prerequisite: consent of instructor.
Mr. Benson (F, W), Mr. Guthrie (F, W, Sp)
298B. Student Personnel and Counseling Psychology.
Prerequisite: courses 240A, 240B, and consent of instructor.
Mr. Morris (F); Mr. Lowe (W, Sp)
298C. Curriculum and Instruction.
Prerequisite: consent of instructor.
Mr. Parker (Su, F, Sp); Mr. Loban (F, Sp);
Mr. Edwards, Mr. Elliott, Mr. Michaels (W); Mr. R. Ruddell (Sp)
298D. Educational Psychology.
Prerequisite: courses 119A, 119B, and consent of instructor.
Mr. Carter (F, W, Sp)
298E. Higher Education.
Prerequisite: consent of instructor.
Miss Heiss (Su); Mr. Medsker (F, Sp);
Mr. Tillery (W)
298F. Humanistic and Social Foundations of Education.
Prerequisite: consent of instructor.
Miss Joncich (Sp)
298G. Adult Education.
Prerequisite: consent of instructor.
Mr. London (W)

299. Directed Research. (3—6)
299A. Educational Administration.
The Staff (Su, F, W, Sp)
299B. Counseling Psychology.
The Staff (Su, F, W, Sp)
299C. Curriculum and Instruction.
The Staff (Su, F, W, Sp)
299D. Educational Psychology.
The Staff (Su, F, W, Sp)
299E. Higher Education.
The Staff (Su, F, W, Sp)
299F. Social and Humanistic Foundations.
The Staff (Su, F, W, Sp)

Professional Courses
310A—310B—310C. Field Work in School Psychology. (3—6)
One 2-hour lecture per week plus supervised field experience. Prerequisite: consent of instructor. The student will observe and assess problems of learning and behavior in schools and participate in planning school programs for pupils with educational handicaps.
Mrs. Lambert (F, W, Sp)

311. Field Work in Special Education. (3)
Hours to be arranged.

331. The Sequence in Supervised Teaching in Elementary Schools: Professional Methods.
Only candidates who meet established criteria can be accepted; enrollment is limited to available facilities. Initial entry into supervised teaching in quarters other than fall is possible by special arrangement.
331A. Introduction to Elementary Supervised Teaching. (3)
One 3-hour lecture and six hours of field work per week. Lectures, conferences, laboratory, and field work. Observations and participation in public school work. Mrs. Cutright (Su, Sp)**;
Mr. Dumas and Staff (F, W)
331B. Elementary Supervised Teaching. (4)
One 3-hour lecture and 8 to 10 hours of laboratory and field work per week. Prerequisite: Music 110 or course 131B, Mathematics 15, Physical Education 12 (sections on elementary school activities); two quarters of laboratory science; and course 331A. Seminars, conferences, observation and supervised teaching.
(Su); Mr. Dumas and Staff (W)
331C. Elementary Supervised Teaching. (8)
One 3-hour lecture and 16 to 20 hours of field work per week. Prerequisite: courses 110, 130; three or more courses from 131A, 131C, 131D, 131E, 131F, and 331B and 331D. Seminars, conferences, observation and supervised teaching. Summer quarter enrollment by consent of instructor only.
(Su); Mr. Dumas and Staff (F, Sp)
**331D. Procedures, Materials, and Curriculum. (3)
One 3-hour lecture per week. Restricted to candidates for the elementary school teaching credential. Must be taken concurrently with course 331B. Summer quarter enrollment by consent of instructor only.
(Su); Mr. Dumas and Staff (Su, F)

Only candidates who meet established criteria can be accepted; enrollment is limited to available facilities. The sequence in supervised teaching normally begins in the fall quarter and extends through the spring quarter, terminating with the close of the secondary school year. Initial entry into supervised teaching in quarters other than fall is possible in some teaching fields, subject to special arrangement with supervisors in those fields.
332A. Introduction to Secondary Supervised Teaching. (4)
One 1-hour lecture and five hours of field work per week. Conferences, observation, and supervised teaching.
(Su); Mr. Hatfield and Staff (F, W, Sp)
332B. Secondary Supervised Teaching in Major Field. (4)
One 1-hour lecture and five hours of field work per week. Conferences, observation, and supervised teaching.
(Su); Mr. Schevill and Staff (F, W, Sp)
332C. Secondary Supervised Teaching in Minor Field. (4)

* Not to be given 1968—69.
** Restricted to Elementary Internship Program.
*** Not to be offered after fall quarter, 1968.
One 1-hour lecture and five hours of field work per week. Conferences, observations, and supervised teaching.

(Su); Mr. Schevill and Staff (F, W, Sp)

332D. Procedures, Materials, and Curriculum. (3)
One 3-hour lecture, or one 2-hour and one 1-hour lecture per week. Study and evaluation of curriculum and curriculum trends, instructional procedures, and materials of a specific subject-matter area commonly taught in secondary school. This course is normally taken concurrently with supervised teaching in the major and minor fields.
Supervisory Staff, (Su, F, W, Sp)

333. Practicum. (3-6)
This is an extra-session course which is scheduled to coincide with the calendar of the public schools. Enrollment is limited to available facilities.

333A. Supervised Teaching in Secondary Schools.
One 1-hour lecture and 5 to 12 hours of field work per week. Prerequisite: a course in secondary supervised teaching and consent of instructor.
Mr. Schevill and Staff (Su, F, W, Sp)

333B. Supervised Teaching in Elementary Schools.
One 1-hour lecture and 5 to 12 hours of field work per week. Prerequisite: a course in elementary supervised teaching and consent of instructor.
Mr. Dumas and Staff (Su, F, W, Sp)

333C. Directed Practice in School Libraries.
One 1-hour lecture and 10 to 12 hours of field work per week. Prerequisite: consent of instructor.
Mrs. Durham (F, Sp)

340. Field Work in Student Personnel and Counseling Psychology. (3-6)
One 2-hour case conference per week plus individual conferences. Prerequisite: courses 240A, 240B, 245A, 245B, and consent of instructor. Supervised practice in selected aspects of student personnel services and counseling psychology at elementary, secondary, or college level, and in other agencies.
Mr. Lowe (Su, F); ——— (F, W, Sp);
Mr. Morris (W, Sp)

350. Internship in Educational Administration. (3-6)
One 2-hour seminar per week plus supervised field experience. Prerequisite: consent of instructor. Conferences and supervised field experiences.
Mr. McPherson, (F, W, Sp)

360. Supervised Teaching in Junior Colleges. (4)
One 2-hour lecture and five hours of field work per week. Conferences, observation, and supervised teaching. Enrollment is limited to available facilities.
Mr. Case (W, Sp)

Individual Study Courses

601. Individual Study for Master's Candidates. (1-8)
Individual study for the comprehensive examination in consultation with the faculty adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the faculty adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ed.D. or Ph.D. degrees. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

IDS 175. A Nontechnical Introduction to Operations Research. (4)
See Interdepartmental Studies for the complete description of this course.

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ENGINEERING

(Office, 315 McLaughlin Hall)

George J. Maslach, B.S., Professor of Aeronautical Engineering.
Irving Fatt, Ph.D., Professor of Engineering Science.
Harold W. Iversen, M.S., Professor of Mechanical Engineering.
James T. Lapsley, Jr., M.S., Associate Professor of Industrial Engineering.
Walter W. Soroka, Sc.D., Professor of Acoustical Sciences.
Charles Susskind, Ph.D., Professor of Electrical Engineering.
Robert L. Wiegel, M.S., Professor of Civil Engineering and Director, State Technical Services Program.

Don O. Horning, M.E., Lecturer in Engineering.

Civil Engineering

(Department Office, 109 McLaughlin Hall)

Harry Bolton Seed, Ph.D., Professor of Civil Engineering (Chairman of the Department).
HYDRAULIC AND SANITARY ENGINEERING

(Division Office, 115 McLaughlin Hall)

Hans Albert Einstein, D.S.T., Professor of Hydraulic Engineering.
Joe W. Johnson, M.S., Professor of Hydraulic Engineering.
Warren J. Kaufman, Sc.D., Professor of Sanitary and Radiological Engineering and Associate Director of the Sanitary Engineering Research Laboratory.
Percy H. McGauhey, M.S., Professor of Sanitary Engineering, Professor of Public Health, Director of the Sanitary Engineering Research Laboratory.
William J. Oswald, Ph.D., Professor of Sanitary Engineering and Professor of Public Health.

Eeman A. Pearson, Sc.D., Professor of Sanitary Engineering (Chairman of the Division).
Bernard D. Tebbens, Sc.D., Professor of Industrial Hygiene Engineering.

Jerome F. Thomas, Ph.D., Professor of Sanitary Engineering.
David K. Todd, Ph.D., Professor of Civil Engineering.
Robert L. Wiegel, M.S., Professor of Civil Engineering.
Sidney T. Harding, B.S., Professor of Irrigation, Emeritus.

Charles G. Hyde, B.S., LL.D., Professor of Sanitary Engineering, Emeritus.
Wilfred F. Langelier, M.S., D.Eng. (hon.), Professor of Sanitary Engineering, Emeritus.

James A. Harder, Ph.D., Associate Professor of Civil Engineering.
Robert E. Selleck, Ph.D., Associate Professor of Sanitary Engineering.
Hugo B. Fischer, Ph.D., Assistant Professor of Civil Engineering.
David I. Jenkins, Ph.D., Assistant Professor of Sanitary Engineering.

STRUCTURAL ENGINEERING AND STRUCTURAL MECHANICS

(Division Office, 215 McLaughlin Hall)

Frank Baron, D.Sc., Professor of Civil Engineering.
Vitelmo Bertero, Sc.D., Professor of Civil Engineering.
Jack G. Bouwkamp, C.I., Professor of Civil Engineering.
Boris Bresler, M.S., Professor of Civil Engineering.
Ray W. Clough, Jr., Sc.D., Professor of Civil Engineering (Chairman of the Division).
Howard D. Eberhart, M.S., Professor of Civil Engineering.
William G. Godden, Ph.D., Professor of Civil Engineering.

Tung-Yen Lin,**1 M.S., Professor of Civil Engineering.
Hugh D. McNiven, Ph.D., Professor of Civil Engineering.
Joseph Penzien, Sc.D., Professor of Civil Engineering.
David Pirtz, M.S., Professor of Civil Engineering.

Karl S. Pister, Ph.D., Professor of Civil Engineering.
Mils Polivka, M.S., Professor of Civil Engineering.
Egor P. Popov, Ph.D., Professor of Civil Engineering.
Jerome M. Raphael, S.M., Professor of Civil Engineering.
Alexander C. Scordelis, M.S., Professor of Civil Engineering.

Joe W. Kelly, B.S., D.Eng. (hon.), Professor of Civil Engineering, Emeritus.
Bruce Jameyson, B.S., Professor of Civil Engineering, Emeritus.
George E. Troxell, B.S., Professor of Civil Engineering, Emeritus.
Jacob Lubliner, Ph.D., Associate Professor of Civil Engineering.
James M. Kelly, Ph.D., Assistant Professor of Civil Engineering.
Povindar K. Mehta, D.Eng., Assistant Professor of Civil Engineering.

**1 Appointed Professor of Arts and Sciences, 1968–69.
Robert L. Taylor, Ph.D., Assistant Professor of Civil Engineering.
Edward L. Wilson, D.Eng., Assistant Professor of Civil Engineering.

Graham H. Powell, Ph.D., Acting Assistant Professor of Civil Engineering.

TRANSPORTATION ENGINEERING

(Division Office, 107 McLaughlin Hall)
Harmer E. Davis, M.S., Professor of Civil Engineering, and Director of the Institute of Transportation and Traffic Engineering.
Dan M. Finch, B.S., Professor of Transportation Engineering.
Robert Horonjeff, B.S., Professor of Transportation Engineering (Chairman of the Division).
W. Norman Kennedy, B.S., Professor of Transportation Engineering and Associate Director of the Institute of Transportation and Traffic Engineering.
Adolf D. May, Jr., Ph.D., Professor of Transportation Engineering.
James K. Mitchell, Sc.D., Professor of Civil Engineering.
Francis H. Mollitt, M.C.E., Professor of Civil Engineering.
Carl L. Monismith, M.S., Professor of Civil Engineering.
Gordon F. Newell, Ph.D., Professor of Transportation Engineering.
Harry Bolton Seed, Ph.D., Professor of Civil Engineering (Chairman of the Department of Civil Engineering).
Paul A. Witherspoon, Ph.D., Professor of Geological Engineering.
France S. Foote, E.M., Professor of Railroad Engineering, Emeritus.
Paul F. Keim, M.Sc., Professor of Civil Engineering, Emeritus.
Ralph A. Moyer, M.S., C.E., Sc.D. (Hon.), Professor of Transportation Engineering, Emeritus.
James M. Anderson, Ph.D., Associate Professor of Civil Engineering.
James M. Duncan, Ph.D., Assistant Professor of Civil Engineering.
Richard E. Goodman, Ph.D., Assistant Professor of Geological Engineering.
John Lysmer, Ph.D., Assistant Professor of Civil Engineering.
Paul R. Wolf, Ph.D., Assistant Professor of Civil Engineering.

Paul D. Berrigan, B.S., Lecturer in Construction Engineering.
Clarence K. Chan, M.S., Lecturer in Civil Engineering.
Paul K. Dygert, M.A., Lecturer in Transportation Engineering.
Walter E. Gillfillan, M.Eng., Lecturer in Transportation Engineering.
Wolfgang S. Homburger, M.S., Lecturer in Transportation Engineering.
William N. Houston, Acting Assistant Professor of Civil Engineering.
Thomas A. Lang, M.S., Lecturer in Geological Engineering.
Wayne H. Snowden, B.S., Lecturer in Transportation Engineering.
Thomas F. Thompson, A.B., Lecturer in Geological Engineering.
Richard M. Zettel, M.A., Lecturer in Transportation Engineering.

Electrical Engineering and Computer Sciences

(Department Office, 231 Cory Hall)
Diogenes J. Angelakos, Ph.D., Professor of Electrical Engineering and Computer Sciences and Director, Electronics Research Laboratories.
Charles K. Birdsell, Ph.D., Professor of Electrical Engineering.
Leonard J. Black, Ph.D., Professor of Electrical Engineering.
Charles A. Desoer, Sc.D., Professor of Electrical Engineering and Computer Sciences.
Thomas E. Everhart, Ph.D., Professor of Electrical Engineering and Computer Sciences.
Arthur M. Hopkin,† Ph.D., Professor of Electrical Engineering and Computer Sciences.
Harry D. Huskey, Ph.D., Professor of Electrical Engineering and Computer Sciences.
Eliahu I. Jury, Sc.D., Professor of Electrical Engineering.
Ernest S. Kuh, Ph.D., Professor of Electrical Engineering and Computer Sciences
(Chairman of the Department).
Paul L. Morton, Ph.D., Professor of Electrical Engineering and Computer Sciences.
Donald O. Pederson, Ph.D., Professor of Electrical Engineering.
Burtis L. Robertson, Ph.D., Professor of Electrical Engineering.
Samuel Silver, Ph.D., Professor of Engineering Science and Director, Space Sciences Laboratory.
Otto J. M. Smith, Ph.D., Professor of Electrical Engineering and Computer Sciences.
Charles Susskind,† Ph.D., Professor of Engineering Science.
Aram J. Thomasian, Ph.D., Professor of Electrical Engineering and Computer Sciences and of Statistics.
George L. Turin, Sc.D., Professor of Electrical Engineering and Computer Sciences.
Shyh Wang, Ph.D., Professor of Engineering Sciences.
John R. Whinnery, Ph.D., Professor of Electrical Engineering.
Lotfi A. Zadeh,† Ph.D., Professor of Electrical Engineering and Computer Sciences.
Charles F. Dalziel, E.E., Professor of Electrical Engineering, Emeritus.
Lester E. Reukema, Ph.D., Professor of Electrical Engineering, Emeritus.
Herbert J. Scott, E.E., Professor of Electrical Engineering, Emeritus.
David H. Sloan, Ph.D., Professor of Electrical Engineering, Emeritus.
Albert C. English, Ph.D., Associate Professor of Engineering Science.
Ivan T. Frisch, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Arthur Gill, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Michael A. Harrison, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Allan J. Lichtenberg,** Ph.D., Associate Professor of Engineering Science.
Wayne W. Lichtenberger, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Richard S. Muller,† Ph.D., Associate Professor of Electrical Engineering.
William G. Oldham, Ph.D., Associate Professor of Electrical Engineering.
Roger F. W. Pease, Ph.D., Associate Professor of Electrical Engineering.
Melvin W. Pirtle, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Elijah Polak,† Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Ronald A. Rohrer,† Ph.D., Associate Professor of Electrical Engineering.
David J. Sakrison, Sc.D., Associate Professor of Electrical Engineering and Computer Sciences.
Jerome R. Singer, Ph.D., Associate Professor of Engineering Science.
Theodore Van Duzer, Ph.D., Associate Professor of Electrical Engineering.
Pravin P. Varaiya, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.

† On leave, 1968—69.
‡ On leave, 1968—69.
‡‡ On leave, fall quarter, 1968.
‡‡‡ On leave, fall and winter quarters, 1968—69.
** Miller Institute for Basic Research leave, 1968—69.
William J. Welch, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Richard M. White, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Eugene Wong, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
John R. Woodyard, Ph.D., Associate Professor of Electrical Engineering and Computer Sciences.
Donald R. Deuel, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Howard Frank, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Leonard H. Haines, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
William G. Howard, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Butler W. Lampson, Assistant Professor of Electrical Engineering and Computer Sciences.
Michael A. Lieberman, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
W. Douglas Maurer, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Kenneth K. Mei, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Andrew Neureuther, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Graham A. Rigby, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Steven E. Schwarz, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Richard M. Van Slyke, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.
Paul O. Vogelhut, Ph.D., Assistant Professor of Electrical Engineering and Computer Sciences.

Sydney Fernbach, Ph.D., Lecturer in Electrical Engineering and Computer Sciences.
Edwin R. Lewis, Ph.D., Acting Associate Professor of Electrical Engineering and Computer Sciences.
Ralph E. Love, Ph.D., Lecturer in Electrical Engineering and Computer Sciences.
Herbert Schorr, Ph.D., Lecturer in Electrical Engineering and Computer Sciences.
Thomas G. Taussig, B.S., Lecturer in Electrical Engineering and Computer Sciences.
Cornelius A. Tobias, Ph.D., Professor of Medical Physics.
Charles W. Turner, Ph.D., Lecturer in Electrical Engineering.
Richard W. Watson, Ph.D., Lecturer in Electrical Engineering and Computer Sciences.

† On leave, 1968–69.
Industrial Engineering and Operations Research

(Department Office, 4135 Etcheverry Hall)

Edward R. F. W. Crossman, Ph.D., Professor of Industrial Engineering.
E. Paul DeGarmo, M.S., Professor of Industrial Engineering and Mechanical Engineering.
David Gale,† Ph.D., Professor of Operations Research and Mathematics.
Raymond G. Grassi, M.S., Professor of Industrial Engineering and Operations Research.
William S. Jewell, Sc.D., Professor of Operations Research (Chairman of the Department).
Robert M. Oliver, Sc.D., Professor of Industrial Engineering and Operations Research.
Ronald W. Shephard, Ph.D., Professor of Engineering Science and Chairman, Operations Research Center.
Richard E. Barlow, Ph.D. Associate Professor of Operations Research.
C. Roger Glasey, Ph.D., Associate Professor of Industrial Engineering and Operations Research.
Edward C. Keachie, Ph.D., Associate Professor of Industrial Engineering.
James T. Lapsley, M.S., Associate Professor of Industrial Engineering.
Sheldon M. Ross, Ph.D., Assistant Professor of Industrial Engineering and Operations Research.
Richard M. Van Slyke, Ph.D., Assistant Professor of Operations Research and Electrical Engineering.
Ronald W. Wolff, Ph.D., Assistant Professor of Operations Research.

James A. Baker, B.A., Lecturer in Electrical Engineering.
Robert Harris, M.S., Acting Assistant Professor of Industrial Engineering and Operations Research.
Stephen Laner, Ph.D., Lecturer in Industrial Engineering and Operations Research.

Mechanical Engineering

(Department Office, 5102 Etcheverry Hall)

Ralph A. Seban, Ph.D., Professor of Mechanical Engineering (Chairman of the Department).

AERONAUTICAL SCIENCES

(Division Office, 6105 Etcheverry Hall)

Gilles M. Corcos, Ph.D., Professor of Aeronautical Sciences.
Maurice Holt,† Ph.D., Professor of Aeronautical Sciences.
Edmund V. Laitone,† Ph.D., Professor of Aeronautical Sciences (Chairman of the Division).
George J. Maslach, B.S., Professor of Aeronautical Engineering.
Antoni K. Oppenheim, Ph.D., Professor of Aeronautical Sciences.
Samuel A. Schaan,† Ph.D., Professor of Engineering Sciences.
Frederick S. Sherman, Ph.D., Professor of Aeronautical Sciences.
Lawrence Talbot, Ph.D., Professor of Aeronautical Sciences.
Stanley A. Berger, Ph.D., Associate Professor of Aeronautical Sciences.
D. Roger Willis, Ph.D., Associate Professor of Aeronautical Sciences.
Franklin C. Hurlbut, Ph.D., Professor of Aeronautical Sciences in Residence.

† On leave, spring quarter, 1968–69.
† On leave, fall and winter quarters, 1968–69.
†† On leave, winter and spring quarters, 1968–69.
APPLIED MECHANICS

(Division Office, 6143 Etcheverry Hall)
Werner Goldsmith, Ph.D., Professor of Applied Mechanics.
Chieh S. Hsu, Ph.D., Professor of Applied Mechanics.
George Leitmann,† Ph.D., Professor of Engineering Science.
Paul Lieber, Ph.D., Professor of Engineering Science.
Paul M. Naghdi, Ph.D., Professor of Engineering Science (Chairman of the Division).
Reinhardt M. Rosenberg, M.S., Ph.D. (hon.), Professor of Applied Mechanics.
Walter W. Soroko, Sc.D., Professor of Acoustical Sciences.
Cyril P. Atkinson, M.S., M.E., Associate Professor of Applied Mechanics.
David B. Boggy, Ph.D., Assistant Professor of Applied Mechanics.
Michael M. Carroll, Ph.D., Assistant Professor of Applied Mechanics.

MECHANICAL DESIGN

(Division Office, 5144 Etcheverry Hall)
G. Wayne Brown, M.S., Professor of Mechanical Engineering.
Don M. Cunningham, M.S., Professor of Mechanical Engineering.
E. Paul DeCarmo, M.S., Professor of Mechanical Engineering and Industrial Engineering.
Iain Finnie, Sc.D., Professor of Mechanical Engineering.
Joseph Frisch, M.S., Professor of Mechanical Engineering (Chairman of the Division).
Frank E. Hauser, Ph.D., Professor of Mechanical Engineering.
Thomas H. Hazlett, M.S., Professor of Mechanical Engineering.
Charles W. Radcliffe, M.S., M.E., Professor of Mechanical Engineering.
Robert F. Steidel, Jr., D.Eng., Professor of Mechanical Engineering.
Yasundo Takahashi, Ph.D., Professor of Mechanical Engineering.
Herman Thal-Larsen, M.S., Professor of Mechanical Engineering.
Erich G. Thompsen,† Ph.D., Professor of Mechanical Engineering.
Alexander S. Levens, M.S., Professor of Mechanical Engineering, Emeritus.
Shiro Kobayashi, Ph.D., Associate Professor of Mechanical Engineering.
David M. Auslander, Sc.D., Assistant Professor of Mechanical Engineering.
Robert R. Donaldson, Ph.D., Assistant Professor of Mechanical Engineering.
Clayton D. Mote, Ph.D., Assistant Professor of Mechanical Engineering.

Milton R. Pickus, Ph.D., Lecturer in Mechanical Engineering.

THERMAL SYSTEMS

(Division Office, 6187 Etcheverry Hall)
Israel I. Cornet, Ph.D., Professor of Mechanical Engineering.
Leonard Farbar,† M.S., Professor of Mechanical Engineering.
Irving Fatt, Ph.D., Professor of Engineering Science.
Everett D. Howe, M.S., Professor of Mechanical Engineering and Director, Sea Water Conversion Laboratory.
Francis W. Hutchinson, M.S., M.E., Professor of Mechanical Engineering.
Harold W. Iversen, M.S., Professor of Mechanical Engineering.
Harold A. Johnson, M.S., Professor of Mechanical Engineering.
Alan D. K. Laird, Ph.D., Professor of Mechanical Engineering.

† On leave, 1968-69.
†† On leave, fall quarter, 1968.
††† On leave, fall and winter quarters, 1968-69.
Ralph A. Seban, Ph.D., Professor of Mechanical Engineering (Chairman of the Department of Mechanical Engineering).

Wilbur H. Somerton, Pet. E., Professor of Petroleum Engineering.

Ernest S. Starkman, M.S., Professor of Mechanical Engineering (Chairman of the Division).

Chang-Lin Tien, Ph.D., Professor of Mechanical Engineering.


Paul B. Stewart, Ph.D., Associate Professor of Mechanical Engineering.

Ralph Greif, Ph.D., Assistant Professor of Mechanical Engineering.

Richard Salant, S.M., Assistant Professor of Mechanical Engineering.

Robert F. Sawyer, Ph.D., Assistant Professor of Mechanical Engineering.

George Trezek, Ph.D., Assistant Professor of Mechanical Engineering.

Lawrence S. Caretto, Ph.D., Acting Assistant Professor of Mechanical Engineering.

Thomas D. Mueller, Ph.D., Lecturer in Petroleum Engineering.

Kurt S. Spiegler, Ph.D., Professor of Mechanical Engineering in Residence.

Yehuda Taitel, M.S., Acting Assistant Professor of Mechanical Engineering.

Mineral Technology

(Department Office, 210 Hearst Mining Building)

John E. Dorn, Ph.D., Professor of Materials Science.

Douglas W. Fuerstenau, Sc.D., Professor of Metallurgy.

Richard M. Fulrath, D.Eng., Professor of Ceramic Engineering.

Ralph R. Hultgren, Ph.D., Professor of Metallurgy.

Earl R. Parker, Met.E., Professor of Metallurgy.

Joseph A. Pask, Ph.D., Professor of Ceramic Engineering.

S. Frederick Ravitz, Ph.D., Professor of Metallurgy.

Alan W. Searcy, Ph.D., Professor of Materials Science.

Gareth Thomas, Ph.D., Professor of Metallurgy.

Stanley H. Ward, Professor of Geophysical Engineering.

Jack Washburn, Ph.D., Professor of Metallurgy (Chairman of the Department).

Victor F. Zackay, Ph.D., Professor of Metallurgy.

Anders J. Carlson, Ph.D., Professor of Petroleum Engineering, Emeritus.

Donald H. McLaughlin, Ph.D., D.Eng., Professor of Mining, Emeritus.

Edward H. Wisser, B.S., L.L.D., Professor of Mineral Exploration, Emeritus.

Leon Borgman, Ph.D., Associate Professor of Engineering Geoscience.

Marshall Merriam, Ph.D., Associate Professor of Engineering Science.

Frank H. Morrison, Ph.D., Assistant Professor of Geophysical Engineering.

Peter W. Rodgers, Ph.D., Assistant Professor of Geophysical Engineering.

George M. Gordon, Jr., M.S., Lecturer in Materials Science.

Kenneth K. Kelley, Ph.D., Lecturer in Metallurgy.

Robert B. Langston, Ph.D., Lecturer in Materials Science.

Naval Architecture

(Department Office, 202 Naval Architecture Building)

Henry A. Schade, Dr. Ing., Professor of Naval Architecture.

John V. Wehausen, Ph.D., Professor of Engineering Science.

† On leave, winter and spring quarters, 1969.
Civil Engineering

Civil engineering is concerned with the planning, design, and construction of public and private works such as buildings, bridges, dams, transportation systems and water supply systems. The civil engineer must have a full understanding of the physical and economic aspects of structures and systems. The four-year undergraduate curriculum leading to the B.S. degree, intends to provide a basic and fairly comprehensive background in civil engineering and related fields. This curriculum may provide a student with a direct entry to professional experience upon graduation, or with preparation for graduate study. The student may arrange his program to integrate graduate and undergraduate study into a five-year program, leading to the bachelor’s degree by the end of the fourth year and the master’s degree by the end of the fifth year.

CURRICULUM FOR THE BACHELOR’S DEGREE

A total of 180 units is required, including:

I. Lower Division: Science, technical, and humanities requirements indicated on page 70.

II. Upper Division: Required: Civil Engineering 130, 131, 165A–165B, 110, 161, 140, 133, 134, 141, 121A–121B, 170, 192; Electrical Engineering 101A; Mechanical Engineering 104A and 111; 24 additional units of technical electives; humanities and social sciences, see page 71.

Recommended technical electives: Industrial Engineering 120; Civil Engineering 100, 191; Geology 15 or Civil Engineering 118; other approved upper division courses in engineering or the physical and biological sciences.
GRADUATE STUDY

Graduate programs of study leading to the master's and doctoral degrees are available in the major civil engineering fields: construction, geodesy and photogrammetry, hydraulics, sanitary, geotechnical engineering, ocean engineering, structural engineering and structural mechanics, transportation, and water resources. For details, please consult the Announcement of the College of Engineering.

Electrical Engineering and Computer Sciences

Modern electrical engineering encompasses a wide range of new areas in addition to the traditional fields of electrical machinery and power systems. Chief among these areas are: solid-state devices and integrated circuits, plasmas, microwave electronics, quantum electronics, bioelectronics, radiation and propagation, active and passive circuits, control systems, communication systems, pattern recognition, information theory, computer systems and information processing, symbol manipulation and artificial intelligence, automata theory, and system theory.

In order to provide a choice of well-integrated programs for the student who has clearly defined interests in one or more major groupings of these areas and who wishes to acquire a high degree of technical competence in them, the department offers four distinct programs of study in: (1) electronics, fields, and plasmas, (2) systems, information, and control, (3) computer sciences, (4) general electrical engineering. These programs are described in detail in the Announcement of the College of Engineering.

CURRICULUM FOR THE BACHELOR'S DEGREE

Students in all four programs must complete a total of 180 units. Lower division course requirements are given on page 70. Upper division requirements are as follows:

Program A: Electronics, Fields, and Plasmas.

Program B: Systems, Information and Control.
Electrical Engineering 104A—104B, 105, 108A—108B, 117A—117B, 119; Mechanical Engineering 104A and 112; Physics 121; Statistics 134; 5 units of senior electrical engineering laboratory; 18 units of technical electives; humanities and sciences, see p. 71.

Program C: Computer Sciences.
Electrical Engineering 104A—104B, 105, 108A—108B, 119, 152A; 4 units of senior electrical engineering laboratory; 31 units of technical electives; humanities and sciences, see p. 71.

Program D: General Electrical Engineering.
Electrical Engineering 104A—104B, 105, 108A—108B, 117A—117B, 119; Mechanical Engineering 104A and 105A or 112; Physics 121; 5 units of senior electrical engineering laboratory; 23 units of technical electives; humanities and social sciences, see p. 71.

GRADUATE PROGRAM

To prepare the graduate student for work in the rapidly developing fields of electrical engineering, the department's program emphasizes fundamentals, yet with a wide selection of courses and seminars and a reasonable amount of freedom for meeting
degree requirements. There is no single required sequence of courses. The student is urged, however, to consult with his graduate adviser to determine what courses are necessary to a particular field of specialization. A detailed description of the available fields of graduate study in electrical engineering is given in the ANNOUNCEMENT OF THE COLLEGE OF ENGINEERING. For further details on graduate programs and procedures, see the "Electrical Engineering and Computer Sciences Orientation Notes," available from the Electrical Engineering and Computer Sciences Office for Graduate Student Matters, 332 Cory Hall.

Engineering Science

The student in engineering science studies in one of several areas where engineering and the natural sciences closely interact. These include: bioengineering, engineering geoscience, engineering mathematical statistics, engineering mathematics, and engineering physics. Students are encouraged to prepare for graduate study in the engineering fields, the natural sciences, or medicine. Graduate programs in engineering science are offered by the individual engineering departments.

PROGRAMS FOR THE BACHELOR'S DEGREE

(Administered by the Engineering Science Committee)

All students must complete a total of 180 units and must maintain a grade-point average of 2.75 or better in the lower division, and 2.5 or better in the upper division. Lower division course requirements are given on page 70. Upper division requirements are as follows (specific courses require in each area are listed in the ANNOUNCEMENT OF THE COLLEGE OF ENGINEERING):

Bioengineering
Biochemistry or molecular biology (4 units); chemistry (11 units); electrical engineering (4 units); mathematics (12 units); medical physics (8 units); fluid mechanics (4 units); life science electives (8 units); engineering electives (18 units); Other technical electives (4 units, premedical students must also take zoology); humanities and social sciences, see p. 71.

Engineering Geoscience
Geology (4 units); geophysics (8 units); physics (15 units); fluid mechanics (4 units); continuum mechanics (4 units); mathematics (12 units); physical chemistry (4 units); geology electives (8 units); engineering electives (16 units); other technical electives (12 units); humanities and social sciences, see p. 71.

Engineering Mathematical Statistics
Statistics (15 units); mathematics (12 units); mathematics or statistics elective (10 units); engineering electives (24 units); other technical electives (6 units); humanities and social sciences, see p. 71.

Engineering Mathematics
Mathematics (25 units); statistics (4 units); mathematics or statistics elective (3 units); engineering electives (24 units); other technical electives (7 units); humanities and social sciences, see p. 71.

Engineering Physics
Physics (28 units); mathematics (12 units); fluid mechanics (4 units); continuum mechanics (4 units); engineering physics laboratory (3 units); engineering electives (15 units); other technical electives (4 units); humanities and social sciences, see p. 71.
Programs for Graduate Degrees in Engineering Science

All departments in engineering offer the M.S. and Ph.D. degree in engineering science. These degrees are awarded for programs of study and research that emphasize the fundamental natural sciences which form the background material for engineering analysis and design. Graduate programs in engineering science are open to all graduate students in engineering. Students who have a B.S. degree in fields other than engineering must be in the engineering science program. Examples of engineering science programs are bioengineering, computer science, engineering geoscience, physical metallurgy, and nuclear processes in reactors.

Industrial Engineering and Operations Research

Industrial engineering and operations research is a modern field of systems design, analysis, and control which is concerned with integrated systems of men, machines, and material, and their interaction with their environment. Increased emphasis is placed on applications in socio-engineering, such as water resources management, transportation systems, pollution and waste disposal systems, and highway accident prevention, as well as the classical studies of production automation, inventory control, scheduling, systems reliability, engineering economics, and man-machine systems.

The undergraduate in Industrial Engineering and Operations Research receives broad training in engineering fundamentals, principles of economics and advanced mathematics and statistics in order to prepare him for elective sequences which stress the construction of systems models, the role of the human being in these systems, and the related mathematical methods of optimization and control. Specialized training is obtained by following one of the undergraduate programs described below in (1) Industrial Engineering (2) Human Factors in Technology, or (3) Operations Research. The number of electives is extremely liberal and the student is encouraged to take electives which satisfy his particular educational goals.

CURRICULUM FOR THE BACHELOR’S DEGREE

Students in all programs must complete a total of 180 units. Lower division course requirements are given on page 70. Upper division requirements are as follows:

Program A: Industrial Engineering
Industrial engineering 170, 160, 172, 120, 150, 180; business administration 120; civil engineering 130; electrical engineering 100A; mechanical engineering 101, 102A, 104A, 105A; statistics 133, 135A–135B; technical electives (11 upper division units of which 4 must be in industrial engineering courses); humanities and social sciences, see p. 71.

Program B: Human Factors in Technology
Industrial engineering 170, 154, 172, 174; civil engineering 130; electrical engineering 100A, 160A; mechanical engineering 101, 102A, 104A, 105A, 134, 137; statistics 133, 135A, 135B; technical electives (14 upper division units of which 12 must be in industrial engineering courses); humanities and social sciences, see p. 71.

Program C: Operation Research
Industrial engineering 154, 160, 170, 120, 150, 162 or 167, 180; electrical engineering 100A; mechanical engineering 105A, 134; statistics 133, 135A–135B; technical electives (20 upper division units of which 7 must be in the College and of which at least 3 must be in industrial engineering courses); humanities and social sciences, see p. 71.
GRADUATE PROGRAMS

Graduate programs leading to the M.S., M.Eng., Ph.D., and D.Eng. are offered in three interrelated graduate programs:

Program A: Industrial Engineering—This program has been developed especially to meet the needs and interests of engineers and scientists who wish to enhance their competence in systems design, analysis, and control and also prepare for administrative positions in modern industry. As an essential core, it includes subject matter fundamental to the understanding of the practice of industrial engineering in the administrative process.

Program B: Operations Research—This program of study is designed to prepare the student for advanced work in the theory of systems science. Emphasis is on the development of quantitative model structures and the necessary methods of analysis and optimization which serve as a scientific basis for the design and operation of governmental and industrial systems.

Program C: Human Factors—This program of study emphasizes specialization in engineering psychology, man-machine-system and sociotechnical-system studies and their civil and industrial application.

Qualified undergraduates from all scientific disciplines may be accepted into these programs. A master's degree may be earned either by preparation of a thesis or by comprehensive examination. Doctoral degrees require additional study in two minor fields and the preparation of a thesis demonstrating ability to conduct independent advanced research. Individual programs of study with electives tailored to students' needs and interests are encouraged. Research and laboratory facilities are available in the Human Factors in Technology Laboratory, page 00 and in the Operations Research Center, page 130. Further information on graduate programs may be obtained from the Industrial Engineering and Operations Research Office, 4135 Etcheverry Hall, and in the ANNOUNCEMENT OF THE COLLEGE OF ENGINEERING.

Mechanical Engineering

Mechanical engineering includes the science and art of the formulation, design, development, and control of systems and components involving thermodynamics, fluid mechanics, and mechanisms. The mechanical engineer requires a thorough preparation in mathematics, physics, chemistry, manufacturing processes, properties of materials, fluid mechanics, thermodynamics, as well as intensive design and laboratory experience. His program of study includes basic subjects common to all engineering fields, fundamental subjects important to all mechanical engineers and specialization in one or more phases of mechanical engineering. Undergraduate specialization is provided in the choice of technical electives which may be selected from the subject areas of aeronautics, applied mechanics, automatic controls, electro-mechanical, energy conversion, fluid mechanics, heat transfer, materials processing, mechanical design, naval architecture, nuclear, petroleum, thermodynamics, and space engineering.

Because of the widening range of technical problems and the limited amount of specialization available in the undergraduate curriculum, qualified students should consider graduate study to enlarge their scientific and technological capability. Further details on undergraduate and graduate fields of emphases in mechanical engineering are available in the ANNOUNCEMENT OF THE COLLEGE OF ENGINEERING.

CURRICULUM FOR THE BACHELOR'S DEGREE

A total of 180 credits is required, including:

1. Lower Division: Science, technical, and humanities requirements indicated on page 70.

GRADUATE STUDY

Both master’s and doctoral programs are available, and the student may choose either a scientific emphasis in particular areas or integrated studies directed to professional objectives. Specialization is offered in the following areas: (1) aeronautical sciences, (2) applied mechanics, (3) mechanical design, (4) thermal systems. Details on topics of study within each area of specialization are available from the ANNOUNCEMENT OF THE COLLEGE ENGINEERING.

Mineral Technology

The Department of Mineral Technology administers an undergraduate program in materials science and graduate programs in materials science and engineering geoscience. (For undergraduate curriculum in engineering geoscience see Engineering Science page 246.) Materials science deals with natural and man-made materials—their extraction, development, and characterization for uses particularly in advanced applications such as solid-state electronics, atomic energy, and aerospace industries. A student in the materials science curriculum is provided a basic background in chemistry, physics, and engineering, and applies this background to a field of specialization: ceramic engineering, extractive metallurgy, or physical metallurgy. Engineering geoscience directs the discoveries and knowledge of mathematics, statistics, physics, chemistry, and the geosciences toward applications in our total environment including the solid earth, the oceans, the atmosphere, and space. While serving the needs of the minerals industries, the program is purposely kept free of occupational constraints. The program therefore provides education in the fundamental subject matter necessary for engineering occupations in mining exploration and exploitation, petroleum exploration, planetary exploration, marine geophysics, and engineering geophysics.

CERAMIC ENGINEERING

The ceramic engineer studies the physical and chemical properties of the raw materials and products of the ceramic industry, and fundamentals of ceramic processing. Ceramics are inorganic nonmetallics which are subjected, either in their production or use, to high-temperature environments. Such materials include rocket nozzles, electrical insulators, precision molds for metallurgical industry, and porcelain and glass of all types. Ceramic engineers work not only in the industries producing ceramic products but also in those industries—such as aerospace, nuclear, and electrical—which make extensive use of ceramic materials.

METALLURGY

Metallurgy is the science and art of processing and utilizing metals and alloys. The field has two main areas of specialization.

Extractive Metallurgy  This is concerned with the study of the scientific and engineering principles utilized in recovering metals from their ores and in refining them to the desired purity. The subject includes mineral processing as well as smelting, leaching and electrochemical methods of extracting and refining metals and requires using the most recent advances in chemistry and physics.

Physical Metallurgy  The physical metallurgist is concerned primarily with the rela-
tionships between the chemical and physical structure of materials and their properties. The improvement and control of properties of materials for advanced applications is a broad field within which primary emphasis can be directed toward fundamental physics or chemistry or engineering aspects. Because of the ever-increasing demand for improved or better characterized materials and because the relationships between thermal mechanical history and structure and between structure and properties are complex and only partly understood, fundamental and applied research in the field is extremely active, providing a wide choice of rewarding career opportunities.

CURRICULUM FOR THE DEGREE AND ITS PROGRAMS

Students in all programs in materials science must complete a total of 180 units. Specific upper division requirements are as follows:

Core Courses
- Chemistry 14, 110A, 110B; Civil Engineering 130; Materials Science 100, 101, 102, 103, 104, 105; Physics 121; Engineering 17 or Electrical Engineering 101B; humanities and social sciences, see p. 71.

Ceramic Engineering
- Materials Science 121, 122, 128, 141; Physics 140; 14 units of technical electives.

Extractive Metallurgy
- Materials Science 107, 141, 142; 21 units of technical electives.

Physical Metallurgy
- Materials Science 107, 160, 161; Mechanical Engineering 101 or 123, and 124; Physics 140; 17 units of technical electives.

The upper division curriculum must include at least 45 units in the College of Engineering including at least 30 units in the department, and permits 8 credits of free electives.

GRADUATE STUDY IN MATERIALS SCIENCE

Research on materials is a broad field ranging from engineering to fundamental physics and chemistry. For this reason qualified holders of the bachelor's degree in fields such as ceramic engineering, metallurgy, physics, chemistry and various fields of engineering can all successfully undertake graduate study in materials science.

The graduate program emphasizes research. Techniques such as transmission electron microscopy, field ion microscopy, X-ray diffraction topography, mass spectrometry, precision electrical conductivity measurements, micro-probes X-ray emission spectroscopy, differential thermal analysis, precision calorimetry and cryogenic and high temperature mechanical testing are used for fundamental characterization of materials. Research topics include study of the mechanical, chemical, surface, thermodynamic, electrical, and magnetic properties of materials, and study of the kinetics, thermodynamics, and simulation of the processes by which materials are produced.

GRADUATE STUDY IN ENGINEERING GEOSCIENCE

The program leads to the M.S. and Ph.D. degrees. The course of study is sufficiently broad and flexible as to allow students with a great variety of undergraduate backgrounds—in engineering science, geology, geophysics, physics, applied mathematics, statistics, or a variety of engineering fields—to earn the M.S. within one to two years, or the Ph.D. within three to five years. Those who terminate at the master's level will have an excellent groundwork of fundamental subjects and the preliminary qualifications for professional activity and research. The emphasis, however, is on the Ph.D. program, which is designed to provide necessary experience for advanced research. For further details on the graduate programs and regulations, please consult the ANNOUNCEMENT OF THE COLLEGE OF ENGINEERING and Chapter III of this catalogue.
**Naval Architecture**

The Department of Naval Architecture offers courses in the fundamentals of marine-vehicle design and the theories of ship structures and ship hydrodynamics.

There is no undergraduate major, but undergraduate courses are offered, and students interested in naval architecture may elect courses in this department as an option within the mechanical engineering major, described on page 248.

Graduate study is offered in the areas of ship structures and ship hydrodynamics, leading to both the master's and doctor's degrees. The graduate student normally must take Naval Architecture 240A-240B-240C, and 241A-241B-241C. Other courses are chosen according to the student's background and objectives. With sufficient undergraduate preparation, a student may earn a master's degree in three quarters of study. Further details on graduate programs (including a related program in naval hydrodynamics) are available from the department upon request.

**Nuclear Engineering**

The Department of Nuclear Engineering offers a broad program of instruction and research in the fundamental aspects of nuclear processes and nuclear radiations. Problems encountered in employing nuclear phenomena for practical purposes are emphasized in the teaching and research programs. The department does not have an undergraduate program, but it does offer several undergraduate courses for students in other engineering curricula.

Graduate study, leading to the master's and doctor's degrees, is offered, with the following fields of emphasis: technology of nuclear fission reactors; radiation effects upon biological processes; development of devices for controlling thermonuclear reactions; and nuclear radiations as analytical tools in probing the structure of matter and initiating chemical reactions, and as a means of controlling industrial processes. The program emphasizes breadth of knowledge and general competence in the applied sciences and ability to formulate and carry out original programs of research. For details on graduate programs and degree requirements, please consult the ANNOUNCEMENT OF THE COLLEGE OF ENGINEERING and Chapter III of this catalogue.

**Engineering**

**Lower Division Courses**

1. **Computers and their Applications. (4)**

   Three hours of lecture and one hour of consultation per week. Prerequisite: Mathematics IA (may be taken concurrently). Students will not be given credit for both Engineering 1 and Computer Science 2. General purpose digital computers. The concepts of algorithm, computer languages, flow charts. Information storage, processing, retrieval. FORTRAN and ALGOL. Applications of computers to numerical and statistical problems, root finding, simultaneous equations, correlation. Nonnumerical applications, alphabetic data processing, sorting, matching.

   The Staff (Mr. Morton in charge) (Su, F, W, Sp)

   2A-2B-2C. **Contemporary Technology. (4-4-4)**

   Four hours of lecture and demonstration per week. Open without prerequisites to all students, but designed for those not specializing in engineering who have already had all or part of Contemporary Natural Science 1. Any one or more quarters qualify for credit toward the natural sciences requirement of the College of Letters and Science.

   2A. Technology and Society. Role of technology in the solution of social problems. Case studies of examples of technological systems such as communications, data processing, energy generation and distribution, materials, and military technology. The place of technology in general education. Mr. Amster, Mr. Ruby (F, W)

   2B. Resources Management and Engineering. Earthquakes, ocean resources, pesticides, water quality and supply, space exploration and construction, geologic hazards, urban planning, public response to engineering problems. Mr. Seed (W)

   2C. Raw Materials and Environmental Science. Study in depth of one aspect of technology, the environment: air, underground, underwater, space. Mr. Ward (Sp)

3. **Applications of Nuclear Energy. (4)**

   Three 1-hour lectures per week. Prerequisite: None. Not open to students majoring in engineering. Radioactivity and nuclear reactions, production and applications of isotopes, radiation effect and dosimetry, reactor principles and applications, controlled fusion research, principles and nonmilitary applications of nuclear explosions, particle accelerators, nuclear energy in the future. Mr. Amster, Mr. Ruby (F, W)
17. Introduction to Electronic Systems, Circuits, and Devices. (4)

Two 1½-hour lectures and two review hours per week. Prerequisite: Physics 4B. Introduction to typical systems and circuits; physical electronics of semiconductor and vacuum devices; characteristics and circuit models of useful electronic devices; analysis of typical amplifying and switching circuits; application to a typical instrumentation system.

The Staff (Mr. Pederson, Mr. Studer in charge) (Su, F, W, Sp)


Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Mathematics 1A which is taken concurrently. The fundamental principles of orthogonal projection and their application to the analysis and solution of space problems arising in various fields of engineering; graphical presentation of data; graphical, numerical, mechanical, and computer solutions and computations; freehand pictorials and orthographics; and an introduction to conceptual design.

Mr. Radcliffe (F, Sp)


Three hours of lecture and one hour of discussion per week. Prerequisite: Physics 4A and Mathematics 11C. A vectorial treatment of the principles of statics of particles and rigid bodies. Application to problems of equilibrium of two-dimensional and three-dimensional systems. Work and potential energy, the principle of virtual work, stability of equilibrium. The Staff (Mr. Rosenberg in charge) (Su, F, W)

45. Properties of Materials. (4)

Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Chemistry 1B and Physics 4B (may be taken concurrently). Applications of basic principles of physics and chemistry to the selection and use of engineering materials, with specific emphasis on mechanical behavior of metals, concrete, and ceramics and upon the electrical properties of semiconducting materials.

Mr. Parker, Mr. Pritz, Mr. Muller (Su, F, W, Sp)

47. Supplementary Work in Lower Division Engineering. (1-3)

Prerequisite: limited to students who must make up a fraction of a required lower division course. May be taken only with permission of the Dean of the College of Engineering. Students with partial credit in a lower division engineering course may complete the work under this heading. May be repeated for credit.

Mr. Iversen (Su, F, W, Sp)

Upper Division Courses

100. Materials and Methods Used in Manufacturing. (3)

Three 1-hour lectures per week. Prerequisite: not open to students in engineering; Study of the common materials (metals and nonmetals), processes and equipment used in modern manufacturing.

Mr. Pickus (W, Sp)

101. Applications of Computers. (4)

Three hours of lecture per week. Prerequisite: Mathematics 1C. Students who have completed Engineering 1 or Computer Science 2 may not receive credit for Engineering 101. Large-scale digital computers. Programming, flow-charting, computable procedures. Comprehensive presentation of one problem oriented language; survey of other compiler languages. Machine solution of complex problems, survey of computer applications. Introductory course for upper division students interested in using computers.

The Staff (F, Sp)

113. Introduction to the Professional Aspects of Engineering. (3)

Two 1½-hour lectures per week. Prerequisite: senior standing in engineering. Development of understanding of the professional responsibility of the engineer; discussion of topics pertinent to the activities of the practicing engineer; preparation of papers and engineering reports. Mr. Robertson (Sp)

140. Optical Radiation (Illumination). (2)

Two 1-hour lectures per week. Prerequisite: Physics 4D. Light: the spectrum from the ultraviolet, visible to the infrared as treated at an engineering subject. Photometric and radiometric concepts, calculations, measurements, color specification, preliminary design problems. Mr. Finch (F, W, Sp)

140L. Optical Radiation (Illumination) Laboratory. (2)

One 3-hour laboratory per week. Prerequisite: course 140 (may be taken concurrently). Laboratory experiments in the fundamental concepts and quantities used in optical radiation: intensity, luminance, irradiation, illumination, radiant flux, reflection, transmission, absorption, light distribution, visibility, color, measuring instruments, measuring techniques.

Mr. Finch (F, W, Sp)

142. Lighting Design. (3)

Three 1-hour lectures per week. Prerequisite: course 140 (may be taken concurrently). Lighting and illumination requirements for job performance and comfort. Conditions for effective seeing for specific tasks. Lighting design and layouts for interior and exterior installations. Utilization of daylight. Interference calculations, paneled and lowered ceilings, wiring and control requirements for lighting.

Mr. Finch (W)

180. Biological and Economic Feedback Systems. (3)


Mr. Smith (W)

197. Supplementary Work in Upper Division Engineering. (1-3)

Prerequisite: limited to students who must make up a fraction of a required upper division course. May be taken only with permission of the Dean of the College of Engineering. Students with partial credit in an upper division engineering course may complete the work under this heading. (May be repeated for credit.)

Mr. Iversen (Su, F, W, Sp)

Graduate Courses

230A-230B. Engineering Analysis. (4-4)

Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: Mathematics 2C. Methods of theoretical analysis of typical engineering systems.
130. Principles of Mechanics. (3) Three 1-hour lectures per week. Prerequisite: course 128. The principles of mechanics introduced and applied to engineering problem solutions. Mr. Posner (Su, F, W).

131. Elasticity and Stress Analysis. (3) Three 1-hour lectures per week. Prerequisite: course 128. Elasticity, stress analysis, and strength of materials. Mr. Sackman (F).

132. Finite Element Method. (3) Three 1-hour lectures per week. Prerequisite: course 128. Finite element analysis and its application to structural analysis. Mr. Sackman (W).

133. Numerical Methods for Engineers. (3) Three 1-hour lectures per week. Prerequisite: course 128. Introduction to numerical methods for solving engineering problems. Mr. Scherbrock (F).

134. Mechanics of Materials. (4) Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 128. Stress analysis, deformation, and stability of structures, including bending and buckling. Mr. Scherbrock (W).

135. Advanced Structural Analysis. (3) Three 1-hour lectures per week. Prerequisite: course 131. (Intended for students continuing with B.S. degree.) Elastic and plastic analysis of statically indeterminate structures. Stability analysis of columns, beams, columns and rigid frames. Dynamic analysis of structures simulated by single-degree and lumped parameter multi-degree of freedom systems. Mr. Clough, Mr. Scordelis (F).

137. Synthesis and Design of Structural Systems. (4) Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: courses 133, 134. Planning and design aspects of structural systems; sources of stress and strain; design criteria; layouts of structural systems; optimization, formal and informal methods of analysis. Mr. Baron, (W).

138. Introduction to Flight Structures. (3) Three 1-hour lectures per week. Prerequisite: course 130. Stress, deformation and stability analyses of flight structures; torsion on bending of typical sections; buckling and post buckling strengths of thin sheet elements; stress and strain consideration of sandwich components; thermal stresses and thermal buckling; high-temperature creep effects. Mr. Kelly (W).

139. Introduction to Mechanics of Solids. (4) Three 1½-hour lectures per week. Prerequisite: course 130 or Physics 105A. Stress-strain relations for elastic and inelastic materials; plastic flow, creep, relaxation, thermal effects; solution of problems in elasticity and inelasticity. Mr. Popov, Mr. Sackman (Sp).

140. Water and Waste Water Engineering. (4) Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 130. Water and waste water systems; distribution systems; collection systems; treatment systems. Mr. Selleck (Sp).

141. Water and Waste Water Treatment. (3) Three 1-hour lectures per week. Prerequisite: course 140. Chemical, physical and biological aspects of water and waste water. Water quality monitoring; waste water treatment plants; wastewater conditioning problems including taste and odor removal, deasalinization and corrosion control. Water-pollution control and its relation to process design. Mr. Pearson (F, W).

142. Sanitary Engineering Design. (3) One 1-hour lecture and one 3-hour supervised discussion and design period per week. Prerequisite: course 140. Lectures and discussions of the nature of engineering organizations; role of design in engineering practice; and concepts of systems, process, and functional design. Parallel problem assignments illustrating the application of design principles to typical units of water and waste water treatment systems. Mr. McCaughey (Sp).


145. Chemistry of Waters. (3) Three 1-hour lectures per week. Prerequisite: Chemistry 1B. A consideration of the inorganic components in water in terms of water quality. Emphasis is placed on the application of chemical principles employed to modify the concentrations of the major anions, cations, and dissolved gases comprising the inorganic constituents. Mr. Thomas (Su, F).

146A. Sanitary Chemistry: Inorganic Laboratory Aspects. (3) One 1-hour lecture and two 3-hour laboratory periods per week. Prerequisite: Chemistry 1B. A systematic consideration of the gravimetric, volumetric and colorimetric analytical techniques involved in the analysis of the major inorganic constituents found in waters. Several introductory experiments are included relative to water quality control. Mr. Jenkins (Su, F).

146B. Sanitary Chemistry: Organic Laboratory Aspects. (2) One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: course 146A. A consideration of the organic components as a factor determining the quality of waste waters. Nomenclature and reactions of pertinent organic compounds are emphasized. Included are special topics such as biochemical degradation and cycles, pesticide pollution, detergent pollution, and air pollution fallout. Mr. Jenkins (W).

147. Organic Chemistry of Water and Waste Water. (3) Three 1-hour lectures per week. Prerequisite: Chemistry 1B. A systematic consideration of the organic components as a factor determining the quality of waste waters. Emphasis is placed on the analysis and treatment of waters containing organic constituents. Mr. Jenkins (W).

160. Hydrology. (3) Three 1-hour lectures per week. Prerequisite: courses 165A, 165B (be taken concurrently). Circulation of water on the Earth's land masses, the hydrologic cycle, elements of climatology and meteorology, interrelation between precipitation and run- off, ground water flow, flood analysis and applications of hydrology in engineering design. Mr. Todd (W).

161. Basic Hydraulic Laboratory. (2) One 4-hour laboratory per week. Prerequisite: course 165B (may be taken concurrently). Performance of standard student experiments in the hydraulic laboratory to acquaint the student with the most common methods of observation and measurement. Mr. Johnson (F, W, Sp).

165A. Elementary Fluid Mechanics. (3) Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 104A or 103 (may be taken concurrently). Principles of mechanics applied to the statics and dynamics of incompressible fluids. Mr. Einstein (F, W).

165B. Elementary Fluid Mechanics for Civil Engineers. (3) Three 1-hour lectures per week. Prerequisite: courses 165A, Mechanical Engineering 111. Principles of fluid mechanics applied to open channel flow.
flows and compressible fluids, forces on submerged objects and laws of similarity, hydraulic machinery.
Mr. Einstein (W, Sp)

166A. Advanced Hydraulics. (3)
Three 1-hour lectures per week. Prerequisite: course 165B. Uniform flow, advanced topics; backwater curves; side-channel spillways; surges, suddenly and gradually varied flow; water hammer and surge chambers; similarity; Froude models, distorted models, flood routing.
Mr. Einstein (F)

166B. Advanced Hydraulics. (3)
Two 1-hour lectures and one 3-hour design period per week. Prerequisite: course 166A. Open channel transitions and junctions; energy dissipators and scour prevention; weirs and drop structures; tailwater effects; movable weirs and gate structures; culverts and drop spillways; design of individual structural elements.
Mr. Harder (W)

166C. Advanced Hydraulics. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: courses 165B, 166B. Flow through porous media; limits of Darcy's law; uplift and drainage; line of creep; sediment motion and its principal aspects; rip-tap design; cavitation; design of a complete spillway or flood channel.
Mr. Einstein, Mr. Harder (Sp)

168. Design of Open Channel Flow Systems. (3)
Two 1-hour lectures and one 3-hour laboratory and design period per week. Prerequisite: courses 166A, 166B. Hydraulic and systems design and analysis applied to open channel systems. Occasional field inspection trips.
Mr. Harder (Sp)

170. Highway Engineering. (5)
Three 1-hour lectures and two 3-hour laboratories per week. Prerequisite: courses 10, 140, 121A (may be taken concurrently). Planning, finance, economics, location, design, drainage, construction, and maintenance of highways, streets and pavements.
Mr. May, Mr. Monismith (F, W, Sp)

171. Introduction to Traffic Engineering. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 170. Street and highway traffic problems; principles of design of thoroughfares on the basis of operational characteristics; traffic regulation and control.
Mr. Kennedy (Sp)

180. Concrete Construction. (3)
One 1-hour lecture and one 3-hour seminar each week. Lectures and seminars. Consideration of broad aspects of concrete construction; technical requirements; selection of materials; control of quality; practices in the construction of dams, highways, airfields, canals, bridges, buildings, hydraulic structures.
Mr. Polivka (F)

181. Engineering Construction. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Industrial Engineering 120 and Civil Engineering 191 (may be taken concurrently). The construction industry: its development, components, organization and importance, construction methods and practices, applications and limitations; factors involved in selection of plant equipment and material, principles of planning, organization and operating construction forces, scheduling of works and estimating costs.
(F, W, Sp)

190. Engineering Reports. (3)
One 1-hour lecture and two 1-hour exercise and analysis periods per week. Prerequisite: junior standing in engineering. Principles of communication with verbal, mathematical and graphic symbols in application to written and oral reporting needs in technical fields; conventions of style and format; practice, and analysis of individual problems in writing and speaking.
Mr. Snowden (W)

191. Contracts, Specifications and Engineering Relations. (2)
Two 1-hour lectures per week. Prerequisite: none. The discussion of principles of ethics, professional duties, responsibilities and privileges. Principles of business law, kinds of contracts, bidding procedures and administration of contracts of construction. Preparation of type specifications and contract documents.
Mr. Horonyi, Mr. Gillfillan (F, Sp)

192. The Art and Science of Civil Engineering Practice. (1)
One 1-hour lecture per week. Prerequisite: senior standing in civil engineering. A course of lectures by distinguished engineers designed to provide the student with an appreciation of the role of science and engineering approach to oceanic problems.
Mr. Seed (in charge) (F, W, Sp)

197. The Art and Science of Civil Engineering Practice. (1)
One 3-hour laboratory period per week. Prerequisite: senior standing in civil engineering. A course of lectures by distinguished engineers designed to provide the student with an appreciation of the role of science and engineering approach to oceanic problems.
Mr. Seed (in charge) (F, W, Sp)

197A. Geologic Oceanography. (3)
Three 1-hour lectures per week. Prerequisite: courses 105 or 110 or consent of instructor. A study of the basic factors involved in the formation and behavior of sea water, the geology of the ocean, with special emphasis on the continental and deep seas.
Mr. Gulland (F)

197B. Oceanography Laboratory. (1)
One 3-hour laboratory period per week. Prerequisite: course 197A or consent of instructor. Laboratory work oriented to the study of the problems of oceanography, the techniques and methods used in solving them, the techniques and methods used in solving them, the techniques and methods used in solving them.
Mr. Gulland (F)

197C. Oceanography Field Trips. (2)
One 3-hour laboratory period per week. Prerequisite: course 197A or consent of instructor. Field trips for the purpose of studying the problems of oceanography, the techniques and methods used in solving them, the techniques and methods used in solving them.
Mr. Gulland (F)

198. Directed Group Study for Advanced Undergraduates. (1–6)
Prerequisite: senior standing in engineering. Group study of a selected topic or topics in civil engineering.
Mr. Seed (in charge) (F, W, Sp)

199. Individual Study and Research for Advanced Undergraduates. (1–5)
Enrollment is limited to students who have demonstrated by achievement of a B average that they have a capacity for independent work. Special prerequisites will be established by the instructor guiding the work.
Mr. Seed in charge (F, W, Sp, Su)

Graduate Courses

201A. Physical Oceanology. (3)
Three lectures of one hour per week. Prerequisite: course 165A–165B or consent of instructor. The basic dynamic of open oceanic circulation with investigations of wind driven and density driven current systems, water masses, and oceanic circulation models. The illustrations and research projects utilized in these courses stress the practical or applied engineering approach to oceanic problems.
Mr. Wilde (F)

201B. Chemical Oceanology. (3)
Three lectures of one hour per week. Prerequisite: course 145 or equivalent or consent of instructor. Chemistry of sea water examined with respect to (1) its interaction with the atmosphere, lithosphere, and biosphere; (2) the origin and evolution of sea water; and (3) the application of marine chemistry to engineering problems in related fields of oceanology.
Mr. Wilde (W)

201C. Geologic Oceanology. (3)
Three lectures of one hour per week. Prerequisite: Geology 105, course 197A, or consent of instructor. Types, distribution, mineralogy, and physical properties of modern marine sediments from both the continental and deep seas are discussed stressing the
interrelationship among the sediments and various marine environments. Mr. Wilde (Sp)

203A. Surface Water Hydrology. (3)
Three 1-hour lectures per week. Prerequisite: consent of instructor. Occurrence and movement of water over the surface of the earth, streamflow measurement and characteristics, floods and flood forecasting, frequency analysis of precipitation and runoff, analysis of the flood hydrograph, and flood routing. Mr. Todd (F)

203B. Ground Water Hydrology. (3)
Three 1-hour lectures per week. Prerequisite: consent of instructor. Occurrence and movement of subterranean water, flow through naturally occurring porous materials, hydraulics of wells, fluctuations in ground water elevations, quality of underground waters, legal aspects of ground water. Mr. Todd (W)

203C. Advanced Applied Hydrology. (3)
Three 1-hour lectures per week. course 203A or 203B. Application of principles of hydrology in solution of practical engineering problems such as artificial recharge, sea water intrusion, storm surges, currents and temperature distribution in the ocean, and application of this information to some coastal engineering problems. Mr. Todd (Sp) Mr. Wiegel, Mr. Johnson (F)

205A. Coastal Engineering. (3)
Three 1-hour lecture and demonstration periods per week. Prerequisite: course 165B. Fundamental principles of the theory and realities of waves, tides, storm surges, currents and temperature distribution in the ocean, and application of this information to some coastal engineering problems. Mr. Wiegel, Mr. Johnson (F)

205B. Coastal Engineering. (3)
Three 1-hour lecture and demonstration periods per week. Prerequisite: course 205A. Application of the basic fundamentals of physical oceanography to the problems of coastal engineering, such as beach erosion, harbor design; use of model studies in such design. Mr. Johnson, Mr. Wiegel (W)

206A. River Hydraulics and Sedimentation. (3)
Three 1-hour lectures per week. Prerequisite: course 166B or consent of instructor. Basic equations. Nonsteady flow in open channels with friction. Mr. Harder (F)

206B. River Hydraulics and Sedimentation. (3)
Three 1-hour lectures per week. Prerequisite: course 206A. Principles of hydraulics of the alluvial channel. Mr. Einstein (W)

206C. River Hydraulics and Sedimentation. (3)
Three 1-hour lectures per week. Prerequisite: course 206B. Application of the hydraulics of the alluvial channel to the solution of river problems. Mr. Einstein (Sp)

207. Advanced Hydraulic Design. (3)
Three 1-hour lectures per week. Prerequisite: courses 166A and 166B. Design of diversion works, distribution systems, special hydraulic structures. Mr. Wiegel (Sp)

208. Advanced Hydraulic-Structures Laboratory. (2)
One 4-hour laboratory per week. Prerequisite: course 161. Laboratory investigation of structures employed in river, harbor, flood, beach, and wave action control. Mr. Johnson (Sp)

210. Water Resources: Quality. (3)
Three 1-hour lectures per week. Prerequisite: courses 140, 141 and 165A. Concepts, rationale, theory, institutions, and engineering aspects of water quality management in the ground and surface water environments. The capacity of soil and water environments to alter the quality of water. Mr. McGauhey (F)

211. Water Treatment: Theory and Design. (3)
Three 1-hour lectures per week. Prerequisite: course 140 and 165A, 145 (may be taken concurrently). Theory and practice of water treatment for public supply by operations and processes such as aeration, flocculation, sedimentation, filtration, softening, ion exchange, chlorination, and fluoridation. Mr. Kaufman, Mr. Selleck (W)

212. Waste Water Treatment: Theory and Design. (3)
Three 1-hour lectures per week. Prerequisite: course 140, 165A, 145 (may be taken concurrently). Theory and practice of treatment of municipal waste waters by engineered systems of unit operations and processes such as flotation, sedimentation, activated sludge, oxidation ponds, filters, digestion, elutriation. Mr. Pearson (Sp)

213A. Sanitary Chemistry: Advanced Laboratory. (2)
One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: course 146A, 146B. The theory and application of electrochemistry and spectrophotometry to problems of sanitary engineering. Included are experiments on redox potential measurements, corrosion control, heavy metal analysis, infrared and ultraviolet analysis of organic pollutants, flame analysis of major cations in water, fluorescent tracer analysis. Mr. Thomas (F)

213B. Sanitary Chemistry: Advanced Laboratory. (2)
One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: course 146B, 213A. The theory of column, paper, thin layer and gas chromatography and electrophoresis and application to problems of sanitary engineering. Included are experiments on ion mobility, pesticide analysis, trace pathological analysis. Mr. Jenkins (W)

215A. Advanced Sanitary Engineering Laboratory. (2)
One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: course 145, 146A, 210. Unit operations and processes for municipal and industrial water treatment. Lectures and experiments on gas transfer, flocculation, sedimentation, softening and deionization. Mr. Kafkaun, Mr. Selleck (W)

215B. Advanced Sanitary Engineering Laboratory. (2)
One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: course 145, 146A, 210, 211. Unit operations and processes for municipal and industrial water and waste treatment, lectures and experiments on water waste and slurry filtration, aerobic and anaerobic biological systems. Mr. Jenkins (Sp)

216. Industrial Waste Control. (3)
Three 1-hour lectures per week. Prerequisite: courses 210, 211, 212 (may be taken concurrently). Theory and design of industrial unit operations and processes to minimize in-process product loss and waste as well as of operations and processes for terminal waste treatment to reduce pollutant emissions to environment. Mr. Pearson (Sp)
218. Atmospheric Pollution. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 146A, 146B. A study of air pollution by such engineering means as scrubbing, filtration, and other source-suppression methods. Consideration of air as a dispersing medium for waste effluents. Administrative and legal concepts of air pollution control.

Mr. Tebbens (W)

219A. Atmospheric Pollution. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 146A, 146B. Nature of materials which contaminate the atmosphere: gases, fumes, vapors, and dusts. Properties of the normal atmosphere and its capacity to dilute contaminants. Methods of air analysis and continuous air monitoring.

Mr. Tebbens (W)

220A. Statically Indeterminate Structures. (4)
Three 1$\frac{1}{2}$-hour lectures per week. Prerequisite: course 131. Analysis of indeterminate structures by force (flexibility) methods and by displacement (stiffness) methods; relaxation and iteration procedures; methods suited for digital computer solutions. Virtual work, real and complementary energy. Classical theorems of Clapeyron, Betti, Castigliano, Maxwell, Mohr, and Muller-Brush.

Mr. Scordelis (F, Sp)

220B. Statically Indeterminate Structures. (3)
Two 1$\frac{1}{2}$-hour lectures per week. Prerequisite: course 220A. Comprehensive presentation of the fundamental principles of structural analysis formulated in matrix algebra language. Consideration of efficient means for analysis of complex structures, with reference to digital computer procedures. Introduction to the finite element method of analysis of problems of continuum mechanics.

Mr. Clough, Mr. Wilson (W)

221. Advanced Structural Theory. (4)
Three 1$\frac{1}{2}$-hour lectures per week. Prerequisite: course 131. The application of classical numerical, and approximate methods of stress analysis to the study of continuous frameworks, truss structures, plates, and shells. Methods of analysis discussed include formalized algebraic procedures, numerical methods, energy procedures, and informal pictorial methods. The methods are illustrated for static and dynamic loads and for elastic and inelastic ranges of structure behavior. The methods are particularly suited for interpretation of structural behavior and for use in preliminary studies or initial design.

Mr. Baron (F)

222. Experimental Stress Analysis. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Lectures and laboratory in the principal experimental methods for stress analysis, including mechanical and electrical strain gaging, instrumentation for strain analysis; stress orientation, photoelasticity, photostress and Moirè.

Mr. Eberhart, Mr. Godden (F)

223. Experimental Model Analysis. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 222 with consent of instructor. Lectures and laboratory in the principal methods for experimental model analysis, including the theory of models and similarity, direct and indirect model techniques, and extrapolation procedures.

Mr. Bertero, Mr. Godden (W)

225A. Dynamics of Structures. (3)
Two 1$\frac{1}{2}$-hour lectures per week. Analysis of stresses and deflections in structures due to the application of dynamic loads. Approximate and "exact" methods for determining the response of buildings, bridges, frames, to earthquake accelerations, wind gusts, moving loads, bomb blasts.

Mr. Clough, Mr. Penzien, (F, W)

225B. Random Vibrations of Structural Systems. (3)
Two 1$\frac{1}{2}$-hour lectures per week. Prerequisite: course 225A. Random process, correlation function, power spectral density. Probability density function for one variable and several variables, Gaussian distribution, random vibration, input-output relation for random loadings. Fatigue failure, Palmgren-Miner criterion. Applications in engineering problems.

Mr. Penzien (F)

227. Structural Design for Dynamic Loads. (3)
Two 1$\frac{1}{2}$-hour lectures per week. Prerequisite: course 225A. Consideration of structural design problems in which dynamic load effects are of major importance. Special emphasis will be given to the design of earthquake and blast resistant structures, but moving load problems and machine vibration isolation problems will also be considered.

Mr. Bertero (Sp)

228. Advanced Study of Cementitious Materials. (3)
Two 1-hour lectures per week. Prerequisite: course 224. Composition of different types of portland cements, chemistry of hydration, structure of hydrates and its influence on resistance, strength, properties, durability. Chemistry of expanding cements, aluminous cements and special portland cements. Minor. Mehta (W)

Three 1$\frac{1}{2}$-hour lectures per week. Prerequisite: course 130. Special topics in bending of beams, bending on elastic foundations, beam column, combination of bending and shear, stability, thermal stresses, curved beams. Two dimensional problems including thick-walled cylinders, foundations; inelastic effects including creep.

Mr. Kelly, Mr. Popov (F)

231. Introduction to Mechanics of Solids. (4)
Three 1-hour lectures per week. Prerequisite: course 130. Behavior of elastic, plastic and viscoelastic solids; stress and strain; derivation of the constitutive equations for linear elastic and viscoelastic materials. Yield theories for materials that behave plastically.

Mr. McNiven, Mr. Popov, Mr. Taylor (W)

232. Theory of Structural Stability. (3)
Two 1$\frac{1}{2}$-hour lectures per week. Prerequisite: course 230. Elastic and inelastic stability of columns and frame; equilibrium, energy and dynamic methods of analysis, non-classical problems: bending, column, torsional instability; stability of arches and rings.

Mr. Penzien, Mr. Popov (W)

To be given odd-numbered years.
233. Theory of Plates and Shells. (3)
Three 1-hour lectures per week. Prerequisite: course 230. Classical plate theory; anisotropic plates; vibration and buckling of plates; large deflection of plates; membrane and general theory of cylindrical shells, and shells of revolution.
Mr. Popov, Mr. Taylor (W)

234. Analysis of Flight Structures. (3)
Three 1-hour lectures per week. Prerequisite: course 238. Material properties; buckling of composite structures; ultimate strength; crippling; fatigue; nonlinear creep; influence coefficients.
Mr. Penzien (Sp)

235. Two-Dimensional Problems in Linear Solids. (4)
Three 1/4-hour lectures per week. Prerequisite: course 231 and Engineering 230A. Extension, flexure, vibration and buckling of thin plates; linear and nonlinear behavior, refined theories; variational principles; solution methods of complex variables, integral transforms, singularities; approximate methods of analysis; anisotropic and nonhomogeneous plates; thermal stress problems.
Mr. Pister (W)

236. Theory of Thin Shells. (4)
Three 1/4-hour lectures per week. Prerequisite: course 231 and Engineering 230A. General theory of thin shells; cylindrical shells, shells having the form of a surface revolution, hyperbolic paraboloids and other shells of double curvature; approximate methods of analysis; anisotropic shells; buckling and vibration; limit analysis.
Mr. Popov (Sp)

237. Three-Dimensional Static Problems in Linear Solids. (3)
Mr. McNiven (Sp)

238. Three-Dimensional Dynamic Problems in Linear Solids. (3)
Three 1-hour lectures per week. Prerequisite: course 231 and Engineering 230A. Study of the displacement equations of motion and the Helmholtz displacement potentials. Dilational and rotational waves in an infinite domain; wave reflection, refraction and dispersion due to boundaries. Rayleigh and Love Wave. Waves in granular and viscoelastic media.
Mr. McNiven (Sp)

239. Mechanics of Nonlinear Solids. (4)
Three 1/4-hour lectures per week. Prerequisite: course 231 and Engineering 230A. Constitutive equation of plastic, viscoplastic, and nonlinear viscoelastic solids; relation to experiment. Perfectly plastic solids; behavior of beams, plates, shells; torsion; plane problems; limit analysis. Behavior of physically nonlinear solids. Dynamic problems: impulsive loading, wave propagation.
Mr. Lubliner (W)

240A. Mechanics of Solids. (3)
Two 1/4-hour lectures per week. Prerequisite: any one of courses 235, 236, 237, 238, 239. Elements of tensor analysis and differential geometry; analysis of deformation strain and stress tensors; energy equations and virtual work; stress equations of motion.
Mr. Lubliner, Mr. Sackman (W)

240B. Mechanics of Solids. (3)
Two 1/4-hour lectures per week. Prerequisite: course 240A. Mechanical constitutive equations for linear and nonlinear elastic and viscoelastic solids; variational principles; applications to solution of problems involving structural materials.
Mr. Lubliner, Mr. Sackman (Sp)

241. Theory of Design. (3)
Mr. Baron (W)

242. Analysis and Design of Structural Systems. (3)
Three 1-hour lectures per week. Prerequisite: course 221. Structural analysis related to structural behavior and design. The ready interpretation of structural action for purposes of design. Sources of stress and participation strains and the interpretation of safety factors and other safety considerations. Variety of kinds of loads, environmental conditions, and structural systems are considered.
Mr. Baron (Sp)

243A. Advanced Reinforced Concrete. (4)
Three hours of lecture per week. Prerequisite: course 133 or equivalent. Structural principles of plain and reinforced concrete including time-dependent behavior, cracking, strength and serviceability criteria in design of reinforced concrete members.
Mr. Bresler (F)

243B. Advanced Reinforced Concrete. (4)
Four and one-half hours of lecture per week. Prerequisite: course 243A or equivalent. Design of reinforced concrete structures—limit-state approach. Design of reinforced concrete frameworks for collapse and serviceability. Limit-design of slabs—recent advances in application of yielding-line theory.
Mr. Bertero, Mr. Bresler, Mr. Lin (Sp)

244. Advanced Prestressed Concrete. (4)
Four and one-half hours of lecture per week. Prerequisite: course 243A or equivalent. Structural behavior and design of prestressed concrete elements and systems—continuous beams, frames, slabs, members under combined axial loads and flexure, torsion, fatigue strength, partial prestress.
Mr. Lin (W)

245. Design of Concrete Shells. (4)
Three 1/2-hour lectures per week. Prerequisite: basic courses in reinforced concrete and in statically indeterminate structures. Application of shell theory, approximate methods, and computers to the design of shell and folded plate structures. Determination of reinforcement or prestressing requirements. Study of existing experimental results including ultimate strength tests. Design project involving shell construction.
Mr. Scordelis (Sp)

246. Design of Steel Structures. (4)
Three 1/2-hour lectures per week. Design of advanced bridge systems, plate girders, composite design, orthotropic decks, prestressed steel construction, suspension systems, domes and tubular structures.
Mr. Bouwkamp (Sp)

† To be given even-numbered years.
‡ To be given odd-numbered years.
247. Analysis and Design of Concrete Dams. (4)
Two 1 1/2-hour lectures per week and one 3-hour laboratory per week. Prerequisite: course 140 or consent of instructor. Selection of location and type; stability analysis, stress analysis of gravity, arch, multiple-arch, dome, and slab-hutress dams; problems imposed by construction conditions and use of mass concrete.
Mr. Raphael (F)

248. Plastic Analysis of Structures. (3)
Two 1 1/2-hour lectures per week. Prerequisite: graduate standing. Introduction to the theory of plasticity. A perfectly plastic material; fundamental theorems of limit analysis; general methods of analysis for structures subjected to proportional loadings or to variable repeated loadings in the plastic range of materials; shakedown theorems; minimum weight design; structures under combined stresses.
Mr. Bettero (W)

249. Advanced Concrete Technology. (3)
Three 1-hour lectures per week. Prerequisite: course 110 or equivalent. Composition and properties of concrete materials; cements, aggregates, admixtures. Properties of fresh and hardened concretes, conventional and special.
Mr. Polivka (Sp)

250. Transportation Policy and Planning. (2)
Two 1-hour lectures per week. Prerequisite: graduate standing in engineering. Analysis of transportation demand and supply in contemporary economic, social, political, and legal settings. Comparative evaluation of transportation modes in meeting transport demands. Analysis of transportation policy and planning as instruments of social and environmental guidance.
Mr. Zettel (F, W)

251. Traffic Stream Characteristics. (3)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Study of traffic stream characteristics and flow analysis for planning design and operations of streets and highways. Stream characteristics include flow, speed, density and headways. Flow analysis includes flow interrelationships, headway distributions, traffic performance at intersections, and capacity investigations.
Mr. May (F)

252. Traffic Flow on Transportation Networks. (3)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Elementary theory of transportation networks. Shortest route, minimum network cost, and equilibrium models. Application to trip distribution and traffic assignment.
Mr. Newell (F)

253. Transportation Engineering. (4)
Four hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Technological characteristics of air, highway, rail, and other modes of transportation; integration of modal components into transportation systems; terminal requirements for individual modes and interface problems among modes; forecasting and planning studies; techniques for evaluating alternative plans.
Mr. Kennedy (F)

253L—253M. Transportation Engineering Laboratory. (1—1)
One 3-hour laboratory per week. Prerequisite: courses 252, 253 (may be taken concurrently). 253L is prerequisite to 253M. Analysis of land-use data, traffic patterns, and transportation networks to develop traffic models, predict future traffic demands, and design future networks. Use of computer programs in urban traffic forecasting and planning.
Mr. Horonjeff (W)

254. Transportation Demand Analysis and Forecasting. (3)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Analysis of alternative forecasting techniques. Economic demand theory applied to transportation services. Use of demand models for forecasting. Peaking problems, choice of mode, and efficient prices for transport services.
Mr. Dygert (W)

255. Traffic Engineering. (3)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Analysis of human and vehicular characteristics as they affect highway traffic flow; traffic regulation; accident cause and prevention; techniques for facilitating and increasing flow on existing traffic systems; planning new traffic systems; parking and other terminal problems.
Mr. Kennedy (W)

256. Traffic Flow Theory. (3)
Three hours of lecture per week. Prerequisite: Statistics 133, course 251, or consent of instructor. Logical foundations and mathematical representation of traffic flow; interrelation between microscopic and macroscopic equations of motion for highway traffic; stochastic properties of traffic at low and moderate densities. Car-following and fluid theories of traffic flow at high densities. Mr. Newell (W)

257. Applications of Queueing Theory to Transportation. (3)
Three hours of lecture per week. Prerequisite: Statistics 133. Deterministic queueing models. Strategy for design and control for queueing systems with multiple services and/or several types of customers. Application to highway intersections, airport terminals, and traffic bottlenecks. Diffusion approximations to stochastic queues. Exact solution of simple stochastic queueing systems. Mr. Newell (W)

258. Geometric Design of Highways. (3)
(Formerly 251)
Three hours of lecture per week. Prerequisite: course 251. Location and design of various types and classes of highways. Emphasis on theory and practice in design of alignments, highway cross-sections, intersections, interchanges, multilane expressways and freeways, and arterial highways in urban areas.
Mr. May (W)

259. Mass Transit Engineering. (3)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Analysis and evaluation of mass transit systems, their operation and design. Technology of transit vehicles and structures. Impact on urban land use. Public policy and financing problems.
Mr. Homburger (W)

260A. Air Transport Engineering. (3)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Nature of civil aviation; aircraft characteristics and performance related to planning of terminal facilities. Air traffic control and navigation systems related to planning terminal facilities. Factors to be considered in selection of airport sites.
Mr. Horonjeff (W)

260B. Air Transportation Economics. (3)
Three hours of lecture per week. Prerequisite: course 256 or consent of instructor. Major models for analyzing demand for air transportation; financial structure of air carriers.
Mr. Homburger (W)

265. Pavement Analysis and Design. (3)
Three hours of lecture per week. Prerequisite: course 140 or consent of instructor. Analysis of pavement structure, calculation of pavement design comfort, and development of design codes.

270. Geometric Design of Bridge Systems. (3)
Three hours of lecture per week. Prerequisite: course 251. Geometric design of bridge systems. Emphasis on design of single and multi-span bridges.
260B. Air Transport Engineering. (3)
Three hours of lecture per week. Prerequisite: course 260A or consent of instructor. Planning of the airport complex; factors affecting airport capacity; models for analysis of airport capacity; geometric design of runways and taxiways. Analysis of facilities for passengers and cargo; noise and noise control.
Mr. Horonjeff (Sp)

261. Feasibility Analysis of Transportation Systems. (3)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Objectives and criteria for choice of transportation investments. Problems of estimating benefits and costs; treatment of intangibles and uncertainty; selection of discount rates. Transportation investment planning in developing economies.
Mr. Dygert (Sp)

262. Simulation of Transportation Systems. (3)
(Formerly 256)
Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. Development of computer simulation models for the analysis of the performance of complex, multivariable, time-dependent transportation systems, with application to surface and air systems.
The Staff (Sp)

263. Highway Traffic Control. (3)
Three hours of lecture per week. Prerequisites: courses 251 and 257. Capacity and delay at isolated fixed-cycle and vehicle-actuated traffic signals. Traffic signal synchronization for single highways. Network control of urban streets, ramp control of freeways, route control.
Mr. May, Mr. Newell (Sp)

264. Design of Transportation Facilities. (3)
One hour of lecture and two 3-hour laboratories per week. Prerequisite: consent of instructor. Comprehensive design of a transportation facility. Design project can be selected by a student or group of students which is concerned with the overall design of a surface or air transportation facility.
The Staff (Sp, Sp)

265. Pavement Design. (4)
Two 2-hour lectures per week. Prerequisite: graduate standing in engineering. Theories, principles, and practices in the structural design and construction of highways and airport pavements including stabilization, design of rigid and flexible pavements, accelerated traffic and loading tests, and the design of asphaltic mixesures.
Mr. Horonjeff (F)

Three hours of lecture per week. Prerequisite: graduate standing or consent of instructor. An advanced course concerned with asphalt paving especially for highway and airport pavements; emphasis is placed on physical properties of asphalts, aggregates and their combinations and the relationship of these properties to proper design and construction of pavements.
Mr. Mitchell, Mr. Monismith (W)

270A. Advanced Soil Mechanics and Foundation Engineering. (3)
Two 1.5-hour lectures per week. Prerequisite: course 123, or 121A–121B and 114, or equivalent. Advanced theories of soil mechanics including consolidation, settlement analysis, stress distribution, lateral pressures, bearing capacity, and their application in foundation engineering.
Mr. Seed (F)

270B. Advanced Soil Mechanics and Foundation Engineering. (3)
Two 1.5-hour lectures per week. Prerequisite: course 123, or 121A–121B and 114, or equivalent. Detailed study of the shear strength of cohesionless and cohesive soils, strength determining factors, methods for strength measurement, slope stability and stability analysis techniques.
Mr. Duncan, Mr. Seed (W)

270C. Advanced Soil Mechanics and Foundation Engineering. (3)
Two 1.5-hour lectures per week. Prerequisite: course 123, or 121A–121B and 114, or equivalent. Design of anchored bulkheads; supporting capacity, design, and installation of pile foundations, laterally loaded piles, case studies involving advanced concepts of soil mechanics and foundation engineering.
Mr. Mitchell, Mr. Seed (Sp)

270L. Advanced Soil Mechanics Laboratory. (3)
One 1-hour lecture and two 3-hour laboratories per week. Prerequisite: course 270A, 270B. Lectures and individual experimental studies of advanced aspects of soil properties and their applications to design. Consolidation, strength testing, pore water pressure measurement, dynamic soil tests, field strength and pile loading tests, pavement design procedures, advanced instrumentation and measurement techniques.
Mr. Duncan, Mr. Houston (Sp)

271. Seepage Through Soils. (2)
Two 1-hour lectures per week. Principles governing the flow of water through soils and their applications in civil engineering.
Mr. Duncan (W)

272. Soil Stabilization. (3)
Three 1-hour lectures per week. Prerequisite: graduate standing. Purposes of soil stabilization, stabilization using compaction, aggregate addition, cement, asphalt, and chemicals; design, construction and economic considerations using stabilized soils for highways and airfields; principles of pavement design and pavement design methods; special applications and methods of stabilization.
Mr. Mitchell, Mr. Monismith (W)

273A. Physico-Chemical Principles and Soil Behavior. (3)
Three 1-hour lectures per week. Prerequisite: course 114, 121A, or consent of the instructor. Clay mineralogy, soil formation and composition, sediments, identification of soil minerals, colloidal phenomena in soils, swelling, ion exchange, soil water.
Mr. Mitchell (F)

273B. Physicochemical Principles and Soil Behavior. (2)
Two 1-hour lectures per week. Prerequisite: course 273A. Analysis of the mechanical behavior of soils in terms of physicochemical principles, including phenomena, deformation mechanisms and strength, compaction, frost action, rate processes such as secondary compression, creep and thixotropy.
Mr. Mitchell (W)
275. Soil Dynamics. (4)
Two 2-hour lectures per week. Prerequisite: graduate standing. Vibration of simple oscillators. Wave propagation in elastic media. Dynamic behavior of soils. Dynamic tests. Analysis of dynamically loaded foundations. Earthquakes and earthquake resistant design of slopes and foundations. Dynamic similarity. Mr. Lysmer (Sp)

276. Earth Dams. (2)
Two 1-hour lectures per week. Prerequisite: course 271 and 270B or consent of instructor. Principles of earth dam design; types of failures; design procedures; practical considerations in design and construction. Mr. Seed (Sp)

277. Theoretical Soil Mechanics. (3)
Two hours of lecture and one 3-hour laboratory per week. Prerequisite: course 270A (may be taken concurrently). Knowledge of FORTRAN programming (may be taken concurrently). Theories and numerical methods for consolidation processes. The mechanics of discrete particles and theories of stress-dilatancy. The theory of subgrade reaction. Mr. Lysmer (F)

278. Stress Analysis in Soil Mechanics. (2)
Two hours of lecture per week. Prerequisite: good knowledge of FORTRAN programming. Analysis of stresses and deformations in plane problems in soil mechanics. Elastic strains are studied by the finite element method and plastic systems by the limits theorems of the theory of plasticity. Mr. Lysmer (W)

280A. Theoretical Rock Mechanics. (3)
Two 11/2-hour lectures per week. Prerequisite: course 119. Elements of elasticity, rock properties and behavior; theory of failure for brittle, jointed, and anisotropic rocks; time effects; theory of in-situ and laboratory testing. Mr. Goodman (F)

280B. Applied Rock Mechanics. (2)
Two 1-hour lectures per week. Prerequisite: course 280A. Design and construction of surface and underground excavations and installations in rock; rock support and reinforcement; case histories. Mr. Goodman (W)

280L. Experimental Rock Mechanics. (2)
One 1-hour lecture and one 3-hour laboratory per week. Several lab periods will be held at the Rock Mechanics Sand Mine Lab near Antioch. Prerequisite: course 280A. Laboratory and in-situ testing of rocks to determine state of stress, deformability, and strength properties. Mr. Goodman (Sp)

282A-282B. Flow of Fluids in Porous Media. (3-3)
Two 11/2-hour lectures per week. Prerequisite: Engineering 230A is recommended. Application of fluid mechanics to the steady state and non-steady state flow of fluids through porous media, boundary value problems relating to idealized and real rock systems. Mr. Witherspoon (F, W)

287A. Analytic Photogrammetry I. (4)
Three-hour lecture and 3-hour laboratory per week. Prerequisite: course 101 or equivalent. Analytic photogrammetry of the general n x n block of overlapping photographs utilizing constraints from auxiliary sensors. Study of special methods of analytic photogrammetry developed by the National Research Council of Canada, British Ordinance Survey, USGS, and USC & GS. Mr. Anderson (Sp)

287B. Analytic Photogrammetry II. (4)
Four-hour lecture per week. Prerequisite: Analytic Photogrammetry I, II, Adjustment Comp. Analytic photogrammetry of the general n x n block of overlapping photographs using the co-planarity and collinearity conditions. Includes study of analytic solutions to the (a) special cases of stereo pair, triple, and subblocks and (b) general n x n block of photographs. Mr. Anderson (W)

287C. Analytic Photogrammetry III. (4)
Four-hour lecture per week. Prerequisite: Analytic Photogrammetry I, II, Adjustment Comp. Analytic photogrammetry of the general n x n block of overlapping photographs using the co-planarity and collinearity conditions. Includes study of analytic solutions to the (a) special cases of stereo pair, triple, and subblocks and (b) general n x n block of photographs. Mr. Anderson (W)

288A. Stereoscopic Plotting Instruments. (4)
Three-hour lecture and 3-hour laboratory per week. Prerequisite: course 101 or equivalent. Design of components of first- and second-order stereoscopic plotting instruments; reduction printers; interior, relative and absolute orientations; scale selection and limitations; double-projection and optical-train designs; map compilation. Mr. Moffitt (F)

288B. Stereotriangulation and Adjustment. (4)
Three-hour lecture and 3-hour laboratory per week. Prerequisite: course 288A (Stereoscopic Plotting Instruments). Preparation of diapositives; pass-point identification; control extension in first-order instruments; control extension by independent models; adjustment to ground control by first, second and third degree polynomials. Analysis of systematic and random errors. Mr. Moffitt (W)

289. Adjustment Computations. (4)
Four-hour lecture per week. Prerequisite: course 10. Brief review of matrix algebra and computer programming. Introduction to probability theory and error propagation; derivation of the method of least squares adjustment with application to surveying and photogrammetry problems. Mr. Wolf (W)

290A. Methods of Analysis of Structural Systems. (4)
Three 11/2-hour lectures per week. Prerequisites: course 130, Mechanical Engineering 104A. Introduction to analysis of equilibrium stability and vibration of discrete and simple continuous systems (strings, cables, beams, columns) by means of matrix methods, calculus of variations, differential equations, Fourier series, and Fourier integrals. Mr. Lubliner (F)

290G. Applications of Digital Computers to Structural Problems. (4)
Two 11/2-hour lectures per week. Prerequisite: graduate standing in civil engineering and knowledge of FORTRAN coding. Numerical methods and digital computer coding techniques appropriate to solution of problems in structural engineering. Computer programs are developed for matrix operations, solution of equilibrium equations, and static and dynamic analysis of frames, trusses and finite element systems. Mr. Wilson (F)

§287B Approved for one offering only, 1968-69.
290L. Water Resources Development. (2)
One 2-hour lecture per week. Prerequisite: graduate standing. The engineering, economic, legal, social, and political factors underlying major decisions in water resources development. Mr. Todd (Sp)

290N. Applications of Digital Computers to Hydraulic and Sanitary Engineering Problems. (3)
Three 1-hour lectures per week. Prerequisite: graduate standing. Use of computers in hydraulic and sanitary engineering: numerical analysis. Mr. Harder (F)

290R. Current Topics in Geological Engineering. (1)
One 1-hour lecture per week. Detailed discussion of topics of particular interest or too recent to have been incorporated into other courses. Content will change from year to year. Mr. Witherspoon, Mr. Goodman (F, W, Sp)

290S. Administration of Transportation Functions. (2)
Two hours of lecture per week. Prerequisite: course 253 or consent of instructor. Seminar on problems and processes of administering activities unique to transportation. Organization and management of planning, design and operational functions. Processes of formulation of transportation policies, practices, and standards. Mr. Davis (Sp)

290T. Advanced Topics in Transportation Theory. (2)
Two hours of lecture per week. Prerequisite: course 257 or consent of instructor. Selected topics in transportation or traffic flow theory with emphasis on advanced mathematical techniques. Recent developments in transportation science. Mr. Newell (F)

290Z. Models Related to Air Transportation. (2)
Two hours of lecture per week. Prerequisite: Statistics 133, 135A, and course 257. Strategies for scheduling landings and take-offs. Models for passenger and baggage movements in airport terminals. Current developments in air traffic theory. Mr. Newell (Sp)

298. Group Studies, Seminars, or Group Research. (1-8)
Prerequisite: graduate standing. Research or investigation in selected advanced subjects. Mr. Seed in charge (Su, F, W, Sp)

601. Individual Study for Master’s Students. (1-8)
Individual study of the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis. Mr. Seed (F, W, Sp, Su)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. Mr. Seed (F, W, Sp, Su)

Electrical Engineering and Computer Sciences

Upper Division Courses

100A–100B. Electrical Circuits, Electronics, and Machines. (3-3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Engineering 17 (may be taken concurrently). 100A is prerequisite to 100B. Not for students in electrical engineering. 100A. Transient and steady-state analysis of circuits; network theorems; analogs and duality; transformers; introduction to electronic circuits; associated laboratory experiments. Three 2-hour lectures and one 3-hour laboratory per week. Mr. Studer (Su, W)

101A. Circuits, Electronics, and Computers. (4)
Two 2-hour lectures per week. Prerequisite: Physics 4B. Theory and applications of electronics and electrical circuits. Single-phase and polyphase circuits, electromechanical energy conversion. Vacuum-tube and semiconductor devices; amplifiers. Designed for students in civil and mining engineering. Mr. Studer (F, W, Sp)

101B. Electronic Circuits and Instrumentation Systems. (4)
Two 2-hour lectures per week. Prerequisite: Physics 4B. Theory and applications of electronics and electrical circuits. Vacuum-tube and semiconductor devices. Basic concepts of electronic instrumentation systems. Designed for students in chemical engineering and in mineral technology except mining engineering, and for students in the physical sciences. Mr. Studer (Su, W)

103. Particle Accelerators. (3)
Three 1-hour lectures per week. Prerequisite: course 100A–100B or 105 or Physics 110B or Physics 121 (any may be taken concurrently). Theory, design, and application of particle accelerators such as cyclotrons, d.c. accelerators, betatrons, r.f. linear accelerators, synchrotrons, and strong-focusing machines; orbit stability; storage rings; colliding beams; ion sources and vacuum systems; recent developments. Mr. Woodyard (Sp)
104A—104B. Electric Circuits. (4-4)
Three 1-hour lectures and one 2-hour recitation per week. Prerequisite: Mathematics 3C and Physics 4C. 104A is prerequisite to 104B.
Mr. Desoer, Mr. Kuh (Su, W, Sp)

106. Introduction to Electronic Circuits. (4)
Four hours of lecture per week. Prerequisite: Engineering 17; course 100B or 104B. Charge-control concepts and models for electronic devices; single-stage and cascaded lowpass amplifiers, gain, bandwidth, output power, distortion; simple feedback amplifiers; selective amplifiers, discrete state circuits, logic, and memory circuits.
Mr. Pederson (F, Sp)

108A—108B. Electronics and Circuits Laboratory. (3-3)
Two 4-hour laboratories per week.
108A. Prerequisite: course 104A and Engineering 17 (both may be taken concurrently). Experiments and introductory lectures concerned with fundamentals of semiconductor and vacuum tube devices, basic laws of circuit design and analysis, and special devices.
108B. Prerequisite: course 108A and 105 to be taken concurrently. Experiments and lectures on new semiconductor devices, magnets, transformers, coupling networks, and special projects on current topics.
Mr. Robertson (W, Sp)

111A—111B. Electrical Machinery. (3-3)
Three hours of lecture per week. Prerequisite: course 104B or 100B. The study of the dynamic and steady-state characteristics of rotating electromechanical devices including the direct-current machine, the induction machine, the synchronous machine, the Ampèride, and other specialized machines.
Mr. Robertson (F)

114A—114B. Electric Power Generation, Transmission and Distribution. (3-3)
Three 1-hour lectures per week.
114A. Prerequisite: course 100B; or 104B and 105B. Analysis of short circuits on power systems by method of symmetrical components, decrement curves and ASA decrement factors, selection and coordination of current interrupters and protection apparatus.
Mr. Robertson (F)
114B. Prerequisite: course 114A. The long transmission line with distributed parameters, voltage, regulation and reactive requirements. Steady-state stability limits. Equal area criterion method of determining transient stability limits.
Mr. Robertson (W)

115. Semiconductor Circuits Laboratory. (2)
One 4-hour laboratory per week. Prerequisite: course 105 and 108B. Experimental studies and design problems of basic semiconductor circuit-functions with an emphasis on the fundamental requisites and interactions. Design and project activity with cascaded, lowpass amplifiers; feedback amplifiers; selective amplifiers; harmonic and relaxation oscillators; and regenerative switching circuits.
Mr. Pederson (Su, F, W, Sp)

116. Microwave Communication Systems. (4)
Two 3/4-hour lectures per week. Prerequisite: course 117B plus either of the following which may be taken concurrently: course 124 or 126. Microwave frequency sources and amplifiers; radiation and propagation; noise; systems applications.
Mr. Angelakos, Mr. Everhart (F, Sp)

117A—117B—117C—117D. Electromagnetic Fields and Waves. (3-3-3-3)
Three hours of lecture per week. Prerequisite: 117A, course 104A or consent of the instructor.
117A. Course 117A, 117C and 117D, course 117B.
117A (Su, F, W, Sp); 117B (F, W, Sp)
117C. Waveguides and resonant cavities. Microwave and optical waveguides, resonant structures, periodic structures, and other circuits. Microwave networks. Radiation and antennas. (W, Sp)
Mr. Van Duzer, Mr. Welch, Mr. White (Sp)

119. Linear Systems Analysis. (4)
Two 3/4-hour lectures and one 1-hour recitation per week. Prerequisite: course 104B. Analysis of linear electrical, mechanical, and electromechanical systems. Description by differential equations and vector differential equations, and analysis of system behavior. Concept of state. Fourier and Laplace transform methods of analysis. Consideration of stability of feedback systems.
Mr. Polak, Mr. Sakrison (F, Sp)

123. Passive Network Synthesis. (4)
Four hours of lecture per week. Prerequisite: course 119. The basic theory and techniques of passive network description, approximation, and synthesis. One- and two-port synthesis for three element and two element kind networks including computer techniques.
Mr. Frisch (Sp)

Four hours of lecture per week. Prerequisite: course 119 (may be taken concurrently). Signal descriptions, Fourier series, integral and spectrum, principles of amplitude, angular and pulse modulations; representative examples of communication systems including circuits; analysis of the effects of noise on communication, comparisons of systems.
Mr. Sakrison, Mr. Turin (W, Sp)

126A—126B. Physical Electronics. (3-3)
Two 1-hour lectures and one 3-hour laboratory per week.
126A. Prerequisite: course 105 or Physics 110B or Physics 121. A unified treatment of the physical principles and theory underlying electronic devices and measurements in physical electronics, including recent developments.
Mr. Robertson (F, W, Sp)
126B. Prerequisite: course 126A or permission of the instructor. A continuation of 126A with emphasis on specific topics within the field of physical electronics, including quantum electronics and relativistic effects. Mr. Woodyard (W)

128A—128B. Feedback Control. (4—4)
Three 1-hour lectures and one 3-hour laboratory per week.

128A. Prerequisite: course 119. Analysis and synthesis of linear control feedback systems.


Mr. Bergen, Mr. Hopkin (W, Sp)

130. Electronics of Solids. (4)
Four hours of lecture per week. Prerequisite: Physics 121 or 137A. Description of solids, the crystalline state, energy band structure and conduction properties of semiconductors and metals, dielectric properties of insulators. Optical effects.

Mr. English, Mr. Oldham, Mr. Wang (F, Sp)

131A. Semiconductor Device Physics. (3)
Three hours of lecture per week. Prerequisite: course 130 or Physics 141A—141B or Physics 140. Electrons and holes in semiconductors. Thermal generation and non-equilibrium conditions. Generation and recombination, the continuity equation. P-n junction theory. Introduction to transistors. Physics of diffusion and oxidation.

Mr. English, Mr. Oldham (F, W)

131B. Semiconductor Devices. (3)
Three hours of lecture per week. Prerequisite: course 131A. Physics of practical junction transistors, field-effect transistors, Schottky-barrier, and tunnel diodes, semiconductor-controlled rectifiers and photodetectors.

Mr. Oldham (W, Sp)

132. Communication Electronics Laboratory. (2)
One 4-hour laboratory per week. Prerequisite: course 105, 108B; and 124 or 160A (the last requirement may be taken concurrently). Experiments illustrating the fundamental principles involved in the operation of communication circuits and systems, including frequency translation, amplitude, frequency and pulse code modulation, methods of demodulation and detection, and spectrum and noise analysis.

Mr. Van Duzer (F, W, Sp, Su)

133. Electrical Machinery Laboratory. (2)
One 4-hour laboratory per week. Prerequisite: course 104A—104B; course 111 or 114. The course comprises experiments, selected by the student, covering alternating current and direct current apparatus and machinery. The laboratory provides experiences in the use of electromechanical energy conversion equipment and training in the techniques of electrical instrumentation. Mr. Robertson (W, Sp)

134. Solid-State Electronics Laboratory. (2)
One 4-hour laboratory per week. Prerequisite: course 130. Experiments in measuring physical parameters and observing and interpreting fundamental phenomena in solid-state materials and devices.

Mr. English (W, Sp)

135. Microwave Laboratory. (2)
One 4-hour laboratory per week. Prerequisite: course 117A—117B; 117C or 117D or 116 (may be taken concurrently). Experiments illustrating the fundamental principles in the operation of active and passive microwave devices. Particular consideration is given to the special methods of measurement and special techniques which must be employed at microwave and optical frequencies.

Mr. Angelakos (W, Sp)

136. Quantum Electronics and Magnetism. (3)
Two 3-hour lectures per week. Prerequisite: course 130, Physics 115 or 137A. Quantum electronics in solid materials. Theory of magnetic properties, magnetic resonance, maser and laser phenomena, electroluminescence, with discussion of applications.

Mr. Wang (Sp)

137. Solid-State Research Preparation. (2)
Four hours of lecture per week. Prerequisite: course 134. A laboratory of extended experimental projects designed to provide training for research in solid-state electronics.

Mr. English (Sp)

140. Nonlinear Electronic Circuits. (4)
Four hours of lecture per week. Prerequisites: courses 105 and 108B. Nonlinear models and description of electronic devices; linear and nonlinear analyses of near-harmonic and relaxation electronic oscillators; oscillator design and performance; systematic development of electronic bistable and monostable configurations, regeneration switching speed and timing calculations, waveform generating circuits.

Mr. Pederson (F, Sp)

141. Linear Electronic Circuits. (4)
Four hours of lecture per week. Prerequisites: courses 105 and 108B. General modeling techniques for electronic mechanisms; computer-aided analysis, second-order effects and excess phase; limitations and design procedures for broadband amplifiers; optimum low-noise performance; feedback amplifier theory and design; frequency selective circuits; potentiostable circuits; frequency translation.

Mr. Pederson (F, W)

148. Introduction to Computers and Information Processing. (2)
Two 1½-hour lectures per week. A survey of the science and art of computing and information processing with emphasis on the realization and minimalization of switching circuits, the organization and programming of simple computers, and mathematical models for digital computers.

Mr. Harrison, Mr. Morton (F)

IDS 105. Elements of Digital Computers. (4)
See Interdepartmental Studies for the complete course description.

S151A—S151B. Switching and Computing Circuits.
Two hours of lecture and one three-hour laboratory per week. Prerequisite: course 105, 108A—108B. Students will not be given credit for more than one of the following courses: Interdepartmental Studies 105 and course 151A. The analysis of circuits operating in highly nonlinear modes. Emphasis is placed on rapidly obtaining approximate solutions and refining these solutions by considering second order effects. Some design problems are considered.

Mr. Graham, Mr. Morton (F, W)

§ Approved for one offering only, 1968—69.
§152A–152B. Digital Computer Systems. (4–3)
152A: Three hours of lecture and one 3-hour laboratory per week. Prerequisite: Engineering 1, 101, Computer Science 2, or thorough knowledge of FORTRAN or ALGOL. Students will not be given credit for both Computer Science 104 and course 152A. Logical design for arithmetic, control, and input-output functions. Study of the design of a digital computer: order code, organization, development of equations. In laboratory, students build small arithmetic unit.
152B: Three hours of lecture per week. Prerequisite 152A and 153. The organization of stored-program digital computer and data processing systems. Multiple processing: its forms and its consequences.
Mr. Lichtenberger (F, W)

§153. Programming Methods. (4)
Three hours of lecture per week. Prerequisite: Engineering 1 or Engineering 101 or Computer Science 2 or a thorough knowledge of FORTRAN or ALGOL. Students will not be given credit for both Computer Science 106 and course 153. Basic programming techniques; machine language programming, assemblers, arrays, lists, searching and insertion, sorting, string processing, languages, recursion, algebraic expressions, input-output fundamentals, computer arithmetic.
Mr. Lampson (F, W)

§154. Programming Systems. (3)
Three hours of lecture per week. Prerequisite: course 153. Students will not be given credit for both Computer Science 106 and course 154. Design and implementation of programming languages; assemblers, methods for description of syntax; declaration; parsing techniques; code generation. At least one nonalgebraic language will be considered in detail. Extensive programming practice.
Mr. Lampson (W)

160A–160B. Communication of Continuous and Digital Information. (4–4)
160A: Three 1-hour lectures and one 1-hour recitation per week. Prerequisite: Statistics 134 and concurrent enrollment in course 119 or Mechanical Engineering 134A. Students will not be given credit for both Electrical Engineering 124 and Electrical Engineering 160A–160B. Methods of analysis of communication in the presence of noise emphasizing existing continuous and digital data systems. Fourier analysis, description of random processes, the sampling theorem. Performance of amplitude and angle modulation. Transmission of digital data over additive noise channels.
Mr. Sakrison, Mr. Turin (W)
160B: Two 1½-hour lectures per week. Prerequisite: course 160A. Analysis of inherent limitations imposed by the noise and ultimate possible system performance. The capacity theorem for a Gaussian channel. Simple codes. Geometrical interpretation of nonlinear modulation; exchange of bandwidth for signal-to-noise ratio; threshold effects.
Mr. Sakrison, Mr. Thomasian (Sp)

162. Switching Theory. (3)
Mr. Gill, Mr. Harrison (F)

163. Finite-State Machines. (3)
Mr. Gill, Mr. Harrison (W)

166. Introduction to Optimization Techniques. (4)
Three hours of lecture per week. Prerequisite: course 119. Description of specific optimization problems arising in control and programming. Necessary and sufficient conditions for optimality. Elementary notions of linear, quadratic, and dynamic programming. The maximum principle for linear systems and the elements of the calculus of variations.
Mr. Van Slyke (W)

170. Plasma and Beam Dynamics. (3)
Two 1½-hour lectures per week. Prerequisite: course 117A or Physics 110A. Basic concepts of plasma and beams. Single particle motion in electric and magnetic fields; guiding center drift motion, invariants; applications to plasma containment, beam focusing, accelerator confinement. Fluid approximations; applications to MHD, space-charge flow, electron and ion guns.
Mr. Birdsal, Mr. Lieberman (Sp)

171. Properties of Plasmas. (2)
One 4-hour laboratory per week. Prerequisite: course 117A or Physics 110A. This is a laboratory course to illustrate the physical and electromagnetic properties of ionized gases, techniques of measurement of these properties, and methods of creation of laboratory plasmas. There will also be experiments on vacuum systems and high current switching.
Mr. Birdsal, Mr. Lieberman (F, Sp)

Three hours of lecture per week. Prerequisite: Mathematics 2C. Device physics and signal-processing properties of neurons; networks of neurons and the role of the nervous system in control; applications of control engineering and circuit system analysis methods to orientation, navigation, communication and other basic types of animal behavior.
Mr. Lewis (F)

*191L. Language Processing Laboratory. (2)
Two hours of laboratory per week. Prerequisite: course 153 or Computer Science 103. Fundamental computer programming techniques used in writing language processors such as assemblers and FORTRAN, ALGOL, and PL-I compilers. Symbols tables, formatting, character expanding and compressing, the Bauer-Samelson algorithm, recursive methods.
Mr. Maurer (F, W)

198. Directed Group Studies for Advanced Undergraduates. (1–5)
Prerequisite: course 105. Group study of selected topics in electrical engineering, usually related to new developments.
The Staff (Mr. Zadeh in charge) (F, W, Sp)

199. Individual Study and Research for Advanced Undergraduates. (1–5)
Enrollment is limited to students who have demonstrated by achievement of a B average that
§ Approved for one offering only, 1968–69.
** Approved for two years, 1968–70.
they have a capacity for independent work. Special prerequisites will be established by the instructor guiding the work.

The Staff (Mr. Kuh in charge) (So, F, W, Sp)

Graduate Courses

204. Electron Optics. (3)
Two 1/2-hour lectures per week. Prerequisite: course 170 or equivalent. Electron optics of low-density electron beams. Electron guns, lenses, deflection yokes, and their aberrations. Thermal velocity limitations. Design of sub-micron diameter beams. Mr. Everhart (F)

205. High-Density Electron Beams. (3)
Three 1-hour lectures per week. Prerequisite: course 117A, 170 or equivalent, and Mathematics 185. Modern methods for analysis and synthesis of electron flows and structures for focusing, where fields are static and space charge is important. Theoretical methods for finding exact flows and paraxial approximations of various orders. Theoretical methods for calculating electrode shapes. Mr. Everhart, Mr. Van Duzer (W)

206. Theory of High-Frequency Devices. (4)
Three hours of lecture per week. Prerequisite: course 117A—117B, recommended: 117C—117D. Interactions between electromagnetic fields and charge particles, in solids and in vacuum. Solid state and vacuum diodes, space-charge waves, traveling wave interactions, coupled modes, parametric and cross-field interactions. Applications to high-frequency solid-state amplifiers and oscillators and microwave vacuum tubes. Mr. Turner (Sp)

210A—210B—210C. Applied Electromagnetic Theory. (3—3—3)
Two 1/2-hour lectures per week. Prerequisite: course 117A—117B or Physics 110A—110B. 210A is prerequisite to 210B, and 210B to 210C. Advanced treatment of classical electromagnetic theory and its application to engineering problems; Electrostatics, magnetostatics, time varying fields. Interactions between electromagnetic fields and moving charges. Mr. Schwarz, Mr. Welch, 210A, (F, Sp); 210B (W); 210C (Sp)

216. Microwave Antennas. (4)
Three 1-hour lectures per week. Prerequisite: course 210A. Application of Maxwell's equations to single antennas and antenna arrays used in transmission and reception of radio waves. Mr. Angelakos (W)

217. Microwave Networks. (4)
Two 1/2-hour lectures per week. Prerequisite: course 117A—117B. A study of the application of network theory, including the general theorems, the methods of analysis, and the measurement techniques to microwave waveguides, cavity resonators, coupling systems and networks of these components. Mr. Whinnery (Sp)

222. Techniques of Linear System Theory. (4)
Four 1-hour lectures per week. Prerequisite: course 118; Mathematics 185 or 104A or 111 (the mathematics course may be taken concurrently). Basic systems concepts: input-output relation, state, linearity, systems with finite dimensional state spaces, including time-varying and discrete-time systems. State space techniques. Laplace and Z-Transformations. Examples from electric circuits, control systems and other fields. Mr. Varaiya (F, Sp)

223. Foundations of Network Theory. (4)
Four hours of lecture per week. Prerequisite: course 222. Basic techniques of network theory, graph theory, state variables, port characterizations of networks, scattering matrices, integral theorems, and network limitations. Mr. Frisch (F, W)

224. Passive Networks. (3)
Three hours of lecture per week. Prerequisite: course 223. Theory of passive networks, properties of n-port networks, equivalent networks, matching networks, rational matrices, synthesis of n-ports, advanced topics. Mr. Frisch (Sp)

225. Nonlinear Networks. (3)
Three hours of lecture per week. Prerequisite: course 223. Qualitative analysis of nonlinear and time-variable networks: formulation of the state equations; stability, power gain, and oscillation studies. Mr. Frisch (W)

228. Optimization Techniques in Programming and Control. (4)
Four hours of lecture per week. Prerequisite: courses 222 and 227A. Recommended: Mathematics 110A. A unified study of necessary and sufficient conditions for optimality including the Pontryagin Maximum Principle, the Discrete Maximum Principle, Kuhn-Tucker and F. John Theory. Computational methods; steepest descent, gradient projection, penalty functions, linear, and quadratic programming. Mr. Polak (F)

227A. Optimization and Control. (3)
Three 1-hour lectures per week. Prerequisite: course 222. Finite-dimensional optimization problems. Introduction to Calculus of Variation. Variational approach to optimal control: necessary conditions; fixed-time and free-time problems, transversality conditions; Hamilton-Jacobi Theory. Feedback control of linear systems: minimum time, quadratic cost. Mr. Varaiya (W)

227B. Identification and Optimization. (3)
Three 1-hour lectures per week. Prerequisite: courses 227A and 260A. Optimal Control: Pontryagin Maximum Principle, Estimation Theory of state and parameter estimation, system identification and filtering of state of a system with noisy inputs and observations. System identification. Stochastic optimal control. Mr. Varaiya (Sp)

228. Digital Control. (3)
Three 1-hour lectures per week. Prerequisite: courses 128 and 222. Analysis, synthesis and critical study of digital control systems. General application of both the z-transform and the state-space approach for discrete systems. Study of various non-linearities in digital control systems, including quantization effects. Application of Popov and Lyapunov stability methods to PWM and PFM feedback systems. Application of discrete theory of biocontrol systems. Mr. Jury (Sp)

229A. Nonlinear Control. (3)
Three hours of lecture per week. Prerequisite: courses 128A and 222 (may be taken concurrently). Analysis and design of nonlinear control systems. Quasilinear methods. Geometrical representation of nonlinear systems in state space. Nature of equilibrium points, limit cycles, separatrices. Asymptotic stability. Use of Lyapunov's direct method. Mr. Bergen (F, Sp)

* Not to be given 1968-69.
229B. Stability of Nonlinear Systems. (3)
Mr. Bergen (W)

230. Physics and Chemistry of Semiconductors. (4)
Three hours of lecture per week. Prerequisite: Physics 121; Physics 140 or Physics 141A-B; Physics 115 or Physics 137B concurrently. Effective mass. Conductivity tensor, high-field conductivity. Magnetic effects. Optical properties. Electrons, holes, and defects as chemical entities. Thermodynamics of defects—mass action. Equilibrium in binary compounds. Diffusion. Phase diagrams.
Mr. Oldham (W)

231. Solid-State Devices. (4)
Two 11/2-hour lectures per week. Prerequisite: course 121; Physics 127A-127B or Physics 115. The fundamental principles of solid-state device operation. Typical topics: a discussion of the implications of the Bloch-wave representation for electrons and of the Boltzmann transport equation to device behavior and design. Devices usually considered are junction and metal-semiconductor diodes; bipolar and field-effect transistors; thermoelectric elements; electromechanical transducers and masers and lasers.
Mr. Wang (Sp)

236A–236B. Quantum and Optical Electronics. (3–3)
Three hours of lecture per week. Prerequisite: course 117A–117B, Physics 115 or equivalent. The laser principle; analysis of various laser systems such as gas lasers, ion lasers and solid-state lasers of the ruby type; laser dynamics; optical resonators and transmission systems; selected applications of coherent optics.
Mr. Schwarz (W)

237. Quantum Electronics of Solids. (4)
Three hours of lecture per week. Prerequisite: course 117B, course 136 or equivalent, Physics 115 or equivalent. Optical properties of solids; electro-optic and magneto-optic effects; second-harmonic generation and parametric amplification; diffraction of laser beams by acoustic and spin waves; energy-band structure and optical properties of semiconductors; semiconductor lasers; crystal symmetry and application of group-theoretical considerations.
Mr. Wang (F)

240A–240B. Nonlinear Active Circuits. (3–3)
Two 1 1/2-hour lectures per week. Prerequisite: course 119 and 140. 240A is prerequisite to 240B. Limiting and optimum performance of nonlinear, discrete-state circuits, piece-wise linear techniques, device modeling; oscillators, basic theory and mechanisms, nonlinear solutions and evaluations; general theory of nonlinear and time-varying circuits, nonlinear feedback theory, state equations, generalized Manley-Rowe relations.
Mr. Pederson (F)

241. Linear Integrated Circuits. (3)
Three hours of lecture per week. Prerequisite: courses 123 and 141. Circuit element and active device properties and constraints in linear integrated circuits. New design and synthesis procedures to achieve prescribed performance. Limiting and optimum bounds of performance of lowpass amplifiers, frequency selective and frequency translation circuits.
Mr. Pederson (Sp)

242. Linear Active Networks. (3)
Three hours of lecture per week. Prerequisite: course 223. Fundamental properties of linear active circuits, passivity, activity, oscillation, gain-bandwidth limitations and optimum matching, negative impedance, parametric and feedback amplifiers.
Mr. Frisch (Sp)

251A–251B. Digital Systems Engineering. (3–3)
Two 1 1/2-hour lectures per week. Prerequisite: course 151A–151B. The design of digital equipment including engineering considerations of components, logical circuits, memories, and peripheral equipment. Analysis of problems in reliability and signal propagation. Design automation and the use of computers as design tools.
Mr. Graham, Mr. Morton (F)

252. Digital Computer Systems. (4)
Two 1 1/2-hour lectures per week. Prerequisite: course 132. The organization and logical design of digital data processing and control systems. Convolutional stored-program computers, highly parallel modular computers, digital differential analyzers. Computers for computation, information processing, and control.
Mr. Graham, Mr. Firtle (F, Sp)

Two 1 1/2-hour lectures per week. Prerequisite: courses 132 and 153. Analysis and synthesis of programming languages and computer operating systems. Syntax and semantics of programming languages. The use of procedures, iteration, replication, and recursion. List processing techniques. Monitor and executive systems. The special problems of multiprogram and real-time systems.
Mr. Lampson, Mr. Maurer (F, W)

260A. Introduction to the Theory of Signals and Noise. (3)
Three hours of lecture per week. Prerequisite: course 119 or 124; Statistics 134 or 200A. Second-order stochastic processes. Correlation and linear operations. Wide-sense stationarity and its implications. Representation: spectral, Karhunen-Loeve, etc. Prediction and filtering.
Mr. Turin, Mr. Sakrison (W)

260B. Stochastic Processes in Electrical Engineering. (3)
Three hours of lecture per week. Prerequisite: course 132 and 153. Analysis and synthesis of programming languages and computer operating systems. Syntax and semantics of programming languages. The use of procedures, iteration, replication, and recursion. List processing techniques. Monitor and executive systems. The special problems of multiprogram and real-time systems.
Mr. Lampson, Mr. Maurer (F, W)

261. Digital Communication Theory. (3)
Three hours of lecture per week. Prerequisite: course 260A. Statistical decision formulation of digital communication and radar detection. Bayes nonsequential and sequential decision rules; Neyman-Pearson and sequential probability ratio tests. Digital communication through the Gaussian channel; optimum receiver structure and signal design, channel capacity. Radar detection.
Mr. Turin, Mr. Sakrison (W)

262. Communication Theory. (3)
Three hours of lecture per week. Prerequisite: course 260B. Statistical decision formulation of analog communication and radar estimation. Bayes and maximum-likelihood estimation. Radar ranging and signal design. Geometric interpretation of parameter
modulation. Analog communication through the Gaussian channel; optimum demodulation, comparison of performance with the rate-distortion bound. Mr. Sakrison, Mr. Turin (Sp)

263. Switching and Automata Theory. (4)

Three 1-hour lectures per week. Prerequisite: course 163. Unified treatment of finite-state systems. Decomposition theory, group invariance, reliability, and state assignment. Other models of automata with applications to coding and languages. Probabilistic automata. Mr. Gill, Mr. Harrison (W)

264. Linear Sequential Circuits. (3)

Three 1-hour lectures per week. Prerequisite: content of instructor. Analysis and synthesis of linear modular sequential circuits. Applications in counting, error-correction and detection, and generation of pseudo random sequences. Mr. Gill, Mr. Harrison (Sp)

265A–265B. Information Theory. (3–3)

Two 1½-hour lectures per week. Prerequisite: Statistics 134 or 200A.

265A. Coding for reliable transmission over discrete and Gaussian channels with noise; channel capacity. Introduction to error-correcting codes.

265B. Prerequisite: 265A. Analysis of the probability of error obtainable with optimum encoding. Topics such as decoding methods, channels with input constraints, feedback, unknown parameters, memory. (Mr. Thomasian (F))

266. Error Correcting Codes. (3)

Two 1½-hour lectures per week. Prerequisite: course 265A and Math 113A–113B. Galois fields, group codes, cyclic codes, convolution codes. Bose-Chaudhuri codes, constructive techniques for generating convolution codes. Burst-correcting codes. Survey of recent approaches to the decoding problem. Relationship to topics in the design of experiments. Mr. Gill, Thomasian (Sp)

267. Theory of Formal Languages. (3)

Two 1½-hour lectures per week. Prerequisite: course 265A and Math 113A–113B. Models of formal languages relevant to programming and natural languages. Relation between language and grammar. Finite state languages, pushdown automata, context sensitive languages, and linear bounded automata. Other languages obtained from various types of automata. Mr. Haines, Harrison (W)

270A–270B–270C. Plasmas. (3–3–3)

Two 1½-hour lectures per week. Prerequisite: course 117A–117B or Physics 110A–110B. 270A is prerequisite to 270B, and 270B to 270C. Theory and applications of plasmas including particle orbit theory, oscillations and waves, radiation, stability and containment, diffusion, and plasma diagnostics; analysis of various controlled fusion experiments. Mr. Birdaall, Mr. Lieberman (F)

290. Advanced Graduate Study in Electrical Engineering.

Current and advanced topics in electrical engineering, primarily for advanced graduate students. Mr. Bergen, Mr. Desor, Mr. Frisch, Mr. Gill, Mr. Kuh, Mr. Thomasian, Mr. Varyaya, Mr. Zadeh (Sp)


290C. Advanced Circuit Theory. (1–3) One to three hours of lecture per week. Prerequisite: course 225 and 227A. Application of the techniques of dynamic optimization and the digital computer to practical design problems which arise in conjunction with time, variable, and non-linear circuit structures. Applications in electronics. Mr. VanDuzer (W, Sp)

290D. System Stability. (3) Three hours of lecture per week. Prerequisite: course 229B. Selected topics in stability theory: frequency domain conditions; Lyapunov theory; methods of functional analysis. Mr. Desor (W)

290E. Operating Systems for Digital Computers. (4) Three hours of lecture per week. Prerequisite: course 153 and permission of the instructor; 253 is recommended. Design and implementation of systems which provide a framework for the application of computer hardware to control problems. Batch-processing monitors, multi-programming systems, real-time sharing systems and real-time systems. Mr. Lampson (Sp)

290F. Boundary Value Problems in Electromagnetic Theory. (3) Three hours of lecture per week. Prerequisites: courses 210A–210B–210C.

Mr. Mei (F)

290H. Integrated Electronic Circuits. (4) Four hours of lecture per week. Prerequisites: courses 140 and 141. Fabrication- and circuit-related aspects of integrated circuit design are discussed. Topics include processing and layout, components and parasitics, logic circuits and arrays, biasing, thermal and power considerations, and frequency selective circuits. Mr. Howard (W)

290I. Topics in the Theory of Random Processes and Communication. (2) Three hours of lecture per week. Prerequisite: course 280A.

Mr. Howard (W)

290J. System Models for Animal Behavior. (3) Three hours of lecture per week. Prerequisite: Mathematics 22 or course 110A or consent of instructor. Applications of engineering analysis techniques to orientation, navigation, communication and other basic types of animal behavior; discussions of hypothetical systems that may underlie each type of behavior; special emphasis on properties of receptors, neural elements, and muscles. Mr. Lewis (W)


290L. Theoretical Cryogenic Electronics. (3) Three hours lecture per week. Prerequisite: course 130 and Physics 115 or equivalent. Recommended; course 290K. Theoretical considerations of cryogenic electronics. BCS theory and Cooper pairs. Many-body formulation of fermion and boson systems. Comparison with the treatments
adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

Industrial Engineering and Operations Research

Upper Division Courses

120. Principles of Engineering Economy. (4)
Three 1½-hour meetings per week. Prerequisite: upper division standing in engineering. Economic analysis for engineering decision-making; economies of the firm; capital sources and their effects: economy study models; alternative, replacement and future-demand investments; risk and uncertainty; income-tax effects; computer and linear programming techniques.

Mr. DeGarmo, Mr. Lapsley, Mr. Keachie (F, W, Sp, Su)

150. Production Systems Analysis. (4)
Two 1½-hour lectures and one 2-hour problem session per week. Prerequisite: course 160. Operations analysis of integrated production systems; use of operating models and quantitative methods of operations research.

The Staff (F)

153. Analysis and Design for Automated Manufacturing. (4)
Two 1½-hour lectures and one 2-hour problem session per week. Prerequisite: course 150. Technical and economic analysis of automated systems. Design of product, selection of materials and equipment for integrated systems. Numerical control of machines, programming and use of computers.

Mr. Grassi (W)

154. Industrial Data Processing Systems. (4)
Two 1½-hour lectures and one 1-hour laboratory session per week. Prerequisite: course 160. Introduction to data acquisition, storage, retrieval, and processing of information pertinent to the design, analysis, and operation of industrial systems. Students will elect a term project for development and evaluation as a data processing application; IBM 7094 computer time available. Mr. Lapsley (F, Sp)

160. Introduction to Operations Research. (4)
Two 1½-hour lectures and two 1-hour problem sessions per week. Prerequisite: Statistics 100A, 133, or 134. Formulation of mathematical models and the determination of optimal policies for inventory, production, replacement and allocation systems.

The Staff (Su, W, Sp)

162. Linear Programming. (5)
Three 1-hour lectures, and one 2-hour problem session per week. Prerequisite: upper division standing. An introduction to linear programming with emphasis on formulation, the simplex method, duality theory, post-optimization problems, and applications to industrial systems.

The Staff (Su, F, Sp)
164. Introduction to Inventory Theory. (3)
Two 1-hour lectures and one 1-hour problem session per week. Prerequisite: Statistics 100A, 133 or 134. An introduction to deterministic and stochastic models of inventory, with emphasis on computation, interpretation, and application of steady-state results.
Mr. Shephard (Sp)

167. Introduction to Queueing Theory. (4)
Two 1/2-hour lectures and one 1-hour discussion per week. Prerequisite: One of Statistics 133, 134, or 100A. Definition and connection between delay, number in the system, and the busy period. The Poisson process and Inter-event times. Steady-state solution of simple queues. The M/G/1 queue. Cost models and optimization. Elementary priority rules. Applications to inventory control, machine repair and traffic.
The Staff (F, W, Sp)

170. Introduction to Human Performance Mechanisms. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: upper division standing. Introduction to the study of man as a component in engineering and industrial systems. An outline of the main anatomical, physiological, psychological, and social performance mechanisms, their quantitative properties and limitations. Laboratory experiments on analytic and measurement techniques.
Mr. Crossman (F)

172. Work Systems Design and Measurement. (4)
Two 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: course 170. Statistics 100C or 135B (may be taken concurrently). Introduction to methods of analysis, design and measurement of work systems. Physical organization and human components; productivity improvement; work measurement and performance standards, control and administration of work systems. Laboratory exercises on analytic and measurement techniques.
The Staff (Sp)

174. Introduction to Human Factors Design. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 170. Mechanical Engineering 164A (may be taken concurrently). Introduction to design of manned systems using scientific data and models of human performance. Interface design for control and communication; Assignment of functions between man and machines; system performance measurement; effects of environment. Computer simulation methods. Design projects.
Mr. Crossman (Sp)

176. Work, Incentives, and Organization. (4)
Two 2-hour lectures per week. Prerequisite: upper division standing. Theory, design, and control of jobs and organizations; monetary and other types of incentives. Evaluation fundamentals; job and merit rating. Influence of technology and human factors.
Mr. Keachie (F)

180. Synthesis and Design of Industrial Systems. (4)
Two 2-hour laboratories per week. Prerequisite: course 150 and one of course 162, 163, or Mechanical Engineering 102A. Application of systems analysis and industrial engineering to the analysis, planning, and/or design of industrial or governmental systems. Consideration of technical and economic aspects of equipment and process design. Students work in teams under faculty supervision. Topics vary yearly.
The Staff (Sp)

198. Directed Group Study for Undergraduates. (1-5)
Meetings to be arranged. Prerequisite: varies with topic. Group studies of selected topics which vary from year to year.
The Staff (F, W, Sp)

199. Individual Study and Research for Advanced Undergraduates. (1-5)
Enrollment is limited to students who have demonstrated by achievement of a B average that they have a capacity for independent work. Special prerequisites will be established by the instructor guiding the study.
The Staff (F, W, Sp)

Graduate Courses

220. Theory of Production. (4)
Two 2-hour lectures per week. Prerequisite: Mathematics 104A. General theory of cost and production functions with application to production planning problems. Optimization of production expansion and other production planning problems.
Mr. Shephard (F)

240. Policy-Level Problems in Industrial Engineering. (4)
Two 2-hour meetings per week. Prerequisite: graduate standing. Past and current factors which influence policy-level problems and decisions in industrial engineering practice. Case studies arising from, and currently affecting industrial engineering practice.
Mr. DeGarmo, Mr. Keachie (F, Sp)

249. Industrial Development. (4)
Two 2-hour meetings per week. Prerequisite: graduate standing. Industrial engineering in industries at various stages of technological and economic growth. Productivity analysis and comparisons. Implications for optimum development of specific industries in particular countries or areas; related technical assistance programs.
Mr. Keachie (W)

251. Production Systems and Facilities. (4)
Two 1/2-hour lectures and one 1-hour laboratory per week. Prerequisite: course 162 or 167. Advanced study of topics related to production system analysis, design, operation and control with emphasis on model construction and the use of computers.
The Staff (W)

254. Process Planning and Scheduling. (4)
Two 2-hour lectures per week. Prerequisite: course 162, Statistics 135B. Mathematical and computer methods for planning, scheduling and control of production and service systems; statistical techniques in forecasting; optimization of facilities utilization.
Mr. Clasey (Sp)

262. Mathematical Programming. (5)
Two 1/2-hour lectures and one 2-hour problem session per week. Prerequisite: Mathematics 111. Basic graduate course in mathematical programming. The simplex method and its variants. Duality theory. Theorems of alternatives and Kuhn-Tucker theory. Pivotal theories of Lemke-Howson and Dantzig-Cottle. Decomposition theorems. Quadratic programming and parametric programming.
The Staff (F, Sp)

263. Applied Stochastic Processes. (4)
Two 1/2-hour lectures and one 1-hour discussion per week. Prerequisite: advanced calculus or Mathe-
Two 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: course 170, Mechanical Engineering 134A, Statistics 130C. Methods of analyzing existing and proposed man-machine systems and principles of synthesis. Design projects which include field work will be undertaken. Mr. Crossman (Sp)

290A. Nonlinear Programming Theory. (3)
One 2-hour lecture per week. Prerequisite: course 262. Convex sets, separation theorems, convex functions, convex and nonconvex programming, optimality criteria, constraint qualification, Fritz John conditions, duality, quasi-convex functions, pseudoconvex functions, optimality criteria in the presence of equalities and inequalities, maximum principles in mathematical programming. The Staff (F)

290E. Large Scale Programming. (3)
Three hours of lectures per week. Prerequisite: course 262. Techniques for solving large mathematical programs with special structures. Partition and decomposition algorithms. Applications to transportation, assignment, and generalized distribution problems as well as convex programming and linear optimal control theory. Mr. Van Slyke (W)

290O. Nonlinear Programming Algorithms. (3)
One 2-hour lecture per week. Prerequisite: course 262 or 290A or Electrical Engineering 220. Survey of various algorithms of nonlinear programming: Frank-Wolfe, Zoutendijk feasible direction, Rosen gradient projection, Kelley cutting plane, Griffith-Stewart approximation programming, Fiacco-McCormick penalty function, Huard method of centers, Abadie reduced gradient, and other promising algorithms. Mr. Mangasarian (Sp)

290-1. Statistical Theory of Reliability and Life Testing. (3)
Two 1½-hour lectures per week. Prerequisite: course 265, Statistics 200C. Exponential life testing procedures; robustness against monotone failure rate alternatives. Tests for monotone failure rate. Non-parametric maximum likelihood estimation. Conservative tolerance limits. Reliability growth, system debugging, and accelerated life testing models. Mr. Barlow (Sp)

298. Group Studies, Seminars, or Group Research. (1-8)
Meetings to be arranged. Prerequisite: varies with topic and instructor. Advanced seminars in industrial engineering and operations research. Topics include integer programming, stochastic processes, combinatorics, Markov-renewal programming; dynamic programming and the calculus of variations, graph theory, man-machine systems, plant location, and others. Topics vary from year to year. The Staff (Su, F, W, Sp)

299. Individual Study or Research. (1-12)
Conferences to be arranged. Individual investigation of advanced industrial engineering problems. The Staff (Su, F, W, Sp)

601. Individual Study for Master's Students. (1-8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)
102. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major advisor, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

Mechanical Engineering

Lower Division Course

1029. Conceptual Design. (4)

Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Engineering 28 and Mathematics 2B. Development of the creative art of conceiving an engineering objective; recognition of the problem; collection of pertinent data; conceptual design sketches; selection of possible solutions; analysis of concepts; preliminary proposals; evaluation; presentation of final proposal.

Upper Division Courses

1101. Manufacturing Processes. (3)

Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 104B and 101. Application of principles of mechanics, material science and manufacturing processes to the design of components and complete machines which must meet prescribed functional requirements. Selection of materials, forming and joining methods based on design requirements.

The Staff (Mr. Hauser in charge) (F, Sp)

102B. Mirror Design—II. (3)

Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 102A. Continuation of course 102A. Design of complex machine components. Use of numerical control in tool and fixture design. The manufacture and design of nonmetallic machine parts. Synthesis and analysis of a major machine design project.

The Staff (Mr. Hsu in charge) (F, Sp)

103. Dynamics. (4)

Three 1-hour lectures and one 1-hour recitation period per week. Prerequisite: Physics 4A and Mathematics 12B. Newtonian mechanics, Principles of dynamics of particles, systems of particles, and rigid bodies, with applications especially to one-dimensional and two-dimensional problems.

The Staff (Mr. Hsu in charge) (W)

104A. Engineering Mechanics—II. (4)

Three 1-hour lectures and one 1-hour recitation period per week. Prerequisite: Engineering 36. A vectorial treatment of the Newtonian principles of dynamics of particles or particles and systems of particles, with applications to one-dimensional and two-dimensional motions. Two-dimensional dynamics of rigid bodies. Methods of impulse and momentum, work and energy. The Staff (Mr. Carroll in charge) (F, Sp)

104B. Engineering Mechanics—III. (4)

Three 1-hour lectures and one 1-hour recitation period per week. Prerequisite: course 104A. Three dimensional kinematics and dynamics of rigid bodies. Moments and products of inertia; kinetic energy and angular momentum. Applications to three-dimensional motion of particles and rigid bodies. Elements of the theory of the mechanical vibrations.

The Staff (Mr. Goldsmith in charge) (Su, W)

105A. Macroscopic Thermodynamics. (4)

Three 1-hour lectures, one 1-hour discussion period per week. Prerequisite: Physics 4E, Mathematics 3C. Credit will not be given for both Mechanical Engineering 105 and 112. First and second laws of thermodynamics; equilibrium properties; reversibility; availability; relations between thermodynamic properties; energy conversion systems.

The Staff (Mr. Tien in charge) (Su, F, Sp)

105B. Introductory Fluid Mechanics. (5)

Three 1½-hour lectures per week. Prerequisite: course 105A; course 104A or 103. An introduction to theoretical and experimental fluid mechanics, with demonstrations and applications of particular interest to mechanical engineers.

The Staff (Mr. Laird in charge) (Su, W)

105C. Thermal Systems. (5)

Four 1-hour lectures including demonstrations per week. Prerequisite: course 105B. Cycles for power generation and refrigeration cryogenics; combustion and reactive systems; irreversible thermodynamics; introduction to heat transfer.

The Staff (Mr. Tien in charge) (F, Sp)

106. Mechanical Engineering Systems Design. (4)

One 3-hour lecture per week. Prerequisite: course 107A, 102B. The course is intended to introduce concepts of mechanical engineering system design by having students complete preliminary designs of a realistic mechanical engineering system and by design seminars and conferences.

The Staff (Mr. Laird in charge) (F, Sp)

107A–107B–107C. Mechanical Engineering Laboratory. (3–3–3)

Two 1-hour discussion periods, one 3-hour laboratory per week. Prerequisite: course 105C, 104B; 107A is prerequisite to 107B and 107C. Experimental investigation and analysis of the steady-state and transient behavior of mechanical engineering systems and of their thermal and dynamic processes.

The Staff (Mr. Greif in charge) (107A (F, Sp); 107B (Su, W); 107C (F, Sp)

111. Elements of Thermodynamics and Heat Transfer. (3)

Three 1-hour lectures per week. Prerequisite: Mathematics 2C, Physics 4E, Civil Engineering 165A (not open to students in Mechanical Engineering). Principles of thermodynamic properties and relations; applications of the first and second laws; elements of heat transfer.

Mr. Cornet (W)

112. Introduction to Statistical Thermodynamics—I. (4)

Three 1-hour lectures per week. Prerequisite: Physics 4E, Mathematics 2C (not open to students in mechanical engineering). Credit will not be given for both Mechanical Engineering 112 and Mechanical Engineering 125 or for both Mechanical Engineering 105A and Mechanical Engineering 112.
115. Methods of Linear Algebra. (3)
Three 1-hour lectures per week. Prerequisite: Mathematics 2C. Methods of classical theoretical analysis; application of linear algebra theory to engineering systems. Mr. Carroll, Mr. Naghdí (F, Sp)

116. Application of Complex Variables. (3)
Three 1-hour lectures per week. Prerequisite: Mathematics 2C. Methods of theoretical engineering analysis; application of complex variable theory to the design and analysis of engineering systems. Mr. Laitone, Mr. Holt (F, W)

117. Methods of Engineering Analysis. (3)
Three 1-hour lectures per week. Prerequisite: Mathematics 2C. Methods of theoretical engineering analysis; techniques for analyzing partial differential equations and the use of special functions related to engineering systems. Mr. Schaaf, Mr. Tien, (W, Sp)

121. Plasticity and Metal Forming. (4)
Four 1-hour lectures per week. Prerequisite: Civil Engineering 130. The theory of plasticity and the forming of metals. Mr. Thomsen (W)

122. Material Processing Laboratory. (1)
One 3-hour laboratory per week. Prerequisite: course 121 (may be taken concurrently). Experimental investigation and analysis of plastic deformation in metal forming processes. Laboratory part of ME 121. The laboratory will consist of experimental investigations and analysis of metal forming and cutting problems. The experiments will include such commercial processes as metal cutting, extrusion, forging, spinning, drawing, machine tool vibrations, etc. Mr. Kobayashi (W)

123. Designing for Weldments and Castings. (3)
Three 1-hour lectures per week. Prerequisite: Engineering 45. An analytical survey of the basic factors that must be considered from a materials and fabrication standpoint when utilizing weldments or castings. Selection of materials and fabrication problems, service properties and reliability. Mr. Hazlett (Sp)

124. Molten Metals Laboratory. (1)
One 3-hour laboratory per week. Prerequisite: course 123 (may be taken concurrently). A laboratory course designed to demonstrate application of the principles of welding and casting. Fundamentals of the various processes will be investigated and their application to engineering design illustrated. Mr. Hazlett (Sp)

125. An Introduction to the Mechanical Behavior of Materials. (3)
Two 1½-hour lectures per week. Prerequisite: Civil Engineering 130. Introduction to brittle, ductile, and transitional fracture, fatigue, creep, and wear with emphasis on the development of design criteria for various conditions of load and environment. Mr. Finnie (Su, W)

127. Advanced Methods in Mechanical Design. (3)
Three 1-hour lectures per week. Prerequisite: course 102B. Application of engineering principles to the synthesis and analysis of complete machines. Conceptual aspects of designs to fulfill economic, environmental, and functional requirements. Use of theoretical and semilempirical techniques in machine analysis. Introduction to optimization and reliability considerations. Mr. Frisch (Sp)

129. Applied Stress Analysis. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Civil Engineering 130. Mathematics 2C or 12B. Solution of practical stress analysis problems related to the design of static and dynamic machine elements. Classical theoretical solutions and various experimental techniques will be brought to bear on real problems. Mr. Cunningham (W)

131. Kinematics of Mechanism. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 103 or 104A. Advanced kinematic analysis and synthesis of typical elements of mechanism. Velocity and acceleration analysis of linkages, gearing, and cams. Mr. Radcliffe (F)

132A. Mechanical Vibrations. (3)
Three 1-hour lectures per week. Prerequisite: course 105 or 104A. An introduction to the theory of mechanical vibrations including the topics of harmonic motion, Rayleigh's principle, damping, mechanical resonance, transient and random excitation. Mr. Steidel (F, Sp)

132B. Dynamics of Machinery. (3)
Three 1-hour lectures per week. Prerequisite: course 132A. Kinematic and dynamic analysis of rigid body mechanism using graphical and analytical computer methods. Dynamics of cam driven systems. Dynamics of rotating systems. Balancing of rotors. Dynamic response of rigid body systems. Design applications. Mr. Radcliffe (W)

134. Automatic Control Systems. (4)
(Formerly 134A)
Two 1½-hour and one 1-hour lecture per week. Prerequisite: Mathematics 2C; Physics 4E. Formulation of dynamic systems in state space. Linearization. Graphical representation. Causality, realizability, feedback control systems and stability. Design and analysis in the Laplace, Fourier, and time domains. Examples from mechanical and chemical engineering. Mr. Thal-Larsen, Mr. Takahashi, Mr. Auslander, Mr. Donaldson (F, W)

135. Control Instrumentation and Switching Logic. (3)
(Formerly 134B)
Three 1-hour lectures per week. Prerequisite: Mathematics 2C; Physics 4E. Configurations and functional descriptions of instruments for measurement and control. Static and dynamic behavior. Noise and noise filtering. Fluidic and electronic devices for analog and logic information handling. OR, AND, NOR, and NAND logic elements. Introduction to design and analysis of switching control systems. Mr. Thal-Larsen, Mr. Takahashi, Mr. Auslander (W, Sp)

137. Controls Laboratory. (1)
(formerly 135)
One 4-hour laboratory period per week. Prerequisite: course 134. Studies of control-loop components, switching and digital control. Mr. Takahashi (W, Sp)
41. Refrigeration and Cryogenics. (4)
Three 1-hour lectures per week and one discussion section. Prerequisite: course 105C. Thermodynamics of producing low temperature fluids and their application in system design.
Mr. Hutchinson (W)

42. Air Conditioning Systems. (4)
Three 1-hour lectures, one discussion section per week. Prerequisite: course 105C. Production of atmospheric and thermal environments for human habitation; special systems for space and underwater application.
Mr. Hutchinson (Sp)

43. Energy Conversion Principles. (3)
Three 1-hour lectures per week. Prerequisite: course 105C. Principles of thermochemistry, energy conversion, systems and machinery, including applications to power plants, combustion engines, thermoelectric devices, fuel cells, and nuclear reactors.
Mr. Farbar, Mr. Sawyer, Mr. Trezek (F)

44. Intermittent Combustion Engine Principles. (3)
Three 1-hour lectures per week. Prerequisite: course 105C. Fundamentals and applications to batch process engines of thermodynamic and transport processes, and performance of the systems.
Mr. Starkman (W)

45. Continuous Combustion Engines. (4)
Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 105C. Fundamentals and applications to continuous process engines of thermodynamic, fluid mechanics and transport process phenomena and analysis system performance. Jet propulsion applications of gas turbines, ram jets and rockets.
Mr. Starkman, Mr. Sawyer (Sp)

148A. Petroleum Development Engineering. (4)
Three 1-hour lectures per week. Prerequisite: senior in engineering. Mechanics of rock breakage; rock drilling mechanics; circulation hydraulics; zonal evaluation; well completion; completion analysis.
Mr. Somerton (F)

148B. Petroleum Reservoir Engineering. (4)
Three 1-hour lectures per week. Prerequisite: senior in engineering. Flow through porous media (Darcy's law); capillary behavior; multiphase flow; fluid displacement processes-miscible-immiscible; transient flow behavior.
Mr. Fatt (W)

148C. Petroleum Engineering Design. (4)
Three 1-hour lectures per week. Prerequisite: senior in engineering. Compressible flow of real gases; high pressure lines, meters and compressors; multiphase flow systems-gas lift design; movement of solids by fluids-design consideration; non-Newtonian flow; dynamics of fluid lifting systems.
Mr. Somerton (Sp)

151. Heat Transfer. (4)
Three 1-hour lectures, one 1-hour discussion period per week. Prerequisite: course 105C. Basic principles of heat transfer and their application; subject areas include steady-state and transient system analysis for conduction, free and forced convection, boiling, condensation, and thermal radiation.
Mr. Greif, Mr. Johnson (F, Sp)

155. Statistical Thermodynamics. (4)
Three hours of lecture per week. Prerequisite: course 105A. Credit will not be given for both Mechanical Engineering 112 and 155. Classical and quantum mechanical descriptions of substances and evaluation of thermodynamic properties of gases, liquids and solids. Elementary kinetic theory of gases and evaluation of transport coefficients.
Mr. Trezek (F, W)

157. Mass Transfer Processes. (4)
Three 1-hour lectures, one 1-hour discussion period per week. Prerequisite: course 105C. Molecular diffusion and mass transfer processes in fluids in turbulent flow. Application of theory to industrial processes such as evaporation, evaporative cooling, gas absorption, distillation and ablation.
Mr. Spiegler (Sp)

158. Fluid Machinery. (4)
Three 1-hour class meetings per week. Prerequisite: course 105C and 104B. Pumps, turbo-compressors, hydraulic and gas turbines. Analysis of fluid machinery performance with emphasis on the applications to fluid systems.
Mr. Iversen (Sp)

159. Viscous Flow. (4)
Three 1-hour lectures per week. Prerequisite: course 105B, Mathematics 2C. Theoretical and empirical bases of laminar and turbulent flows.
Mr. Salant, Mr. Sherman (F, W)

161A. Gas Dynamics. (3)
Three 1-hour lectures per week. Prerequisite: course 104B and 105B. Dynamics and thermodynamics of compressible fluid flow. Application to flow in ducts and nozzles.
Mr. Oppenheim, Mr. Talbot (F, Sp)

161B. Jet Propulsion. (3)
Three 1-hour lectures per week. Prerequisite: course 104B. Application of gas dynamics and thermochromy to the analysis of various jet propulsion systems for aircraft and rockets.
Mr. Oppenheim (W)

162. Elementary Hydrodynamics. (4)
Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: Mathematics 2C; course 116 recommended. Kinematics and dynamics of inviscid, primarily incompressible, fluid flow.
Mr. Laird, Mr. Talbot (F, W)

164. Engineering Aero- and Hydrodynamics. (3)
Three 1-hour lectures per week. Prerequisite: course 104B and 105B; course 117 recommended. Calculation of the forces and moments acting on various types of solid bodies moving either through the atmosphere, or under water, in order to be able to evaluate the power required, the stability, and the control forces for various maneuvers.
Mr. Laitone (Sp)

172A. Application of Analog Computers. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Mathematics 2C. Introductory course on application of analog computers to engineering problems. Simulation of systems described by ordinary linear and nonlinear differential equations with necessary amplitude and time scaling. Applications in vibration studies, operations research, control systems, solution of partial differential equations, hybrid computers. Use of electronic analog computer in computer laboratory.
Mr. Atkinson (F)

Three 1-hour lectures and one 3-hour laboratory period per week. Prerequisite: Mathematics 2C. Application of digital computers to solution of engineering problems. Solution, by compiler languages, of linear algebraic equations, polynomials, ordinary and partial differential equations. Assembly programs, machine languages for error analysis of computer programs. Digital computer time available for course work.

Mr. Atkinson (W)

173. Fundamentals of Acoustics. (3)


174. Acoustical Environment Control. (3)

Two 1-hour lectures per week and one 3-hour laboratory. Prerequisite: course 104A or 103, or Architecture 151. Principles of sound generation and propagation. Reverberation and diffusion. Design criteria for sound control. Prediction of noise environments, annoyance, communication interference, and effects on man. Interrelationships between noise and vibration. Noise control in mechanical systems. Laboratory noise measurement and analysis.

Mr. Soroka (Sp)

175. Intermediate Dynamics. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 103 or 104B. Lagrangian mechanics. Theory of constraints, virtual displacement and velocities; generalized coordinates; Lagrangian function, Hamilton's principle and Lagrange's equations of motion, first integrals; engineering applications to constrained motion of particles and rigid bodies oscillations, gyrodynamics and electromechanical problems.

Mr. Leitmann, Mr. Rosenberg (F, Sp)

182. Theory of Elasticity. (3)

Three 1-hour lectures per week. Prerequisite: course 183. Fundamentals of the linear theory of elasticity (in three dimensions) and formulation of various types of boundary-value problems. Application to torsion, flexure and two-dimensional problems of plane strain, plane stress, generalized plane stress theory and other approximate methods. Analysis of the mechanics of general forming problems; application of the theory of plasticity, including slip-line theory to the solution of selected forming problems; effect of deformation on structure; forming limits; forming defects.

Mr. Hauser (Sp)

199. Individual Study and Research for Advanced Undergraduates. (1-5)

Enrollment is limited to students who have demonstrated by achievement of a B average that they have a capacity for independent work. Special pre-requisites will be established by the instructor guiding the work.

The Staff (Mr. Starkman for Thermal Systems; Mr. Frisch for Mechanical Design; Mr. Naghdi for Applied Mechanics; Mr. Laitone for Aeronautical Sciences) (Su, F, W, Sp)

220. Case Studies in Mechanical Engineering. (2)

Two hours of lecture per week. Prerequisite: course 225A or 234A, or 227 concurrently. Studies of selected problems which illustrate various methods of the design process in advanced mechanical engineering systems.

Mr. Steidel (W)

221. Advanced Metal Cutting. (4)

Two 2-hour lectures per week. Prerequisite: course 151 (may be taken concurrently). Metal cutting theories, heat transfer and temperature distribution in cutting zone, tool chatter, tool wear, and problems in machining economics.

Mr. Thomsen (F)

222. Advanced Metal Forming. (4)

Two 2-hour lectures per week. Prerequisite: course 121. Solution of forming problems using slip-line theory and other approximate methods. Analysis of the mechanics of general forming problems; application of the theory of plasticity, including slip-line theory to the solution of selected forming problems; effect of deformation on structure; forming limits; forming defects.

Mr. Thomsen (Sp)

$225A. Mechanical Behavior of Engineering Materials. (3)

Three 1-hour lectures per week. Principles governing structure and mechanical behavior of materials with application to elasticity, plasticity, creep fatigue, and fracture. Application of theoretically and experimentally determined material properties for quantitative prediction of service performance.

Mr. Hauser (F, W)

$225B. Mechanical Behavior of Engineering Materials. (3)

Three 1-hour lectures per week. Advanced treatment of plastic deformation, fatigue, creep, and fracture. Case studies to illustrate the application of these topics to design.

Mr. Finnie (F, Sp)

227. Optimal Design of Mechanical Elements. (3)

Three 1-hour lectures per week. Prerequisite: course 102A—102B, 127 or equivalent. Optimization of mechanical designs for normal and redundant specification showing relationships between optimizing and limiting design equations. Statistical considerations of failure theories and factor of safety. Probabilistic evaluation of manufacturing errors and reliable usage of materials. Use of reliability evaluation in analysis and synthesis of mechanical designs.

Mr. Frisch (W)

228. Bearings and Lubrication. (4)

Four 1-hour lectures per week. Prerequisite: course 105B. Fluid mechanics of thin films, Reynolds's equation. Analysis and design of liquid and gas film journal and thrust bearings for externally pressurized and self-acting operation. Introduction to boundary lubrication and rolling element bearings.

Mr. Donaldson (Sp)

§ Approved for one offering only, 1968–69.
29A. Experimental Mechanics I. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 129, 182 or 185 and 32A or 134A (two courses total). Expose of the basic experimental methods used in engineering mechanics. Analysis of measurement systems for static, steady state vibratory, and transient excitations including transducers for displacement, strain, velocity, acceleration, stress, and force, as well as the associated amplifiers and circuits.

Mr. Cunningham (F, Sp)

29B. Experimental Mechanics II. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 132A or 134A. Synthesis of measurement systems for dynamic problems in experimental mechanics, including transducer design, choice of circuitry and recording systems, choice of data processing equipment, including evaluation.

Mr. Cunningham (W)

31. Advanced Kinematics and Mechanism. (3)
Three 1-hour lectures per week. Prerequisite: course 131. Analysis and synthesis of plane and space mechanical systems. Continuation of variable methods in motion analysis. Advanced analytical and graphical techniques for the design of mechanism to guide a plane or point through multiple positions.

Mr. Radcliffe (W)

323A. Dynamic Systems and Control—I. (3)
Two 1½-hour lectures per week. Modeling of real systems as a set of static elements and integrators. Dynamic behavior, controllability, observability and stability of linear deterministic systems. Examples are chosen from mechanical and chemical engineering applications with emphasis on application of modern theory.

Mr. Takahashi (F)

323B. Dynamic Systems and Control II. (3)
Two 1½-hour lectures per week. Prerequisite: course 135 recommended. Design and analysis of single and multivariable feedback control systems in scalar and vector variable formulation for deterministic and stochastic signals. Integrated approach to conventional and modern control viewpoints. Application to mechanical and chemical engineering systems.

Mr. Takahashi (W)

323C. Dynamic Systems and Control III. (3)
Two 1½-hour lectures per week. Prerequisite: course 135 recommended. Design and analysis of direct digital control systems, nonlinear systems, adaptive and optimal control systems, with emphasis on realization by closed and open loop configurations in mechanical and chemical engineering.

Mr. Takahashi (Sp)

235. Switching Control (3)
Three 1-hour lectures per week. Design and analysis of control systems utilizing switching elements. Mechanical, fluidic, electric, electronic devices for logic operations in Boolean algebra. Coding and counting. Analog to digital and digital to analog conversion. Digital control of machine tools and other processes.

Mr. Thai-Larsen (W)

236. Control Systems Design. (3)
Three 1-hour lectures per week. Prerequisite: consent of instructor. Establishment of design criteria and performance constraints which lead to the synthesis of realizable system configurations. Optimization of dynamic performance based on suitable component selection.

Mr. Auslander (F)

237. Advanced Control Laboratory. (1)
One 3-hour laboratory per week. Prerequisite: course 134. Experimental methods in the analysis and synthesis of dynamic systems and controls. Application to mechanical, electromechanical, chemical and other systems. Investigations include electronic analog and digital simulation, direct digital control, fluidic and electronic switching logic.

Mr. Takahashi (F, W, Sp)

243. Valuation of Oil and Gas Producing Properties. (3)
Two 1½-hour lectures per week. Prerequisite: basic knowledge of economics. Physical and economic factors underlying the appraisal of oil and gas producing properties. Estimation and evaluation of oil and gas reserves. Profitability analysis, optimization of expenditures.

Mr. Somerton (F)

248A. Rock Mechanics. (3)
Two 1½-hour lectures per week. Prerequisite: basic geology and a course in mechanics of materials. Fundamentals of rock behavior, strength, failure theories, fracture; rock behavior under confining stress and pore pressure; thermal stresses, thermo-chemical behavior; applications to reservoir behavior, hydraulic fracturing, well simulation and rock drilling.

Mr. Somerton (W)

251. Heat Conduction. (3)
Three 1-hour lectures per week. Prerequisite: course 105B or 148B. Study of the detailed behavior of petroleum reservoirs using as a basis the thermodynamics and phase behavior of the fluids and the mechanics of multiphase flow through porous media.

Mr. Fatt (Sp)

252. Heat Convection. (4)
Three 1-hour lectures, one 1½-hour discussion per week. Prerequisite: course 151, 159 or 162; Engineering 230A. The transport of heat in fluids in motion; free and forced convection in laminar and turbulent flow over surfaces and within ducts.

Mr. Seban, Mr. Spalding (W)

253. Thermal Radiation. (4)
Three 1-hour lectures per week. Prerequisite: course 151; Engineering 230A. Thermal radiation properties of gases, liquids and solids; the calculation of radiant energy transfer.

Mr. Tien (F)

254. Equilibrium Thermodynamics. (4)
Three 1-hour lectures per week. Prerequisite: course 155 or equivalent. Axiomatic formulation of classical thermodynamics. Statistical mechanics of pure substances and of mixtures.

Mr. Tien (W)

255. Thermodynamics of High Temperature Gases. (4)
Three 1-hour lecture, one 1½-hour discussion per week. Prerequisite: course 155. Ideal and non-ideal gases at high temperatures. Thermodynamics of dissociating and ionizing gases. Spectroscopic properties. High temperature systems.

Mr. Geir (Sp)
290B. Advanced Welding Metallurgy and Processes. (4)

Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 123 and 124. The fundamental factors important to the utilization of various welding processes will be reviewed in light of their effect on the properties of the metals being joined. Principles will be elucidated to permit the analysis of and probable consequences of using any new process or new alloy. Mr. Hazlett (W)

290C. Photoelasticity. (3)

Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 129 or equivalent. Two and three-dimensional photoelasticity, photoelastic coatings. Use of the conventional polariscope and a gas laser for scattered light photoelasticity. Mr. Brown (Sp)

290N. Corrosion. (4)


290 O. Boiling Heat Transfer. (3)

Three 1-hour lectures per week. Prerequisite: course 151 and Engineering 230A. Study of two phase flow bubble growth models and analysis methods in boiling heat transfer. Mr. Johnson (W)

290P. Cryogenic and Reverse Cycle Systems. (4)

Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: graduate standing. System design for cascade and other mechanical compression cycles used in producing low-temperature regions. Optimizing cryogenic system design and applications of cryogenic fluids. Mr. Hutchinson (Sp)

290Q. Psychrometric Systems Synthesis. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 116 or equivalent. Specialized techniques for transient psychrometric loads and cycles. Mr. Hutchinson (F)

290R. Introduction to Nonequilibrium Thermodynamics. (4)

Four hours of lecture per week. Prerequisite: course 155 or equivalent. General formulation of coupled transport phenomena. Detailed application to diffusion process, electrokinetic phenomena, thermoelctricity, membrane processes, thermal diffusion, and others. Mr. Spiegler (F)

290S. Advanced Natural Gas Engineering. (3)

Two 1½-hour lectures per week. Prerequisite: consent of instructor. Advanced problems in phase behavior of natural gas systems including water-hydrocarbon systems, vapor-liquid equilibria, steady and nonsteady state flow of gas, operation of gas fields, underground storage of natural gas. Mr. Witherspoon (Sp)

290T. Diffusional Transport in Reacting Liquid Systems. (4)

Prerequisite: Engineering 230 or equivalent course in partial differential equations. General formulation of the equations governing diffusion in liquid systems in which there is chemical or physical reaction. Application to engineering and bioengineering systems, includes diffusion in presence of instantaneous and noninstantaneous physical absorption and chemical reaction.

290U. Combustion. (4)

Four 1-hour lectures per week. Prerequisite: course 105G. Atomic and molecular structure, reaction rates, chemical equilibrium, flame temperatures, nonequilibrium phenomena, ignition limits, diffusion flames and droplet burning, premixed flames, spectral properties of flames, experimental techniques, combustors. Mr. Sawyer (Sp)

290V. Advanced Problems in Jet Propulsion. (3)

Four hours of lecture per week. Prerequisite: course 155 or equivalent. Topics in fluid mechanics, physics and chemistry of particular interest to jet propulsion systems. Mr. Starkman (F)

298. Group Studies, Seminars, or Group Research. (1-8)

Advanced studies in various subjects through special seminars on topics to be selected each year, informal group studies of special problems, group work in fluid mechanics, application to engineering and bioengineering systems, analysis of and probable consequences of using any new process or new alloy. Mr. Hazlett (W)

602. Individual Study for Doctoral Students. (1-8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mr. Frisch for Mechanical Design, Mr. Starkman for Thermal Systems) (Su, F, W, Sp)

AERONAUTICAL SCIENCES

261A—261B. Compressible Fluid Flow. (4-4)

Three 1-hour lectures per week. Prerequisite: Engineering 230A, Mechanical Engineering 161A or 162. 261A prerequisite for 261B. An introduction to the thermodynamics and dynamics of steady and unsteady compressible flow. Mr. Holt, Mr. Talbot, 261A (F, Sp); 261B (Su, W)

261C. Hypersonic Flow. (4)

Three 1-hour lectures per week. Prerequisite: course 261B. Dynamics of a gas at very high Mach numbers. Small disturbance theory using equivalence principle, Newtonian flow. Numerical methods. Viscous interactions. Bluntness effects. Mr. Sherman (Sp)

262. Theoretical Hydrodynamics. (4)

Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 162 and Engineering 230A. Development of the theoretical methods for solving some of the classical problems in hydrodynamics with emphasis on the applications to current research work in fluid mechanics. Mr. Laitone, Mr. Sherman (Sp)

293C. Advanced Metallurgy and Processes. (4)

Four 1-hour lectures per week. Prerequisite: course 230 or equivalent. Advanced studies in various subjects through special seminars on topics to be selected each year, informal group studies of special problems, group work in fluid mechanics, application to engineering and bioengineering systems, analysis of and probable consequences of using any new process or new alloy. Mr. Hazlett (W)
263A-263B. Viscous Fluid Flow. (4-4)


Mr. Sherman, Mr. Corcos, 263A (W, Sp); 263B (F)

264. Wing Theory. (4)

Three 1-hour lectures per week. Prerequisites: Engineering 230 and Mechanical Engineering 162. Incompressible airfoil theory for steady flow in two and three dimensions. Cavitation and noncavitating hydrofoils. Introduction to airfoils in compressible flow, and in unsteady motion. Mr. Berger (W)

265. Introduction to Rarefied Gas Dynamics. (4)

Three 1-hour lectures per week. Prerequisite: a graduate course in fluid mechanics or kinetic theory of gases. An introduction to rarefied gas dynamics, with emphasis on surface interactions, free-molecule flow, slip-flow and experimental results.

Mr. Willis (W)

266. High Temperature Gas Dynamics. (4)

Three 1-hour lectures per week. Prerequisites: courses 261G, 263B. Behavior of gas flows at unusually high temperatures, including effects of dissociation, ionization and vibrational relaxation. Calculation of nonequilibrium and equilibrium flow fields by linearized and numerical methods.

Mr. Holt, Mr. Talbot (W)

267. Magnetohydrodynamics. (4)

Three 1-hour lectures per week. Prerequisite: course 261A. The continuum theory of the interaction of conducting fluids and magnetic fields.

Mr. Berger (Sp)

268. Gas Dynamics of Reactive Fluids. (4)

Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 161A. Studies of processes involving mutual interaction between fluid-dynamic, chemico-kinetic, heat- and mass-transfer phenomena.

Mr. Oppenheim (F)

269. Experimental Methods of Aerodynamics. (4)

Three hours per week lecture and laboratory (approximately ½ each). The principles and techniques of physical measurement. Instrumentation resources and characteristics. Error sources and the design of experiments. Reduction of observations. Contemporary developments in experimental gas dynamics.

Mr. Hurlbut (F)

290A. Kinetic Theory of Transport Phenomena in Gases. (3)

Three 1-hour lectures per week. Prerequisite: a background in kinetic theory, transport phenomena, and statistical mechanics. The kinetic theory of quasi-equilibrium processes in homogeneous gases, plasmas, and mixtures. Intermolecular forces and transport properties.

Mr. Willis (Sp)

290B. Kinetic Theory of Transition Flow. (3)

Three 1-hour lectures per week. Prerequisite: course 265. The kinetic theory of dilute gases under conditions of extreme departure from equilibrium, with special application to aerodynamics of the transition-flow regime.

Mr. Hurlbut (Sp)

290C. Turbulence. (4)


Mr. Corcos (F)

290D. Upper Atmosphere Studies. (3)

Three 1-hour lectures per week. Study of the terrestrial upper atmosphere in its relation to problems or high altitude flight. Physical and chemical characteristics. Atmospheric models. Experimental methods.

Mr. Hurlbut (Sp)

290E. Gasdynamics of Explosions. (4)

Three 1-hour lectures per week. Prerequisite: course 268 or equivalent background in gasdynamics and physical chemistry. Theory of phenomena involving the interaction between rate processes that result in the deposition of a significant amount of specific power in a gaseous medium and its concomitant nonsteady motion, as exemplified by explosion processes.

Mr. Oppenheim (W)

290G. Aircraft Stability and Control. (3)

Three 1-hour lectures per week. Prerequisite: course 264 or 164; Engineering 230A. A theoretical study of the aerodynamic control and the dynamic stability of aircraft and missiles. The dynamics of a spacecraft reentering a planetary atmosphere.

Mr. Laitone (Su)

298. Group Studies, Seminars, or Group Research. (1-8)

Advanced studies in various subjects through special seminars on topics to be selected each year, informal group studies of special problems, group participation in comprehensive design problems, or group research on complete problems for analysis and experimentation.

The Staff (Su, F, W, Sp)

299. Individual Study or Research. (1-12)

Investigation of advanced problems in aeronautical sciences.

The Staff (Mr. Laitone in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Mr. Laitone in charge) (Su, F, W, Sp)

APPLIED MECHANICS

271. Methods of the Calculus of Variations and Applications. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 115 or 175. Methods of the calculus of variations to fixed, free and movable endpoint problems without and with side conditions and inequality constraints. Applications to stationarity and minimum principles and to problems of optimal control and design of dynamical systems.

Mr. Leitmann, (Sp)
277. Oscillations in Nonlinear Systems. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 175. Oscillations in nonlinear systems having one degree of freedom. Qualitative and quantitative methods: phase-plane, graphical, iteration, perturbation and asymptotic methods; self-excited oscillations and limit cycles. Mr. Rosenberg, Mr. Hsu (W)

*278A. The Dynamics of Projectiles. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 104B or 175. Projectile (shell and unpowered rocket) exterior ballistics, particle trajectories in vacuum and air with constant gravity, equations of motion, Siacci method, numerical integration, differential correction theory, effects of wind, etc., motion of spinning projectile, stability criteria. Mr. Leitmann (W)

*278B. The Dynamics of Rockets. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 104B or 175. Topics in exterior ballistics of rockets, approximate motion equations, solutions refined motion equations, long-range rockets and satellite carriers, optimum trajectories, performance analysis, guided missile kinematics. Mr. Leitmann (Sp)

281. Methods of Tensor Calculus and Differential Geometry. (3)

Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 115 or 185. Methods to tensor calculus and classical differential geometry. The tensor concept and the calculus of tensors, the Riemann-Cartesian tensor and its properties, Riemannian and Euclidean spaces. Geometry of a surface, formulas of Weingarden and equations of Gauss and Codazzi. Mr. Naghdi, Mr. Hsu (Fr, W)

*282A. Theory of Elasticity— I. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 281 and Mechanical Engineering 185. General theorems including variational theorems and minimum principles, representation of the basic field equations in terms of displacement potentials and (stress functions). Three-dimensional problems of elasticity and related special theorems. Mr. Bogy, Mr. Carroll, Mr. Hsu, Mr. Naghdi (Sp)

282B. Theory of Elasticity— II. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 281 and Mechanical Engineering 185. The general theory of bending of elastic shells with small displacements. Various approximate theories and methods of solution with application to shallow shells and shells of revolution. Nonlinear theories of shells. Mr. Naghdi, Mr. Hsu (W)

283. Wave Propagation in Elastic Media. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 185. Propagation of mechanical disturbances in unbounded and bounded elastic media. Stress waves due to periodic and transient sources. Wave reflection and transmission at bounding surfaces. Pulses in infinite and finite rods and plates. Mr. Goldsmith, Mr. Carroll (F)

284. Nonlinear Theory of Elasticity. (3)


285. Foundations of the Theory of Continuous Media. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 185 and course 281. Multipolar kinematics and principles of conservation of mass, momentum, moment of momentum, and energy in the presence of multipolar stresses, entropy production inequality, Memory functional, basic invariance principles, nonlinear constitutive equations for special type of continua with application. Mr. Naghdi (W)
Theory of Elasticity. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 185. General principles of stability of elastic systems and its connection with eigenvalue problems. Special topics such as postbuckling behavior, stability of nonlinear systems, dynamical stability. Stability theory based upon the work of Fredrik, Goodier, Pearson, Hill and others. Mr. Rosenberg (W)

Topics in Nonlinear Oscillations. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 277. Oscillations in nonlinear systems having many degrees of freedom. The geometrical methods of dynamics applied to nonlinear vibrations. Definition and determination of normal modes, and of resonant oscillations in weakly and strongly nonlinear systems, and their stability. Mr. Rosenberg (W)

Topics in Nonlinear Continuum Mechanics. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 285. Selected topics from recent developments in continuum mechanics, e.g., nonlinear theory of diffusion, theory of electrodynamics, and nonlinear theory of elastic-plastic continua. Mr. Naghdi (Sp)

Acoustic Wave Propagation. (3)

Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 173 or 185. Acoustic wave propagation in isotropic and in nonhomogeneous media. Refraction, diffraction and scattering of waves. Radiation pressure. Moving sound source, sound waves of finite amplitude. Mr. Soroka (Sp)

Self-Excited Oscillations and Flutter. (3)


Selected Topics in Wave Propagation in Anelastic Materials. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 283. Diffraction of elastic waves. Transients in viscoelastic, elasto-visco-plastic media and in other rheological models. Hydrodynamic and shock waves in solids. High-energy impact and penetration phenomena. Recent developments. Mr. Goldsmith (W)

Relativistic Mechanics. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 175 and 185. Critical examination of experiment and conceptual foundations of principle of relativity and bearing on aether concept. Tracing relativistic evolution of mechanics and development of important consequences in particle and continuum mechanics based on generalization of Hamilton's Principle. Mr. Lieber (F)

Topics in Dynamical Systems. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 175. Qualitative treatment of dynamics following Poincare, Birkhoff, Hill, Sundman, Whittaker, Hada-maard and Levi-Civita. Study basic in bridging micromechanics and macromechanics, also in ergodic theory, statistical thermodynamics, random processes, information handling, control and automation. The problem of three bodies examined in depth. Mr. Lieber (W)

Variational Principles of Fluid Dynamics and Thermodynamics. (4)

Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 282A. Selected topics from recent developments in linear continuum theories, for example, linear elasticity and linear viscoelasticity and others which bear on modern concepts of material behavior. Topics may change from year to year. Mr. Bogy, Mr. Hsu, Mr. Naghdi (W)

Group Studies, Seminars, or Group Research. (1-8)

Advanced studies in various subjects through special seminars on topics to be selected each year, informal group studies of special problems, group participation in comprehensive design problems, or group research on complete problems for analysis and experimentation. The Staff (Mr. Naghdi in charge) (Su, F, W, Sp)

Individual Study or Research. (1-12)

Prerequisite: graduate standing in engineering, physics, or mathematics. Investigations of advanced problems in applied mechanics. The Staff (Mr. Naghdi in charge) (Su, F, W, Sp)

Individual Study for Doctoral Students. (1-8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used. * Not to be given 1968-69.
for units or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Mr. Naghdi in charge) (Su, F, W, Sp)

MATERIALS SCIENCE

Upper Division Courses

100. Field Trips. (2)
One 4-hour laboratory per week. Prerequisite: junior standing in ceramics or metallurgy. Selected plant visitations, lectures by practicing metallurgical and ceramic engineers, and reports on industrial organizations engaged in the manufacture or use of ceramic and metallurgical products. Mr. Pask (F)

101. Crystallography and Diffraction—I. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Physics 4E. Crystal geometry; geometry of diffraction for electrons, neutrons, X rays. Powder method, fluorescent analysis.
Mr. Thomas, Mr. Washburn (F)

102. Crystallography and Diffraction—II. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Physics 4E and course 10. Crystallographic techniques, theory of diffraction for X rays, electrons and neutrons, microscopy; identification of structures, crystal chemistry, bonding.
Mr. Thomas, Mr. Washburn (W)

103. Phase Diagrams and Microstructures. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Chemistry 1C. Phase diagrams through ternary systems; relation to equilibrium-nonequilibrium effects; relation to microstructures.
Mr. Hultgren (F)

104. Thermodynamics. (4)
Three 1-hour lectures and one 2-hour section per week. Prerequisite: Chemistry 14 or Physics 112. Application of the principles of thermodynamics to metallurgical and ceramic problems.
Mr. Hultgren, Mr. Ravitz (Sp)

105. Mechanical Behavior. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite Engineering 45 or course 101. Mechanical testing methods, elastic and plastic properties of materials, dislocations, strain hardening, effects of crystal structure and alloying, fracture mechanics and concepts—all applied to metals, ceramics, and polymers.
Mr. Washburn, Mr. Parker (Sp)

107. Chemical Metallurgy. (4)
Three 1-hour lectures and one 2-hour section per week. Prerequisite: course 104 and Chemistry 110B. Interaction of metals with gases, slags, and refractories; production and refining of metals.
Mr. Ravitz (Sp)

121. Glass and Ceramic Coatings. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 104. Chemistry and physics of the glassy state of inorganic materials, emphasis on structure and bonding and the composition of glass; strengthening of glass; glass coating of metals, and ceramic-metal joining.
Mr. Fulbrich, Mr. Pask (W)

122. Ceramic Processing. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 141. Characterization of ceramic bodies; forming and firing processes; sintering in presence and in absence of liquid phase; problems in obtaining desired microstructures.
Mr. Fulbrich, Mr. Pask (Sp)

128. Seminar in Ceramic Science and Engineering. (2)
Two 1-hour lectures per week. Prerequisite: senior standing in ceramics or metallurgy. Seminar discussions of recent scientific and technical literature pertaining to ceramics. Specific assignments on individual problems involving engineering analysis and design as related to ceramic engineering practice.
Mr. Fulbrich, Mr. Searcy (Sp)

130. Physical Metallurgy. (4)
Three 1-hour lectures and one 3-hour laboratory per week. (Not open to majors in ceramics and metallurgy.) Emphasis on physical metallurgy related to chemical engineering problems; relation of mechanical and chemical behavior to microstructure and fabrication processes.
Mr. Zackay, Mr. Ravitz (F, W)

141. Particulate Materials. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 104 or Mechanical Engineering 105A or equivalent. Characterization of solid particles, size distribution, size reduction, rheology of particle-fluid systems, size separations, unit operations in solid-liquid and solid-solid separations, mixing, agglomeration and coating.
Mr. Fuerstenau (F)

142. Materials Engineering. (4)
Four 1-hour lectures per week. Prerequisite: course 104. Material and energy balances in metallurgical and ceramic systems; fuels and combustion; fluid flow; heat transfer.
Mr. Ravitz (W)

160. Dislocation Theory. (4)
Four 1-hour lectures per week. Prerequisite: senior standing in engineering, physics, or chemistry. Nature of dislocations and their role in plastic deformation and fracture of crystalline materials; interactions between dislocations and other defects; athermal and thermally activated mechanisms of plastic deformation.
Mr. Dorn (F)

161. Solid State Phase Transformations. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 103 and 104. Theory of alloying, nucleation and growth, homogeneous and heterogeneous transformations, martensitic transformations, structure and properties, heat treatment and control of structure.
Mr. Parker, Mr. Thomas, Mr. Zackary (W)

198. Directed Group Studies for Advanced Undergraduates. (1-5)
Prerequisite: course 101 and 103. Group study of selected topics. The Staff (Su, F, W, Sp)

199. Individual Study and Research for Advanced Undergraduates. (1-5)
Enrollment is limited to students who have demonstrated by achievement of a B average that they have a capacity for independent work. Special prerequisites will be established by the instructor guiding the work. The Staff (Su, F, W, Sp)
### Graduate Courses

#### 06. Nuclear Materials. (4)
Four 1-hour lectures per week. The behavior of material, moderator, control and structural materials in nuclear reactor environments with emphasis on the mechanism of radiation damage and the effect of radiation damage on the properties of materials.

Mr. Fuerstenau (W)

#### 30. Surface Properties of Materials. (3)
Three 1-hour lectures per week. Thermodynamics of surface and phase boundaries, surface tension of solids and liquids, surface activity, adsorption, conditions for three-phase stable contact, electrochemical double layer at interfaces, interaction between double layers.

Mr. Fuerstenau (W)

#### 31. Applied Interfacial Phenomena. (3)
Three 1-hour lectures per week. Prerequisite: course 104. Special properties and applications of high-purity materials; principles of methods of preparation (solvent extraction, zone refining, electronbeam melting, etc.).

Mr. Fuerstenau (Sp) (offered in odd-numbered years)

#### 33. High Purity Materials. (3)
Three 1-hour lectures per week. Prerequisite: course 104. Special properties and applications of high-purity materials; principles of methods of preparation (solvent extraction, zone refining, electron-beam melting, etc.).

Mr. Fuerstenau (Sp) (offered in odd-numbered years)

#### 35. Processing Particulate Solids. (3)
Three 1-hour lectures per week. Prerequisite: course 141 or equivalent. Theoretical size distributions, fracture of brittle solids, analytical models of size reduction, surface and bulk properties in materials separations. Analysis of solid-liquid and solid-solid separations, applications to mineral processing.

Mr. Fuerstenau (Sp) (offered in even-numbered years)

#### 40. Advanced Thermodynamics. (3)
Three 1-hour lectures per week. Prerequisite: course 104 or Chemistry 114H. Thermodynamic properties of metallurgical and ceramic substances and their application to reaction equilibria.

Mr. Kelley (F) (offered in even-numbered years)

#### 255. Diffusion in Crystals. (3)
Three 1-hour lectures per week. Mathematics of diffusion; mechanisms of atomic migration; thermally activated and correlated random walk processes; diffusion dependent phenomena.

Mr. Dorn (W)

#### 256. Kinetics of Phase Transformations. (3)
Three 1-hour lectures per week. Kinetics of nucleation and growth of phases in solid state reactions; role of surfaces, stacking faults, dislocations, coherency stresses and strain energy; diffusion-controlled and martensitic transformations.

Mr. Dorn (Sp) (offered in odd-numbered years)

#### 257. Advanced Solid State Transformations. (3)
Three 1-hour lectures per week. Homogeneous, heterogeneous and martensitic phase transformations; crystallographic relationships and predictions, effects of defects on transformations; relation between structure and properties.

Mr. Thomas (Sp)

#### 258. Statistical Thermodynamics—I. (3)
Three 1-hour lectures per week. Prerequisite: course 258. The canonical partition function and its applications: Bose-Einstein, Fermi-Dirac and Boltzmann statistics; specific heats of solids, equations of state, gases, vapor pressure over crystals, phase equilibria, point defects in crystals, ideal solutions.

Mr. Dorn, Mr. Searcy (W) (offered in even-numbered years)

#### 259. Statistical Thermodynamics—II. (3)
Three 1-hour lectures per week. Prerequisite: course 258. The grand canonical partition function and its application; regular solutions, short and long range order, adsorption, high polymers; fluctuation theory.

Mr. Dorn, Mr. Searcy (Sp) (offered in even-numbered years)

#### 260. Advanced Dislocation Theory. (3)
Three 1-hour lectures per week. Prerequisite: course 160 (may be taken concurrently). Properties of dislocations in crystals—interaction with point defects and surface defects—application to theories of mechanical behavior of crystals.

Mr. Washburn (F)

#### 271. High Temperature Materials. (3)
Three 1-hour lectures per week. Prerequisite: course 204 and Chemistry 110B. Relationship between high temperature properties and structure and composition; kinetics of high temperature reactions.

Mr. Searcy (Sp)

#### 273. Structure and Bonding in Inorganic Materials. (3)
Three 1-hour lectures per week. Prerequisite: Chemistry 110B and Physics 121. Theories on the structure and bonding in vapor species and solids.

Mr. Searcy, Mr. Hultgren (W)

#### 275. High Temperature Thermodynamics. (3)
Three 1-hour lectures per week. Prerequisite: course 104 or Chemistry 114H. Methods for measuring and estimating thermodynamic data for materials at high temperatures; application to prediction of behavior in high temperature environments.

Mr. Searcy (F) (offered in odd-numbered years)

#### 276. Sintering. (3)
Three 1-hour lectures per week. Mechanisms and kinetics of the densification and/or development of strength during heat treatment of metallic or non-
metallic inorganic powder compacts; evaluation of the influence of process variables such as externally applied pressure, liquid phase development, and secondary phases. 

Mr. Fulrath (F)

277. Principles of Ceramic Forming. (3)

Three 1-hour lectures per week. Properties of particulate materials, rheological behavior of solid-liquid systems; application to ceramic forming processes, e.g., compaction, extrusion, casting; relationships to development of a desired microstructure.

Mr. Pask (W)

280. Electron Diffraction and Microscopy. (4)

Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 101 and 102 and instructor's consent. Diffraction patterns and images of perfect and imperfect crystals; kinematical and dynamical theories of scattering; absorption; Kikuchi diffraction; resolution; applications to research problems in Materials Science.

Mr. Thomas (W)

290. Advanced Graduate Study in Materials Science.

(3)

Three 1-hour lectures per week, Prerequisite: instructor's consent.

290A. Special Topics in Ceramic Engineering. (3)

Mr. Pask (F)

290B. Special Topics in Extractive Metallurgy. (3)

Mr. Ravitz (F) (offered in even-numbered years)

290C. Special Topics in Mineral Processing. (3)

Mr. Fuerstenau (Sp)

290D. Special Topics in Physical Metallurgy. (3)

Mr. Parker (Sp)

298. Group Studies, Seminars, or Group Research.

(1-8)

Advanced study in various subjects through special seminars on topics to be selected each year, informal group studies of special problems, group participation in comprehensive design problems, or group research on complete problems for analysis and experimentation. The Staff (Su, F, W, Sp)

299. Individual Study or Research. (1-12)

The Staff (Su, F, W, Sp)

601. Individual Study for Master's Students. (1-8)

Individual study for the comprehensive or language examinations required of candidates for the Master's degree. Units may not be used to meet either unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

Engineering Geoscience

Upper Division Courses

105. Geochemical Prospecting. (1)

One 3-hour laboratory per week. Prerequisite: Geology 150, 106 (concurrently). The principles and practice of geochemical methods of prospecting for deposits of metallic minerals.

The Staff (F)

106. Applied Geophysics. (3)

Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Physics 4E and Geology 150. An introductory course in geophysical techniques used for the solution of geological mapping problems. Intended for geologists, civil engineers, geologic engineers, and other nongeophysics majors.

Mr. Morrison, Mr. Rodgers (S)

198. Directed Group Studies for Advanced Undergraduates. (1-5)

Prerequisite: consent of instructor. Group study selected topics. The Staff (Su, F, W, Sp)

199. Individual Study and Research for Advanced Undergraduates. (1-5)

Enrollment is limited to students who have demonstrated by achievement of a B average that they have a capacity for independent work. Special prerequisites will be established by the instructor guiding the work.

The Staff (Su, F, W, Sp)

Graduate Courses

200A–200B. Electromagnetic Propagation. (3-3)

Three 1-hour lectures per week. Prerequisite: Engineering 230A–230B; Physics 110C or Electromagnetic Engineering 117A–117B–117D. Physics 210A–210B advisable. The theory of dispersive propagation, M VLF, ELF, and ULF frequencies, in inhomogeneous anisotropic and layered media, including plasma, dipole antennas; microwave scattering; diffraction around obstacles of simple form. Numerous assignments are made on problems arising in geophysical engineering.

Mr. Ward (W, Sp)

201. Analysis of Potential Field Data in Geophysics. (3)

Three 1-hour lectures per week. Prerequisite: Engineering 230A; Mathematics 185 or 120A–120B–120C; Statistics 200A–200B–200C. Interpretation of potential field data arising in geophysical surveys. Transfer functions of potential field operators such as analytic continuation, derivatives, detrending and data smoothing; linear filters in geophysical interpretation; application of Euler's theorem, conformal mapping, numerical methods of calculating gravitational and magnetic attraction. Mr. Morrison (F)

203. Physical Properties of Rocks. (3)

Two 1½-hour lectures per week. Prerequisite: Chemistry 110A, Physics 4E, and Mathematics 2C, or consent of instructor. A survey of the electrical, magnetic, thermal and rheological properties of rocks.

Mr. Ward (F)

204. Seismic Exploration. (3)

Two 1½-hour lectures per week. Prerequisite: course 121B or equivalent, Engineering 230A or Electrical Engineering 119 or Geophysics 104A–104B or equivalent. Engineering aspects of the analysis and processing of data in modern seismic exploration. Applications of linear theory: digital filtering, temporal and spatial filtering, signals and noise, statistical methods, arrays, beam steering. Types and configurations of the sources and receivers, stacking. Typical results.

Mr. Rodgers (Sp)

206. Electrical, Magnetic and Gravity Methods. (5)

Five 1-hour lectures per week. Prerequisite: course 200A–200B, 201, 203. Modern engineering practice in application of electrical, magnetic, and gravity

methods to resolve for subsurface properties. Two upper division courses in electrical engineering or equivalent. Lecture 5 hours per week.
502. Individual Study for Doctoral Students. (1-8)

magnetic measurements; cross-spectral analysis for
various examinations required of candidates for the
qualified students to prepare themselves for the
adviser, intended to provide an opportunity for
dividual study in consultation with the major field
degree. Must be taken on a satisfactory/unsatisfac-
tory basis. The Staff (Su, F, W, Sp)

07. Mineral Exploration. (3)

Two 1/2-hour lectures per week. Prerequisite: course 106, Geology 205A–205B. The design of
exploration campaigns based upon the integration of
geological and geophysical methods.
Mr. Meyer, Mr. Ward (W)

90A. Electronic Instrumentation in Geophysical
Engineering. (3)

Two hours of lecture and three hours of laboratory
per week. Prerequisite: consent of instructor. The
course treats a broad range of electronic devices
common to instrumental work in geophysical en-
eineering. The principles and the dynamic prop-
erties of the various instruments are covered. Actual
laboratory experience with the techniques involved
is provided by a series of experiments.
Mr. Rodgers (W)

90C–980D. Random Models for Geophysical
Phenomena. (3–3)

Three 1-hour lectures per week. Prerequisite: Statistics 134 or equivalent; knowledge of Fortran
programming recommended. 90C must be taken
before 90D may be taken. The construction and
analysis of random models for various geophysical
phenomena, including ocean wave seismic and geo-
magnetic measurements; cross-spectral analysis for
stationary and nonstationary geophysical models;
techniques for treating certain nonlinear models;
filter theory applied to geophysical data.
Mr. Borgman (W, Sp)

098. Group Studies, Seminars, or Group Research.
(1–8)

Advanced study in various subjects through spe-
cial seminars on topics to be selected each year,
informal groups of special studies, participation in comprehensive design problems, or
group research on complete problems for analysis and
experimentation. The Staff (Su, F, W, Sp)

099. Individual Study or Research. (1–12).
The Staff (Su, F, W, Sp)

061. Individual Study for Master's Students. (1–8)

Prerequisite: graduate standing in engineering; individual study for the comprehensive or lan-
guage requirements in consultation with the field
adviser. Units may not be used for either unit or
residence requirements for a master's degree.
Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

082. Individual Study for Doctoral Students. (1–8)

Prerequisite: graduate standing in engineering. Individual study in consultation with the major field
adviser, intended to provide an opportunity for
qualified students to prepare themselves for the
various examinations required for the Ph.D. (and other doctoral degrees). May not be used
for either residence requirements for the doctoral
degree. Must be taken on a satisfactory/unsatisfactory
basis. The Staff (Su, F, W, Sp)

Nautical Architecture

Upper Division Courses

151. Statics of Naval Architecture. (3)

Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 105B and Civil Engineering
130. Geometry of the ship's form, conditions of
static equilibrium and stability of equilibrium of
floating and submerged bodies; effect of damage,
subdivision, freeboard, strength and launching of
ships. Laboratory exercises in ship static computa-
tions including application of digital computers.
Mr. Paulling (F)

152A. Ship Resistance and Propulsion. (3)

Three 1-hour lectures per week. Prerequisite: course 151 which may be taken concurrently. Ele-
mentary theory of water waves. Fundamentals of
ship resistance and dimensional analysis. Estimates
of resistance from model tests and tabulated data.
Theories of propeller action and performance of open
water propellers. Interaction between propeller and
ship. Selection of an optimum propeller from series
charts. Laboratory experiments in the ship model
tank.
Mr. Paulling (F)

152B. Ship Dynamics. (3)

Three 1-hour lectures per week. Prerequisite: course 152A. Rigid-body dynamics of ships and
other marine structures. Motions and loads in a seaway. Steering and control.
Mr. Paulling (W)

153. Marine Engineering. (5)

Three 1-hour lectures and one 1-hour discussion
per week; three to five field trips. Prerequisite: Mechanical Engineering 105C (recommended course
152B). Power requirements and selection of power
plants for various types of vessels. The selection of
auxiliary machinery for steam and motor ships will
be considered.
Mr. Paulling (Sp)

154A–154B. Ship Design. (3–3)

One 3-hour lecture and two 3-hour laboratories
per week. Prerequisite: course 152A. Preliminary
design of a ship of the student's choice, including
weight and size estimates, preparation of a line drawing and a preliminary struc-
tural design. (W) 154B. A more detailed study of some single aspect of
the design. (Sp)

Mr. Paulling (Sp)

198. Directed Group Studies for Advanced
Undergraduates. (1–5)

Prerequisite: requirements will be specified by
the instructor. Group studies of selected topics which
will vary from year to year.
The Staff (Mr. Paulling in charge) (F, W)

199. Individual Study and Research for Advanced
Undergraduates. (1–5)

Enrollment is limited to students who have dem-
strated by achievement of a B average that they
have a capacity for independent work. Special pre-
requisites will be established by the instructor guid-
ing the work.
The Staff (Mr. Paulling in charge) (F, W, Sp)

Graduate Courses

(3–3–3)

Three 1-hour lectures per week. Prerequisite: course 151. Design and performance of ship struc-
tures; fundamental behavior of parallel and series
arches; computer determined methods to solution of
geological problems. Lectures, laboratory scale model experiments, and field excursions will illustrate the conduct of geophysical sur-
veys and interpretation of the resulting data. Includes
surface, borehole, and airborne techniques.
Mr. Ward (W)
241A—241B—241C. Hydrodynamics of Ships. (3—3—3)

Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 159 and 162 and course 152A—152B. Theory of similarity and model testing. Boundary-layer theory and frictional resistance. Wave resistance. Air- and hydrofoil theory. Theory of propellers. Steering and stability on course. Motion of ships in calm water and waves. Mr. Wehausen (F)

242. Advanced Ship Design. (3)

One 1-hour conference plus one 4-hour laboratory period per week. Prerequisite: courses 240A—240B—240C, 241A—241B—241C. Each student will execute a design project involving part of the whole of a ship. Instead of classic, standardized or codified methods, advanced (more speculative) techniques of rational mechanics, deriving from the analyses of Naval Architecture 240 and 241 will be applied. The Staff (Mr. Schade in charge) (Su, F, W, Sp)

290. Advanced Graduate Study in Naval Architecture.

Current and advanced topics in theory and design of screw propellers, hydrodynamics of free surfaces, ship vibrations, and other specialized studies in related areas of naval architecture.

290A. Theory and Design of Screw Propellers. (4)

Three 1-hour lectures per week. Prerequisite: course 241B. Applications of modern airfoil theory to the design of marine screw propellers. Mr. Paulling (Sp)

290B. Ship Dynamics. (4).

Three 1-hour lectures per week. Prerequisite: course 241B. A more advanced treatment of topics broached in 241, including formulation and solution of boundary-value problems and the statistical description of motion in an irregular seaway. Mr. Wehausen, Mr. Paulling (Sp)

288. Group Studies, Seminars, and Group Research. (1—8)

Advanced study in various subjects through special seminars on topics to be selected each year, informal group studies of special problems, group participation in comprehensive design problems, or group research on complete problems for analysis and experimentation.

The Staff (Mr. Paulling in charge) (F, W, Sp)

299. Individual Research. (1—12)

Investigation of selected advanced naval architecture subjects.

The Staff (Mr. Wehausen in charge) (F, W, Sp)

601. Individual Study for Master's Students. (1—8)

Individual study for the comprehensive or language requirement in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Mr. Paulling in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1—8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other Doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Mr. Paulling in charge) (Su, F, W, Sp)

Nuclear Engineering

Upper Division Courses

101A—101B—101C. Engineering Science Laboratory. (2—2—2)

Two 3-hour laboratory periods per week. Prerequisite: Physics 121. (The sequence can be started with A, B, or C.) Laboratory for upper division students in engineering science program. Design of experiments, measurements and interpretation of physical phenomena of importance in many of the new areas of applied science. Neutronics, solid-state phenomena and the interaction of radiation with matter, are some of the topics treated.

Mr. Kaplan, Mr. Mark (F)

165. Introduction to Nuclear Engineering. (4)

Four hours of lecture per week. Prerequisites: Physics 4E, Mathematics 2C. Nuclear physics of the fission reaction. Diffusion and slowing down of neutrons. Criticality conditions for bare, reflected, and heterogeneous reactors. Kinetics and reactor control, heat removal from reactors, radiation effects and reactor shielding, special reactor types.

Mr. Chambre, Mr. Prussin (F, Sp)

199. Individual Study and Research for Advanced Undergraduates. (1—5)

Enrollment is limited to students who have demonstrated by achievement of a B average that they have a capacity for independent work. Special prerequisites will be established by the instructor guiding the work.

Mr. Mark (Su, F, W, Sp)

Graduate Courses

NEUTRONICS

202. Experimental Neutronics Laboratory. (2)

Four 1-hour laboratory periods per week. Prerequisite: course 201. Problems in experimental neutronics utilizing a nuclear reactor, subcritical reactor assemblies; accelerators as pulsed neutron sources.

Mr. Mark (W)

250A—250B. Nuclear Reactor Theory. (4—4)

Three 1½-hour lectures per week. Prerequisite: course 270 (may be taken concurrently), course in advanced calculus including partial differential equations. Neutron transport theory; one group diffusion theory; slowing down of neutrons; thermal spectra; multigroup theory; perturbation theory and adjoint functions; heterogeneous reactors; reactivity coefficients; reactor kinetics; fuel depletion, management and cycling.

Mr. Amster, Mr. Ruby (F, W)

255. Numerical Methods of Reactor Analysis. (4)

Three 1½-hour lectures per week. Prerequisite: course 250A—250B, Mathematics 120A—120B—120C recommended. Computational methods for the numerical analysis of various approximations to the neutron transport equations in problems of nuclear reactor theory. Difference equations for neutron dif-


\textbf{250A-250B. Advanced Reactor Analysis and Transport Theory. (3-3)}


\textbf{290A. Integral Transform Methods in Neutron Transport Theory. (4)}

Three 1½-hour lectures per week. \textit{Prerequisite:} consent of instructor. Theory and applications of single and multiple integral transforms (Fourier, Hankel, Mellin, and Laplace) in solution of neutron transport and diffusion equations. Mr. Chambre (F)


Mr. Grossman (Sp)

\textbf{265. Design Analysis of Nuclear Reactors. (4)}

Two 2-hour lectures per week. \textit{Prerequisite:} course 250A and 260A. Design analysis of nuclear fission power reactors.

Mr. Schrock (F)

\textbf{CHEMISTRY AND MATERIALS}

\textbf{203. Chemical Methods in Nuclear Technology. (3)}

One 1½-hour lecture and one 4½-hour laboratory per week. \textit{Prerequisite:} course 201 and consent of instructor. Experimental illustrations of the interrelation between chemical and nuclear science and technology; fission process; chemistry of fission fragments; chemical effects of nuclear transformations; application of radioactivity to study of chemical reactions; neutron activation analysis.

Mr. Prussin (Sp)

\textbf{220. Radiation Effects in Nuclear Materials. (4)}

Two 2-hour lectures per week. \textit{Prerequisite:} upper division course in thermodynamics. Application of the principles of solid state physics and thermodynamics to the analysis of fission gas behavior and radiation damage in nuclear materials and to the study of solid state nuclear detection devices.

Mr. Olander (Sp)

\textbf{221. Chemical Aspects of Nuclear Technology. (4)}

Two 2-hour lectures per week. \textit{Prerequisite:} upper division course in thermodynamics. Chemical thermodynamics and statistical mechanics; high temperature inorganic systems; phase equilibria and electron chemistry; reprocessing of reactor fuels; radiation chemistry of liquids and gases; disposal of radioactive wastes.

Mr. Prussin (W)

\textbf{223. Interaction of Radiation with Surfaces. (3)}

Three hours of lecture per week. \textit{Prerequisite:} consent of instructor. Interaction of atomic particles and photons with surfaces. Application to space power and propulsion systems.

Mr. Smith (F)

\textbf{Applied Nuclear Reactions and Instrumentation}

\textbf{201. Radiation Detection Laboratory. (2)}

\textit{Prerequisite:} Physics 121 and 124, course 250A, or 165 (may be taken concurrently). The electronics and instrumentation associated with measurement and detection of nuclear radiations; study of the interactions of radiation with matter. Mr. Mark (F)

\textbf{270. Nuclear Reactions and Radiations. (4)}

Three 1½-hour lectures per week. \textit{Prerequisite:} Physics 121 or Physics 137A-137B-137C. Interactions of gamma rays, neutrons, and charged particles with matter; nuclear structure and isotopes, radioactive decay; cross sections and energies of nuclear reactions, resonance theory; fission and fusion reactions as energy sources. Mr. Kaplan (F)
273. Neutron Scattering Theory. (4)
Four 1-hour lectures per week. Prerequisite: Physics 115. Formal scattering theory and nuclear models that lead to the prediction of cross sections. R-matrix (Breit-Wigner) theory, wave packet analysis, partial waves. Statistical, optical and direct interaction models. Chemical binding and coherent scattering.
Mr. Ruby (Sp)

Radiation Biology
240. Biological Effects of Radiation and Radiation Safety. (4)
Three 1 1/2-hour lectures per week. Prerequisite: consent of instructor. Safety criteria. Effects of charged particle and gamma radiations on cells and cell growth.
Mr. Wallace (W)

Energy Conversion
230. Controlled Thermonuclear Reactions. (4)
Four hours of lectures per week. Prerequisite: Physics 142 or Electrical Engineering and Computer Sciences 170 or equivalent. Principles of controlled thermonuclear fusion including nuclear reaction rates, plasma containment, energy balance and a description of present fusion approaches.
Mr. Pyle (W)

231. Thermoelectric and Thermionic Energy Conversion. (4)
Two 2-hour lectures per week. Prerequisite: consent of instructor. Direct conversion of heat to electrical energy.
Mr. Figford (Sp)

232. Magnetohydrodynamic Energy Conversion. (4)
Three 1 1/2-hour lectures per week. Prerequisite: course 260A. Principles and applications of the direct conversion into electrical energy of the thermal and kinetic energy of an electrically conducting fluid in interaction with an electromagnetic field. General magnetohydrodynamic theory: Magnetohydrodynamic power generation. Coupling of fission reactors to magnetohydrodynamic converters.
Mr. Grossman (Sp)

Special Studies
298. Group Studies, Seminars, or Group Research. (1-8)
Advanced study in various subjects through special seminars on topics to be selected each year, informal group studies of special problems, group participation in comprehensive design problems or group research on complete problems for analysis or experimentation.
(F, W, Sp)

299. Individual Research. (1-12)
Investigation of advanced nuclear engineering problems.
The Staff (Su, F, W, Sp)

601. Individual Study for Master's Candidates. (1-6)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory or unsatisfactory basis.
(Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-6)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
(Su, F, W, Sp)

Earthquake Engineering Research Center
The activities of the Earthquake Engineering Research Center are concerned with three basic problems: (1) predicting the characteristics and intensities of strong ground motions caused by earthquakes, (2) predicting their potential damage effects on existing structural and mechanical systems, and (3) improving seismic resistant designs.

Presently, numerous theoretical and experimental investigations are being pursued by the center to provide answers in these important problem areas. These studies include: (1) preliminary design of a 100-square-ft. earthquake simulator for full-scale experimental research, (2) force-deformation and energy absorption characteristics of structural materials, components, and systems under controlled dynamic conditions, (3) damping and stiffness characteristics of selected full scale structures, (4) deterministic and nondeterministic response studies of inelastic structures, (5) propagation of waves in deformable media, (6) seismic effects on earth and concrete dams, (7) ground-structure interaction problems, (8) response of soil and soil structures to earthquake excitation, and (9) characteristics of tsunamis.

Excellent physical facilities are available for research in earthquake engineering. These include the Structural Research Laboratory, the Soils Laboratory, and the Earthquake Simulator Laboratory (20-square-ft. simulator) now under construction at the Richmond Field Station and the laboratories of the new Davis Hall on campus. In addition, the computer center on campus is an invaluable facility in support of theoretical research.

* Not to be given 1968-69.
Through the active participation of numerous graduate students in its research programs, the Earthquake Engineering Research Center plays an important role in graduate education within the College of Engineering.

**Electronics Research Laboratory**

Research in electrical sciences covers a vast range of activities and the results of his research affect many of the other sciences and engineering disciplines. The Electronics Research Laboratory reflects this breadth, with investigations in such areas as: bioelectronics; communications, information theory, control and system theory; computer systems and computer sciences; integrated circuits, solid-state and semiconductor materials and devices; quantum and optical electronics including gas and semiconductor lasers; active microwave devices; electromagnetic problems in antennas and propagation; scanning electron microscopy and its applications to semiconductor devices and biological studies; high- and low-temperature plasmas. To support this research, the Laboratory receives a Joint Services Electronics Program Grant, as well as other grants and contracts from the Department of Defense, the National Science Foundation and other agencies of the Federal Government. The Laboratory’s function is to coordinate research projects, assist in developing new projects, and provide facilities. The Laboratory is staffed by faculty members primarily from the Department of Electrical Engineering, and Computer Sciences, by research assistants and other graduate students. All work is intimately related to the graduate curriculum.

**Hydraulic Engineering Laboratory**

The Hydraulic Engineering Laboratory, located in Hesse Hall, is equipped for work in general fluid mechanics, general hydraulics, hydraulic machinery, surface and ground water hydrology, water resources, hydraulic structures, and sediment transportation. There are several facilities for research on pumps, sediment transportation, and waves. The laboratory maintains facilities for study of various river, harbor, and coastal problems at the Richmond Field Station. These include a large model basin for model studies of rivers, harbors, wave phenomena, and related topics; several windwave channels for studies of wind tides and generation of wind waves in shallow water; a large wave channel, serving also as a towing tank for wave action studies on a large scale; and flumes and other facilities for investigations of sediment transportation in open channels.

**Industrial Engineering Laboratories**

**Human Factors in Technology Laboratory**

The Department of Industrial Engineering and Operations Research maintains facilities for laboratory and field studies in human performance, man-machine interaction, work measurement and sociotechnical system analysis. Advanced equipment includes an online digital computer with comprehensive peripheral equipment.

**Operations Research Center**

(See page 130.)

**Inorganic Materials Research Laboratory**

(See Research Facilities, page 124.)

**Institute of Transportation and Traffic Engineering**

(See Research Facilities, page 130.)
Mechanical Engineering Laboratories

The Department of Mechanical Engineering has combined teaching and research laboratories in Hesse Hall and in Etcheverry Hall, with additional facilities for instruction and research at the Richmond Field Station.

The campus laboratories have facilities and services for undergraduate laboratory study and for graduate research programs in all phases of mechanical engineering: acoustics, aerodynamics, air conditioning, analog computers, automatic controls, propulsion dynamics, combustion, dynamic stress, fluid flow, fluid mechanics, fluid machinery, heat-power, heat transfer, impact, instrumentation, lubrication, refrigeration, stress analysis and experimental mechanics, thermal radiation, thermodynamics, and vibration. These laboratories are kept flexible to meet the progress of technology and science, and many of the pioneer research equipments are incorporated into the undergraduate laboratory program upon completion of the initial original research.

Research efforts that are too large to be accommodated on campus are conducted at the Field Station. The major facilities are low pressure aerodynamic wind tunnels for the study of upper atmosphere flight phenomena of high speed aircraft, missiles, and spacecraft; combustion and detonation systems for rocket thrust research; wind tunnels for convective heat transfer programs related to spacecraft reentry into the earth's atmosphere; and anechoic and reverberation chambers and related sound rooms for noise isolation, identification, and insulation.

Naval Architecture Laboratory

The Naval Architecture Laboratory at the Richmond Field Station includes several facilities for ship structural and hydrodynamics research.

The principal hydrodynamics facility is the ship model towing tank, 200 feet in length by 8 feet wide and 6 feet deep. This tank is equipped with a carriage for towing ship models at constant speed and in accelerated motion. A wave generating machine is installed which is capable of producing regular or irregular seas. Instrumentation is provided for measurements of forces, motions, and pressures on surface or submerged models moving in calm water or waves.

For static structural investigations, a bending machine has been constructed which can apply to a ship structural model nearly any desired bending moment or shear force distribution to represent the loading on a ship in a seaway. Associate instrumentation is provided for measurement of strain and deflection throughout the model undergoing test.

A third facility is intended for research in the hydrodynamic and structural areas associated with water impact, which is an especially important problem for high-speed ships operating in rough seas. In this machine, a large-scale model is dropped into a water-filled tank while instruments record the motion, pressure, strain and deflection at selected points throughout the model.

Nuclear Engineering Laboratory

The Nuclear Engineering Laboratory serves as an instructional and research center for the graduate students and staff of the Department of Nuclear Engineering. Portions of the laboratory are also used for undergraduate laboratory instruction in Engineering Physics. The laboratory facilities include small accelerators for pulsed neutron experiments, sources of ionizing radiation, nuclear instrumentation for detecting and analyzing ionizing radiation, and subcritical assemblies moderated by light water and graphite. Data analysis is facilitated by three 400-channel pulse-height and time analyzers and one two-dimensional 4096-channel analyzer. The latter is connected through tape and card-punch equipment to the campus IBM 7090 digital computer. A new high
A new high flux research reactor, the TRIGA Mark III, has been installed in a new on-campus laboratory.

Current research investigations include the study of the energy and spatial transport of neutrons in homogeneous and heterogeneous media, neutron spectrometers, radiation in outer space, ion erosion of solid surfaces, direct energy conversion by thermionic emission and semiconducting materials, transient boiling phenomena, pulsed-neutron grating techniques in multiplying systems, diffusion of fission gases in nuclear fuel bodies, plasma physics of thermonuclear reactions, chemonuclear reactions and separations, and magnetohydrodynamics. Several of these investigations are supported by facilities of the Lawrence Radiation Laboratory.

Operations Research Center
(See Research Facilities, page 130)

Sanitary Engineering Research Laboratory
The function of the Sanitary Engineering Research Laboratory is to provide a facility for the independent research requirements of graduate students in sanitary and public health engineering and related environmental health sciences, as well as an opportunity for members of the instructional staff to pursue their interests and to develop in professional and academic stature and to serve the State through research. It offers no academic program of its own, but is coordinated at the graduate level with the instructional laboratories of the Hydraulic and Sanitary Engineering Division of the Department of Civil Engineering and the Environmental Health Sciences Division of the School of Public Health. Both contract and University-sponsored projects are pursued in the Laboratory under the guidance of the faculty. The wide variety of projects in environmental sanitation in progress at all times is concerned with the treatment and reclamation of industrial and domestic waste waters and with problems of water pollution, radioactive wastes, air pollution, water resources, solid wastes, and other environmental factors. Its activities include publication of technical bulletins and the sponsoring of technical conferences. Its staff includes all members of the instructional staff in sanitary and public health engineering and related environmental health sciences, together with some seventy to eighty professional and technical personnel, including graduate students employed on a part-time basis. Projects involving cooperation with other organized research groups or individual professors on the Berkeley and Davis campuses of the University are an important feature of the program of the Laboratory.

Sea Water Conversion Laboratory
The Sea Water Conversion Laboratory, located at the Richmond Field Station, consists of a series of experimental units connected with the demineralizing of sea water. Experimental work is carried on by graduate students and full-time research personnel in the fields of distillation (including solar), electrodialysis, reverse osmosis, ion exchange, and other schemes.

Soil Mechanics, Geological Engineering and Bituminous Materials Laboratories
The Soil Mechanics and Bituminous Materials Laboratory situated at the Richmond Field Station and the Geological Engineering Laboratory located in Hearst Mining Building provide extensive facilities for research on soil and rock properties, soil mechanics, foundation engineering, and the behavior and properties of asphalts and asphaltic mixtures. Graduate students working toward master's or doctoral degrees in the Department of Civil Engineering conduct individual research in these labora-
ories while a continuing program of research is conducted by faculty members in the Department of Civil Engineering and research engineers in the Institute of Transportation and Traffic Engineering. Current research studies are concerned with the strength and deformation characteristics of soil under dynamic and repeated loading, effects of earthquakes on embankments and foundations, soil stabilization with admixtures, properties of lunar soils, stresses and deformations in slopes and embankments, permeability of clays, rheologic characteristics and fatigue behavior of asphalt mixtures, field testing of pavements, stresses around underground openings, underground storage, and various studies in rock mechanics and groundwater resources. The laboratories provide special facilities for work in these areas in addition to equipment for standard tests on soils, rocks, asphalts and asphaltic mixtures.

**Structural Engineering Materials Laboratory**

The Structural Engineering Materials Laboratory comprises the principal teaching and research facilities of structural engineering and structural mechanics, a Division of the Department of Civil Engineering. Located in Davis Hall on campus and the Structural Research Laboratory at the Richmond Field Station, it contains facilities for class instruction and for research in materials of construction and in behavior of structures. The study of structures and structural models includes elastic displacement methods, strain measurements, and photoelastic procedures.

A wide variety of testing machines and measuring apparatus is available, including a universal testing machine with a capacity of four million pounds in compression. Facilities for determining dynamic effects on structural models include a large shaking table for simulating earthquakes and oscilloscopes, oscillographs, and strain-gage amplifiers for measuring the response.

For study of materials, control rooms are provided for tests over a wide range of temperature and humidity. The Laboratory operates an experimental plant, with a chemical laboratory, for the manufacture of cements, limes, and lightweight aggregates.

**ENGLISH**

(Department Office, 322 Wheeler Hall)

Jonas A. Barish, Ph.D., Professor of English.
Bertrand H. Bronson, Ph.D., D. és L. (hon.), Professor of English.
Frederick C. Crews, Ph.D., Professor of English.
Phillip Damon, Ph.D., Professor of English and of Comparative Literature.
Bertrand Evans, Ph.D., Professor of English.
Norman S. Grabo, Ph.D., Professor of English.
James D. Hart, Ph.D., Professor of English (Chairman of the Department).
Arthur E. Hutson, Ph.D., Professor of English.
Charles W. Jones, Ph.D., Litt.D., Professor of English.
John E. Jordan, Ph.D., Professor of English.
Josephine Miles, Ph.D., Litt.D., Professor of English.
Charles Muscatine, Ph.D., Professor of English.
Thomas F. Parkinson, Ph.D., Professor of English.
Ralph W. Rader, Ph.D., Professor of English.
John H. Raleigh, Ph.D., Professor of English.
Alain Renoir, Ph.D., Professor of English and of Comparative Literature.

† On leave, fall quarter, 1968.
‡ On leave, fall, winter, and spring quarters, 1968–69.
§ Humanities Research Fellowship Program, winter and spring quarters, 1969.
¶ Humanities Research Fellowship and National Endowment Fellowship.
Hugh M. Richmond, D.Phil., Professor of English.
Mark Schorer, Ph.D., Litt.D., Professor of English.
Wayne Shumaker, Ph.D., Professor of English.
Henry Nash Smith, Ph.D., Litt.D., Professor of English.
John L. Traugott, Ph.D., Professor of English.
Ernest Tuveson, Ph.D., Professor of English.
Warzer Ziff, Ph.D., Professor of English.
Arthur G. Brodeur, Ph.D., LL.D., Professor of English and Germanic Philology, Emeritus.

Willard E. Farnham, Ph.D., LL.D., Professor of English, Emeritus.
Benjamin H. Lehman, Ph.D., LL.D., Professor of English, Emeritus.
George R. Stewart, Ph.D., L.H.D., Professor of English, Emeritus.
Robert Bloom, Ph.D., Associate Professor of English.
Richard Bridgman,*** Ph.D., Associate Professor of English.
Jackson V. Burgess,† M.F.A., Associate Professor of English.
John S. Colledge,‡ Ph.D., Associate Professor of English.
Stanley E. Fish, Ph.D., Associate Professor of English.
Thomas B. Flanagan, Ph.D., Associate Professor of English.
Donald M. Friedman, Ph.D., Associate Professor of English.
Howard E. Hugo, Ph.D., Associate Professor of English.
Ulrich Knoepfmacher,† Ph.D., Associate Professor of English.
Robert L. McNulty,† Ph.D., Associate Professor of English.
Brendan P. O Hehir,† Ph.D., Associate Professor of English.
Stephen K. Orgel, Ph.D., Associate Professor of English.
John Paterson, Ph.D., Associate Professor of English.
Norman Rabkin, Ph.D., Associate Professor of English.
Peter D. Scott, Ph.D., Associate Professor of English.
George A. Starr,*** Ph.D., Associate Professor of English.
Gardner D. Stout, Jr., Ph.D., Associate Professor of English.
Robert Tracy,*** Ph.D., Associate Professor of English.
Alex Zwerdling, Ph.D., Associate Professor of English.
Paul K. Alkon, Ph.D., Assistant Professor of English.
Paul J. Alpers, Ph.D., Assistant Professor of English.
John S. Anson, Ph.D., Assistant Professor of English.
Thomas Arp, Ph.D., Assistant Professor of English.
James L. Battersby,† Ph.D., Assistant Professor of English.
Stephen Booth,‡‡ Ph.D., Assistant Professor of English.
Julian C. Boyd,‡‡ Ph.D., Assistant Professor of English.
James E. Breslin,‡‡ Ph.D., Assistant Professor of English.
Thomas R. Brooks, Ph.D., Assistant Professor of English.
Jack D’Amico,† Ph.D., Assistant Professor of English.
Carl Dawson, Ph.D., Assistant Professor of English.
Anthony Herbold, Ph.D., Assistant Professor of English.
Richard E. Hutson, Ph.D., Assistant Professor of English.
Joseph E. Kramer, Ph.D., Assistant Professor of English.
Ojars Kratins, Ph.D., Assistant Professor of English.

† On leave, fall quarter, 1968—69.
‡ On leave, winter quarter, 1968—69.
§ On leave, spring quarter, 1968—69.
† On leave, fall, winter and spring quarters, 1968—69.
*** Humanities Research Fellowship Program, fall and winter quarters, 1968—69.
**** Humanities Research Fellowship Program, spring quarter, 1968—69.
**** Humanities Research Fellowship Program, winter quarter, 1968—69.
The Department of English offers the undergraduate considerable flexibility in shaping a program of studies in British and American literature around a core of basic courses. English 1A—IB grounds the student in the fundamentals of composition and literary analysis; English 146A—146B—146C—146D provides an intensive survey of major authors in English from Chaucer to Yeats; English 151, the senior seminar, allows the student to bring to bear on the work of a single major author the critical techniques and scholarly resources acquired in previous years. Beyond these courses, the student is largely free to construct his own program in cooperation with his adviser. Collateral study in art, history, literature, philosophy, and language is recommended but not specifically required.

**Major Program** The English major consists of not less than fourteen courses in English, of which at least nine must be upper division courses, and which must include: English 1A—1B, 146A—146B—146C—146D, a course in Shakespeare, English 151 and, as prerequisite to 151 a period or type course appropriate as background for the major author selected in 151. At least two terms of 146A—146B—146C—146D are to be completed before the junior year.

**Honors Program** Students with an overall grade-point average of 3.0 or better may apply for admission to the honors program. Candidates for the A.B. with honors in English are required to write a bachelor's thesis (for which 5 units of credit are given

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On leave, fall quarter, 1968—69.
under English H195) in their senior year. The thesis is normally an extension of the student's work in English 151 but may deal with another area already fairly familiar to him. A member of the department must agree to direct the thesis. Interested students may obtain application forms for the program in the Department of English Office.

**Preparation for Graduate Study** Those interested in graduate study in English at Berkeley are advised to familiarize themselves with the regulations of the Graduate Division. The potential graduate student is strongly advised to gain a solid background in foreign languages: the Department of English requires candidates for the Ph.D. to pass examinations in Latin and modern languages, normally French and German. Students must pass at least one language examination upon entrance.

**Graduate Study**

**The Ph.D. Program** There is no M.A. program; students are admitted to the doctoral program only in the fall. Courses 208 and 250 are required of all graduate students, and should be completed as early as possible; there are no other specific course requirements. The first five quarters of study are normally spent preparing for the nine-hour written comprehensive examination on the history and criticism of English literature from Chaucer to the present, with special attention to the ages of Chaucer, Shakespeare, and Milton. This preparation should include satisfactory completion of a seminar, and any other courses which will provide a background sufficient for passing the comprehensive examination. For additional details on requirements for the Ph.D., please consult the vice-chairman in charge of graduate studies, Room 319 Wheeler Hall.

**Teacher Training** Consult department office; see also the *Announcement of the School of Education*.

**Departmental Major Advisers** Consult departmental office.

**Subject A** Students must have fulfilled the requirement in Subject A before taking any course in the Department of English.

All courses listed below for three 1½-hour meetings will consist of an hour of regular class to be followed by a half hour of discussion, at the pleasure of the instructor, or two 2-hour class meetings similarly divided.

**Letters and Science List:** for regulations governing this list, see page 80.

**Lower Division Courses**

1A–1B. First-Year Reading and Composition. (5–5)
Three 1½-hour meetings per week. Prerequisite for the English major. Prerequisite: a passing grade in Subject A (examination or course). Credit for English 1A or 1B will not be given to any student who has not passed the Subject A examination or course.
1A. Training in writing and reading of expository prose.
1B. An introduction to the study of literature, with further training in writing.
The Staff (Mr. Flanagan in charge) (Su, F, W, Sp)

20. Modern British and American Literature. (5)
Three 1½-hour meetings per week. (F)
40. Intermediate Expository Writing. (5)
Three 1%-hour meetings per week. Prerequisite: course 1A–1B or Speech 1A–1B or equivalent.

41. Writing in Connection with the Reading of Important Books of the Nineteenth and Twentieth Centuries. (5–5–5)
Three 1%-hour meetings per week. Prerequisite: course 1A–1B or Speech 1A–1B, or consent of instructor.

43. Introduction to the Study of Poetry. (5)
Three 1%-hour meetings per week. Lectures on poetry intended to develop the student’s ability to read, understand, and evaluate a poem. Designed primarily for students whose major is not English.

Mr. Shumaker (W)

44A–44B–44C. Masterpieces of Literature. (5–5–5)
Three 1%-hour meetings per week. Lectures on great works of the world’s literature.

44A. Classical literature. Mr. Rabkin (F)
44B. Medieval and Renaissance literature. Mr. Richmond (W)
44C. Literature since the seventeenth century. Mr. Tracy (Sp)

46A–46B. Survey of English Literature. (5–5)
Three 1%-hour meetings per week. Close study of typical works of major authors from Chaucer to the twentieth century with consideration of the more important aspects of English literary history.

The Staff

INDEPENDENT STUDY

49. Independent Study. (2–5)
Independent study under direction of the instructor. Open to sophomore honors students upon submission of a reading prospectus and upon approval by the instructor and the chairman of major advisers. This course cannot be substituted for a departmental requirement.

The Staff (Mr. Littlejohn in charge) (Su, F, W, Sp)

See also English 146A–146B–146C–146D listed below.

Upper Division Courses

Group I: Unrestricted Courses

Open to all students in the upper division; enrollment not limited, except as noted.

COURSES IN LANGUAGE

110A–110B. The English Language. (5–5)
Three 1%-hour meetings per week.

110A. Structure of English language.
Mrs. Traugott (Su, F, Sp)

110B. History of English language.
Mrs. Traugott (W)

COURSES IN LITERATURE

114A–114B–114C. English Drama. (5–5–5)
Three 1%-hour meetings per week.

114A. English drama to 1603. Mr. Kramer (F)
114B. English drama 1603–1700. Mr. Kramer (W)
114C. British and American drama from 1860 to the present.
Mr. Nestruck (Sp)

115. Music and Poetry of the English Renaissance. (2)
Two 1%-hour meetings per week. Prerequisite: Major in English or consent of instructor. Must be taken concurrently with Music 115. English music from the carol to the madrigal and “recitative music,” and English poetry from late medieval forms to the sonnet and the masque will be studied to show their relationships.

116. The English Bible as Literature. (5)
Three 1%-hour meetings per week. Mr. Jordan (F)

117A–117B. Shakespeare. (5–5)
Three 1%-hour meetings per week. A chronological survey of Shakespeare’s career.

117A, Mr. Kramer (F); 117B, Mr. Kramer (W)

117E. Shakespeare for Nonmajors. (5)
Three 1%-hour meetings per week.
Mr. Herbold (F)

117J. Shakespeare. (5)
Three 1%-hour meetings per week. (Limited to 25 students.) Studies of selected plays, with practice in various critical approaches; e.g., establishing text, relation to source, changing concepts of comedy and tragedy, influence of physical conditions on technique.

Mr. Alpers (F); Miss Adelman (W); Mr. McNulty (Sp)

117S. Shakespeare. (5)
Three 1%-hour meetings per week. Lectures on Shakespeare and reading of his best work.

Mr. Traugott (Su); Mr. Richmond (F)
Mr. Kurdys (W); —— (Sp)

119. The Age of Johnson. (5)
Three 1%-hour meetings per week.
Mr. Battersby (W)

120A–120B. Medieval Literature. (5–5)
Three 1%-hour meetings per week. Students may receive credit for 120A without taking 120B.

120A. Development of literary form and idiom throughout the Christian West from the first to the fifteenth centuries.
Mr. Scott (F)

120B. Close study of selected classics in translation, including the Nibelungenlied and Dante’s Divine Comedy.
Mr. Scott (W)

121. Romantic Period. (5)
Three 1%-hour meetings per week. Mr. Paley (Sp)

122. Victorian Period. (5)
Three 1%-hour meetings per week.

123. Nineteenth-Century British Prose. (5)
Three 1%-hour meetings per week.

Mr. Middlebrook (W)

125A–125B. The English Novel. (5–5)
Three 1%-hour meetings per week. 125A is not prerequisite to 125B.

125A. Defoe to Scott.
Mr. Rader (F)

125B. Dickens to Conrad.
Mr. Witemeyer (W)

COURSES IN LANGUAGE

110A–110B. The English Language. (5–5)
Three 1%-hour meetings per week.

110A. Structure of English language.
Mrs. Traugott (Su, F, Sp)

110B. History of English language.
Mrs. Traugott (W)

COURSES IN LITERATURE

114A–114B–114C. English Drama. (5–5–5)
Three 1%-hour meetings per week.

114A. English drama to 1603. Mr. Kramer (F)
114B. English drama 1603–1700. Mr. Kramer (W)
114C. British and American drama from 1860 to the present.
Mr. Nestruck (Sp)
### Group I: Restricted Courses

#### 100. Methods and Materials of Literary Criticism. (5)

Three 1½-hour meetings per week. (Sections limited to 20 students each.) Designed primarily for freshmen whose major subject is English. 

The Staff (Mr. Barry in charge) (Su, F, W, Sp)

#### 108. Special Topics. (5)

Three 1½-hour meetings per week. (Sections limited to 20 students each.) Designed primarily for English majors. Topics vary from year to year. Those offered in 1968–69 are as follows: fall, Medieval Romance to Spenser (Miss Middleton); Comedy (Mr. Nestrick). In the winter, Satire (Mr. Manning); and Fiction (Mr. Miyoshi), Spring, Recent Poetry (Miss Levertov); The English Elegy (Mr. Middlebrook); and The Romantic Poets (Mr. Zimmerman).

146A–146B–146C–146D. Major British Writers. (5–5–5–5)

Three 1½-hour meetings per week. **Prerequisite:** course 1A–1B. Close study of typical works of major authors from Chaucer to the twentieth century with consideration of the more important aspects of English literary history. 146A, Chaucer to Spenser; 146B, Marlowe to Dryden; 146C, Pope to Austen; and 146D, Wordsworth to Yeats.

The Staff (Mr. Friedman in charge) (Su,F,W,Sp)

### THE SENIOR COURSE

Sections limited to 20 students each. **Prerequisite:** a course in an appropriate period or type as determined by the adviser. Designed primarily for English majors. Intensive study of the more important works of a major author and the writing of a long essay.

#### 151CH. Chaucer. (5)

Three 1½-hour meetings per week. Mr. Cline (W); Mr. Theiner (F); Mr. Elbow (W); Mr. Jones (Sp)

#### 151G. Major Authors. (5)

Three 1½-hour meetings per week. The authors chosen vary from year to year. Those offered in 1968–69 are as follows: in the fall quarter, Joyce (Mr. Raleigh), Stevens (Mr. Arpi), Shaw (Mr. Nestrick), Keats (Mr. Dawson), and Byron (Mr. Manning). In the winter quarter, Blake (Mr. Rieger), Keats (Mr. Griffin), George Eliot (Mr. Witemeyer), Donne (Mr. Herbold), Melville (Mr. McWilliams), and Stevens (Mr. Breslin). In the spring quarter, Marlowe (Mr. Barry), Yeats (Mr. Bloom), Woolf (Mr.
Sussman), Melville (Mr. R. Hutson), Wordsworth (Mr. Brooks), Fielding (Mr. Cohen), and Blake (Mr. Auld).

151MI. Milton. (5)
Three 1½-hour meetings per week.
Mr. Friedman (Su); Mr. Shumaker (F); Mr. Alpers (W); Mr. Richmond (Sp)

151S. Shakespeare. (5)
Three 1½-hour meetings per week.
Mr. Anson (F); Mr. McNulty (W); Mr. D'Amico (Sp)

HONORS COURSES

H195. Honors Course. (5)
Credit assignment: 5 units for a successful thesis; the work may take one or two quarters, at the instructor's option. Prerequisite: open only to students in the honors program who have completed a section of English 151. In this course the English major student will write a bachelor's thesis, which may come out of work begun in a section of English 151. The Staff (Mr. Zwerdling in charge) (Su, F, W, Sp)

H197. Honors Course. (5)
Credit assignment: 5 units for a successful thesis; the work may take one or two quarters, at the instructor's option. Students in the honors program may substitute this course for English H195. Prerequisite: open only to students in the honors program who have completed a section of English 151. In this course the English major student will write a bachelor's thesis, which may come out of work begun in a section of English 151. The Staff (Mr. Zwerdling in charge) (Su, F, W, Sp)

SPECIAL STUDIES

199. Special Study for Advanced Undergraduates. (1-5)
Meetings to be arranged. Open to honor students who have completed 15 or more units of upper division English in the junior year with an average grade of not less than B. Reading and conference with the instructor in a field that shall not coincide with that of any regular course and shall be specific enough to permit the student to write a significant essay based upon his study. Not open to students in the honors program (see H195 and H197). The Staff (Mr. Zwerdling in charge) (Su, F, W, Sp)

ADVANCED COMPOSITION

141. Modes of Writing. (Exposition, Fiction, Verse, etc.) (5)
Three 1½-hour meetings per week. Prerequisite: course 1A–1B or Speech 1A–1B, or consent of instructor. Open to all upper division students and to qualified sophomores with consent of the instructor. Writing in connection with readings in recent English literature and its continental background.
Mr. Goodman (F); Mr. Herbold (W); Mr. Littlejohn (Sp)

(The following courses are open only to upper division students who have the consent of the instructor. With the consent of the instructor, courses numbered 142 and 143 may be repeated without duplication for credit.)

142A. Advanced Composition. (5)
Three 1½-hour meetings per week. Primarily for candidates for the Certificate of Completion of the teacher training curriculum whose teaching major is English.
Mr. Evans (Su); Mr. Coolidge (Sp)

142B. Advanced Composition. (5)
Three 1½-hour meetings per week. Specifically for candidates for the Certificate of Completion of the teacher training curriculum whose teaching major is not English. Mr. Brown (Su); Mr. Witmeyer (F); Mr. Barry (W); Mr. Battersby (Sp)

142C. Advanced Composition. (5)
Three 1½-hour meetings per week. For candidates for the general elementary credential with any major. Review of elements of composition, writing in connection with discussion of books suitable for elementary and junior high school. Mr. Holt (W)

H 19 5. Honors Course. (5)
Three 1½-hour meetings per week. Prerequisite: consent of instructor. Special section in advanced prose for teaching assistants, readers, and students in departments other than English. Mr. Rader, Mr. Stout

143A. Short Fiction. (5)
Three 1½-hour meetings per week.
Mr. Schorer (Su); Mr. Goodman (F, W, Sp)

143B. Verse. (5)
Three 1½-hour meetings per week.
Miss Levertov (F, W); Miss Miles, Mr. Scott (Sp)

143C. Long Narrative. (5)
Three 1½-hour meetings per week. The student, under the direction of the teacher, will work throughout the quarter on a single project; either fiction (novel) or nonfiction (biography, history). Mr. Littlejohn (F); Mr. Rader, Mr. Stout (W, Sp)

143D. Expository and Critical Writing. (5)
Three 1½-hour meetings per week.
Mr. Krutins (F)

Teacher's Courses

300. Problems in Teaching English Literature and Composition in Secondary Schools. (3)
Three 1-hour meetings per week. For senior and graduate students undertaking an English teaching major or minor, ordinarily completed before practice teaching. Accepted in partial satisfaction of the 36-unit requirement for the general secondary credential.
Mr. Brown (Su); Mr. Evans (W, Sp)

301. Problems in the Teaching of Literature. (3)
Students will serve as readers and discussion section leaders in an undergraduate lecture course, and must have completed satisfactorily a seminar, project seminar, or equivalent course in the area of the undergraduate course. Weekly meetings, preparation, and evaluation of student exercises, and a term project report required.

*344. Problems and Methods in Teaching World Literature. (3)
Three 1-hour meetings per week. Prerequisite: one course in the literature of a language other than English in the original, or consent of the instructor. Studies of various texts, chiefly European, from 1800/1900 to the present day. Mr. Anson (F); Mr. Evans (W, Sp)

*Not to be given 1968-69.
Greeks tragedy to the present, with emphasis on philosophical, historical and biographical backgrounds.

Graduate Courses

Students who have not passed the department's examination in French or in German will be admitted to a seminar only with consent of the instructor.

202. History of Literary Criticism. (5)
Three 1 1/2-hour meetings per week.
Mr. Muscatine

203. Graduate Readings. (5)
Three 1 1/2-hour meetings per week. Graduate lecture courses covering broad areas and directing students in wide reading. Open to graduate students and, with the instructor's consent, advanced undergraduates. Offerings vary from year to year. May be repeated for credit in a different area but only when approved and with the permission of the student's adviser and the instructor. Offerings for 1968-69 are: fall, Renaissance literature (Mr. Orgel); Romantic and Victorian Period (Mr. Rieger); winter, Elizabethan Drama (Mr. Anson); Romantic and Victorian Period (Mr. Kuenzelmacher); spring, American literature (Mr. Garbo).

204. Celtic Studies. (5)
Three 1 1/2-hour meetings per week. This course may be repeated for credit.

205. Structure of English. (5)
Three 1 1/2-hour meetings per week. The structure of present-day English—pronunciation, grammar, vocabulary, dialects. Mr. Boyd (F)

208. Problems in the Study of Literature. (5)
Three 1 1/2-hour meetings per week. Textual analysis, discussion of scholarly approaches based on secondary reading, problems in the presentation of materials. Topics will vary from year to year. The program for 1968-69 will be as follows: in the summer quarter, Eighteenth-Century Literature (Mr. Starr) and Victorian Novel (Mr. Levine). In the fall quarter, Romanticism (Mr. Zwerdling), Malory (Mr. Oliver), English Poetry 1744-1798 (Mr. Alkon), Victorian Literature (Mr. Sussman), Eighteenth-Century Literature (Mr. Starr), and Victorian Period (Mr. Miyoshi). In the winter quarter, Modern Poetry (Mr. Bloom), English Alliterative Verse (Miss Middleton), Melville (Mr. McWilliams), Stevens (Mr. Breslin), Romantic Theory (Mr. Dawson), and American Poetry (Mr. Arp). In the spring quarter, Theories of the Arts in England 1750-1820 (Mr. Griffin), Comedy (Mr. Anson), Shakespearean Comedy (Mr. Herold), (Mr. Kratins), and (Mr. Griffin).

210A–210B. Readings in Medieval Latin. (5–5)
Three 1 1/2-hour meetings per week. Prerequisite: Latin 2 or equivalent. An introduction to the central language and literature of the Middle Ages.
210A: Prose, Mr. Jones (F)
210B: Verse, Mr. Jones (W)

211A. Introduction to Old English. (5)
Three 1 1/2-hour meetings per week. Open to seniors with consent of the instructor. Rapid reading of Old English texts.
Mr. A. Hutson (F, Sp); Mr. Theiner (W)

211B. Beowulf. (5)
Three 1 1/2-hour meetings per week.
Mr. Renoir (F); Mr. A. Hutson (W); Mr. Oliver (Sp)

213. Readings in Middle English. (5)
Three 1 1/2-hour meetings per week. Rapid reading of selections in Middle English, and perhaps some entire poems, from the twelfth century to the fifteenth.
Mr. Sklute (F); Mr. Oliver (Sp); Mr. Kratins, Miss Middleton (F); Mr. Renoir (W); Mr. Theiner (W, Sp)

SEMINARS

250. English Seminars. (5–5)
One 2–3 hour meeting per week. Required of M.A. candidates, open to Ph.D. candidates. Extends two consecutive quarters; normally "In Progress" grades will be assigned for the first quarter. Offerings vary from year to year and a student may take a second 250 course for credit with the permission of his adviser and the instructor. Offerings for 1968–69 are: fall-winter, American Literature (Mr. Hart, Mr. Smith); Period from 1660-1744 (Mr. O'Hehir, Mr. Traugott), Theory of Fiction (Mr. Schorer), and The Metaphysical Poets (Mr. Friedman), Studies in Shakespeare (Mr. Orgel), The Popular Ballad (Mr. Bronson), Romantic Period (Mr. Pauley), and Linguistics and Literary Analysis (Mr. Boyd), (winter-spring), Victorian Period (Mr. Flanagan), American Literature (Mr. Ziff), Henry James (Mr. Zwerdling), Johnson and His Contemporaries (Mr. Alkon), Renaissance Nondramatic Poetry (Mr. Alpers), Supplementary and Literary Theory (Mr. Rabin), Seventeenth Century stylistics (Mr. Fish), Swift and Sterne: Backgrounds, Influences, Literary Techniques and Traditions (Mr. Stout), Modern British Literature (Mr. Parkinson), Victorian Period (Mr. Ruder), Literature and History (Mr. Raleigh), and Psychoanalysis and Literary Criticism (Mr. Crews).

270. Research Seminars. (5)
One 2–3 hour meeting per week. Intended for specially qualified Ph.D. candidates; will not satisfy the M.A. seminar requirement. May be repeated for credit. Offerings vary from year to year; for 1968–69 they are: summer, Swift (Mr. Tuveson), fall, Medieval Period (Mr. Scott); Period from 1660-1744 (Mr. O Heard, Mr. Sussman), Victorian Period (Mr. Traugott), Theory of Fiction (Mr. Schorer), and The Metaphysical Poets (Mr. Friedman), Studies in Shakespeare (Mr. Orgel), The Popular Ballad (Mr. Bronson), Romantic Period (Mr. Pauley), and Linguistics and Literary Analysis (Mr. Boyd), (winter-spring), Victorian Period (Mr. Flanagan), American Literature (Mr. Ziff), Henry James (Mr. Zwerdling), Johnson and His Contemporaries (Mr. Alkon), Renaissance Nondramatic Poetry (Mr. Alpers), Supplementary and Literary Theory (Mr. Rabin), Seventeenth Century stylistics (Mr. Fish), Swift and Sterne: Backgrounds, Influences, Literary Techniques and Traditions (Mr. Stout), Modern British Literature (Mr. Parkinson), Victorian Period (Mr. Ruder), Literature and History (Mr. Raleigh), and Psychoanalysis and Literary Criticism (Mr. Crews).

298. Special Studies. (5–10)
Normally reserved for students directly engaged upon the doctoral dissertation.

The Staff (Mr. Ziff in charge) (Su, F, W, Sp)

299. Special Study. (1–5)
Primarily for students engaged in preliminary exploration of a restricted field, involving research and the writing of a report. May not be substituted for available seminars.

The Staff (Mr. Ziff in charge) (Su, F, W, Sp)

601. Individual Study. (1–8)
Individual study, in consultation with the graduate adviser, intended for qualified students to do necessary work to prepare themselves for language examinations and M.A. orals. Does not count in satisfaction of minimum higher degree requirements.

The Staff (Mr. Ziff in charge) (Su, F, W, Sp)
602. Individual Study for Doctoral Studies. (1-8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on satisfactory/unsatisfactory basis.

The Staff (Mr. Ziff in charge) (Su, F, W, Sp)

English as a Foreign Language (EFL)

C. Douglas Chrétien, Ph.D., Director of Subject A and English as a Foreign Language, and Professor of Linguistics.

June R. McKay, M.A., Lecturer, and Associates.

Performance on the Examination in English for Foreign Students, given at the beginning of each quarter, will determine the course in which an entering foreign student must enroll. Auditors will not be permitted.

EFL 24. Elementary English for Foreign Students. (10)

Intensive course required of foreign students whose grades on the diagnostic examination indicate need for training in basic English for University work.

The Staff (Su, F, W, Sp)

EFL 24A–G24B. Elementary English for Foreign Students. (5-5)

A reduced course for foreign graduate students whose grades on the diagnostic examination indicate need for training in basic English for University work.

The Staff (F, W)

EFL 26. Intermediate English for Foreign Students. (5)

Required of: (1) foreign students whose grades on the diagnostic examination indicate need for further instruction in English at this level and (2) those who have passed EFL 24.

The Staff (Su, F, W, Sp)

EFL 28. Advanced English for Foreign Students. (5)

Required of: (1) foreign students whose grades on the diagnostic examination indicate need for further instruction in English at this level and (2) those who have received C or D in EFL 26.

The Staff (Su, F, W, Sp)

EFL 40. Advanced English Composition for Foreign Students. (5)

Required of: (1) foreign students whose grades on the diagnostic examination indicate need for further instruction in English at his level and (2) those who have received a grade of B in EFL 26 or a grade of C or D in EFL 28. Must be passed with a grade of C or better.

The Staff (Su, F, W, Sp)

ENTOMOLOGY AND PARASITOLOGY

(Department Office, 137 Giannini Hall)

John E. Casida, Ph.D., Professor of Entomology.
Roderick Craig, Ph.D., Professor of Entomology.
Richard L. Doutt, Ph.D., L.L.B., Professor of Biological Control.
Julius H. Freitag, Ph.D., Professor of Entomology.
Deane P. Furman, Ph.D., Professor of Parasitology.
Carl B. Huffaker, Ph.D., Professor of Entomology.
Paul D. Hurd, Jr., Ph.D., Professor of Entomology.
Dilworth D. Jensen, Ph.D., Professor of Entomology.
E. Gorton Linsley, Ph.D., Professor of Entomology.
John W. MacSwain, Ph.D., Professor of Entomology.
Powers S. Messenger, Ph.D., Professor of Entomology.
Woodrow W. Middelkauff, Ph.D., Professor of Entomology.
Ray F. Smith, Ph.D., Professor of Entomology (Chairman of the Department).
Ronald W. Stark, Ph.D., Professor of Entomology.
Edward S. Sylvester, Ph.D., Professor of Entomology.
Yoshinori Tanada, Ph.D., Professor of Entomology.
Robert L. Usinger, Ph.D., Professor of Entomology.
Robert van den Bosch, Ph.D., Professor of Entomology.
William M. Hoskins, Ph.D., Professor of Entomology, Emeritus.
Abraham E. Michelbacher, Ph.D., Professor of Entomology, Emeritus.

Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on satisfactory/unsatisfactory basis.

The Staff (Mr. Ziff in charge) (Su, F, W, Sp)

Performance on the Examination in English for Foreign Students, given at the beginning of each quarter, will determine the course in which an entering foreign student must enroll. Auditors will not be permitted.

EFL 24. Elementary English for Foreign Students. (10)

Intensive course required of foreign students whose grades on the diagnostic examination indicate need for training in basic English for University work.

The Staff (Su, F, W, Sp)

EFL 24A–G24B. Elementary English for Foreign Students. (5-5)

A reduced course for foreign graduate students whose grades on the diagnostic examination indicate need for training in basic English for University work.

The Staff (F, W)

EFL 26. Intermediate English for Foreign Students. (5)

Required of: (1) foreign students whose grades on the diagnostic examination indicate need for further instruction in English at this level and (2) those who have passed EFL 24.

The Staff (Su, F, W, Sp)

EFL 28. Advanced English for Foreign Students. (5)

Required of: (1) foreign students whose grades on the diagnostic examination indicate need for further instruction in English at this level and (2) those who have received C or D in EFL 26.

The Staff (Su, F, W, Sp)

EFL 40. Advanced English Composition for Foreign Students. (5)

Required of: (1) foreign students whose grades on the diagnostic examination indicate need for further instruction in English at his level and (2) those who have received a grade of B in EFL 26 or a grade of C or D in EFL 28. Must be passed with a grade of C or better.

The Staff (Su, F, W, Sp)

ENTOMOLOGY AND PARASITOLOGY

(Department Office, 137 Giannini Hall)

John E. Casida, Ph.D., Professor of Entomology.
Roderick Craig, Ph.D., Professor of Entomology.
Richard L. Doutt, Ph.D., L.L.B., Professor of Biological Control.
Julius H. Freitag, Ph.D., Professor of Entomology.
Deane P. Furman, Ph.D., Professor of Parasitology.
Carl B. Huffaker, Ph.D., Professor of Entomology.
Paul D. Hurd, Jr., Ph.D., Professor of Entomology.
Dilworth D. Jensen, Ph.D., Professor of Entomology.
E. Gorton Linsley, Ph.D., Professor of Entomology.
John W. MacSwain, Ph.D., Professor of Entomology.
Powers S. Messenger, Ph.D., Professor of Entomology.
Woodrow W. Middelkauff, Ph.D., Professor of Entomology.
Ray F. Smith, Ph.D., Professor of Entomology (Chairman of the Department).
Ronald W. Stark, Ph.D., Professor of Entomology.
Edward S. Sylvester, Ph.D., Professor of Entomology.
Yoshinori Tanada, Ph.D., Professor of Entomology.
Robert L. Usinger, Ph.D., Professor of Entomology.
Robert van den Bosch, Ph.D., Professor of Entomology.
William M. Hoskins, Ph.D., Professor of Entomology, Emeritus.
Abraham E. Michelbacher, Ph.D., Professor of Entomology, Emeritus.
Undergraduate Major Adviser: Mr. Wood.

Graduate Advisers for Entomology: Mr. Freitag, Mr. Hurd, Mr. Oliver, Mr. van den Bosch.

Graduate Adviser for Parasitology: Mr. Anderson.

The Department of Entomology and Parasitology in the College of Agricultural Sciences offers the entomology major in the Agricultural Sciences Curriculum (see page 66). It is designed to give broad training in biology, with a general orientation toward entomology as it relates to modern agriculture’s broad spectrum of activity.

Undergraduate Major Requirements

**Humanities and Social Sciences**, 29 units as follows: English, speech, or comparative literature (8); foreign language† through course 3; additional courses, which may include not more than 10 units of foreign language (21).

**Physical Sciences and Mathematics**, 40 units as follows: chemistry—inorganic with laboratory (12); organic with laboratory (8); physics (12); mathematics and/or statistics (8).

**Biological and Agricultural Sciences**, 43 units, other than major field as follows: Microbiology with laboratory (5); genetics (5); physiology (5); pathology (4); additional biological sciences (24).

**Major Field**, 33 units as follows: general entomology (4); systematic entomology (4); insect ecology (4); insect classification (4); anatomy and physiology of insects (8); summer field course (5); additional entomology (4).

**Additional courses**, 35 units.

**Total units**, 180.

Certain courses may be required in satisfaction of the above. The undergraduate adviser will provide this information and any other details about the major.

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† No units are indicated for this requirement since it may be met wholly or in part by work taken in high school. If satisfied at the collegiate level, units may be used where applicable.
Graduate Programs

A basic educational background in the physical and biological sciences is prerequisite to the study of entomology at the graduate level. The minimum requirements are usually fulfilled by a bachelor's degree from an institution of acceptable standing and an undergraduate program which includes: general chemistry, organic chemistry, botany, general zoology, invertebrate zoology, genetics, physiology, and one course in a microbial science. General entomology, insect functional anatomy, systematic entomology, and insect ecology are required. Two courses in zoology in addition to those mentioned above must also have been taken. If the undergraduate program on previous studies have not included the above prerequisites, the deficiency must be removed at the outset of graduate study. Students with a B.S. degree in zoology and a satisfactory scholastic record, may be admitted for graduate study in parasitology. A background in entomology is desirable but not essential.

The graduate curricula in entomology and parasitology leading to the M.S. and Ph.D. degrees are designed to prepare students for research and teaching responsibilities in these fields. Encouragement is given to studies of a fundamental nature. Before the Ph.D. degree is granted the candidate must satisfactorily demonstrate an understanding of the subject matter of a large field of study, an ability to perform original and significant research, and an ability to interpret and communicate findings in such fashion as to serve the progress of ideas in his field of emphasis. For further details, consult the graduate advisers.

Lower Division Course

10. Natural History of the Insects. (4)
Lectures, 3 hours per week: demonstration, 1 hour per week; one or more field trips. For students not specializing in zoological sciences.
Mr. MacSwain (F)

Upper Division Courses

100. General Entomology. (5)
Lectures, 2 hours per week; laboratory, 6 hours per week, plus field trips to be arranged. Prerequisite: introductory course in a biological science. Biology of insects, including classification of orders, morphology, physiology, behavior, and ecology.
Mr. Daly (F)

101. Insect Classification. (4)
Lecture, 2 hours per week; laboratory, 6 hours per week. Prerequisite: course 100. Classification of insects to the family level with emphasis on identification.
Mr. Hurd (W)

102A–102B. Anatomy and Physiology of Insects. (3-4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: upper division standing in zoology or entomology. Recommended: course work in chemistry through introductory organic. 102A is not prerequisite to 102B. Sequence, beginning (F). 102A. Principles of nutrition, metabolism, and distribution of metabolites. Mr. Pipa, Mr. Craig (F) 102B. Principles of growth and development, sensory reception, neuromuscular interactions, and reproduction. Mr. Pipa, Mr. Craig (W)

104. Systematic Entomology. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: courses 100, 101. Principles and practices, classification at the generic and specific levels, nomenclature, and bibliographic methods.
Mr. Linsley, Mr. Usinger (Sp)

105. Insect Ecology. (4)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: upper division standing in one of the biological sciences. Ecology with examples from the insects; insect behavior; analysis of the insect environment; population dynamics.
Mr. Dahlsten, Mr. Messenger (Sp)

109. Entomology Field Practice Course. (5)
Five weeks, daily. Prerequisite: one course in entomology.
Mr. Bohart, Mr. Hurd, Mr. Powell (Extracourse)

110. Economic Entomology. (5)
Lectures, 3 hours per week; laboratory, 6 hours per week. Life histories and habits of beneficial and injurious insects and arachnids on plants and animals, and the principles involved in manipulating populations.
Mr. Middlekauff, Mr. Koehler (W)

111. Summer Field Course in Economic Entomology. (3)
Laboratory, 1- or 2-day field trips per week. Prerequisite: one course in entomology. May be repeated for credit. Observation of the injurious and beneficial insects affecting man, and the production and storage of agricultural and forest commodities, including the methods used for their control.
The Staff (Mr. Smith in charge) (Su)

114. Introductory Forest Entomology. (4)
Lectures, 3 hours per week; laboratory and field trips, 3 hours per week. Prerequisite: one course in general biology. Not open to entomology majors. Interrelationships of insect populations, forest stands, and forest practices. Identification, life histories, ecology, and control of insects affecting western forests and forest products.
Mr. Dahlsten, Mr. Stark, Mr. Wood (F)
17. Insect Toxicology. (4)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: Chemistry 8A–8B, or equivalent. Chemical composition of insecticides; their mode of action; resistance mechanisms; and methods of toxicity testing. Mr. Gordon, Mr. Casida (Sp)

30. Biological Control of Insect and Weed Pests. (4)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: courses 100, 101. Theories and practices of biological control; population phenomena; and the biology of entomophagous insects.
Mr. Doutt, Mr. Van den Bosch, Mr. Callagheone, Mr. Hagen (F)

410. Insect Pathology. (5)
Lectures, 4 hours per week; laboratory, 3 hours per week. Prerequisite: course 100, at least one course in a microbiological science. Principles of insect pathology and insect microbiology; infectious and noninfectious diseases of insects; diagnosis, therapy, and microbial control.
Mr. Tanada, Mr. Poinar (W)

150. Medical and Veterinary Helminthology. (6)
Lectures, 3 hours per week; laboratory, 9 hours per week. Helminthic infections of man and domestic animals. Biology, host-parasite interrelationships, identification, prophylaxis, and therapeutics.
Mr. Furman, Mr. Weinmann (Sp)

153. Medical and Veterinary Entomology. (5)
Lectures, 3 hours per week; laboratory, 6 hours per week. Role of insects and other arthropods in transmission and causation of diseases of humans and domestic animals.
Mr. Furman, Mr. Anderson (W)

198. Directed Group Studies for Advanced Undergraduates. (1–5)
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1–5)
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

Graduate Courses

204. Principles of Systematic Entomology. (3)
Lectures, 3 hours per week. Prerequisite: course 104.
To be offered in odd-numbered years. Theory and philosophy of systematic entomology with emphasis on phylogeny, zoography, and nomenclature.
Mr. Linsley, Mr. Usinger (W)

205. Population Ecology. (3)
Lectures, 3 hours per week. Prerequisite: course 105.
To be offered in even-numbered years. Population dynamics, regulation, and measurement theory of natural control.
Mr. Hufaker, Mr. Messenger (F)

210. Principles and Problems in Agricultural Entomology. (3)
Lectures, 3 hours per week. Prerequisite: course 100 or 110. The principles of insect control, the side effects to plants and animals following insecticide usage; plot design and sampling techniques; legislative controls in agricultural entomology.
Mr. Middlekauff, Mr. Allen (W)

211. Insect-Crop Relationships. (4)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: course 100 or 110. Bionomics of important insects and mites on agricultural crops; their relationships to crop production; and special problems of control on the different crops.
Mr. Allen, Mr. Koehler (Sp)

214. Concepts and Research in Forest Entomology. (3)
Lectures, 2 hours per week; one 2-day field trip each month. Prerequisite: course 100, 101, or 114. To be offered in even-numbered years. Discussion of concepts and practices in forest entomology and the past and current research from which they are derived.
Mr. Dahlsen, Mr. Stark, Mr. Wood (F)

217. Advanced Insect Physiology, Biochemistry, and Toxicology. (3)
Lectures, 3 hours per week. Prerequisite: courses 102A–102B, 117. Recommended: Biochemistry 102. May be taken twice for credit. Selected topics.
Mr. Casida, Mr. Craig, Mr. Gordon (W)

218. Laboratory in Advanced Insect Physiology, Biochemistry, and Toxicology. (1)
Laboratory, 3 hours per week. Prerequisite: course 217 (may be taken concurrently). May be taken twice for credit. Selected laboratory studies demonstrating techniques and principles.
Mr. Casida, Mr. Craig, Mr. Gordon (W)

240. Advanced Insect Pathology. (3)
Lectures, 2 hours per week; laboratory, 3 hours per week. Prerequisite: courses 202A, 202B, 140. To be offered in odd-numbered years. Advanced consideration of infectious and noninfectious diseases of insects, diagnosis, symptomatology, morphopathology, physiopathology, epizootiology, and microbial control.
Mr. Tanada, Mr. Poinar (Sp)

253. Advanced Medical and Veterinary Entomology. (2)
Lectures, 2 hours per week. Prerequisite: course 153; Public Health 180A and 180B. To be given in even-numbered years. The genesis of arthropod-borne diseases.
Mr. Furman, Mr. Anderson (Sp)

260. Plant Nematology. (5)
Lectures, 3 hours per week; laboratory, 6 hours per week. To be given in odd-numbered years. Identification, morphology, biology, and distribution of plant parasitic and associated nematodes. Symptomatology, pathology, and control of nematode infections in cultivated crops.
Mr. Furman, Mr. Anderson (F)

263. Acarology. (5)
Lectures, 2 hours per week; laboratory, 6 hours per week; plus 3 additional laboratory hours to be arranged. Prerequisite: courses 100, 101. To be given in even-numbered years. Taxonomy, biology, and ecology of mites and ticks.
Mr. Oliver (Sp)

266. Insect Vectors of Plant Pathogens. (4)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: Plant Pathology 120. To be given in odd-numbered years. Role of insects and arachnids in the transmission and causation of plant diseases; the relationship of the pathogens to their vectors and the approaches to control.
Mr. Freitag, Mr. Sylvester (Sp)
269. History of Entomology. (4)
Lectures, 3 hours per week. Prerequisite: course 100. To be given in even-numbered years. Development of influential ideas and principles in biology with special reference to entomology. Consideration given to effects of philosophy, religion, political and economic factors on evolution of scientific method.
Mr. Jensen (W)

272. Principles and Methods of Entomological Research. (4)
Lectures, 4 hours per week. To be given in odd-numbered years. Techniques and purposes of the scientific method in entomology with emphasis on problem selection and the collection, evaluation, and presentation of data.
Mr. Sylvester (F)

276. History of the Environment. (4)
Lectures, 4 hours per week; laboratory, 9 hours per week. Prerequisites: courses 100, 101. To be given in even-numbered years. The biology and classification of immature insects with emphasis on aquatic and holometabolous forms.
Mr. Anderson, Mr. Daly, Mr. Powell (Sp)

289. Special Seminar Topics. (2)
May be repeated for credit.
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

290. Seminar in Agricultural Entomology. (2)
May be repeated for credit.
Mr. Allen, Mr. Batiste, Mr. Koehler, Mr. Middlekauff (F, W)

291. Seminar in Parasitology. (2)
May be repeated for credit.
Mr. Anderson, Mr. Furman, Mr. Weinmann (W, Sp)

292. Seminar in Insect Physiology, Biochemistry, and Toxicology. (2)
May be repeated for credit.
Mr. Casida, Mr. Craig, Mr. Gordon, Mr. Mittler (W, Sp)

293. Seminar in Insect Pathology. (2)
May be repeated for credit.
Mr. Poinar, Mr. Tanada (F, Sp)

294. Seminar in Systematic Entomology. (2)
May be repeated for credit.
Mr. Daly, Mr. Hard, Mr. MacSwain, Mr. Usinger (W, Sp)

295. Seminar in Insect Ecology and Biological Control. (2)
May be repeated for credit.
Mr. Doutt, Mr. Huffaker, Mr. Messenger, Mr. Smith (F, Sp)

296. Seminar in Forest Entomology. (2)
May be repeated for credit.
Mr. Dahlsten, Mr. Stark, Mr. Wood (F, Sp)

298. Directed Group Studies. (1-6)
Advanced study or research on topics which may vary from quarter to quarter.
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

299. Research in Entomology and Parasitology. (1-12)
Original study on special topics in laboratory, field, and museum. Credit awarded according to work accomplished.
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

601. Individual Study for Masters Students. (1-8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

Staff Seminar in Entomology. (No credit)
Biweekly meeting for presentation of special topics.
The Staff (Mr. Smith in charge) (Su, F, W, Sp)

IDS 250. Experimental Helminthology. (5)
See Interdepartmental Studies for complete description of this course.

ENVIROational Design
(Office of the Dean, 230 Wurster Hall)

William L. C. Wheaton, Ph.D., Professor of City Planning.
Henry J. Lagorio, M.A., Professor of Architecture.
Roslyn Lindheim, B.Arch., Associate Professor of Architecture.

Environmental Design courses include those courses whose content, philosophy, or method provide a common base of knowledge for the several disciplines within the College of Environmental Design. These courses are taught at both the undergraduate and graduate levels. At the present time, courses on history of the environment and certain introductory courses in architecture are represented. The scope and number of Environmental Design courses is expected to expand with the growth of inter-
disciplinary research and the definition of common areas of concern within the college.

For general information concerning the College of Environmental Design, please see page 74. Detailed information on the degree programs can be found in the architecture, City and Regional Planning, Design, and Landscape Architecture sections of this catalogue, as well as in the ANNOUNCEMENT OF THE COLLEGE OF ENVIRONMENTAL DESIGN.

The College of Environmental Design is comprised of the departments of Architecture, City and Regional Planning, Design, and Landscape Architecture. Courses offered by the respective departments are to be found immediately following the listing of Environmental Design courses.

ENVIRONMENTAL DESIGN COURSES

Lower Division Courses

1. Perception and Communication in the Environment. (4)
Two 1-hour lectures and two 2-hour laboratory-seminars per week. Theories of perception and communication as applied to environmental design. Must be taken at Berkeley in the first year of residence.
Mr. Prestini (F, W, Sp)

1. Man and Environment. (4)
Three 1-hour lectures and one 2-hour discussion per week. Man and environment; an overview of the design field as related to other disciplines. Must be taken at Berkeley in the first year of residence.
Mr. Quinn (F, W)

6. Graphic Communication and Drawing. (4)
Two 1-hour lectures and two 2-hour laboratories per week. Freehand drawing and sketching as a medium for the development and communication of physical concepts.
__________ (F, W, Sp)

Upper Division Courses

110X. Experimental Student-run Tutorials. (3)
One 1-hour discussion per week. Enrollment limited by number of available tutors. Each tutorial will consist of four student tutes and one senior or graduate tutor. Each tutorial will concern itself with some theoretical question concerning the foundations of architecture.
Mr. Alexander (F, W, Sp)

169. History of the Environment. (4)
Three 1-hour lectures per week. Evolution of the American landscape, 1865 to present, with particular emphasis on highways, recreation, conservation, the agricultural landscape, and new forms of collective settlements.
Mr. Jackson (W)

170. History of the Environment—Ancient and Medieval. (4)
Two 1½-hour lectures and one 1-hour discussion per week. Prerequisite: open to sophomores in the College. Ancient and medieval architecture, their relation to urban and rural land patterns, transportation systems, and to the cultural artifacts of their time.
Mr. Kostof (F)

171. History of the Environment—Renaissance and Modern. (4)
Two 1½-hour lectures and one 1-hour discussion per week. Prerequisite: open to sophomores in the College. Renaissance and Modern architecture, their relation to urban and rural land patterns, transportation systems, and to the cultural artifacts of their time.
Miss Evenson (W)

172. History of the Environment. (4)
(Formerly numbered Design 145)
Three 1-hour lectures per week. The theory and practice of design from preindustrial handcrafts to mechanical production and the evolution of a machine aesthetic.
Mr. Schafer (Sp)

*173. American Architecture. (4)
Two 1½-hour lectures per week and other meetings as scheduled. Prerequisite: courses 170 and 171 or consent of instructor. The architecture of America from Colonial times to the present.
Miss Evenson (Sp)

*174. Modern Architecture. (4)
Two 1½-hour lectures per week and other meetings as scheduled. Prerequisite: courses 170 and 171 or consent of instructor. The background and evolution of modern architecture in the 19th and 20th centuries.
Miss Evenson (Sp)

175. Great Cities. (4)
Two 1½-hour lecture-discussions per week and independent student research under faculty guidance. Prerequisite: courses 170 and 171 or consent of instructor. A study of the major monuments of a great city and its changing character from its founding to the present. Course may be repeated for credit.
__________ (W)

*176. The Architecture of Islam. (4)
Two 1½-hour lecture-discussions per week and independent student research under faculty guidance. Prerequisite: courses 170 and 171 or consent of the instructor. Selected monuments in Muslim lands from the Seventh Century to the present with emphasis on the early period and on buildings in Spain and the Near East.
Mr. Kostof (Sp)

177. Survey of Urban Design. (4)
Two 1½-hour lectures per week and other meetings as scheduled. Prerequisite: courses 170 and 171 or consent of instructor. The evolution of urban form, civic design, and planning theory from ancient

* Not to be given, 1968-69.
times to the present with emphasis on the role of the city in civilization and on structure and function of contemporary cities. Miss Evenson (W)

*178. The Architecture of the Far East. (4)
Two 1½-hour lecture-discussions per week. Prerequisites: courses 170 and 171 or consent of instructor. Detailed investigation of selected architecture of the Near and Far East. Mr. ———

*190. Environmental Structure. (3)
Three 1-hour meetings per week. Prerequisites: upper division standing in any College. The structure of the environment— including region, urban area, buildings, and details—from the point of view of its overall pattern. Special attention will be given to the way in which the pattern meets needs, and to the interweaving of constituent patterns at different scales. Mr. Alexander (F)

ARCHITECTURE

(Department Office, 232 Wurster Hall)

E. Michael Czaja, M.Arch., Professor of Architecture.
Vernon A. DeMars, A.B., F.A.I.A., Professor of Architecture.
Joseph Esherick, B.Arch., F.A.I.A., Professor of Architecture.
Donald L. Foley, Ph.D., Professor of Architecture and of City Planning.
Michael A. Goodman, M.A., F.A.I.A., Professor of Architecture.
Sami Y. Hassid, Ph.D., Professor of Architecture.
Henry J. Lagorio, M.A., Professor of Architecture.
Gerald M. McCue, M.A., Professor of Architecture (Chairman of the Department).
Richard L. Meier, Ph.D., Professor of Environmental Design.
Roger Montgomery, M.Arch., Professor of Urban Design.
Donald E. Olsen, M.Arch., Professor of Architecture.
James L. Prestini, B.S., Professor of Design.
Donald P. Reay, M.Sci., Professor of Architecture.
Jesse Reichel, Professor of Design.
George P. Simonds, M.A., F.A.I.A., Professor of Architecture.
Claude Stoller, B.Arch., Professor of Architecture.
Raymond W. Jeans, M.A., Professor of Architecture, Emeritus.
Stafford L. Jory, Gr.Arch., Professor of Architecture, Emeritus.
Warren C. Perry, B.S., F.A.I.A., Professor of Architecture, Emeritus.
Christopher Alexander, Ph.D., Associate Professor of Architecture.
Kenneth H. Cardwell, A.B., Associate Professor of Architecture.
Ezra D. Ehrenkranzt, M.Arch., Associate Professor of Architecture.
Spiro Kostof, Ph.D., Associate Professor of Architectural History and Curator of Architecture, University Art Museum.
William H. Liskamm, M.Arch., Associate Professor of Architecture.
Richard C. Peters, M.F.A., Associate Professor of Architecture.
Patrick J. Quinn, M.Arch., Associate Professor of Architecture.
Horst W. J. Rittel, Associate Professor of the Science of Design.
Harold A. Stump, A.B., Associate Professor of Architecture.
Sim H. Van der Ryn, B.Arch., Associate Professor of Architecture.
—David A. Brodie, M.Arch., Assistant Professor of Architecture.
Gary R. Brown, M.Arch., Assistant Professor of Architecture.
Norma D. Evenson, Ph.D., Assistant Professor of Architectural History.
—James A. Leary, M.Arch., Assistant Professor of Architecture.
Roslyn Lindheime, B.Arch., Assistant Professor of Architecture.
H. Donn Logan, M.Arch., Assistant Professor of Architecture.

* Not to be given, 1968–69.
** Faculty Research Professor for Humanities, fall, 1968.
† On leave, 1968–69.
‡ On leave fall, 1968.
§ On leave winter, 1969.
¶ On leave spring, 1969.
The Department of Architecture provides a program of courses dealing with the satisfaction of human needs through individual buildings and the setting of the community. The major in architecture includes the study of the human environment, and a consideration both of the difficulties and the advantages provided by technology. The aim of the architect is to achieve order and beauty in the environment, and the aim of his education is to give him the means for this task. He is helped to understand that a satisfactory form of any environment is not readymade, but must arise out of the analysis and synthesis of many biological, social, technological, and aesthetic factors. The architect must develop an instinct for sensing the dozens of unforeseen problems which arise out of designing for the environment. He must learn to take into account the variations in human tastes and habits. Otherwise, his training is incomplete, no matter how technically proficient he may be.

It is for these reasons that the student in architecture must complete a program of courses over a wide range of subjects, including mathematics, physics and engineering, and, in addition, courses in design, graphics, and architectural history; in aspects of architecture as a profession; and finally, in the social sciences and humanities. Students are advised to see page 74 for curriculum information and to consult the Announcement of the College of Environmental Design for details on specific requirements.

Study Area A—Design Problems

101. Introduction to Architectural Design Process. (4)

Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: Environmental Design 3, 4, and 6. Origin, nature, and identification of architectural design problems. Investigation of form determinants and form as a structural concept.

Mrs. Lindheim and Staff (Su, F, W, Sp)

102A–102B–102C. Architectural Design. (4-4-4)

One 1-hour lecture and two 3-hour laboratories per week. Prerequisite: course 101 and upper division standing. Design problems involving elementary building forms, neighborhood areas and building groups, abstract design problems and systems approach to design. Sequence beginning each quarter.

Mr. Peters and Staff (Su, F, W, Sp)

Course Series: Design Options Group I—Architectural Design.

Two 4-hour laboratory-seminars per week. Prerequisite: course 102A–102B–102C. Architectural design problems entailing the range of relevant factors and difficulties concerning typical cases. Courses shall present topical problems as case studies and may be taken in any sequence.

201. Housing Facilities. (4)

Mr. Stump, Mr. DeMars and Staff (Su, F, W, Sp)

202. Educational Facilities. (4)

Mr. Gilland, Mr. Osmon and Staff (Su, F, W, Sp)

203. Commercial Facilities. (4)

Mr. Czaja, Mr. Goodman and Staff (F, W, Sp)

204. Civic Facilities. (4)

Mr. Brown and Staff (Su, F, W, Sp)

205. Multi-Level Real Estate. (4)

Mr. Stoller and Staff (F, W, Sp)

206. Introduction to Urban Design. (4)

Mr. Liskamn, Mr. Logan and Staff (F, W, Sp)

207. Special Problems. (4)

Mr. Liskamn and Staff (Su, F, W, Sp)

208. Combined Course. (4)

Mr. Simonds and Staff (F, W, Sp)

Course 208 must be taken concurrently with courses 213 and 222. Recommended as last course of Design Options Group I series. Prerequisite: completion of all required courses in Areas B and C.
Course Series: Design Options Group II—
Architectural Design and Research.

Two 4-hour laboratory-seminars per week. Design and research in special study areas. Prerequisite: enrollment in Option I or completion of three courses in Design Options Group I and completion of all required courses and 6 units of professional electives in the particular study area of the course offering. Students are expected to enroll in the individual laboratory-seminar for a minimum of two consecutive quarters. At the end of the first quarter, an “in progress” grade will be given, and at the end of the second quarter, a letter grade will be assigned for the two-quarter work. Following completion of the second quarter and at the option of the instructor, students may repeat for one additional quarter.

281. Study in Area B, Environment Control Systems. (6)
   Mr. McCue, ----------- (F, W, Sp)

282. Study in Area C, Structure and Production as Related to Design Problems. (6)
   Mr. Ehrenkrantz (F, W, Sp)

283. Study in Area D, Design Theories and Methods as Related to Design Problems. (6)
   Mr. Esherick (F, W, Sp)

284. Study in Area E, Social and Economic Factors as Related to Design Problems. (6)
   Mr. Reichek (F, W, Sp)

286. Architectural Thesis and Comprehensive Seminar. (3)

Two 3-hour seminars. Prerequisite: graduate standing. Recommended for two consecutive quarters for students in Plan A and for one quarter for students in Plan B. Review of the development of thesis contents. Assignments preparatory to comprehensive examination. At the option of the instructor, students may repeat the seminar up to a maximum of three quarters. Mr. Hassid and Staff (W, Sp).

288. The Integrated Specification of Environmental Structure. (6)

Five 1-hour seminars and other times to be arranged per week. Prerequisite: two courses from Design Options Group I series, and 40 units in one field outside of the College of Environmental Design, or consent of instructor. Each student will choose a facet of environmental structure as the subject of an individual design-research project. The seminar will deal with the theoretical problems of combining these facets to form an integrated whole. Students will enroll for a minimum of three consecutive quarters. “In progress,” grades will be given until the third quarter, at which time a letter grade will be assigned. Following completion of the third quarter, at the option of the instructor, students may repeat for a maximum of three quarters. Each repeated quarter will be graded. Mr. Alexander (F, W, Sp)

Study Area A—Environmental Control Systems

110. Introduction to Environmental Control Systems. (4)

Two 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: completion of Physics sequence or consent of the instructor. Environmental phenomena, needs, controls and counter measures, introduction and general survey.
   Mr. Ehrenkrantz and Staff (W, Sp)

211. Environmental Control Systems. (3)

One 2-hour lecture and one 2-hour laboratory per week. Prerequisite: course 110. Psychophysical synthesis of sensory factors in the design of control systems.
   Mr. Halldane (F, Sp)

212. Environmental Control Systems. (3)

One 2-hour lecture and one 2-hour laboratory per week. Prerequisite: course 211. Synthesis of control systems including the distribution of light, sound, air, transport, power, communications, water, waste and protective devices.
   Mr. Halldane (W)

213. Design Problems in Environmental Control Systems. (3)

Two 2-hour laboratory-seminars per week. Prerequisite: course 212 or consent of instructor. Combined course, must be taken concurrently with 208 and 222. Interaction of environmental control systems, relation and integration of natural and artificial systems with other design components.
   Mr. Anderson, Mr. Yanov (F, W, Sp)


Two ½-hour seminars per week. Prerequisite: course 212 or consent of instructor. Advanced study in environmental control systems.

219A. Light in Architectural Design.
   Mr. Peters, Mr. Halldane (F, W, Sp)

219B. Acoustics in Architectural Design.
   Mr. ------ (Sp)

219C. Environmental Control Systems related to Climatic Conditions.
   Mr. ------ (W)

Study Area C—Structure and Production

120. Building Materials. (4)

One 4-hour lecture-discussion per week with field trips. Properties and application of building materials. Specification sources, presentation and information retrieval.
   Mr. Prestini (Sp)

121. Construction Systems and Production. (3)

Two 1½ hour lectures per week. Prerequisite: completion of engineering sequence or consent of the instructor. Study of building construction techniques, systems and components.
   Mr. Testa (W, Sp)

222. Design Problems in Structure and Production. (3)

Two 2-hour laboratory-seminars per week. Prerequisite: course 121 or consent of instructor. Combined course, must be taken concurrently with 208 and 213. Synthesis of structural systems and relation to architectural design. Mr. Steinbrugge (F, W, Sp)

223. Architectural Design for Seismic Forces. (3)

Two 2-hour laboratory-seminars per week. Prerequisite: completion of engineering sequence or consent of the instructor. The study of seismic forces; generation and effect on structures, earthquake resistant design and failures.
   Mr. Steinbrugge (Sp)

224. Industrialized Construction. (3)

Two 2-hour laboratory-seminars per week. Prerequisite: course 121 or consent of the instructor. Implications of industrialized building components and systems; design, fabrication and erection.
   Mr. Testa (F)
Two 1-hour seminars and one 2-hour laboratory per week. Prerequisite: course 121 or consent of instructor. Advanced study in structure and production in architecture.
229A, Mr. —— (F); 229B, Mr. Testa (Sp); 229C, Mr. —— (Sp)

Study Area D—Design Theories and Methods

110. Architectural Design Methods. (4)
Two 1 3/4-hour lectures and one 2-hour laboratory-seminar per week. Prerequisite: Environmental Design 3, and for the architecture major completion of the sequence. Description, testing and comparison of the various methods, tools, and techniques which are available in architectural design. Mr. Rittel (W, Sp)

230. Advanced Design Methods. (3)
Two 1 1/2-hour seminars per week. Prerequisite: course 130. Intensive study of problem solving techniques developed in other fields as they apply to environmental design problems. Mr. Rittel (W)

231A–231B. Architectural Programming. (3–3)
Two 3-hour laboratory-seminars per week. Prerequisite: course 130 or consent of the instructor.
231A. Problem definition and program development. Mrs. Lindhein (F)
231B. Methods of evaluating and validating architectural programs, such as interviews, observation, simulation, and questionnaire techniques. Mr. —— (W)

232. Seminar in Architectural Research. (3)
One 2-hour seminar per week. Prerequisite: enrollment in Option I. Research methods and problems. Presentation by instructors and guests, discussion of student reports. Sequence beginning (W). Mr. —— (W, Sp)

Two 1 1/2-hour seminars per week. Prerequisite: consent of the instructor.
239A. Symbolic Processes in Architectural Design. Mr. —— (F)
239B. Rational Thought and the Design Process. Mr. Rittel (W)
239C. Exploration Toward a Theory of Form. Mr. —— (Sp)

Study Area E—Social and Economic Factors in Architectural and Urban Design

140. Social and Cultural Factors in Architectural and Urban Design. (4)
Three 1-hour lectures and one 2-hour discussion per week. A survey of the relations of social functions to architectural forms, with respect to individual, group, family, neighborhood and complex organizational units. Identification and definition of recognized "institutionalized" forms and symbols. Mr. Seaton (W, Sp)

141. Form Determinants of the Dwelling. (3)
(Formerly numbered 110)
Three 1-hour lectures per week. Interaction of technological and aesthetic innovation in dwellings and the physical environment of the residential community. Mr. Goodman (F); Mr. Stump (Sp)

241. Major Problems of Architecture. (4)
One 2-hour seminar, one 2-hour laboratory and one 4-hour laboratory per week. Prerequisite: enrollment in Option I. Identification of major problems of architecture; development of approaches to solutions. Problems proposed by the instructor, or the student. Mr. Hassid and Staff (F)

*242A–242B. Seminar in Architecture. (2–2)
One 2-hour seminar per week. Prerequisite: enrollment in Option I. Relation of architectural research to the discipline of architecture. Topics related to theory and practice. Presentation by instructors and guests, discussion of student reports. Sequence beginning (W). Mr. —— (W, Sp)

Two 1 1/2-hour seminars per week. Prerequisite: consent of the instructor.
249A. Social and Cultural Factors. Mr. Foley (Sp)
249B. Behavioral Factor. Mr. Seaton (Sp)
249C. Economic Factors. Mr. Gruen (W)
249D. Technological Factors. Mr. Meier (W)

Study Area F—Architectural Administration and Related Professional Studies

160. Introduction to Architectural Administration. (4)
Two 2-hour lecture-discussions per week. Prerequisite: completion of two courses from course 201 series. Architect, owner, contractor relations, contract documents, and the ethics of the profession. Mr. Simonds (Su, F, Sp)

161. Construction Administration. (4)
Two 2-hour lecture-discussions per week. Prerequisite: course 160. Administration and supervision of construction, industry practices and the application to the construction process. Mr. Simonds (W)

269A–269B–269C. Seminar in Architectural Administration. (3–3–3)
Two 1 1/2-hour seminars per week. Prerequisite: course 160 or consent of instructor.
269A. Construction Law. Mr. Sweet (Sp)
269B. Building Economics. Mr. Goodman (W)
269C. Architectural Administration. Mr. Simonds (Sp)

Study Area G—History of the Environment

See Environmental Design 169 through Environmental Design 178.

* Not offered in 1968–69.
271. History of Architecture Theory. (4)
(Formerly Environmental Design 179)
Two 1 1/2-hour seminars per week. Prerequisite: Environmental Design 170 and 171, plus one course from Environmental Design 173 to 178 or consent of instructor. Consideration of historical aspects of architecture from Vitruvius to present.

272A-272B. Seminar in the Architecture of Antiquity. (4-4)
(Formerly Environmental Design 180A-B)
Two 1 1/2-hour seminars per week. Prerequisite: Environmental Design 170 and 171, plus one course from Environmental Design 173 to 178 or consent of instructor. Special problems selected for concentrated study from the building types of the ancient world. Sequence beginning fall. Mr. Kostof (F, W)

273. Seminar in American Architecture. (4)
Two 1 1/2-hour seminars per week. Prerequisite: Environmental Design 170 and 171, plus one course from Environmental Design 173 to 178 or consent of instructor. Original research on selected problems in the history of past and recent architecture in the United States, and especially in the physical environment of the West Coast.

274. Seminar in Modern Architecture. (4)
(Formerly Environmental Design 181)
Two 1 1/2-hour seminars per week. Prerequisite: Environmental Design 170 and 171 plus Environmental Design 173 or 174 or consent of instructor. Consideration in depth of selected aspects of modern architecture. Miss Evenson (F)

277. Seminar in History of Urban Design. (4)
Two 1 1/2-hour seminars per week. Prerequisite: Environmental Design 170, 171, and 177 or consent of instructor. Consideration of selected aspects of urban design through discussion and directed research. Miss Evenson (W)

278A-278B. Methods of Historical Research and Criticism in Architecture. (4-4)
One 3-hour seminar per week and other meetings to be arranged. Prerequisite: graduate standing and consent of instructor. Consideration of basic tools and methods of research in the history of the environment, the historiography of the field since 1900, and the relevance of allied disciplines like archaeology, preservation and restoration, anthropology etc.
Mr. Kostof and Staff (W, Sp)

Special Studies
198. Special Group Study. (1-4)
To be arranged. Studies developed to meet needs. No more than 4 units are allowed in any one quarter.
The Staff (Mr. McCue in charge) (Su, F, W, Sp)

199. Special Individual Study. (1-4)
To be arranged. Studies developed to meet individual needs. No more than 4 units are allowed in any one quarter.
The Staff (Mr. McCue in charge) (Su, F, W, Sp)

298. Individual Research. (1-4)
Prerequisite: graduate standing. Individual research related to the master's thesis or studies developed to meet individual needs, undertaken prior to advancement to candidacy for degree. No more than 4 units allowed in any one quarter.
The Staff (Mr. Hassid in charge) (Su, F, W, Sp)

299. Individual Research. (1-4)
Prerequisite: graduate standing. Individual research related to the master's thesis or studies developed to meet individual needs, undertaken after advancement to candidacy for degree. No more than 4 units allowed in any one quarter.
The Staff (Mr. Hassid in charge) (Su, F, W, Sp)

CITY AND REGIONAL PLANNING

(Department Office, 228 Wurster Hall)

William Alonso, Ph.D., Professor of Regional Planning.
John W. Dyckman, Ph.D., Professor of City Planning (Chairman of the Department).
Donald L. Foley, Ph.D., Professor of City Planning and of Architecture.
I. Michael Heyman, B.A., LL.B., Professor of Law and of City Planning.
T. J. Kent, Jr., M.C.P., Professor of City Planning.
Richard L. Meier, Ph.D., Professor of Environmental Design.
Corwin R. Mocine, B.S., Professor of City Planning.
Roger Montgomery, M.Arch., Professor of Urban Design.
Francis Violich, B.S., Professor of City Planning and of Landscape Architecture.
Melvin M. Webber, M.A., M.C.P., Professor of City Planning.
William L. C. Wheaton, Ph.D., Professor of City Planning.
Donald Appleyard, M.C.P., Associate Professor of Urban Design.

* Not offered in 1968-69.
The planning of cities is as old as urban civilization, but the present-day planning profession has emerged in response to the rapid growth, changing character, and critical problems of twentieth-century urban development. Planning has become an accepted function of government, both in overall terms and in connection with particular programs, while planning techniques are likewise employed by large-scale private developers. Theorists and researchers in other disciplines have become increasingly interested in urban problems, and their work, often in partnership with planners, is contributing to greater knowledge and more sophisticated methods in planning practice.

City and regional planning is a rapidly expanding field, with some 3,500 professionals in the United States, most of them members of the American Institute of Planners.

Characteristically, city, county, and metropolitan regional planning agencies are responsible for recommending guidelines for channeling the urban physical development of their respective jurisdictions. City planners are also relied upon in other types of public agency—including local, state and federal agencies dealing with highways, transportation, housing, urban renewal, public works, economic development, human and natural resources development, education, and health. A significant fraction of the profession engages in consulting, to city planning and other governmental agencies, and to private firms of various sorts.

The Department of City and Regional Planning offers a two-year graduate program of professional education in the field of city and regional planning leading to the degree, Master of City Planning. The Department also offers a Ph.D. degree in city and regional planning. These programs reflect the expanding concern of city planners with a wide variety of urban and regional problems, and the search for the empirical and theoretical understanding necessary to attack those problems. Courses in planning theory and practice are supplemented both within and outside the Department by courses in the basic structure and functioning of the urban system from many viewpoints. Some of these courses are open to qualified undergraduate and graduate students in related fields. For more detailed information about these curricula, consult...
the Announcement of the College of Environmental Design or the Department of City and Regional Planning, Room 228 Wurster Hall.

Undergraduate Course Work There is no undergraduate major in City and Regional Planning. All undergraduate courses in city and regional planning are included in the Letters and Science List of Courses. For regulations governing this list, see page 80.

The Master of City Planning Degree The two-year graduate curriculum leading to the professional M.C.P. degree is geared to emerging intellectual developments that have increasing significance for the city planning field, while also familiarizing students with our heritage and with current problems and practice. Three programs are offered within the M.C.P. curriculum which permit students to pursue their interests beyond the common core courses.

A Emphasis, urban physical planning, will provide an opportunity for the student to specialize in the preparation of a general physical plan for a city or a metropolitan region and in the various ways by which such a plan may be carried out. Work will range in scale from precise planning for small areas to broad-scale planning for entire metropolitan regions.

B Emphasis, housing, renewal, and development, will offer organized instruction dealing with substantive and programmative spheres of activity to which, increasingly, city planners are expected to contribute. This emphasis encompasses housing problems and policy, the improvement of central areas and the development of new communities.

C Emphasis, planning and programming for urban systems, deals with the construction and application of theoretical models and the symbolic simulation of urban systems, together with rational procedures for formulating improved decision-making approaches. Such an emphasis makes considerable use of mathematics and statistics and draws upon current developments in econometrics and regional science.

A well-prepared student can complete the program in two academic years, together with a three-month internship, preferably undertaken during the summer between the two graduate years. Some students may need to supplement their previous education; a few may be advised to or may elect to enter in an earlier quarter, devoting an initial quarter to prerequisite courses.

The Ph.D. Degree in City and Regional Planning For information about this program, in effect since January 1, 1966, please consult directly with the Department of City and Regional Planning, Room 228 Wurster Hall.

100. City Planning for Architects and Landscape Architects. (4)
Three 1½-hour lectures per week. Prerequisite: advanced standing in architecture or landscape architecture, or consent of the instructor. (Not open to students who have taken course 110). Introduction to the theory and techniques of city planning.
Mr. Doebele (F); Mr. Cooke (Sp)

100L. City Planning Laboratory for Architects and Landscape Architects. (5)
Three 3-hour studies per week. Prerequisite: course 100. (Not open to students who have taken course 110). Laboratory: individual and group practice in solving typical city planning problems.
Mr. Jones, Mr. Mader, Mr. Menil, Mr. Rust, Mr. Sims, Mr. Wornum, ———, ———, ——— (Su and W)

110. Introduction to City Planning. (5)
Three 1½-hour lectures per week. Prerequisite: open to majors in all fields except architecture. Not open to students who have taken course 100. 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.

111. Introduction to Housing. (5)
Two 1½-hour lectures per week and two 3-hour field trips. Open to major in all fields. Historical development of housing problems in Western Europe and the United States; local, state, and federal housing programs in the United States; critical issues and the future of housing.

121. Urban Aesthetics. (4)
Three 1½-hour lectures per week. Open to majors in all fields. Perception of the city in concept and actuality through both vicarious and direct experience; development of the form of the urban environment; influence of utopian and ideal concepts; current criticisms of, and proposals for, the design of urban areas.
199. Special Study for Advanced Undergraduates.  
Prerequisite: consent of the instructor.  
Faculty (F, W, Sp)

200. The Evolution of Cities. (4)  
Two 1%-hour lectures per week and one 2-hour seminar every three weeks. The role of cities in civilization. The historical origins of their institutions and physical forms. The structure and functions of cities in developed and developing countries.  
Mr. Kent, Mr. Wheaton, and Staff (F)

201. Introduction to City Planning. (4)  
Two 1%-hour lectures and one 2-hour seminar per week. Origins and evolution of city planning, influences of urban growth, legal and institutional framework, and scientific and philosophical premises. Major principles of current practice; roles of analysis, projection, design, and public and private policy. Alternative approaches.  
Mr. Kent, Mr. Wheaton, and Staff (F)

202. Studio: Community General Plan and Developmental Studies. (5)  
Two 4-hour studios and one 2-hour studio per week. Introductory laboratory experience in analysis, policy-advising and general-plan preparation for a small urban community; emphasis is on planning for physical development of new communities.  
Mr. Vielich (Sp)

203. Planning and Governmental Decision-making.  
Two 1%-hour lectures per week. Prerequisite: graduate standing in city and regional planning, or consent of instructor. Origins and evolution of the idea of planning. Values hierarchies, ends-means continua, and the nature of social action. Rationales for governmental intervention in self-regulating social systems. Problems of prediction and choice under conditions of uncertainty. Alternative planning strategies.  
Mr. Webber (F)

204A. The Use of Urban Data. (4)  
Two 1%-hour lectures and one 2-hour laboratory per week. Prerequisite: introductory statistics, or consent of the instructor. Data systems relevant for city planning. Methodological considerations in the selection, assembly, analysis and interpretation of empirical data. The use of computers in city planning analysis. Laboratory problems.  
Mr. Bradwell (F)

204B. Methods of Urban Data Processing and Analysis. (4)  
Two 1%-hour lectures per week. Prerequisite: Statistics 125 or equivalent, or consent of instructor. A rigorous introductory course in urban data processing and urban analysis. Introduction to computers and FORTRAN programming. Topics in the design of urban information systems. Application of analytical methods to urban planning problems.  
Mr. Rogers (W)

205. Advanced Analytic Methods in Planning. (4)  
Two 1%-hour seminars per week. Prerequisite: Statistics 125B or equivalent and a course in linear algebra, or consent of instructor. An advanced methods course in urban and regional analysis. Topics selected from the following: theory of non-negative matrices, multivariate regression and analysis of variance, component and factor analysis, non-linear and dynamic programming. Application in urban and regional planning.  
Mr. Rogers (Sp)

206. City Planning Legislation and Governmental Organization. (4)  
Two 1%-hour seminars per week. Prerequisite: course 201 or consent of instructor. Duties and role of the physical planning agency in municipal and metropolitan governments; major alternative definitions of city planning; relationship of long-range physical plan to urban development agencies; significance of city planning legislation in reorganization of local government.  
Mr. Kent (W)

208. Studio: Urban District and Physical System Plans. (6)  
Three 4-hour studios per week. Preparation of detailed physical development plans for major city districts, e.g., a central district, or physical systems. Determination of the design of vital components; development policies, timing; implementation devices. Introduction to survey and analysis techniques for physical design. Mr. Cooke, Mr. Montgomery (F)

209. Introduction to Housing, Renewal, and Development. (4)  
Two 1%-hour lectures per week. Prerequisite: consent of instructor. Structure of the housing industry, finance, public policies, technology. Planning for neighborhoods, new development, urban renewal. Roles of the market, public action, design and building processes. Social consequences of alternative policies.  
Mr. Wheaton (W)

210. Orientation to Design. (4)  
One 1%-hour lecture and one 2%-hour laboratory per week. An introduction to the physical environmental components, and the logic of their interrelationship with the operational requirements of activities. Criteria of evaluation. Perception and communication of form.  
Mr. Appleyard (W)

211. Location Theory and Spatial Interaction Models. (4)  
One 2-hour seminar and one 1-hour seminar per week. Prerequisite: Economics 100B or equivalent; one semester of college calculus. Density and interaction approaches to analysis of spatial distributions. Ecological descriptive theories and economic behavioral theories of location and of spatial structure. Introduction to static and growth models of residential and industrial location. Governmental influences on spatial distribution of urban activities.  
Mr. Mocine (Sp)

212. Introduction to Economics of Public Enterprise. (4)  
Two 1%-hour lectures per week. Prerequisite: course 203; and Economics 100B or equivalent; or consent of instructor. Roles of governmental agencies as producers of urban services in nonmarket setting. Measurement of benefits and costs, and their incidences. Criteria and procedures for investment decisions concerning types and qualities of services and facilities.  
Mr. Dyckman (Sp)

214. Zoning, Subdivision Control, Capital Improvement Programming. (4)  
One 2-hour seminar and one 3-hour studio per week. Methods of effectuating general-plan policy. Legal, administration, and financial aspects. Review of current practice and possible improvements in effectuation procedures.  
Mr. Mocine (Sp)
215. Introduction to Urban Land Use and Transportation Systems. (4)
Two 1½-hour seminars per week. The dimensions and determinants of land use; survey methods; introduction to analytic and predictive models. Determinants of travel; accessibility and channel capacity; traffic generation, assignment and distribution. Problems of planning for land use and for transportation facilities.

216. Studio-Laboratory: Plan Preparation I. (5)
One 3-hour session and one 2-hour session per week. One 3-hour studio per week. Field problems in major phases of city and metropolitan planning work. A collaborative student group effort in formulating policy recommendations within specific governmental framework. Mr. Kent and the Staff (W)

217. Urban Renewal. (4)
Two 1½-hour lectures per week. Prerequisite: course 209 or consent of instructor. (Open to city planning graduate majors only.) Central-city housing and renewal policies; new construction, conservation, rehabilitation and redevelopment; economic, social and political issues, and fiscal implications. Organization of federal, state and local programs, planning and programming. Mr. Burns (W)

*218. Planning Public Services and Facilities. (4)
Two 1½-hour lectures per week. Prerequisite: courses 203 and 212, or consent of instructor. Analysis of consumer preferences for public services and of suppliers' criteria. Problems of ethics and governmental policy associated with efficiency and distributive effects. Investment criteria for community services and facilities; allocative procedures adapted to pluralistic suppliers and clientele. (F)

219. Population and Employment Analysis and Forecasting. (4)
Two 1½-hour sessions per week. Theory, estimation, and projection of urban-metropolitan population and employment; spatial allocation methods. Regional and interregional social accounts for local economic analysis and forecasting. Mr. Foley (F)

220. Housing and Urban Redevelopment Policy. (4)
One 3-hour lecture per week. Prerequisite: graduate study or consent of instructor. Social, economic, and civic aspects of the housing problems. The development of federal and local policies with respect to private home building, public housing, slums, and blight. Current trends and issues. Lectures, student research and reports, field trips. Mr. Gruen (F)

221. Visual Aspects of the Urban Environment. (4)
Prerequisite: open to graduate students from all departments upon consent of instructor. The visual components of the contemporary urban environment; recording, analysis, and communication of visual experiences; impact of increased visual sensitivity to urban form upon individuals in various disciplines. Mr. Appleyard, Mr. Craik (Sp)

222. The Metropolitan Region. (4)
Two 1½-hour seminars per week. The social organization and spatial patterning of the large metropolitan area. Physical development problems and policies. Mr. Foley (W)

223. High-Density Urban Design. (3)
Two 1½-hour seminars per week. Prerequisite: two courses numbered 201 or 202 or consent of instructor. The visual components of the contemporary urban environment; recording, analysis, and communication of visual experiences; impact of increased visual sensitivity to urban form upon individuals in various disciplines. Mr. Appleyard, Mr. Craik (Sp)

224. Housing and Urban Development. (4)
Two 1½-hour lectures per week. Prerequisite: courses 209 and 217. Housing and related development in urban fringe areas; social, economic and political implications. Effects upon speculative and social overhead investment requirements, regulatory policies. New towns, land assembly, open space, and blight. Current trends and issues. Lectures, student research and reports, field trips. Mr. Bums (W)

225. Seminar on Urban Planning in Latin America. (3)
Two 1½-hour lectures per week. Prerequisite: knowledge of city planning field or of Latin American development; a reading knowledge of Spanish is desirable. Problems of urban development in Latin America; policies and programs to alleviate them; regional urbanization forces and their impact on cities, governmental framework for urban planning; underlying concepts, current methods and further evolution of the field. Mr. Violich (W)

226. City and Metropolitan Planning for Engineers. (4)
Two 1½-hour lectures per week. Prerequisite: graduate standing in civil engineering; consent of instructor. Survey of theory and practice; functions of planning agency and its principal policy instruments; analytic and design methods; relationship to engineering. Mr. Sedway (Sp)

227. The Future of Urbanism and Cities. (4)
Two 1½-hour lectures per week. Consequences of increasing societal scale. Multiple conceptions of "community"; implications of declining localism. Problems of prediction. Review of current regional planning activity. Mr. Meier (Sp)

228. Seminar on Urban Planning in Latin America. (3)
Two 1½-hour lectures per week. Prerequisite: knowledge of city planning field or of Latin American development; a reading knowledge of Spanish is desirable. Problems of urban development in Latin America; policies and programs to alleviate them; regional urbanization forces and their impact on cities, governmental framework for urban planning; underlying concepts, current methods and further evolution of the field. Mr. Violich (W)

229. Seminar on Urban Planning in Latin America. (3)
Two 1½-hour lectures per week. Prerequisite: knowledge of city planning field or of Latin American development; a reading knowledge of Spanish is desirable. Problems of urban development in Latin America; policies and programs to alleviate them; regional urbanization forces and their impact on cities, governmental framework for urban planning; underlying concepts, current methods and further evolution of the field. Mr. Violich (W)

230. Methods and Techniques in Modern Planning. (3)
Two 1½-hour seminars per week. Prerequisite: knowledge of city planning field or of Latin American development; a reading knowledge of Spanish is desirable. Problems of urban development in Latin America; policies and programs to alleviate them; regional urbanization forces and their impact on cities, governmental framework for urban planning; underlying concepts, current methods and further evolution of the field. Mr. Violich (W)

232. City and Metropolitan Planning for Engineers. (4)
Two 1½-hour lectures per week. Prerequisite: graduate standing in civil engineering; consent of instructor. Survey of theory and practice; functions of planning agency and its principal policy instruments; analytic and design methods; relationship to engineering. Mr. Sedway (Sp)

233. Introduction to Regional Analysis and Planning. (4)
One 2-hour seminar and one 1-hour seminar per week. Prerequisite: consent of instructor. The concept of region and methods of regionalization; survey of regional problems and objectives; emerging views of regional planning. Regional models as planning tools. Intra- and interregional investment allocation during the development process. Review of current regional planning activity. Mr. Alonso (W)

234. History of Civic Design. (3)
Three 1-hour seminars per week. Role of the designer in guiding the shape of cities throughout history, with emphasis on their visual and functional reality. Concepts and theories of city design at significant periods. Influence of civic design experience on contemporary practice. Miss Evenson (F)

235. Studio-Laboratory: Plan Preparation II. (6)
Three 4-hour studios per week. Refinement and elaboration of general city and/or metropolitan planning policies established in the preceding studio. Development of related urban design concepts and policies; application of programming and implementation techniques within a governmental framework. (Sp)

236. Housing and Urban Development. (4)
Two 1½-hour lectures per week. Prerequisite: courses 209 and 217. Housing and related development in urban fringe areas; social, economic and political implications. Effects upon speculative and social overhead investment requirements, regulatory policies. New towns, land assembly, open space, and other problems. (Sp)

237. Planning Land-use and Communications Systems. (4)
Two 2-hour lectures per week. Prerequisite: courses 204B and 211, or consent of instructor.
Structure of urban systems and interdependencies among subsystems. Predictive growth models; evaluative frameworks for policy-making, operational planning strategies. Emphasis upon regional landscape, transportation, and communications systems and behavior. Laboratory exercises in application of operational models. (W)

247. Methods of Program Planning. (4)
Two 2-hour lectures per week. Prerequisite: courses 203 and 212, or consent of instructor. Techniques for simulating and evaluating alternative sequences of government actions. Designing community-development programs within a setting of mixed public-private enterprise. Benefit-costs analysis; cost-effectiveness bases for budgeting and programming; the politics of program planning. The Staff (Sp)

250. Theories of the Planning Process. (3)
Two 1 1/2-hour lectures per week. Prerequisite: courses 203 and 212, or consent of instructor. Planning as a special type of decision-making process; applications in guiding urban spatial development. Mr. Dyckman (F)

255. Seminar on the Urban General Plan. (3)
One 2-hour seminar per week. The legislative and technical functions of the urban general plan; general-plan characteristics; organization of general-plan documents. Mr. Kent (Sp)

290. Seminar. (3)
Prerequisite: consent of the instructor. Advanced study in city and regional planning. Specific topics will be announced at the beginning of each quarter. Mr. Alonso, Mr. Dyckman and the Staff (F, W, Sp)

298. Group Studies. (1-5)
Prerequisite: consent of instructor.
The Staff (Su, F, W, Sp)

299. Individual Study or Research. (1-12)
Prerequisite: consent of instructor.
The Staff (Su, F, W, Sp)

601. Individual Study for Master's Students. (1-8)
Individual study for the comprehensive or language examination requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

IDS 175. A Nontechnical Introduction to Operations Research. (4)
See Interdepartmental Studies for the complete description of this course.

DESIGN

(Department Office, 234 Wurster Hall)

Mary A. Dumas, M.A. Professor of Design.
Corwin R. Mocine, B.S., Professor of City Planning (Acting Chairman of the Department).
Lucretia Nelson,† M.A., Professor of Design.
Willard V. Rosenquist, M.A., Professor of Design.
Charles E. Rossbach,† M.F.A., Professor of Design.
Herwin Schaefer, Ph.D., Professor of Design.
Peter H. Voulkos, M.F.A., Professor of Design.
Anna Hadwick Gayton (Anna Gayton Spier), Ph.D., Professor of Design and Curator of Textiles, Lowie Museum of Anthropology, Emeritus.
Hope M. Gladding, Professor of Design, Emeritus.
Lea Van Puyymbroek Miller, M.F.A., Professor of Design, Emeritus.
Ruth McDonald Boyer,† Ph.D., Assistant Professor of Design and Assistant Curator of Textiles, Lowie Museum of Anthropology, Emeritus.
Margaret P. Dhaemers (D'Hamer),† M.F.A., Assistant Professor of Design.
Michael Lacktman, M.F.A., Assistant Professor of Design.
Marvin Lipofsky, M.F.A., Assistant Professor of Design.
Donald E. Potts, M.A., Assistant Professor of Design.

† On leave, fall, 1968.
‡ On leave, winter, 1969.
# On leave, spring, 1969.
The program in design is directed toward the development of knowledge in design by a parallel program of study in the practical and the historical-theoretical field. The major student not only gains acquaintance with several types of materials and media of design, such as textiles, ceramics, and metal, but also explores a field of concentration. Undergraduate work leads to the A.B. degree and is oriented toward study of the field from a broadly humanistic standpoint. The present major is under the direction of the College of Letters and Science, although administrative direction of the Department, and its further development, are under the College of Environmental Design. Majors are required to fulfill the breadth, unit, scholarship, and other general requirements of the College of Letters and Science. Graduate study leading to the M.A. degree is offered.

The Major

A student may elect a major in design emphasizing ceramics, interior design or textile design.

Lower Division. Required: Design 1, 2A, 2B, 11, 12; one of the following: Design 20, 21, 22, 24, 25; Art 1A or 1B or 1C or 1D. Recommended: History 4A, 4B, 4C, 4D, 19A, 19B; Philosophy 126A; Anthropology 2, 3.

Upper Division. Required of all majors in design: 127A, 144A, 190.

EMPHASIS ON CERAMICS

Design 120A, 120B, 140A, 140B, 140C; 4 units from upper division studio design courses other than 120A, 120B, 127A; 4 units from upper division history-theory design courses other than 140A, 140B, 140C, 144A.

EMPHASIS ON INTERIOR DESIGN

Design 123A, 123B, 142A, 142B, 148; 4 units from upper division studio design courses other than 123A, 123B, 127A; 4 units from upper division history-theory design courses other than 142A, 142B, 144A, 148.

EMPHASIS ON TEXTILE DESIGN


Preparation for Graduate Study The graduate major in design requires broad background training in studio and history-theory courses in the visual arts, with an emphasis in one of the design areas. Before admission to graduate standing, the candidate must present credentials and a portfolio, or other evidence, to the graduate committee of the department.
## The Graduate Major

Graduate work leads to the M.A. in design. The minimum degree requirements are 30 units, 12 of which must be in graduate courses (200 series) and a written thesis. Course 201 is required of all graduate students and should be completed as early as possible. Seminars, concentrated studio work, and other graduate courses allow for a specialized program or for an interrelated survey program among the fields covered by the department. Course work normally entails a year of study in residence. For further details on the requirements for the M.A. please consult the graduate adviser.

### Lower Division Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction to Design. (4)</td>
<td>Nine hours studio per week. An introduction to creative work in design, including color, simple graphic methods and three-dimensional design through studio work and discussions.</td>
</tr>
<tr>
<td>2A–2B.</td>
<td>Design Survey. (5-5)</td>
<td>Three hours lecture and one 1-hour section per week. An historical survey of design in the minor arts from the ancient Near East to the present, with emphasis on the development of style and analysis and evaluation of form.</td>
</tr>
<tr>
<td>11.</td>
<td>Freehand Drawing for Design. (4)</td>
<td>Six hours studio per week. Prerequisite: course 1. Observation of form and structure in natural objects. Development of abstraction and form.</td>
</tr>
<tr>
<td>12.</td>
<td>Design. (4)</td>
<td>Six hours studio per week. Prerequisite: course 1. Three-dimensional design experience in the use of machine tools.</td>
</tr>
<tr>
<td>20.</td>
<td>Form in Clay. (4)</td>
<td>Six hours studio per week Prerequisite: courses 1, 11, 12. Basic processes of ceramics.</td>
</tr>
<tr>
<td>21.</td>
<td>Printed Textile Design. (4)</td>
<td>Six hours studio per week. Prerequisite: courses 1, 11, 12. Pattern development and structure in textile printing with emphasis on screen and stencil processes.</td>
</tr>
<tr>
<td>22.</td>
<td>Woven Textile Design. (4)</td>
<td>Six hours studio per week. Prerequisite: courses 1, 11, 12. Design on the loom emphasizing expressive use of varied linear elements to create colors, textures, and patterns of woven textiles. The nature and operation of the loom are explored for comprehension of relationships between loom mechanism and textile structure.</td>
</tr>
<tr>
<td>24.</td>
<td>Calligraphy. (4)</td>
<td>Six hours studio per week. Prerequisite: courses 1, 11, 12. Laboratory study of calligraphy and letter forms of western civilization since Roman times.</td>
</tr>
<tr>
<td>25.</td>
<td>Form in Metal. (4)</td>
<td>Six hours studio per week. Prerequisite: courses 1, 11, 12. An introduction to the basic techniques of metal design.</td>
</tr>
</tbody>
</table>

### Upper Division Courses

**Group A: Studio Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>120A–120B.</td>
<td>Advanced Ceramic Design. (4-4)</td>
<td>Six hours studio per week. Prerequisite: courses 20, 140A, 140B. Advanced ceramic processes in construction and glazing. 120B may be repeated for credit.</td>
</tr>
<tr>
<td>121A–121B.</td>
<td>Advanced Printed Textile Design. (4-4)</td>
<td>Six hours studio per week. Prerequisite: courses 21, 141A, 141B. Advanced problems of printed textile design through various dyeing and printing processes. 121B may be repeated for credit.</td>
</tr>
<tr>
<td>122A–122B.</td>
<td>Advanced Woven Textile Design. (4-4)</td>
<td>Six hours studio per week. Prerequisite: courses 22, 142A, 142B, 148. Planning for interiors, including scale drawings and study of color and materials. 122B may be repeated for credit.</td>
</tr>
<tr>
<td>123A–123B.</td>
<td>Interior Design. (4-4)</td>
<td>Six hours studio per week. Prerequisite: courses 21 or 22, 142A, 142B, 148. Planning for interiors, including scale drawings and study of color and materials. 123B may be repeated for credit.</td>
</tr>
<tr>
<td>124A–124B.</td>
<td>Advanced Design: Lettering. (4-4)</td>
<td>Six hours of studio per week. Prerequisite: course 24.</td>
</tr>
<tr>
<td>125A–125B.</td>
<td>Advanced Metal Design. (4-4)</td>
<td>Six hours studio per week. Prerequisite: course 25. Studies of volume and spatial relationships in metal. 125B may be repeated for credit.</td>
</tr>
<tr>
<td>126A–126B.</td>
<td>Form in Glass. (4-4)</td>
<td>Six hours studio per week. Prerequisite: courses 20, 140C. An introduction to the basic techniques of free-blown glass and its design. 126B may be repeated for credit.</td>
</tr>
</tbody>
</table>
127A. Advanced Design: Light and Motion. (4)
Six hours studio per week. Prerequisite: course 12. Study of relationships of light and motion.
Mr. Rosenquist (Su, F, W, Sp)

127B. Advanced Design: Photography. (4)
Six hours studio per week. Prerequisite: course 12. Basic techniques of photography. Design with light.
127B may be repeated for credit.
Mrs. Dhaemers (Su, F, W, Sp)

128A–128B. Advanced Design: Communicative Design. (4–4)
Six hours studio per week. Prerequisite: courses 1, 11, 12 or equivalent, or consent of instructor.
128A. Two-dimensional systems. Symbolic properties of form and color. Symbolization of developmen-
tal phenomena, e.g., change, interaction, growth, structure.
128B. Application of visual systems to the communicative process, designing of models of social structure, historical movements, and other developmen-
tal material, in consultation with experts from the appropriate disciplines. 128A prerequi-
tive for 128B.
Mr. Wolf, 128A (F, W); 128B (W, Sp)

Group B: Lecture Courses

*140A–140B–140C. Survey of Ceramic and Glass Forms. (4–4–4)
Three hours lecture per week. 140A. Ceramics: Western tradition; 140B. Ceramics: Non-Western tradi-
tion; 140C. Glass.

141A–141B–141C. History of the Textile Arts. (4–4–4)
Three hours lecture per week.
141A. The New World: Andean South America, Middle America and the Southwestern United States. Developments of native materials, tech-
niques and designs.
Mrs. Boyer (F)
141B. The Old World: The Orient, India and the Near East. Early developments and establishment of his-
toric styles to the 17th century.
Mrs. Boyer (W)
141C. The Old World: Mediterranean countries and Europe. Coptic and European tapestry art, influ-
ces from Persia, India and the Orient on European textile design in the seventeenth and eleventh centuries.
(Sp)

142A–142B. Theory of Interior Design. (4–4)
Three hours lecture per week. Application of the principles of composition to the design, selection and ar-
rangement of furniture, with special consideration for its relation to the architectural background.
Mr. Strandgaard, 142A (W); 142B (Sp)

143A–143B. Primitive Art. (5–5)
Three hours lecture per week. Lectures, readings, films, and observation exercises using material from
Robert H. Lowie Museum of Anthropology. 143A stresses early developments and problems of formal or-
ganization; 143B stresses problems of representa-
tional and associative content and culture contexts.
143A not prerequisite to 143B.
Miss Nelson, 143A (W); 143B (Sp)

144A–144B. Survey of Expression in Materials. (4–4)
Three hours lecture per week. A study of form as exemplified by significant objects made from metal,
wood, glass, clay, etc.
Mr. Strandgaard, 144A (Sp); 144B (F)

146A–146B. Historic Costume. (4–4)
Four hours lecture per week. Survey of costume with attention directed toward design, material, cul-
tural factors and contemporary arts.
146A. Native America; Indonesia; Asia.
146B. Classic Mediterranean; Medieval to Modern
Europe. — 146A (F), 146B (W)

147. Concept and Expression of Folk Art. (4)
Four hours lecture per week. Survey of representa-
tive areas of European folk art to illustrate basic problems and theories. Exploration of aesthetic quali-
ties, social functions and factors of change.
Mrs. Boyer (F)

148. History of Interior Design. (5)
Three hours lecture and one 1-hour section per week. The interior as an aesthetic composition and as an expression of domestic culture from the Middle Ages to the present, with a preliminary survey of the Ancient World.
Mr. Schaef er (W)

*149. American Decorative Art. (4)
Three hours lecture per week. From the First Colonial Periods to 1850.

Group C: Special Courses

190. Senior Colloquium. (3)
Two hours per week, consisting of lectures and discussions. Prerequisite: senior standing. Critical sur-
vey of contemporary design.
The Staff (Miss Nelson in charge) (W, Sp)

*191. Critical Literature of the Decorative Arts. (3)
Two hours per week. Prerequisite: senior standing in design or consent of instructor. Guided readings and discussions.

193. Non-Woven Textiles. (4)
Three hours per week. Prerequisite: courses 122A, 141A, 141B, 141C. Theory and problems concerning
the construction and design of ethnic and historic textiles.
Mr. Rossbach (F)

198. Special Studies in the Practice of Design. (2–5)
Prerequisite: restricted to senior honors students and graduates. Advanced studio work in specific design areas.
The Staff (Su, F, W, Sp)

199. Directed Research. (2–5)
Prerequisite: restricted to senior honors students and graduates.
The Staff (Mr. Schaef er in charge) (F, W, Sp)

Graduate Courses

Prerequisite: graduate standing and consent of instructor.

201. Introduction to Advanced Study: Design and the Decorative Arts. (3)
Required of all graduate students. Advanced study specially related to graduate work and research.
The Staff (Graduate Adviser in charge) (Sp)
230. Form in Interior Design. (3)
Analysis of elements relating to interiors. Problems and development of approaches to solutions.
Mr. Strandgaard (Sp)

247. Traditionalism and Individualism in Folk Art. (3)
Prerequisite: Course 147. Intensive research, reports and critiques of selected problems concerning traditional and individual influences in the folk arts; psychological and social factors of stability and change in regional styles.
Mrs. Boyer (W)

SEMINARS IN DESIGN
*294A. American Decorative Art. (3)

*294B. Textile Research. (3)
Prerequisite: Course 141A or 141B or 141C. Problems in textile research, utilizing literary sources, analytical techniques and specimens in University collections.

*294C. Decorative Motifs in Oriental Art. (3)

*294D. Components of Costume. (3)
Prerequisite: Course 146A or 146B. Analysis of the tangible and intangible determinants of style in ethnic and historic costume. Reports and critiques by students. Emphasis on research, methodology and bibliography.
Mrs. Boyer (Sp)

*294E. Studies in Form. (3)
Miss Nelson

294F. Industrial Design. (3)
Mr. Schaefer (Sp)

*294G. Ceramic Design. (3)

298. Special Study in the Practice of Design. (2–6)
The Staff (Su, F, W, Sp)

299. Directed Research. (2–6)
The Staff (Mr. Rossbach in charge) (F, W, Sp)

IDS 110. Historical Design. (5)
See Interdepartmental Studies for the complete description of this course.

LANDSCAPE ARCHITECTURE

(Department Office, 202 Wurster Hall)

Garrett Eckbo, M.L.A., Professor of Landscape Architecture (Chairman of the Department).
Richard Harris, Ph.D., Professor of Landscape Horticulture.
H. Leland Vaughan, B.L.A., Professor of Landscape Architecture.
Francis Violiach, B.S., Professor of City Planning and of Landscape Architecture.
John W. Gregg, B.S., D.L.A., Professor of Landscape Architecture, Emeritus.
Donald Appleyard, M.C.P., Associate Professor of Urban Design.
R. Burton Litton, Jr., M.L.A., Associate Professor of Landscape Architecture.
Robert J. Tetlow, M.S., Associate Professor of Landscape Architecture.
Robert T. Buchanan, M.L.A., Assistant Professor of Landscape Architecture.
Michael M. Laurie, M.L.A., Assistant Professor of Landscape Architecture.

J. B. Jackson, B.A., Lecturer in Landscape Architecture.
Tito Patri, B.S., Lecturer in Landscape Architecture.
Lindsay Robertson, M.L.A., Lecturer in Landscape Architecture.
Griet Terpstra, M.L.A., Lecturer in Landscape Architecture.
Robert H. Twiss, Ph.D., Lecturer in Landscape Architecture.

Departmental Major Advisers: Undergraduate, Mr. Tetlow
Graduate, Mr. Eckbo
* Not to be given, 1968–69.
† On leave, fall quarter, 1968.
‡ On leave, spring quarter, 1968.

Landscape architecture approaches the physical environment both open-mindedly, as an existing fact, and critically, as a qualitative expression of existing and intended relations between man and nature, and between man and man. These two types of relations condition each other, and must be understood together as well as separately. The accelerating expansion of urbanization, scattering which is both antiant and antinature, exploitation and destruction of landscape open space resources, technologi-
cal determination to remodel nature in its own image, and social pressures toward mindlessness and emotional superficiality, all complicate these originally simple relations enormously. Desirable optimum relations between people and environment, buildings and open space, urban construction and the landscape must be studied and formulated constantly in the ever-changing environmental developments which surround us.

Landscape architecture as theory is concerned with the continuing search for the truth about qualitative relations between people and environment. Landscape architecture as practice is concerned with the continuing search for solutions to the specific problems which result from the impact of change and development programs on that environment. Together these two aspects of the field complement and reinforce each other. In order to prepare for them the student must take broad and balanced studies in the humanities, social and natural sciences. In addition esthetic preparation in basic design, graphics, and the arts, and technical preparation in horticultural practice, structural and site engineering are essential. Along with this essential experience, the student goes through the specific landscape architectural design sequence, leading to emphases in intensive, urban, and regional design. Surrounding this central sequence an expanding structure of electives will offer opportunities to explore in such diverse directions as historical research; open space, conservation, and resource management; physical and land planning; regional analysis and evaluation; recreation planning and park design; professional and interprofessional relations in practice; detailed refined specific design; general education in matters of environmental quality; foreign study; political action to preserve and improve the environment.

Preparation for the Major

For courses required in preparation for the major, see page 74. For further information, consult the ANNOUNCEMENT OF THE COLLEGE OF ENVIRONMENTAL DESIGN.

The Bachelor of Arts Degree in Environmental Design with a Major in Landscape Architecture

The four-year curriculum leading to the A.B. degree in Environmental Design with a major in landscape architecture is organized to give the student a broad general education as well as an introduction to the problems of landscape architecture. This curriculum leads to and is completed in the graduate program which follows, and orients the student to an understanding of the links between society and architecture, landscape and the community, for participation as a citizen in community affairs and development. This degree in Environmental Design coupled with a master's degree in landscape architecture supplants the previously offered Bachelor of Landscape Architecture degree as professional training for all students entering from high school and for all transfers from other institutions.

The requirements for the Bachelor of Arts in Environmental Design are listed on page 75. The following partially fulfill the requirements for the major in landscape architecture: natural sciences—24 units; general college courses—24 units; departmental courses—40 units.

For more detailed information about the curriculum consult the ANNOUNCEMENT OF THE COLLEGE OF ENVIRONMENTAL DESIGN and undergraduate advisers in the Department of Landscape Architecture.

The Master of Landscape Architecture Degree

The assets of the University, the College of Environmental Design, and the region have made it possible to develop an exceptional graduate program. The program is designed to accept on a preparatory basis, interested students from a number of disci-
lines such as architecture, design, planning, engineering, plant science, forestry, geography, as well as holders of the bachelor's degree in landscape architecture. It is also designed to complete professional training for those who receive the Bachelor of Arts in Environmental Design from the University of California, Berkeley. The program provides for three broadly conceived emphases, with a good deal of specialization in the second year of work. These emphases are: (a) the urban landscape, (b) the regional landscape, and (c) detailed or intensive design, in order that the refinements of high-quality landscape architecture not be lost in concern with broad problems. The background of the student and his particular capabilities should indicate the emphasis, or combination, he will pursue. For holders of the B.L.A. this is a basic two-year program including a three-month internship. Additional work will be required of the holders of degrees in other disciplines. Unusually gifted graduates of a five-year undergraduate landscape architecture curriculum may find it possible to meet requirements in slightly less time. For more detailed information about the curriculum consult the ANNOUNCEMENT OF THE COLLEGE OF ENVIRONMENTAL DESIGN and graduate advisers in the Department of Landscape Architecture.

Students interested in applying for admission to the graduate program in landscape architecture should write to the Dean of the Graduate Division, sending a copy of their letter to the Chairman of the Department of Landscape Architecture together with at least three letters of recommendation and adequate samples of work.

Lower Division Courses

11A–11B. Graphic Communication—Landscape
Subjects. (2–2)
One 3-hour laboratory per week. Prerequisite: Environmental Design 6. Methods of graphic communication in landscape architecture: (a) mechanical, (b) freehand. Mr. Buchanan (W, Sp)

23. Introduction to Plant Materials. (3)
Two 3-hour laboratories p/wk. Prerequisite: Biology 11A–11B or equivalent. Plant identification and classification. Common plants suitable for central California. Mr. Beatty (Sp)

25. History and Literature of Landscape Architecture. (3)
Three 1-hour lectures per week. Developmental history of landscape design; relationships to society, climate and topography. Mr. Streetfeld (Sp)

49. Summer Travel and Observation Course. (0)
Six weeks of field trips. Limited to major students in landscape architecture. Study and analysis of outstanding natural landscapes, site planning and landscape design. The Staff (Su)

Upper Division Courses

Students should see their advisers for prerequisites to all upper division courses in landscape architecture for majors in landscape architecture.

100. Survey of Landscape Architecture. (3)
Three 1-hour lectures per week. Not open to majors in landscape architecture. An introduction to the history, theory, and materials of landscape architecture; contemporary application and practice. Mr. Laurie (F, Sp)

121A–121B. Theory of Landscape Architecture.
(2–2)
One 1-hour lecture and one 1-hour discussion per week. 121A to be taken concurrently with Landscape Architecture 122A and 121B concurrently with 122B. Literature and theory of landscape architecture. Mr. Tétlow, Mr. Fatri, Mr. Litton (F, W)

Two 3-hour laboratories per week. Prerequisite: Environmental Design 3, 4, 6; Architecture 101; Landscape Architecture 11A, and any one of the following: Art 2A–2B, 14A–14B; Design 1, 10A–10B, or 12. Landscape Architecture 122A prerequisite to 122B, and 122B to 122C, or equivalent. Landscape Architecture 122A to be taken concurrently with Landscape Architecture 121A, and 122B concurrently with 121B. Elementary program development, analytical techniques and the determinants of form, as applied to basic landscape architectural design problems. Mr. Tétlow, Mr. Fatri, Mr. Robertson, Mr. Litton (F, W, Sp)

123A–123B. Plant Materials. (3–3)
Two 3-hour laboratories per week. Prerequisite: course 23, or equivalent. Landscape Architecture 123A prerequisite to 123B. Identification and utilization of native and horticultural plants. 123B emphasizes native species. Mr. Beatty (F, W)

124. Landscape Construction. (4)
Two 4-hour laboratories per week. Prerequisite: plane surveying. Topographic and grading problems in landscape construction. Design and structural relationships; graphic and computational exercises; working drawings. Mr. Tétlow, Mr. Litton (W)

131. Professional Practice Seminar. (2)
Two 2-hour seminars per week. Prerequisite: courses 121A–121B and 122A–122B, or consent of instructor. Seminars with active practitioners both public and private. Consideration of the present state and future potential of the profession. Mr. Eckbo (Sp)
### 143. Landscape Horticulture, (3)
One 2-hour lecture and one 1 1/2-hour laboratory per week. Prerequisite: course 121A—121B, or equivalent. Analytical, technical and aesthetic principles of planting design. Mr. Beatty (W)

### 151. Landscape Analysis, (2)
Two 1-hour lectures per week. Prerequisite: course 121A—121B, or equivalent. Analytic methodology. Research analysis and evaluation of landscapes of all types. Mr. Laurie, Mr. Buchanan, Miss Terpstra (F)

### 152A—152B. Design Laboratory II, (4—4)
Two 4-hour laboratories per week. Prerequisite: courses 152A—152B—152C, 23, 124, 151, or consent of instructor. Solution of landscape architectural design problems within the context of specific geographical areas. Mr. Litton, Mr. Laurie, Mr. Buchanan (F, W)

### 153. Planting Design Theory, (2)
Two 1-hour lectures per week. Prerequisite: course 123A, or equivalent. Functional, technical and aesthetic principles of planting design. Mr. Beatty (W)

### 154. Landscape Construction, (4)
Two 4-hour laboratories per week. Prerequisite: course 124. Materials and structures in landscape construction. Design and structural relationships; graphic exercises and working drawings; specifications. Mr. Tetlow, Mr. Litton (F)

### 162. Open Space Systems, (4)
Two 4-hour laboratories per week. Prerequisite: consent of the instructor. Planning and design of open space systems for neighborhood, community, and region; including, but not limited to, park and recreation areas. Principles, standards, and procedures. Mr. Eckbo (F)

### 164. Landscape Construction and Site Engineering, (4)
Two 4-hour laboratories per week. Prerequisite: course 124 or equivalent. Design and construction of site utilities. Engineering of irrigation, drainage, and soil structures used in site development. Graphic exercises, working drawings, and specifications. Mr. Eckbo (F)

### 172. Site Planning, (4)
Two 4-hour laboratories per week. Prerequisite: advanced standing in architecture or landscape architecture. Planning and design of large-scale site developments with special reference to the landscape architect's role. Mr. Vaughan (W)

### 182. Intensive Design, (4)
Two 4-hour laboratories per week Prerequisite: Art 144—14B, Design 1, Landscape Architecture 121A—121B, 122A—122B—122C, or consent of instructor. The design of gardens, parks, plazas, general open spaces, in intimate and refined detail. Mr. Litton, Mr. Laurie, Mr. Buchanan (Sp)

### 198. Directed Group Study. (1—5)
To be arranged. Prerequisite: consent of the instructor. The Staff (F, W, Sp)

### 199. Special Study for Advanced Undergraduates. (1—5)
To be arranged. The Staff (F, W, Sp)

See Environmental Design course listings for description of required environmental design courses for landscape architecture major.

#### Graduate Courses

**201A—201B. Seminar in Landscape Design and Theory. (2—2)** Two hours per week. Mr. Eckbo (F)

**202A—202B—202C. Graduate Landscape Design Theory. (5—5—5)** Two 4-hour laboratories per week. Prerequisite: course 152A—152B, or equivalent. 202A is prerequisite to 202B, and 202B to 202C. Design problems oriented to the development of analytical, technical and graphic abilities, including basic problems in urban design and regional landscape design. Mr. Violich, Mr. Streetfield, Mr. Patri (F, W, Sp)

**203. Advanced Planting Design. (4)** Two 3-hour laboratories per week. Prerequisite: course 154 or equivalent. Advanced studies in the use of plant materials to organize outdoor space. Mr. Eckbo, Mr. Beatty (W)

**204. Advanced Construction. (5)** Two 4-hour laboratories per week. Prerequisite: course 154 or equivalent. Advanced landscape construction and administration. Mr. Tetlow (F)

**211A—211B. Seminar in Urban Landscape Design. (2—2)** Two hours per week. Prerequisite: course 201A—201B, or equivalent. Mr. Appleyard, Mr. Buchanan (F, W)

**212A—212B. Urban Landscape Design. (5—5)** Two 4-hour laboratories per week. Prerequisite: course 201A—201B and 202A—202B—202C, or equivalent. Design problems related to the landscape character of the existing urban environment, and the analysis and design of new communities and cities. Mr. Appleyard, Mr. Buchanan, Mr. Tucker (F, W)

**221A—221B. Seminar in Regional Landscape Design. (2—2)** Two hours per week. Prerequisite: course 201A—201B. Mr. Meier, Mr. Violich, Mr. Twiss (F, W)

**222A—222B. Regional Landscape Design. (5—5)** Two 4-hour laboratories per week. Prerequisite: course 201A—201B and 202A—202B—202C, or equivalent. Problems concerned with the inventory, analysis, and evaluation of regional landscape resources and values. Landscape policy-making and design for major physiographic regions. Mr. Vaughan, Mr. Violich, Mr. Twiss (F, W)

**231A—231B. Seminar in Intensive Landscape Design. (2—2)** Two hours per week. Prerequisite: course 201A—201B or equivalent. Mr. Buchanan (F, W)
FAMILY SOCIOLOGY

For courses in Family Sociology, see Department of Nutritional Sciences.

FOOD SCIENCE

For courses in Food Science, see Department of Nutritional Sciences.

FOREIGN LITERATURE IN TRANSLATION

Comparative Literature

41A–41B–41C. Introduction to Literary Forms.
110. The Classical Tradition in Western Literature.
120. The Biblical Tradition in Western Literature.
151A–151B. The Literature of the Renaissance in Western Europe.
155. Trends in Contemporary Literature.
160. Western Literary Crosscurrents in Twentieth-Century China.

French

142A–142B. French Literature of the Middle Ages in English Translation.
146A–146B. Contemporary French Literature in English Translation.

German

Dutch 39. Dutch Literature in English Translation.

Italian

130. Dante's Divine Comedy.
140. Dante, Petrarch, and Boccaccio.

Near Eastern Languages

163A–163B. History of Persian Literature.
165C. Armenian Civilization: A Survey of Armenian Literature.
168A–168B. Survey of Turkish Literature.
172A–172B. Ancient Mesopotamian Documents and Literature.
182A–182B. Survey of Arabic Literature.

Oriental Languages

22. Indonesian Civilization.
142.C. Civilizations of Eastern Asia: China.
142J. Civilizations of Eastern Asia: Japan.
142K. Civilizations of Eastern Asia: Korea.
142M. Civilizations of Eastern Asia: Mongolia.
163. Readings in Pacific Literature in English Translation.

Scandinavian

100A–100B–100C. History of Scandinavian Literature.
106. History of Scandinavian Drama up to 1900.
107. The Plays of Ibsen.
108. Strindberg and his Writings.
109. Scandinavian Drama of the Twentieth Century.
120A–120B. The Novel in Scandinavia.
125. Masterpieces of Old Norse Literature.
160. Scandinavian Mythology.

Slavic Languages and Literatures

39. Great Writers of Russian Literature.
130. Topics in Twentieth-Century Russian Literature.
133A–133B–133C. The Russian Novel and its Relations to West European Literatures.
134A. Dostoevsky.
134B. Tolstoy.
134C. Chekhov.
134D. Turgenev.
134G. Gogol.
134N. Monographic Studies in Russian Literature.
135. Russian Drama from the Seventeenth Century to the Twentieth.
136. Russian Folklore.
138. Russian Formalism.
139. Concepts in Nineteenth Century Russian Literary Criticism.
143. Introduction to Modern Slavic Literary Theory.
150A–150B. Survey of Polish Literature and Intellectual Trends.
155. Polish Romanticism.
156. The Polish Theater.
159. Contemporary Polish Poetry and Fiction.
170A–170B. Survey of Serbian and Croatian Literature.

Hungarian

185A–185B. Survey of Hungarian Literature.

Portuguese

39C–39D. Brazilian Literature in English Translation.

Spanish

The Folklore Program

This program is designed to provide graduate students with a competent knowledge of both the materials of folklore and of the various methods of studying these materials. The program is an interdisciplinary one in which faculty members from both the humanities and the social sciences participate. The scope of the courses is international and worldwide. However, students may specialize in a particular genre, e.g., folktale; or in a particular area, such as Russian folklore.

The Major  There is no undergraduate major in folklore.

Preparation for Graduate Study  The best preparation for a graduate program in folklore is a strong undergraduate record in one of the broad fields with which folklore is closely affiliated. Since it is a study of the humanist expression which is handed down by tradition rather than by writing, it is related to all those departments that deal with literature, art, and music. Since folklore also deals with entire traditional culture of man as manifested in his customs and beliefs, it has close affiliations with anthropology, design, history, linguistics, philosophy, psychology and sociology. Consequently, a good undergraduate record in any of these disciplines is highly desirable though not necessarily required.

The Graduate Major  The requirements for the M.A. in folklore include 30 units of which at least 12 must be graduate level (200 number) in folklore, and an M.A. thesis based upon fieldwork or some other research project. (No course credits are allowed for the thesis.) Students must take at least one course in two of the following three areas: folk narrative, folk or ethnic music, folk or primitive art. As an introduction to the discipline, students must take Anthropology 159, The Forms of Folklore, and Anthropology 160, Narrative Folklore, or present evidence of having taken equivalent courses at other institutions. In addition, all students are required to take the interdisciplinary Folklore 250A–250B, Folklore Theory and Techniques. The student must also demonstrate proficiency in reading at least one foreign language. German is perhaps the most useful language for folklore studies, but French, Spanish or some language intimately connected with the M.A. thesis may be approved to satisfy the language requirement. Questions on the requirements for the M.A. in folklore should be addressed to the graduate adviser, Folklore Program, in 201 Kroebier.

250A–250B. Folklore Theory and Techniques. (3–3)
One 2-hour meeting per week. An interdisciplinary consideration of diverse topics related to fieldwork and research in folklore.  The Staff (F, W)

266A–266B. The Folktale and Allied Forms. (3–3)
One 2-hour meeting per week. The study of folk narrative including motif and type classifications, theories of myth and folktale, and methods of analyzing prose narrative.  Mr. Dundes (W, Sp)

298. Readings in Folklore. (3–6)
Individual conferences to be arranged.  The Staff (Mr. Bascom, Mr. Dundes in charge) (Su, F, W, Sp)

299. Directed Research. (3–6)
Individual conferences to be arranged.  The Staff (Mr. Bascom, Mr. Dundes in charge) (Su, F, W, Sp)

Related Courses in Other Departments
The Forms of Folklore (Anthropology 159)
Narrative Folklore (Anthropology 16C)
Folklore Seminars (Anthropology 260)
   a. problems of folklore
   b. psychology and folklore
   c. North American Indian folklore
   d. additional seminars on special topics to be announced

Mythology (Classics 178)

Historic Costume (Design 146A–146B)

Concept and Expression of Folk Art (Design 147)

Traditionalism and Individualism in Folk Art (Design 247)

Components of Costume (Design 294D)

The Popular Ballad (English 226A–226B)

Introduction to Germanic Folklore (German 125)

Children’s Literature: Oral Interpretation (Librarianship 210)

Theory of Dance: Ethnic and Social Dance (Physical Education 160A)

Scandinavian Mythology (Scandinavian 160)

Readings in Old Icelandic Sagas (Scandinavian 206)

The Poems of the Poetic Edda (Scandinavian 208)

Russian Folklore (Slavic 134)

Introduction to the Ballad (Spanish 108)

The Ballad (Spanish 208A, 208B, 208C)

FORESTRY AND CONSERVATION

(Department Office, 145 Mulford Hall)

Harold H. Biswell, Ph.D., Professor of Forestry.

David L. Brink, Ph.D., Professor of Forestry.

Robert A. Cockrell, Ph.D., Professor of Forestry.

Robert N. Colwell, Ph.D., Professor of Forestry.

Fred E. Dickinson, Ph.D., Professor of Forestry.

Rudolf F. Grah, Ph.D., Professor of Forestry.

Harold F. Heady, Ph.D., Professor of Forestry.

A. Starker Leopold, Ph.D., Professor of Forestry (Wildlife) and Zoology.

Arno P. Schniewind, Ph.D., Professor of Forestry.

Arnold M. Schultz, Ph.D., Professor of Forestry.

Edward C. Stone, Ph.D., Professor of Forestry.

Henry J. Vaux, Ph.D., Professor of Forestry.

John A. Zivnuska, Ph.D., Professor of Forestry and Director of Wildland Research Center (Chairman of the Department).

William J. Libby, Ph.D., Associate Professor of Forestry.

Paul J. Zinke, Ph.D., Associate Professor of Forestry.

John A. Helms, Ph.D., Assistant Professor of Forestry.

William L. M. McKillop, Ph.D., Assistant Professor of Forestry.

Arthur B. Anderson, Ph.D., Lecturer in Wood Chemistry.

Paul Casamajor, M.F., Lecturer in Forestry.

James D. Cumming, Ph.D., Lecturer in Wood Machining.

William G. O’Regan, Ph.D., Lecturer in Forestry.

Helmut Resch, Ph.D., Lecturer in Forestry.

Herbert C. Sampert, M.F., Lecturer in Forestry.

Dennis E. Teeguarden, Ph.D., Acting Associate Professor of Forestry.

Lee C. Wensel, Ph.D., Acting Assistant Professor of Forestry.

Marshall L. White, Ph.D., Acting Assistant Professor of Forestry.

W. Wayne Wilcox, Ph.D., Lecturer in Forest Products Pathology.

Eugene Zavarin, Ph.D., Lecturer in Wood Chemistry.

The requirements for the curricula in the School of Forestry and Conservation are listed on page 88.
Letters and Science List. Courses 10, 115, 22, 123, 124 are included in the Letters and Science List of Courses. For regulations concerning this list see the ANNOUNCEMENT OF THE COLLEGE OF LETTERS AND SCIENCE.

Lower Division Course

10. Conservation of Forest and Wildland Resources. (4)
Three 1-hour lectures per week. Principles of use and management of forests and other wildlands in relation to the needs of society for wood, water,orage, and recreation; forestry and conservation policies and programs. Mr. Zivnuska (F)

Upper Division Courses

100A—100B—100C—100D. Field Study of Forestry and Wildland Resources. (4—4—3—4)
450 hours of field instruction. Prerequisite: Biology 1A—1B—1C and Civil Engineering 21. Ten-week summer field program offered only at U.C. Forestry Camp, Meadow Valley, Plumas County. Required of all students in the curriculum in forestry.

100A. The Resource Environment.
Mr. Stone (Extrasession)

100B. Resource Measurement.
Mr. McKillop (Extrasession)

100C. Resource Operations.
Mr. Helms (Extrasession)

100D. Resource Management.
Mr. Teeguarden (Extrasession)

101. Quantitative Methods in Forestry. (5)
Four 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Statistics 20 and Mathematics 16A—16B, or equivalent. Measurement and estimation of quantifiable characteristics of forest products, trees, forests, wildlands and associated phenomena; sample survey design; reliability of estimates; computational methods. Mr. Wensel (F)

102. Forest Photogrammetry and Photo Interpretation. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Specifications for aerial photography for forestry use; procurement of aerial photographs; geometry of aerial photographs; mapping from aerial photographs; fundamentals of photogaphic interpretation; photo interpretation applied to forestry problems. Mr. Colwell (Sp)

103. Forest Utilization Facilities. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Design and operation; engineering, cost, aesthetic, and protection aspects of forest roads, structures, logging facilities, and recreation areas. Mr. Sampert (W)

104. Anatomy and Physical Properties of Wood. (3)
Two 1-hour lecture-discussion periods and one 3-hour laboratory per week. Prerequisite: Upper division students in other departments may be admitted with consent of instructor. Not open to students majoring in wood science. Gross and minute characteristics of wood in relation to identification and properties; identification of certain important commercial woods; relation of principal physical and mechanical properties to conditions of timber growth. Mr. Cockrell (W)

105. Control and Management of Fire. (3)
Two 1½-hour lectures per week. Prerequisite: 8 units of physics. Effects of fire on wildland vegetation, and environment; fundamentals of fire behavior; organization and practices for preventing and suppressing wildfires; objectives of wildland fire control policies; use of fire. Mr. Casamajor (W)

111. Analysis of the Forest Economy. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: 8 units of principles of economics. Economic organization, supply, demand, and pricing in the forest economy; extra-market costs and benefits; the forest as a condition of the environment; national and world trends in the forest economy; output goals in forestry. Mr. Vaux (Sp)

112. Economics of Forestry Enterprises. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: courses 101, 111, and others in other departments may be admitted with consent of instructor. The resource allocation problem of the enterprise; the effect of time on resource allocations; financial aspects of forestry; the optimum combination of the factors of production in forest resource management; marketing and distribution for the individual enterprise. Mr. McKillop (F)

113. Forest Regulation and Planning. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 112. Objectives of private and public forest ownership; property organization, control of investment and regulation of growing stock for the production of wood crops and other forest goods and services; management planning and control of wildland resources. Mr. Grah (W)

114. Decision-Making in Resource Management. (5)
Three 1-hour lectures and one 4-hour laboratory per week. Prerequisite: courses 113 and 125; Mathematics 16A—16B or equivalent. Concepts, techniques, and organization of decision-making in forest resource management and conservation; analysis of selected case studies. Mr. Teeguarden (Sp)

115. Introduction to Forest Policy. (4)
Two 1½-hour lectures and one 1-hour discussion per week. Prerequisite: courses 113 and 125. Evolution of forest and wildland policies in the U.S.; processes and groups involved in formulating forest policies and programs; administration of policies; comparative policies of other countries in relation to forestry conditions; introduction to current issues in wildland conservation. Mr. Vaux (Sp)

121. Dendrology. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: General Biology 1A—1B; upper division students from other departments may be admitted with consent of instructor. Identification of principal forest species of California, the U. S., and the world; their silvical characteristics; genetic variation in forest tree populations. Mr. Libby (F)

122. Forest Environment and Microenvironmental Influences. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: 8 units of physics and a course in soil science, or consent of instructor. Microclimate, hydrology, and soil as influenced by forests and associated vegetation. Mr. Zinke (W)
123. Physiological Plant Ecology. (4)
Three 1-hour lectures and one 4-hour laboratory per week. Prerequisite: Soil Science 100, 4 units of plant physiology; or, for students not majoring in forestry, consent of instructor. An examination of the relative response of plant species throughout their life cycles to the physical, chemical, and biotic aspects of the wildland environment, followed by an examination of species interaction among various multidimensional environmental gradients.

Mr. Schniewind (W)

124. Plant Community Ecology. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 123. Students from other departments may be admitted with consent of instructor. Description and characterization of principal wildland plant communities of North America; measurement and analysis of change in composition, structure and yield; plant growth and yield in relation to site, structure, and structural changes; evaluation of vegetative trend and potential productivity.

Mr. Stone (Sp)

125. Principles of Silviculture. (5)
Four 1-hour lectures and one 4-hour laboratory per week; two weekend excursions will be required. Prerequisite: course 124. Principles and concepts of the biological aspects of establishment, growth, composition, and quality of forest trees and stands. The manipulation of forests and the development of stand structure to maximize the usefulness of forests to man.

Mr. Schultz (F)

126. Culture of Nonforest Wildland Vegetation. (3)
Two 1½-hour lectures per week. Not open to students in Option II. Principles and practices of treating grassland, chaparral, and woodland types to produce forage for domestic animals and wildlife, to produce water, to moderate run-off, and to enhance recreation values.

Mr. Heady (W)

131. Wood Anatomy. (4)
Two 1½-hour lectures and one 3-hour laboratory per week. Upper division students in other departments may be admitted with consent of instructor. Gross, microscopic, and submicroscopic characteristics of wood.

Mr. Resch (W)

132. Mechanical Processing of Wood. (4)
Four 1-hour lectures per week. Prerequisite: Upper division and graduate students from other departments may be admitted with the consent of the instructor. Production methods, raw material requirements, material flow, and product specifications of solid and laminated products produced from wood; integration of wood processing plants.

Mr. Dickinson (W)

133. Physical Properties of Wood. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Course 131, Physics 2A–2B–2C. Density, physical stability, and durability of wood as influenced by such factors as wood characteristics and moisture content; thermal, electrical, and acoustical properties of wood.

Mr. Resch (F)

134. Mechanics of Wood. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 131, Civil Engineering 130 or equivalent; upper division or graduate students from other departments may be admitted with consent of instructor. Elasticity, strength, and theology of wood; factors affecting mechanical behavior; derivation of working stresses.

Mr. Schniewind (W)

135. Chemical Processing of Wood. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 131 and 7 units of organic chemistry; upper division students from other departments accepted with consent of instructor. Chemical constituents of wood; chemistry and technology of pulp, paper, fiberboard, and silvichemicals; chemical treatments of wood.

Mr. Brink (Sp)

198. Directed Group Study. (1–8)
Prerequisite: consent of instructor. Group study or investigation of special problems. The Staff (Mr. Zivnuska in charge) (F, W, Sp)

199. Special Study for Advanced Undergraduates. (2–5)
Open only to senior honor students having an adequate background in the subject proposed. This course may also be taken during the summer at the Forestry Camp at Meadow Valley.

The Staff (Mr. Zivnuska in charge) (Su, F, W, Sp)

Graduate Courses

201. Advanced Quantitative Methods. (3)
One 3-hour meeting per week. Prerequisite: knowledge of introductory calculus and statistics. Statistical estimation of forest quantities and relationships. Models and their use in research and management; equation systems; computer-based methods in forestry.

Mr. Wensel (F)

202. Advanced Photographic Interpretation. (3)
Two 1-hour lectures and one 2-hour discussion period per week. Prerequisite: a basic course in photo interpretation or photogrammetry. A survey of current research in forest photo interpretation and related fields. An analysis of the practical forestry applications of multiband spectral recognition. Practice in the interpretation of aerial photography and other imagery of forested areas.

Mr. Colwell (Sp)

205. Fire Behavior and Fire Management. (3)
One 3-hour meeting per week. Prerequisite: course 105 or equivalent, and consent of instructor. Analysis of forest fire behavior, meteorological effects; fuel effects; management of fire control activities; techniques of forest fire control.

Mr. Casamajor (W)

209. Seminar in Research Methods. (3)
One 3-hour seminar per week. Identification and statement of research problems; formation of hypotheses; analytical methods applicable to forestry problems.

Mr. O'Regan (W)

211. Seminar in Analysis of the Forest Economy. (3)
Two 1½-hour meetings per week. Prerequisite: 12 units of economics, agricultural economics, or forest economics.

Mr. McKillop (F)

212. Seminar in Economics of Forestry Enterprises. (3)
One 3-hour seminar per week. Prerequisite: 12 units of economics, agricultural economics or forest economics.

Mr. Treguardien (W)

Two 1½-hour lecture-discussion periods per week. Prerequisite: course 115 or equivalent.

Mr. Treguardien (W); Mr. Grab (Sp)
215. Seminar in Forest Policy. (3)  
One 2-hour seminar and one 1-hour conference per week. Prerequisite: course 115 or equivalent.  
Mr. Vaux (Sp)

221. Seminar in Forest Genetics. (3)  
Two 1 ½-hour meetings per week. Mr. Libby (F)

222. Seminar in Forest Influences and Watershed Management. (3)  
One 3-hour seminar per week. Open to qualified graduate students from other departments.  
Mr. Zinke (W)

223. Seminar in Forest Ecology. (3)  
One 2-hour seminar and one 1-hour conference per week. Open to qualified graduate students from other departments.  
Mr. Stone (Sp)

224. Natural Resource Ecosystems. (3)  
Derivation of ecosystem concept from ecological and philosophical backgrounds; relation of ecosystem study to the natural and social sciences; general systems analysis and synthesis; man’s role as dependent factor and independent planning agent; the ecosystem as a conceptual tool in resource management.  
Mr. Schultz (W)

225. Advanced Silviculture. (3)  
Two 1%-hour lectures per week. Prerequisite: course 125.  
Mr. Holmes (F)

229. Seminar in Silviculture. (3)  
One 3-hour seminar per week. Prerequisite: course 125.  
Mr. Vaux (Sp)

231. Seminar in Wood Anatomy. (3)  
One 3-hour seminar per week. Open to qualified graduate students from other departments.  
Mr. Cockrell (F)

232. Seminar in Physical Properties of Wood. (3)  
One 3-hour seminar per week. Open to qualified graduate students from other departments.  
Mr. Resch (W)

233. Seminar in Mechanical Properties of Wood. (3)  
One 3-hour seminar and one 1-hour of individual conference per week. Open to qualified graduate students from other departments.  
Mr. Schniewind (Sp)

234. Seminar in Wood Chemistry. (3)  
One 3-hour seminar per week. Mr. Anderson (SP)

296. Individual Study. (1-7)  
Prerequisite: consent of instructor and graduate adviser. Individual study in consultation with a member of the faculty directed to analysis and synthesis of the literature of a specialized subject area in forestry.  
The Staff (Mr. Zivnuska in charge) (Su, F, W, Sp)

298. Directed Group Study. (1-5)  
Reading and conferences, under direction of a member of the staff, for properly qualified graduate students.  
The Staff (Mr. Zivnuska in charge) (F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)  
Individual study in consultation with the major field advisor, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

- FRENCH

(Department Office, 4125 Dwinelle Hall)  
Alexandre E. Calame,† Docteur ès Lettres, Professor of French.  
Francis J. Carmody,‡ Ph.D., Professor of French.  
Alvin A. Eustis, Jr., Ph.D., Professor of French.  
Basil Guy, Ph.D., Professor of French.  
Irving Futter, Ph.D., Professor of French.  
Warren Ramsey, Ph.D., Professor of French and of Comparative Literature.  
Manfred M.G. Sandmann, Litt.D., Professor of French and Romance Philology.  
Ronald N. Walpole,‡ Ph.D., Professor of French.  
Clarence D. Brenner, Ph.D., Professor of French, Emeritus.  
Jacqueline de La Harpe, Docteur ès Lettres, Professor of French, Emeritus.  
Marie-Louise Dufrenoy, Ph.D., Professor of French, Emeritus.  
Percival B. Fay, Ph.D., Professor of French, Emeritus.

† On leave, 1968-69.  
‡ In residence fall and winter quarters only, 1968-69.  
§ In residence winter and spring quarters only, 1969.
Arnold H. Rowbotham, Ph.D., Professor of French, Emeritus.
Clifford H. Bissell, Ph.D., Associate Professor of French, Emeritus.
Mathurin Dondo, Ph.D., Associate Professor of French, Emeritus.
Paul M. Bertrand Augst, Ph.D., Associate Professor of French.
Edward F. Meylan, Ph.D., Associate Professor of French.
Walter E. Rex, Ph.D., Associate Professor of French.
Joseph J. Duggan, Ph.D., Assistant Professor of French.
Robert W. Greene, Ph.D., Assistant Professor of French.
Leonard W. Johnson, Ph.D., Assistant Professor of French.
Colin W. Nettelbeck, Dr. d'Université (Paris), Assistant Professor of French.
Dennis D. Porter, Ph.D., Assistant Professor of French.
Jack R. Vrooman, Ph.D., Assistant Professor of French.
Seth L. Wolitz, Ph.D., Assistant Professor of French.
Lillian Ruf, Agrégée, Instructor in French.
Marie Sarrieu, Agrégée, Instructor in French.

Esther Alder, Ph.D., Lecturer in French.
Christiane Allais, Diplôme d'études Supérieures, Acting Instructor in French.
William Daoust, B.A., Lecturer in French.
Andréé Darling, Agrégée, Lecturer in French.
Claudie C. Hester, Licence ès Lettres, Lecturer in French.
François M. Hourcade, Diplôme d'études Supérieures, Acting Instructor in French.
Jurate Izokaitis, M.A., Associate in French.
Gérard Jian, M.A., Lecturer in French.
Anne-Marie Lasocki, Ph.D., Lecturer in French.
Carroll L. Olsen, M.A., Associate in French.
Anne Prat-Péronchon, Diplôme d'études Supérieures, Lecturer in French.

The Major  Prerequisite: courses 1, 2, 3, 4, 5A, 5B, 35, or their equivalents. Course 44 is highly recommended.
The major requires 44 upper division units in French, including courses 101, 102, 103, 109A–109B–109C, 130A.

Recommended electives: art (any course devoted to French art); Classics 178; Comparative Literature; English 100, 110A–110B, 125D; History 4A–4B–4C–4D, 5C, (and any other course devoted to France); Latin; Linguistics 105, 115; Music (any course devoted to French music); Philosophy 126A–126B; Political Science (any course devoted to France).

Certificate of Completion in French  Requires the equivalent of the major and courses 130B, 134A–134B, and 300.

Honors Program. Honor students may enroll in the honors program. Students in the honors program must complete two quarters of H197 with a grade of B or better and pass the comprehensive examination.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

Duplication of Credit  Unit credit will not be allowed for a foreign language course which duplicates any of the first four units of secondary school credit in the language or courses completed in another institution of collegiate grade. The first unit of secondary school credit in a language is considered to be equivalent to the first quarter course in college; each successive unit of credit in the same language is equal to one additional course in a sequence of four quarter courses in college.
1. Elementary French. Beginner's Course. (4)
Five 1-hour classes and at least one laboratory session per week. Mr. Jian (in charge) (Su, F, W, Sp)

2. Elementary French (Continuation of 1). (4)
Five 1-hour classes and at least one laboratory session per week. Prerequisite: course 1 or equivalent. Mrs. Hester (in charge) (Su, F, W, Sp)

3. Intermediate French. (5)
Five 1-hour classes per week and at least one laboratory session per week. Prerequisite: course 2 or equivalent. Mrs. Hester (in charge) (Su, F, W, Sp)

4. Intermediate French (Continuation of 3). (5)
Five 1-hour classes per week. Prerequisite: course 3 or equivalent. Mrs. Hester (Su, F, W, Sp)

5. Advanced Intermediate French. (8)
Five 1-hour classes per week. Prerequisite: course 4 or equivalent. Composition and conversation; and intensive course for prospective majors. Equivalent to 5A–5B.
Mrs. Ruf (in charge) (Su, F, W, Sp)

5A–5B. Advanced Intermediate French. (4–4)
Five 1-hour classes per week. Prerequisite: course 4 or equivalent. Composition and conversation. Sequence, beginning each quarter.
Mrs. Hourcade (in charge) (Su, F, W, Sp)

*5R. Advanced Intermediate French. (4)
Five 1-hour classes per week. Prerequisite: course 4 or equivalent. Reading; study and translation of French texts; classroom work in English. (W, Sp)

12A. Beginning French. (8)
An intensive course in beginning French, equivalent to French 1 and French 2. Five 2-hour classes and four laboratory sessions per week.
Mr. Jian (in charge) (Su, F, W, Sp)

12B. Intermediate French. (10)
An intensive course in intermediate French, equivalent to French 3 and French 4. Five 2-hour classes and four laboratory sessions per week.
Mr. Jian (in charge) (Su, F, W, Sp)

35. French Phonetics. (2)
Two 1-hour classes per week and one laboratory session per week. Prerequisite: course 4B or equivalent. Pronunciation; required for the major.
Mr. Osen (in charge) (Su, F, W, Sp)

44. Methods of Literary Study. (4)
Five 1-hour classes per week. Prerequisite: course 5B or equivalent. Highly recommended for the major.
Mr. Nettelbeck (F, Sp)

Upper Division Courses

The prerequisite to all upper division courses except 142 and 146 is 28 units of lower division courses, including courses 5B and 35. Courses 101 and 109A–109B–109C must usually be taken before any other upper division course, with the exception of course 108. Courses 101, 130A, and 134A are prerequisite respectively to 102, 130B, and 134B.

* Not to be given, 1968–69.

Three 1-hour classes per week. Prerequisite: for 101—courses 5B and 35; for 102—course 101; for course 103—course 102. Students with an A or B in French 5B may be permitted to proceed directly to French 102. Transfer students will normally be expected to take French 101. (In special cases students may be allowed to proceed to French 102 if they first take an examination at the level of difficulty of French 101.) Required for the major.
Mr. Nettelbeck (in charge) (Su, F, W, Sp)

Three 1-hour classes per week. 106A. Sounds and spelling (introduction to historical grammar); 106B. Words (elementary semantics and linguistic geography); 106C. Constructions, personal and impersonal, verbal and nominal, coordinating and subordinating, etc.
Mr. Sandmann (F, W, Sp)

*108A–108B. Readings in French Literature. (4–4)
Three 1-hour classes per week. Masterpieces of French literature read in French; classroom work in English.

Some three 1-hour classes and some two 1½-hour classes per week. Prerequisite: courses 5B and 35. 109A should preferably be taken before 109B, and 109B before 109C. Required for the major.
109A. From the origins to the end of the sixteenth century. Mr. Rex (in charge) (Su, F, W, Sp)
109B. The seventeenth and eighteenth centuries. Mr. Rex (in charge) (Su, F, W, Sp)
109C. The nineteenth and twentieth centuries. Mr. Rex (in charge) (Su, F, W, Sp)

110A–110B. The Middle Ages. (4–4)
Three 1-hour classes per week. Miss Certin (F, Sp)

112A–112B–112C. The Nineteenth Century. (4–4–4)
Three 1-hour classes per week.
Mr. Putter (Su, F, W, Sp)

114A–114B. Contemporary Literature. (4–4)
Three courses per week.
114A. Mr. Wolitz (W); 114B. Mr. Wolitz (Sp)

115A–115B. Modern Drama. (4–4)
Three 1-hour classes per week.
Mr. Augst (W, Sp)

116A–116B. Literature from 1885 to 1914. (4–4)
Three 1-hour classes per week.
Mr. Vrooman (F, W)
130A–130B–130C. Advanced Composition. (4–4–4)
Three 1-hour classes per week. Prerequisite: for course 130A—course 103; for course 130C—course 130B. 130A and 130B are required for the Certificate of Completion in French. Sequence beginning each quarter. Mrs. Darling (in charge) (Su, F, W, Sp) 130C (W, Sp)

134A–134B. Culture and Institutions. (4–4)
Three 1-hour classes per week. Prerequisite: course 102. Required for the Certificate of Completion in French. 134B (F, Sp); 134A (W, Su) Mrs. Prah-Perochon

H197. Honors Course. (2)
Individual and group appointments. Two quarters with grade of A or B required to qualify for honors in French at graduation. Writing of papers, followed at the end of the senior year by a comprehensive examination. To be undertaken not later than the beginning of the senior year.
Mr. Wolitz (F); Mr. Greene (W); Mr. Johnson (Sp)

199. Special Study for Advanced Undergraduates. (2–5)
Individual appointments. Restricted to senior honor students with 3.0 or better in French. The Staff (Su, F, W, Sp)

Courses in Which No Knowledge of French Is Required
Three 1-hour classes per week. Mr. Porter (in charge) 39A. To the end of the eighteenth century. (F, Sp) 39B. The nineteenth century. (Su, W) 39C. The contemporary period. (F, Sp)

*142A–142B. French Literature of the Middle Ages in English Translation. (4–4–4)
Three 1-hour classes per week. 142A. Epic, romance, history. 142B. Drama, lyric and allegorical poetry.

*146A–146B. Contemporary French Literature in English Translation. (4–4–4)
Three 1-hour classes per week.

Graduate Courses
201A–201B–201C. Historical Grammar. (4–4–4)
One 2-hour class and one 1-hour class per week. Mr. Walpole (W, Sp)

202A–202B. Studies in Medieval Literature. (4–4–4)
One 2-hour class per week. Mr. Walpole (W, Sp)

203A–203B. French Syntax. (4–4)
One 2-hour class per week. Mr. Sandmann (F, Sp)

*204A–204B. Studies in the Eighteenth Century. (4–4)
One 2-hour class per week. Mr. Carmody (W, Sp)

One 2-hour class per week. Letters and memoirs.

206A–206B. Reading and Interpretation of Typical Old French Texts. (4–4)
One 2-hour class per week. 206A, Mr. Duggan (Su); 206B, (F, W)

One 2-hour class per week. Mr. Guy (F, Sp)

208A–208B. Nineteenth-Century Poetry to the Symbolists. (4–4)
One 2-hour class per week. Mr. Putter (W, Sp)

209A–209B. Modern Authors. (4–4)
One 2-hour class per week. 209A, Mr. Nettelbeck (F); 209B, Mr. Greene (W)

210A–210B. Studies in the Eighteenth-Century Drama. (4–4)
One 2-hour class per week.

*214A–214B. Seminar on Modern Drama. (4–4)
One 2-hour class per week. Prerequisite: consent of instructor. Mr. Augustin

215A–215B. Literary Symbolism and Its Twentieth-Century Developments. (4–4)
One 2-hour class per week. Mr. Ramsey (F, Sp)

216A–216B. Poetry of the Renaissance. (4–4)
One 2-hour class per week. 216A, Mr. Johnson (F); 216B, (W)

217A–217B. Humanism in the Renaissance. (4–4)
One 2-hour class per week. Mr. Meylan (F, W)

218A–218B. Classicism. (4–4)
One 2-hour class per week. Mr. Rex (F, W)

219A–219B. Studies in Nineteenth-Century Prose. (4–4)
One 2-hour class per week. 219A, Mr. Digeon (Su); Mr. Porter (F, W)

220A–220B. Explication de Textes. (4–4–4)
220A, Mr. Calame (Su); Mrs. Wise (F, Sp)

221A–221B. La Dissertation Litteraire. (4–4–4)
One 2-hour class per week. Required of all graduates. Mr. Roubichou (W, Sp)

225A–225B. Seventeenth-Century Religious Texts. (4)
One 2-hour class per week. 225A, Mr. Digeon (Su); 225B, (F, W)

*226A–226B. Editing of Medieval Texts. (4–4–4)
One 2-hour class per week. Prerequisite: consent of instructor.

230A–230B. Literary Criticism. (4–4)
One 2-hour class per week. 230A, From the origins to the end of the eighteenth century. 230B, From 1800 to the present. Mr. Eustis (F, W)

*235. Methods of Literary Research. (2)
One 3-hour class per week.

NOTES
241A–241B. Studies in Surrealism. (4–4)

One 2-hour class per week.

101. Special Study for Graduate Students. (1–8)

Individual study for the comprehensive or language requirements in consultation with the field advisor. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Graduate Advisers in charge) (Su, F, W, Sp)

102. Individual Study. (1–8)

Prerequisite: an M.A. or completion of at least 24 units beyond the B.A. Individual study with the major adviser, intended to provide an opportunity for qualified students to prepare for the various examinations required of candidates for the Ph.D. May not be used for unit of residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Graduate Advisers in charge) (Su, F, W, Sp)

299. Individual Research. (5–9)

Individual appointments. Normally reserved for students directly engaged upon the doctoral dissertation. The Staff (Graduate Advisers in charge) (Su, F, W, Sp)

16. French for Graduate Students, Beginning. (0)

Continuation of 301A. Additional seminars and self-criticism with video tapes.

For graduate reading examinations in all other disciplines.

Mrs. Alder (in charge) (F, W, Sp, Su)

26. French for Graduate Students, Advanced. (0)

Two 1-hour classes per week. Course must be taken on a pass/not pass basis. a. Preparation for graduate reading examination in field of English (three 1-hour classes); b. Preparation for graduate reading examinations in the sciences; c. Preparation for graduate reading examinations in all other disciplines.

Mrs. Alder (in charge) (Su, F, W, Sp)

Teachers' Courses

300. The Teaching of French at the Secondary Level. (4)

Two 1½-hour classes per week. Required for the Certificate of Completion in French.

Mr. Daoust (F, W)

301A. Teaching French in College. (2)

Prerequisite: for graduate students teaching at the college level; required for new teaching assistants. Bi-weekly lectures on methodology, grading and testing; demonstration class with required attendance three times a week; language laboratory observations; supervised classroom practice. Additional seminars and discussion sessions on methodology.

Mr. Jian (F)

301B. Teaching French in College. (2)

Prerequisite: 301A. Continuation of 301A. Additional seminars and self-criticism with video tapes.

Mr. Jian (W)

Note: 301A and 301B must be taken in succession (full and winter) to obtain credit.

GENETICS

(Department Office, 345 Mulford Hall)

Spencer W. Brown, Ph.D., Professor of Genetics.

Donald R. Cameron, Ph.D., Professor of Genetics.

Everett R. Dempster, Ph.D., Professor of Genetics (Chairman of the Department).

I. Michael Lerner, Ph.D., D.Sc. (hon.c.), Professor of Genetics.

Curt Stern, Ph.D., D.Sc., Professor of Genetics and Zoology.

Patricia St. Lawrence, Ph.D., Associate Professor of Genetics.

James W. Fristrom, Ph.D., Assistant Professor of Genetics.

Alec D. Keith, Ph.D., Assistant Professor of Genetics.

=>

William J. Libby, Jr., Ph.D., Associate Professor of Forestry.

Undergraduate Major Adviser: Miss St. Lawrence.

Graduate Advisers: Mr. Dempster, Mr. Libby.

The student may obtain a Bachelor of Science degree in genetics in the College of Agricultural Sciences, or a Bachelor of Arts degree in the genetics group major in the College of Letters and Science.

Undergraduate Major Requirements

The B.S. degree requirements in the genetics major, offered under the Agricultural Sciences Curriculum (see page 66), are:

*Not to be given, 1968–69.
tive literature (8); foreign language†† through course 3; additional courses, which may include not more than 8 units of foreign language (28).

**Physical Sciences and Mathematics**, 42 units as follows: chemistry (20); mathematics (6); statistics (4); physics (12).

**Biological and Agricultural Sciences**, 44 units as follows: biology (15); biochemistry (4); microbiology (8); additional biological sciences (17).

**Major Field**, 23 units as follows: cytology (5); genetics (18).

**Additional courses**, 35 units.

**Total units**, 180.

Certain courses may be required in satisfaction of the above. The undergraduate adviser will provide this information and any other details about the major.

The A.B. degree in genetics may be obtained by fulfilling the breadth requirements of the College of Letters and Science and completing for the group major in genetics, the courses listed below (some of which satisfy in part the breadth requirements):

**Lower Division Courses**

**Required**: Biology 1A, 1B, 1C; Chemistry 1A, 1B, 1C; Chemistry 8A–8B (or 12A–12B–112); Physics 6A–6B; Mathematics 16A–16B. **Recommended**: Chemistry 5, 14; Physics 6C.

**Upper Division Courses**

**Required**: Bacteriology 100A–100B; Biochemistry 102 (or 100A–100B–100C); Botany 130 (or Zoology 110A–110B); Genetics 100 (or Zoology 150 or 150A–150B); Genetics 101, 131; one of the following: Genetics 110, 130, 140. **Recommended**: Molecular Biology 111; Zoology 104, 151A–151B.

**Graduate Programs**

Students frequently elect genetics as their major subject only at the graduate level, and may enter the field from a diverse range of undergraduate majors, including certain physical sciences or mathematics as well as the biological sciences. The program of courses in genetics and other course work necessary in the student’s specialty may be completed after admission to graduate standing. Students interested in graduate work in genetics are strongly advised, however, to gain a background in mathematics and biochemistry and in at least one foreign language. For both the master’s and the doctor’s degrees, a thorough background in the basic aspects of genetics is essential. This can usually be achieved through completion of a course in general genetics, plus three or more courses in biochemical genetics, biometrical or population genetics, cytogenetics, developmental genetics, evolution, and human genetics. Because of the highly diverse nature of the field, each student’s individual program must be carefully arranged on consultation with his guiding committee and the graduate adviser. For further details, consult the graduate adviser.

**Lower Division Course**

10. **Heredity and Evolution. (5)**

Lectures, 4 hours per week; 1-hour section meeting per week. For students not specializing in genetics. No credit to students who have had or are taking upper division genetics. Inheritance, variation and evolution in plants, animals, and man. Social implications of genetics and evolution. **Mr. Lerner (F)**

**Upper Division Courses**

100. **General Genetics. (5)**

(Formerly numbered 100A)

Lectures, four hours per week; section, one hour per week. **Prerequisite**: Biology 1A–1B–1C. The fundamentals of genetics at the molecular, organismal, and population levels. May be suitable as a terminal course for nonmajors. **Mr. Fristrom (F)**

100L. **Genetics Laboratory. (2)**

Two 3-hour laboratories per week. **Prerequisite**: course 100, or Zoology 150 or 150A–150B (may be taken concurrently). Principles of genetics utilizing chiefly microorganisms and Drosophila with emphasis on both the molecular and organismal aspects of the subject. **Miss St. Lawrence (W, So)**

101. **Advanced General Genetics. (3)**

(Formerly numbered 100B)

Lecture, one hour per week; section, two hours per week. **Prerequisite**: course 100, or Zoology 150 or 150A–150B. This course covers in greater depth
Biochemical Genetics. (4)
Lectures, four hours per week. Prerequisite: course 100, or Zoology 150 or 150A–150B; and a course in biochemistry. Mr. Keith (F)

Population Genetics. (4)
Lectures, four hours per week. Prerequisite: course 100, or Zoology 150 or 150A–150B; elementary statistics. Mr. Dempster (W)

Organic Evolution. (5)
Lectures, four hours per week; discussion, one hour per week. Prerequisite: course 100, or Zoology 150 or 150A–150B; and general cytology. Mr. Cameron (Sp)

Cytogenetics. (5)
Lectures, four hours per week; demonstration, one hour per week. Prerequisite: course 100, or Zoology 150 or 150A–150B; and general cytology. Mr. Cameron (Sp)

Lectures in Advanced Genetics. (4)
Lectures, 4 hours per week. Prerequisite: consent of instructor. May be repeated for credit. Selected topics in advanced genetics. The Staff (F, W, Sp)

Directed Group Study. (1–5)
Prerequisite: consent of instructor. The Staff (Miss St. Lawrence in charge) (Su, F, W, Sp)

Special Study for Advanced Undergraduates. (1–5)
The Staff (Miss St. Lawrence in charge) (Su, F, W, Sp)

Graduate Courses

Developmental Genetics. (2)
Lectures, 2 hours per week. Prerequisite: course 110 or equivalent. Gene action and development. (W)

*230. Advanced Population Genetics. (3)
Lectures, 2 hours per week; laboratory, 3 hours per week. Prerequisite: course 130. Quantitative genetic analysis and experimental design. Mr. Dempster (Sp)

280. Graduate Seminar in Genetics. (1–4)
The Staff (F, W, Sp)

298. Directed Group Study. (1–6)
Prerequisite: consent of instructor.
The Staff (Mr. Libby in charge) (Su, F, W, Sp)

299. Research in Genetics. (1–12)
The Staff (Mr. Libby in charge) (Su, F, W, Sp)

601. Individual Study for Master’s Students. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Libby in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare for the various examinations required of candidates for the Ph.D. May not be used for unit or resident requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Libby in charge) (Su, F, W, Sp)

Staff Seminar in Genetics. (No credit)
The Staff (F, W, Sp)

Other courses in genetics or in closely related subjects are given in the departments of Anthropology, Bacteriology, Biochemistry, Botany, Medical Physics, Molecular Biology, Psychology, Public Health, and Zoology.

GEOGRAPHY

(Department Office, 501 Earth Sciences Building)
Clarence J. Glacken, Ph.D., Professor of Geography (Chairman of the Department).
David J. M. Hooson, † Ph.D., Professor of Geography.
James J. Parsons, Ph.D., Professor of Geography.
Hilgard O’R. Stemberg, † Ph.D., Professor of Geography.
James E. Vance, Jr., † Ph.D., Professor of Geography.
John E. Kesseli, Ph.D., Professor of Geography, Emeritus.
John Leighly, Ph.D., LL.D., Professor of Geography, Emeritus.
Carl O. Sauer, Ph.D., D.Phil. (hon.c.), LL.D., Professor of Geography, Emeritus.
Allan Fred, Ph.D., Associate Professor of Geography.
Herbert M. Eder, Ph.D., Assistant Professor of Geography.
Mario B. Giovinetto, Ph.D., Assistant Professor of Geography.
Theodore M. Oberlander, † Ph.D., Assistant Professor of Geography.
Bernard W. Riley, Ph.D., Assistant Professor of Geography.

* Not to be given, 1968–69.
† On leave, fall quarter, 1968.
† On leave, fall, winter, spring quarters, 1968–69.
Robert N. Colwell, Ph.D., Professor of Forestry.
John B. Jackson, A.B., Lecturer in Landscape Architecture and Geography.
Daniel B. Luten, Ph.D., Lecturer in Geography.

Graduate Advisers: Mr. Parsons, Mr. Vance.

The Department of Geography aims to provide students with an understanding of what is involved in the study of the earth as the home of Man, either in itself (climate, land forms, vegetation) or as related to human occupancy (rural landscapes, the physical structure of cities, spatial organization, and distribution). The geographer must take account of historical and cultural processes, including Man's diverse attitudes toward the earth and how they have changed through time. He must take account of economic and social processes which influence such geographical conditions as industrial location, urbanization, urban morphology, settlement pattern, and the use of resources. And because of his concern for the surface of the earth and the balance and nature conditioning the human use of it, many must be able to employ the data of natural science. Those working in human geography will instead be most concerned with the data of social science and the intelligence of history.

The undergraduate major in geography therefore includes the study of cultural, economic, physical, and regional geography as well as map laboratory, quantitative methods, and field work. Backgrounds in the natural and social sciences, history, and statistical methods are useful to the geography major. In the graduate program importance attaches to theoretical or field study, both of which call for preparation in foreign languages.

Courses in the 150-169 series are concerned with the content and character of the principal regions of the earth; they are designed to accommodate the needs of students in other fields, as well as in geography, who are interested in specific areas. Most other upper division courses are also open to nonmajors.

The Major

Lower Division

1, 4, and 7 or 8.

Upper Division

40 units of upper division work in geography, normally including: one course in each of the following groups: A. 180, 181 or 182; B. 183, 184, 185, 186 or 187A; C. 189; and at least five other upper division courses in geography selected in consultation with the major adviser.

Honors Program

An overall grade-point average of at least 3.00 is required for acceptance in the honors program. A student in the honors program must complete course H195.

Graduate Study

Geography deals with a broad spectrum of questions relating to society, environment, and spatial order. A variety of previous backgrounds may prove sound as a foundation for advanced work in the field. Students entering the graduate program from fields other than geography should expect to take at least one upper division course in each of three areas—cultural, economic, and physical geography—during their first year of residence.

The M.A. Program involves completion of not less than one year of residence, at least three graduate seminars or courses (not individual research), and an original thesis. The Ph.D. candidate must complete a minimum of two years of residence (normally at least three for those entering from other disciplines) and pass a preliminary written examination in the systematic or regional area of his specialization as well as
the oral qualifying examination. In the preparation of many theses he must also be prepared to spend a year in field or archival research following the oral examination. He is asked normally to pass reading examinations in two foreign languages—one within the first year of residence. A large group of languages is open to the student and the emphasis rests on selecting those that will be of the greatest long-term use to the individual. Further details are available from the departmental office.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. Introduction to Physical Geography. (5)
   Three lectures and two sections per week. Basic elements of meteorology and climatology and their relation to the geography of vegetation and soils. The origin and distribution of land forms. Emphasis upon processes as causal factors in the distribution of natural phenomena.
   Mr. Giovinetto, Mr. Oberlander, Mr. Powell, Mr. Riley (Su, F, W, Sp)

2. Historical Geography of the United States. (4)
   The "problem approach" in geographic research. Descriptive and inferential statistics: analysis of variance, correlation and regression, covariance analysis. Special emphasis on the analysis of point patterns, special sampling designs, networks and the problem of regionalization. Mr. Greer-Wootton (Su)

   (Formerly numbered 150B)
   Three hours lecture and one hour consultation per week. The influence of geographical factors in the creation, transformation, and maintenance of transportation technologies and patterns; the shaping of patterns of settlements and economy by transportation innovation; the role of transportation in regional development in Britain and Anglo-America. Mr. Pred (W)

4. Principles of Economic Geography. (5)
   (Formerly numbered 150A)
   Three hours lecture and one hour consultation per week. A geographical approach to the origins and present viability of specific nationstates; degrees of internal coherence; the concept of "effective national territory"; regional blocs and spheres of influence; sensitive frontiers; a comparative evaluation of national power. Mr. Hooson

5. Historical Geography of Transportation. (5)
   Three hours lecture and one hour consultation per week. Technological change, economic growth, and dynamic interpretations of economic-geographic phenomena. Mr. Pred (W)

6. Principles of Cultural Geography I. (5)
   (Formerly numbered 100A)
   Three hours lecture and one hour consultation per week. The theory of geographical inquiry, major themes in the relationships among culture, society, and environment; attitudes to nature illustrated from contemporary and historical sources.
   Mr. Glacken (F)

7. Principles of Cultural Geography II. (5)
   (Formerly numbered 100B)
   Three hours lecture and one hour consultation per week. A geographical approach to the origins and present viability of specific nationstates; degrees of internal coherence; the concept of "effective national territory"; regional blocs and spheres of influence; sensitive frontiers; a comparative evaluation of national power. Mr. Pred (W)

8. The Relations between Nature and Culture. (5)
   (Formerly numbered 176)
   Three hours lecture and one hour consultation per week. A history of the great ideas in Western thought, from antiquity to the present, concerning the relationship of human culture to the natural environment.
   Mr. Glacken (Sp)

9. Quantitative Methods in Geography. (4)
   Three hours lecture and one hour consultation per week. A review of classical agricultural location theory; industrial location theory, central place theory, and some of their contemporary revisions. Spatial behavior of individuals and firms, information circulation, and real-world deviations from location theory.
   Mr. Pred (F)

10. Industrial Localization. (5)
    (Formerly numbered 142)
    Three hours lecture and one hour consultation per week. A geographical approach to the origins and present viability of specific nationstates; degrees of internal coherence; the concept of "effective national territory"; regional blocs and spheres of influence; sensitive frontiers; a comparative evaluation of national power. Mr. Pred (F)

11. Historical Geography of the United States. (4)
    Three hours lecture and one hour consultation per week. A consideration of factors of history and culture that shape the American geographical landscape; the distinctive occupancy patterns that emerged; the understanding of environment by various groups within the United States at different times and in different regions.
    Mr. Hewes (Su)
120. Urban Geography. (5)
(Formerly numbered 155)
Three hours lecture and one hour consultation per week. Study of the physical structure of cities emphasizing forces that create and transform patterns; a survey of the theory of urban growth from the Middle Ages to the present with particular concern for the urban revolution of the nineteenth century.
Mr. Vance, Mr. Greer-Wooten (Su, W)

130A. Natural Resources and Population. (5)
(Formerly numbered 153)
Three hours lecture and one hour consultation per week. A survey, with emphasis on current literature, of the impact of technology and population growth on natural resources, especially those which are in crisis in deprived societies: food, timber, and energy.
Mr. Luten (W)

130B. Open Land as a Natural Resource. (5)
(Formerly numbered 153T)
Three hours lecture and one hour consultation per week. Continuing from Geography 130A with emphasis on the resources which are in crisis in affluent societies: water, wildlife, parks, recreation, and wilderness. The growth, philosophy, and current action and influence of the conservation movement.
Mr. Luten (Sp)

*135. Energy as a Resource. (5)
(Formerly numbered 145)
Three hours lecture and one hour consultation per week. The development of the understanding of energy and of the technology of its use. Distribution of use in relation to (a) nature, magnitude, and location of the resource, (b) demand, (c) the developing technology of harvest, transport, storage, and conversion. Estimates of future conditions.
Mr. Luten (Sp)

*140A-140B. Analysis of Land Forms. (5-5)
(Formerly numbered 108)
Three hours lecture and one hour consultation per week. Prerequisite: consent of instructor. Origin of land forms. Review of varied interpretation of processes involved, with emphasis on recent views.
Mr. Oberlander

144. Descriptive Meteorology. (5)
(Formerly numbered 111)
Three hours lecture and one hour consultation per week. Nature of the atmosphere and of weather processes, including radiation, temperature, pressure, wind, and moisture conditions as related to the structure and circulation of the atmosphere.
Mr. Giovinetto (Su)

*145. Dynamic Meteorology. (5)
(Formerly numbered 112)
Three hours lecture and one hour consultation per week. Prerequisite: Physics 2B and Mathematics 1B or equivalent. No credit allowed for students who have had geography 144.
Mr. Giovinetto

146. General Climatology. (5)
(Formerly numbered 113)
Three hours lecture and one hour consultation per week. Atmospheric structure and processes. Elements and factors in large- and small-scale climates. Relationships between the climate and the topography, soils, and biota. World distribution of climates and classification systems.
Mr. Giovinetto (Sp)

147. Physical Climatology. (5)
Three hours lecture and one hour consultation per week. Prerequisite: Mathematics 1B and Physics 2B (concurrent registrations are acceptable) or consent of instructor. The heat and water budget of the atmosphere and natural regions. Atmospheric diffusion.
Mr. Giovinetto (F)

148. Paleoclimatology. (5)
Three hours lecture and one hour consultation per week. Prerequisite: consent of instructor. Data collection and analysis. Historical climatology. Characteristics and distribution of paleoclimates inferred from associated biological, geological, and cultural phenomena. Theories on climatic changes.
Mr. Giovinetto (W)

150. California. (5)
(Formerly numbered 131)
Four hours lecture per week. Geography of California.
Mr. Eder, Mr. Parsons (W, Sp)

*151. Western United States. (5)
(Formerly numbered 121B)
Three hours lecture and one hour consultation per week.
Mr. Parsons, Mr. Vance

*152. Eastern United States. (5)
(Formerly numbered 121A)
Three hours lecture and one hour consultation per week.
Mr. Vance

153. Geography of Canada. (5)
(Formerly numbered 121C)
Three hours lecture and one hour consultation per week.
Mr. Parson

154. Middle America. (5)
(Formerly numbered 122A)
Three hours lecture and one hour consultation per week. Mexico, Central America, and the West Indies.
Mr. Eder (W)

155. Spanish South America. (5)
(Formerly numbered 122C)
Three hours lecture and one hour consultation per week. The Andean and La Plata countries.
Mr. Parsons (F)

156. Brazil. (5)
(Formerly numbered 123B)
Four hours lecture per week. Portuguese America (Brazil).
Mr. Sternberg (W)

157A. The Brazilian Amazon. (3)
(Formerly numbered 123Y)
Two hours lecture and one hour consultation per week. Prerequisite: course 156 or consent of instructor. Problem-oriented themes in a regional context. Environmental problems in the occupancy and development of the world's largest continuous area of humid tropical lowlands.
Mr. Sternberg (Sp)

*157B. The Nordeste. (3)
(Formerly numbered 122T)
Two hours lecture and one hour consultation per week. Prerequisite: course 156 or consent of instructor. Problem-oriented themes in a regional context. Traditional and recent approaches to environmental problems of a diversified region, with emphasis on the "drought polygon"; water as a critical factor and its use in agriculture and industry.
Mr. Sternberg
180. Field Geography. (5)  
(Formerly numbered 102)  
All day Saturday. Prerequisite: senior standing. Required of geography majors. A geographical survey of selected physical and cultural landscapes in the Bay Area and adjacent parts of Northern California.  
Mr. Parsons, Mr. Powell (F, Sp)

*190. Special Study for Advanced Undergraduates. (1-5)  
Prerequisite: restricted to senior honor students.  
The Staff (Su, F, W, Sp)

Graduate Courses  
Admission to graduate courses requires in all cases consent of the instructor. Undergraduate courses are not prerequisite to graduate courses unless so indicated.

*200. Advanced Cultural Geography. (5)  
(Formerly numbered 263)  
Three hours per week.  
Mr. Glacken

*210. Problems in Economic Geography. (5)  
(Formerly numbered 265)  
Three hours per week.  
Mr. Fred

* Not to be given, 1968-69.
220. Advanced Urban Geography. (5)
(Formerly numbered 267)
Three hours per week. Mr. Vance (Sp)

230. Geographical Problems in Regional Development and Resource Utilization. (5)
(Formerly numbered 269)
Three hours per week. The region to be studied will be announced each year. Mr. Sternberg

240. Problems in Physical Geography. (5)
(Formerly numbered 261)
Three hours per week. Mr. Giovinetto, Mr. Oberlander

Graduate Research Seminars

251. Cultural Geography. (5)
(Formerly numbered 201 IE)
Three hours per week. Mr. Glacken, Mr. Jackson (W, Sp)

252. Economic Geography. (5)
(Formerly numbered 201G)
Three hours per week. Mr. Pred (F)

253. Urban Geography. (5)
(Formerly numbered 201F)
Three hours per week. Mr. Vance

254. Population and Natural Resources. (5)
(Formerly numbered 201H)
Three hours per week.

255. Historical Geography. (5)
(Formerly numbered 201D)
Three hours per week. Mr. Lowenthal (W)

256. Climatology. (5)
(Formerly numbered 201J, Sec. b)
Three hours per week. Prerequisite: consent of instructor. Mr. Giovinetto (Su)

257. Geomorphology. (5)
(Formerly numbered 201J, Sec. j)
Three hours per week. Mr. Oberlander

258. Biogeography. (5)
(Formerly numbered 201J, Sec. c)
Three hours per week. Mr. Parsons (F)

259. Cartography. (5)
(Formerly numbered 201J, Sec. d)
Three hours per week. Mr. Oberlander

260. History of Geography. (5)
(Formerly numbered 201K)
Three hours per week. Mr. Hooson

270. North America. (5)
Three hours per week. Mr. Vance

271. Latin America. (5)
(Formerly numbered 201A)
Three hours per week. Mr. Parsons, Mr. Sternberg, Mr. Eder (Sp)

272. Europe. (5)
Three hours per week. Mr. Vance

273. Africa. (5)
Three hours per week.

274. Asia. (5)
(Formerly numbered 201B)
Three hours per week. Mr. Glacken

275. Soviet Union. (5)
(Formerly numbered 201C)
Three hours per week. Mr. Hooson

276. Middle East. (5)
Three hours per week. Mr. Oberlander

277. Southwest Pacific. (5)
Three hours per week. Mr. Hooson

Graduate Professional Courses

280. Advanced Field Study in Geography. (5–10)
(Formerly numbered 200)
The Staff (Su, F, W, Sp)

289. Problems in Geographical Thought. (5)
Three hours per week. Mr. Hooson (Sp)

299. Individual Research. (1–6)
(Formerly numbered 219)
The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examination required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

Geography Colloquium. (No credit)
Weekly meetings for the presentation of original work by the faculty, visiting lecturers and graduate students. Graduate students are expected to attend. Geography majors are welcome. (F, W, Sp)

GEOLGY AND GEOPHYSICS

(Department Office, 301 Earth Sciences Building)

Bruce A. Bolt, Ph.D., Professor of Seismology and Director of Seismographic Stations.
Ian S. E. Carmichael, ** Professor of Geology.
Garniss H. Curtis, Ph.D., Professor of Geology.
Charles M. Gilbert, Ph.D., Professor of Geology.

* Not to be given, 1968–69.
** Appointment to the Miller Institute of Science, 1968–69.
The Department of Geology and Geophysics offers the undergraduate excellent opportunities to acquire a broad background of knowledge and experience in the study of the structure and evolution of the earth. The department emphasizes the physical and chemical aspects of geological processes, and attaches much importance to direct observation (e.g., field work) combined with rigorous analysis.

**Geology**

The major in geology is designed around a relatively small number of required courses so as to give the student maximum freedom to pursue in depth his special field of interest: geochemistry, petrology, structural geology, geomorphology, stratigraphy, etc. Courses such as 107 (Evolution of Continents and Oceans) and 108 (Advanced Physical Geology) are meant to provide a broad outlook on the whole field of geological inquiry.

### THE MAJOR

#### Lower Division Courses

Geology 5A–5B, Paleontology 1 or equivalent, 40 units of lower division courses in physics, chemistry, mathematics (including statistics and computing), and biological sciences. Chemistry 1A or 4A must be included. Recommended: for students anticipating postgraduate study or a professional career in geology: Chemistry 1A, 1B, 1C or 4A, 4B, 4C and 14; Physics 4A–4B–4C–4D–4E; Mathematics 1A–1B–1C (or 11A–11B), 11C, 12A–12B; Statistics 2 or 20.

#### Upper Division Courses

Geology 102A–102B–102C, 118; either Geology 107 and 116 or Geology 119 (8 units); and 8 additional units of upper division courses in geology, geophysics, physics, chemistry, paleontology, engineering, mathematics, as approved by the major adviser. Geology 103A, B, and 105 are strongly recommended.

#### Honors Program

Students with an overall grade-point average of 3.0 may apply for admission to the honors program. Application should be made through the student’s major adviser not later than the end of the student’s junior year. Candidates for graduation with honors in geology are required to take one or more appropriate upper divi-
tion courses specified by undergraduate major adviser in addition to the regular program.

Geophysics

The major in geophysics is designed for students with facility in mathematics and an interest in geology; it provides a general background in the physical sciences, with emphasis on the physics of the earth.

THE MAJOR

Lower Division Courses  
Chemistry 1A; Physics 4A–4B–4C–4D–4E; Geology 5A–5B; Mathematics 1A–1B–1C, (or 11A–11B), 11C, 12A–12B.

Upper Division Courses  

Honors Program  
Students with an overall grade-point average of 3.0 may apply for admission to the honors program. Application should be made through the student's major adviser not later than the end of the student's junior year. Candidates for graduation with honors in geophysics are required to take Geophysics 121B, 122B, and 123 in addition to the regular program.

Engineering Geoscience

The College of Engineering with the cooperation of the Department of Geology and Geophysics offers a curriculum in engineering geoscience leading to the degree of Bachelor of Science (see section on Engineering Science).

GRADUATE PROGRAMS

Geology. Thirty units of course work and a thesis are required for the master's degree. The courses must include at least 12 units of graduate work in the major subject. All incoming graduate students must take Geology 202, Field Study. Ordinarily, one summer is spent in gathering data for the thesis.

There is no formal course requirement for the Ph.D. degree, nor is an M.A. degree prerequisite to it. A candidate for the Ph.D. degree must be able to translate original scientific literature in two foreign languages (generally, French, German, or Russian); he must pass an oral qualifying examination covering a broad field of knowledge, and carry out a substantial piece of fundamental research. The department has excellent laboratories and facilities for field and experimental work. It encourages intensive research of an analytical rather than a descriptive nature.

Geophysics. The master's degree is given by examination. Candidates must also complete a minimum of 36 units of upper division and graduate courses, of which at least 18 must be strictly graduate work. The degree usually requires between one and two years of full-time study.

Candidates for the Ph.D. degree must pass the examination for the master's degree, demonstrate ability to read scientific literature in two foreign languages (generally, French, German, or Russian) and pass an oral qualifying examination covering a broad field of knowledge in the physical sciences. There is no formal course requirement for the degree, except that candidates are encouraged to take at least 8 units of graduate work in mathematics, and a comparable number of units related to their field of interest (e.g., advanced dynamics, electromagnetism, etc.) in other departments. The preparation of a thesis requires at least a full academic year.
Letters and Science List: for regulations governing this list, see page 80.

Geology

Lower Division Courses

5A—5B. The Earth. (4-4)

Credit for this course will be given ordinarily only if both quarters are passed. 5A. Two 1-hour lectures and two 3-hour laboratory periods per week. (Students enrolling in this course must have the entire after­noon free for field work on the days of their scheduled laboratory periods.) Prerequisite: Chemistry 1A or equivalent. For students majoring in the earth sciences. Introduction to geology through field mapping and laboratory studies. Minerals, rocks, geologic structures and processes. Mr. Evans (F)

5B. Three 1-hour lectures and one 3-hour labora­tory period per week. Prerequisite: course 5A. The interior of the earth; history of the earth; external and internal processes. Mr. Wang (W)

10. Introduction to Geology. (4)

Three 1-hour lectures and one 3-hour laboratory period per week plus one half­day Saturday field trip. Designed for students not majoring in physical science or engineering; not open to students who have completed any college course in geology. Mr. Berry (F); Mr. Gilbert (Sp); (Su)

15. General Geology. (4)

Two 1-hour lectures and one 3-hour laboratory period per week. For majors in engineering. Not open to students who have passed course 5A or 10. Similar in scope to course 5 but with some topics omitted. Mr. Christensen (Sp)

Upper Division Courses

101. Field Geology. (3)

Two 4-hour meetings per week. Prerequisite: a course in general geology. Geology of the Berkeley Hills and vicinity. Not open to students who have completed course 5A at Berkeley. Mr. Gilbert (F); (Sp)

102A—102B—102C. Mineralogy. (4-4-4)

102A. Two 1-hour lectures and two 3-hour labora­tory periods per week. Geometrical crystallography, symmetry, X-ray crystallography. Sequence beginning (F). Mr. Wenk (F)

102B. Two 1-hour lectures and two 3-hour labora­tory periods per week. Prerequisite: course 102A. Crystal chemistry. Mr. Wenk (W)

102C. Two 1-hour lectures and two 3-hour labora­tory periods per week. Prerequisite: course 102A or consent of instructor. Introduction to optical mineralogy. Mr. Christensen (Sp)

103A—103B. Igneous and Metamorphic Petrology. (4-4)

Two 1-hour lectures and two 3-hour laboratory periods per week. Prerequisite: courses 102A—102B—102C. Study of igneous (103A) and metamorphic (103B) rocks in hand specimen and with the petrographic microscope. Introduction to problems relating to origin and evolution of igneous and metamorphic rocks. 103A. (W); 103B, Mr. Evans (Sp)

105. Sedimentary Petrology. (5)

Two 1-hour lectures and two 3-hour laboratory periods per week; one or more field trips. Prerequisite: courses 102A—102B—102C or equivalent. 102C may be taken concurrently. Origin, classification, and relationship of sedimentary rocks. Microscopic examination of sedimentary rocks. Physical stratigra­phy. Mr. Hay (F)

106. Mineral Deposits. (4)

Three 1-hour lectures and one 3-hour laboratory period per week. Prerequisite: courses 102A or consent of instructor. Geological environments of economic mineral de­posits. Mr. Meyer (Sp)

107. Evolution of Continents and Oceans. (5)

Three 1-hour lectures and two 1-hour discussion periods per week. Prerequisite: junior standing in geology. The structure and evolution of the surface of the earth. The Staff (Mr. Curtis in charge) (W)

108. Advanced Physical Geology. (3)

Three 1-hour lectures per week. Prerequisite: senior standing in geology, and consent of instructor. May be repeated for credit, as content will vary from term to term. Selected topics in physical ge­ology, discussed from a point of view that cuts across traditional fields. The Staff (Mr. Verhoogen) (Sp)

110. History of the Earth. (4)

Three 1-hour lectures per week and four days in the field. Prerequisite: Geology 10. A sequel to course 10 designed for nonscience majors in the College of Letters and Science. Geological history of the earth and the evolution of its animal and plant inhabitants. Mr. Christensen (W)

111. Geology of Fluids. (4)

Two 1½-hour lectures per week and one 3-day field trip. Prerequisite: consent of instructor. Water, oil, and gases within rocks, with emphasis on the physics and chemistry of these fluids. Mr. Berry (Sp)

112. Stratigraphy and Tectonics. (5)

Two 2-hour lecture and discussion periods per week. Prerequisite: consent of instructor. Interpreta­tion of sedimentary rocks and geologic maps with respect to structural history. Paleo­geological studies will be undertaken. Mr. Berry (W)

116. Structural Geology. (4)

Two 1-hour lectures and one 3-hour laboratory period per week plus field studies. Prerequisite: course 5A or 101, and 5B (may be taken concur­rently). Mr. Weiss (Sp)

117. Geomorphology. (4)

Two 1-hour lectures and one 3-hour laboratory period per week. Two weekend field trips. Prerequisite: course 102A—102B and either 5A—5B or 101. Weathering, erosion, and development of land­scape. Glacial geology and Pleistocene history. Inter­pretation of topographic maps. Mr. Walbranig (F)

118. Summer Field Course. (8)

Prerequisite: course 5A—5B or 101, or consent of instructor. A detailed geological investigation of a selected area. Five weeks in the field. (Su)
119A–119B. Geologic Field Studies.
Prerequisite: course 5A–5B or 101 and consent of instructor.
119A. (2) One to four weekend field trips to localities of geological interest. Mr. Hay (F)
119B. (8) One five-week field trip to selected areas throughout the western United States, for the purpose of studying a variety of geological occurrences. (Su)

150. Minerals and Rocks. (4)
Two 1-hour lectures and two 3-hour laboratory periods per week. Prerequisite: course 5A, or 101, or consent of instructor. Laboratory study of minerals and rocks, covering selected topics from courses 102A–102B–102C, 103A–103B, and 105. Mr. Gilbert (W)

199. Special Study for Advanced Undergraduates. (2–5)
Restricted to junior or senior honor students having a grade average of 3.0. Research under the guidance of a member of the department.
The Staff (Mr. Weiss in charge) (F, W, Sp, Su)

Graduate Courses

201. Seminar in Geochemistry. (4)
Two 2-hour discussion periods per week. Prerequisite: consent of instructor. Principles and general problems in geochemistry. Course content varies from quarter to quarter. Mr. Evans (Sp)

202. Field Study. (4)
Two 4-hour meetings per week. Prerequisite: course 101 or equivalent and consent of instructor. Supervised field study for graduate students with prior experience. Mr. Curtis (F)

203. Rock-forming Minerals. (4)
Two 1-hour lectures and one 3-hour laboratory period per week. An intensive survey of the physical properties and chemistry of the rock-forming minerals (including fossils), with emphasis on their petrogenetic significance. (F)

205A–205B. Processes of Ore Deposition. (4–4)
Two 1-hour lectures per week and two 3-hour laboratory periods per week. Detailed geological, mineralogical, chemical, and experimental evaluation of theories of genesis of ore bodies. Sequence beginning (W) Mr. Meyer

209. Stratigraphy and Tectonics. (3)
One 3-hour meeting per week. Prerequisite: course 112 or consent of instructor. Regional tectonic interpretation as deduced from stratigraphy, sedimentation, and geomorphology. Mr. Berry (F)

210. Advanced Metamorphic Petrology. (4)
Two 1-hour lectures and two 3-hour laboratory periods per week. Prerequisite: course 103B; Chemistry 14 or equivalent and consent of instructor. Intensive study of metamorphic mineral assemblages and metamorphic processes, with emphasis on thermodynamics. Content varies alternate years. Mr. Evans (W)

211. Geology of Fluids. (3)
One 1-hour lecture and one 2-hour discussion period. Prerequisite: consent of instructor. Course 111 recommended. Content will vary from year to year.*

212. Universal-Stage Petrography. (5)
One 2-hour lecture and two 3-hour laboratory periods per week. Prerequisite: consent of instructor. Use of the universal stage; microscopic fabric analysis; deformed crystals. Mr. Turner (F)

213A–213B. Geomorphology and Pleistocene Geology. (3–3)
Rates and Processes of erosion. The history of the Pleistocene. Sequence beginning (W) Mr. Wahrahafti

214A–214B. Advanced Igneous Petrology. (3–6)
One 2-hour lecture and two 3-hour laboratory periods per week. Prerequisite: Course 105 or equivalent; adequate training in the use of the petrographic microscope. 214A. Silicate melt equilibria. Basic magmas and derivatives. (F)
214B. Granitic, andesite-rhyolite and alkaline plutonic rock series. (Sp)

One 2-hour lecture and one 3-hour laboratory period per week. Prerequisite: Course 105 or equivalent; adequate training in the use of the petrographic microscope. 215A. Processes and products of sedimentation in water. Mr. Gilbert (F)
215B. Petrology of nonvolcanic sedimentary rocks. Sequence beginning (W) Mr. Hay
215C. Petrology of volcanic sedimentary rocks. Mr. Hay (Sp)

216A–216B–216C. Deformed Rocks. (3–3–3)
One 2-hour lecture and two 3-hour laboratory periods per week. Prerequisite: consent of instructor. Naturally and experimentally deformed rocks and minerals. Sequence beginning (F) Mr. Weiss

237A–237B. Crystal Structure Analysis. (3–3)
237A. One 1-hour lecture and two 3-hour laboratory periods per week. Prerequisite: consent of instructor. Quantitative aspects of X-ray diffraction. Elementary theory of crystal structure analysis. Mr. Wenk (W)
237B. One 1-hour lecture and two 3-hour laboratory periods per week. Prerequisite: course 237A. Crystal structure determination by means of selected examples. Discussion of some important mineral examples. Mr. Wenk (Sp)

280. Research. (2–12)
The Staff (F, W, Sp, Su)

290. Seminar. (2–6)
Topics will be announced each quarter. The Staff (F, W, Sp)

601. Individual Study for Master's Students. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field advisor. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field advisor, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May be repeated for the same number of unit credits.

* Not to be given, 1968–69.
Geophysics

Upper Division Courses

104A–104B. Mathematical Methods in Geophysics. (4–4)
Three 1-hour lectures per week and computer laboratory. Prerequisite: Mathematics 11C and 12A–12B.
104A. Method of least squares; Fourier analysis; probability and statistical inference; treatment of observational errors. Mr. Bolt (F)
104B. Special functions; spherical harmonics; transforms; differential equations of geophysics. Examples are drawn from the whole field of geophysics. Mr. Bolt (W)

120. Mechanics of Earthquakes and Faulting. (3)
Two 1-hour lectures per week. General discussion of earthquakes and their occurrence; seismicity; applications to earthquake engineering. Mr. McEvilly (F)

121A–121B. Seismology. (4–4)
Two 1-hour lectures and one 3-hour laboratory period per week. Prerequisites: Geophysics 4A–4B, Mathematics 11C and 12A–12B.
121A. Causes, effects, and distribution of earthquakes; the seismograph; interpretation of seismographic records in terms of earthquake mechanism and structure of the earth. Mr. Bolt (F)
121B. Paths and types of seismic waves; travel times; velocity distributions; reflection and refraction; seismic prospecting. Mr. McEvilly (W)

122A–122B. Physics of the Earth. (4–4)
Three 1-hour lectures per week and discussion periods. Prerequisite: Geophysics 104B (may be taken concurrently). Physics 110A–110B is prerequisite to Geophysics 122B.
122A. The earth's gravitational field; density distribution; internal constitution; heat transfer; temperature distribution. Mr. Wang (W)
122B. The earth's magnetic field; its origin and history. Mr. Verhoogen (Sp)

123. Mechanics of the Earth. (4)
Three 1-hour lectures per week. Prerequisite: Geophysics 121A–121B, 122A–122B. Geophysical discussion of major problems of the structure and evolution of the earth. Mr. Wang (Sp)

Graduate Courses

204A–204B. Elastic Waves. (4–4)
Three 1-hour lectures per week. Prerequisite: Geophysics 104 or equivalent; Geophysics 121A; Physics 105A.
204A. Stress; infinitesimal and finite strain; wave motion in isotropic solids; water waves; effects of anelasticity and anisotropy; propagation in layered media. Sequence beginning (W). Mr. McEvilly (W)
204B. Spherical waves; terrestrial oscillations; Lamb's problems; modeled earthquake sources. Mr. Bolt (Sp)

208. Physics of Solids. (3)
Two 1½-hour lectures per week. Physical properties of solids and equation of state at high pressure; magnetic properties of rocks. Content will vary from year to year. Mr. Verhoogen (F)

217. Advanced Seismometry. (4)
Two 1-hour lectures and two 3-hour laboratory periods per week. Mathematical theory of the pendulum and other seismographs. Techniques of modern seismometry. Mr. McEvilly (Sp)

218. Seminar in Seismology. (3)
Three 1-hour discussion periods per week. Critical study of problems in contemporary seismological research. Topic will vary from quarter to quarter. Mr. McEvilly (F); Mr. Bolt (W)

219. Seminar in Geophysics. (3)
Two 1½-hour discussion periods per week. Critical study of problems in current geophysical research. Content will vary. Mr. Wang (F); Mr. Verhoogen (W)

222. Geochronology. (3)
One 3-hour lecture and discussion period per week. Radios isotopes in geology; age of the earth; selected problems in geochronology. Mr. Curtis (W)

224. Geomagnetism. (4)
Three 1-hour lectures per week. Prerequisite: consent of instructor. The geomagnetic field and its variations; magnetohydrodynamics and plasma physics of cosmic phenomena, including self-exciting dynamos; origin and propagation of micropulsations; the magnetosphere; geomagnetic storms; ionosphere-exosphere current systems. Mr. Ward (Sp)

*225. Geoelectricity. (4)
Three 1-hour lectures per week. Prerequisite: consent of instructor. VLF, ELF, and ULF propagation in the ionosphere, ionosphere, lithosphere, and in the earth-ionosphere cavity; origin of geoelectromagnetic disturbances such as sferics, whistlers, VLF emission; conductivity of the interior of the earth; interactions occurring in the ionosphere-exosphere column. Mr. Ward (Sp)

285. Research. (2–12)
The Staff (F, W, Sp, Su)

601. Individual Study for Master's Students. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)

* Not to be given, 1968–69.
The University of California now operates sixteen seismographic stations in northern California. The stations at Berkeley and Mount Hamilton were established in 1887, the oldest stations in the Western Hemisphere. A number of stations are operated in cooperation with local agencies while ten have their data telemetered directly to the Earth Sciences Building.

The function is to study the seismicity in northern California and adjacent parts of Nevada and Oregon and to conduct other research in seismology.

The Director of the seismographic stations teaches courses in seismology leading to the master's and doctoral degrees in geophysics.

Research work has involved the study of earthquake wave propagation, the nature of the waves, their relation to earth structure, the nature of earthquake sources, eigenvibrations, of the earth, the theory of the seismograph.

The offices are in the Earth Sciences Building; the seismographs and laboratories are in Haviland Hall and in an underground vault in Strawberry Canyon.

The staff consists of the Director, associate research seismologist, graduate research assistants, secretary, and technicians.

GERMAN

(Department Office, 5317 Dwinelle Hall)

Andrew O. Jásci, Ph.D., Professor of German.
Philip Motley Palmer,* Ph.D., Professor of German.
Herbert Penzl, Dr. phil., Professor of Germanic Philology.
Heinz Politzer, Ph.D., Professor of German.
Blake Lee Spahr, Ph.D., Professor of German and of Comparative Literature (Chairman of the Department).
Frederic C. Tubach, Ph.D., Professor of German.
Arthur G. Brodeur, Ph.D., Professor of Germanic Philology and English, Emeritus.
Lawrence M. Price, Ph.D., Professor of German, Emeritus.
Archer Taylor, Ph.D., D.Phil. (h.c.), LL.D., Professor of German, Emeritus.
Marianne Bonwit, Ph.D., Associate Professor of German.
Michael Mann, Ph.D., Associate Professor of German.
Joseph Mileck, Ph.D., Associate Professor of German.
Erwin G. Gudde, Ph.D., Associate Professor of German, Emeritus.
Franz Schneider, Ph.D., Associate Professor of German, Emeritus.
David E. R. George, Ph.D., Assistant Professor of German.
Bluma Goldstein, Ph.D., Assistant Professor of German.
Cerd Hillen, Ph.D., Assistant Professor of German.
Eli Katz, Ph.D., Assistant Professor of German and Yiddish.
R. William Leckie, Jr., Ph.D., Assistant Professor of German.
Johan P. Snapper, Ph.D., Assistant Professor of German and Dutch.
Margrit Wulf, Ph.D., Assistant Professor of German.

Klaus A. Mueller, M.A., Senior Lecturer in German.
Edith Lewy Hecht, M.A., Lecturer in German.
Reinhard Hennig, M.A., Acting Assistant Professor of German.
Winfried Kudszus, Ph.D., Acting Assistant Professor of German.

The Department of German offers the undergraduate the opportunity to obtain a broad background in the field of German language, literature, and culture, and introduces him to the principles of literary analysis and criticism. German language instruction ranges from the elementary courses to advanced courses in German style.

* In residence fall quarter only, 1968.
The literature courses cover the area from earliest times to the present, with emphasis upon the period since 1700. The graduate program emphasizes literature seminars which concentrate on the deeper penetration of more limited areas. The graduate offerings in linguistics provide a complete program of study in the Germanic languages. Instruction in methodology is provided for prospective teachers and teaching assistants.

The Major

**Lower Division**  German 1, 2, 3, 4, 5 or their equivalent.

**Upper Division**  10 courses (40 units) in Upper Division, including: German 139A-139B (8 units); 2 courses selected from German 103A-103B-103C-103D (8 units).

**Honors Program**  Senior students who have a 3.0 overall grade-point average and a 3.5 grade-point average in at least 5 courses (20 units) of upper division German may enroll in the honors program. The honors program will include completion of three quarters of German H195 and a comprehensive examination.

Graduate Study

**Preparation for Graduate Study**  Those interested in the graduate program in German at Berkeley must have an undergraduate major in German or its equivalent. Prospective graduate students in the field of German are strongly urged to acquire as thorough a speaking, reading, and writing knowledge of the German language as they can. They are also strongly urged to acquire a working knowledge of French and Latin.

**Master of Arts in German**  The degree of Master of Arts in German is granted after satisfactory completion of 9 courses (36 units) beyond an A.B., after passing an examination in French, and after passing a comprehensive examination covering the field.

**LITERATURE**

**Upper Division**  **Required:** 3 courses (12 units): German 142 (Composition and Style), German 145 (Introduction to Descriptive German Grammar), and German 148A (Middle High German).

**Graduate**  A minimum of 5 courses (20 units).

**LINGUISTICS**

**Upper Division**  **Required:** same as above.

**Graduate**  A minimum of 5 courses (20 units) including German 271 (Historical Phonology and Morphology of German).

All new teaching assistants in German are required to take German 301 (The Teaching of German in College).

**Doctor of Philosophy in German**  The initial requirement for this degree is a Master of Arts degree in German and a two-hour oral exploratory examination. After the master's degree there are no specific course requirements. There are two curricula leading to the degree of Doctor of Philosophy in German, one in the field of history and criticism of German literature, and the other in the field of Germanic languages and linguistics. The student is advanced to candidacy after passing an examination in Latin, and a comprehensive examination, both oral and written, covering the field. Interested students are urged to consult one of the graduate advisers of the department.
Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

Duplication of Credit
A student will not receive unit credit for German 1, 2, 3, or 4 when these duplicate courses previously completed in secondary school, or at another university or college. The first year of work in a foreign language in secondary school is considered to be equivalent to one quarter in college; each successive year in the same foreign language in secondary school is equal to one additional course in a sequence of five quarters courses in college.

1. Elementary German, Beginner’s Course. (5)
Five 1-hour class meetings and two 1-hour sessions in the Language Laboratory per week.
Mr. Mueller in charge (Su, F, W, Sp)

2. Elementary German. (5)
Prerequisite: course 1 or its equivalent. Five 1-hour class meetings and two 1-hour sessions in the Language Laboratory per week.
Mr. Mueller in charge (Su, F, W, Sp)

3. Intermediate German. (4)
Prerequisite: course 2 or its equivalent. Five 1-hour class meetings and one 1-hour session in the Language Laboratory per week.
Mr. Mueller in charge (Su, F, W, Sp)

4. Intermediate German. (4)
Prerequisite: course 3 or its equivalent. Five 1-hour class meetings and one 1-hour session in the Language Laboratory per week.
Mr. Mueller in charge (Su, F, W, Sp)

5. Advanced German. (4)
Prerequisite: course 4 or its equivalent. Five 1-hour class meetings and one 1-hour session in the Language Laboratory per week.
Mr. Mueller in charge (Su, F, W, Sp)

12A. Elementary German, Intensive Course. (10)
Five 2-hour class meetings and two 1-hour sessions in the Language Laboratory per week. This course is equivalent to courses 1 and 2. —— (F)

12B. Intermediate German, Intensive Course. (8)
Prerequisite: course 2 or 12A or the equivalent. Five 2-hour class meetings and one 1-hour session in the Language Laboratory per week. This course is equivalent to courses 3 and 4. —— (W)

Four 1-hour lectures per week.
39A. Medieval Period. (4) Mr. Leckie (Sp)
39B. Eighteenth Century. (4) —— (W)
*39C. Nineteenth Century. (4)
39D. Twentieth Century. (4) —— (Su); Miss Goldstein (W)

Upper Division Courses
Prerequisite: unless otherwise stated, five courses (22 units) of lower division German language courses, or their equivalent. It is recommended that students take a survey course (103A, 103B, 103C, 103D) before proceeding to a more restricted course in a given period.

100. Introduction to German Literature. (4)
Four 1-hour lectures per week. Designed primarily for students majoring in German.
Mr. George (in charge) (Su, F, W, Sp)

103A–103B–103C–103D. Survey of German Literature.
Four 1-hour lectures per week.
103A. To 1500 (4) Mr. Tubach (F)
103B. From 1500 to 1700 (4) Mr. Hillen (W)
103C. Eighteenth Century. (4) Mr. Snapper (Sp)
103D. Nineteenth Century. (4) —— (Su), Miss Wolff (F)

106. Lessing. (4)
Four 1-hour lectures per week
Mr. Hillen (Sp)

109. Schiller. (4)
Four 1-hour lectures per week.

112A–112B–112C. Goethe.
Four 1-hour lectures per week.
*112A. 1749–1786. (4) Miss Bonwit (F)
112B. 1786–1814. (4) Miss Bonwit (W)
112C. 1814–1832. (4) Mr. Jasz (Sp)

114. Romanticism. (4)
Four 1-hour lectures per week. Miss Goldstein (Sp)

115A–115B. Nineteenth-Century German Drama. (4–4)
Four 1-hour lectures per week.
115A: Mr. Jasz (F); 115B: —— (Su)

118A–118B. Nineteenth-Century German Prose. (4–4)
Four 1-hour lectures per week.
118A: Miss Bonwit (F); 118B: Miss Bonwit (W)

121A–121B. Twentieth-Century German Drama. (4–4)
Four 1-hour lectures per week. Mr. George (F, W)

124A–124B. Twentieth-Century German Prose. (4–4)
Four 1-hour lectures per week.
124A: —— (Su); Mr. Mileck (F); 124B: Mr. Mileck (W)

125. Introduction to Germanic Folklore. (4)
Four 1-hour lectures per week.
Mr. Katz (Sp)

127. German Lyric Poetry. (4)
Four 1-hour lectures per week. Readings in German poetry from the Enlightenment to the present day. Given every other year.
Mr. Kudszus (W)

*130. German Poetry of the Twentieth Century. (4)
Four 1-hour lectures per week. Given every other year.
Mr. Jasz

133A–133B. Survey of German Culture and Institutions. (4–4)
Four 1-hour lectures per week. M. Kudszus (F, W)

* Not to be given, 1968–69.
136. German Conversation. (4)
Four 1-hour meetings per week.
Mr. Mueller (in charge) (F, Sp)

139A—139B. Advanced Grammar and Composition. (4—4)
Four 1-hour class meetings per week. Not open to native Germans except with consent of the instructor. Sequence beginning (F) and (Sp).
Mr. Katz (in charge)

42. Composition and Style. (4)
Prerequisite: course 139B or consent of instructor. Required of all candidates for the M.A. in German.
Four 1-hour class meetings per week.
Mrs. Hecht, Mr. Mann (F, Sp)

45. Introduction to Descriptive German Grammar. (4)
Four 1-hour lectures per week. Prerequisite: course 5. Recommended for prospective teachers. All candidates for the M.A. in German must take either course 145 or Linguistics 166.
Mr. Katz (Sp); ——— (Su)

148A—148B—148C. Middle High German. (4—4—4)
Four 1-hour meetings per week.

148A. Outlines of grammar; the Nibelungenlied and selected readings. 148A is required of all candidates for the M.A. in German.
Mr. Palmer (F)

148B. Selected readings in Middle High German Literature. Prerequisite: course 145A or equivalent.
Mr. Leckie (W)

148C. Selected readings in Middle High German Literature. Prerequisite: course 145A or equivalent.
Mr. Leckie (Sp)

1195. Special Study for Honors Candidates. (4)
Prerequisite: a 3.5 grade-point average in at least four courses (20 units) of upper division German and a 3.0 overall grade-point average.
The Staff (Su, F, W, Sp)

1199. Special Study for Advanced Undergraduates. (1—4)
Five courses (20 units) of upper division German and a 3.0 overall grade-point average.
The Staff (Su, F, W, Sp)

Graduate Courses

(Literature: All graduate courses in literature will meet three hours a week: a 2-hour seminar and a 1-hour tutorial.

1200. Proseminar in Bibliography and Textual Analysis. (4)

203. Studies in Middle High German Literature. (4)
Prerequisite: course 148A.
Topic: Minnesang. Mr. Tubach (F)
Topic: Wolfram von Eschenbach. Mr. Spahr (W)

206. German Literature of the Renaissance and Reformation. (4)
Mr. Spahr

209. German Literature of the Seventeenth Century. (4)
Mr. Spahr

212. Lessing. (4) Mr. Mann

215. Goethe. 1749—1786. (4) Mr. Jászi (F)

218. Goethe. 1786—1814. (4) Mr. Politzer (W)

221. Goethe. 1814—1832. (4) Mr. Politzer (Sp)

224. Schiller. (4) Mr. Mann (W)

227. German Romanticism. (4) Miss Goldstein (F)

230. Kleist, Büchner, Grabbe. (4) Mr. Jászi (Sp)

233. Grillparzer and the Austrian Drama of the Nineteenth Century. (4) Mr. Politzer (W)

236. German Realism. 1850—1900. (4) Miss Bonwit

239. German Naturalism. (4) Mr. George (Sp)

242. Hofmannsthal and the Austrian Drama of the Twentieth Century. (4) Mr. Politzer

245. Interpretation and Criticism of German Poetry. (4) Mr. Kudszus (F)

248A—248B—248C. Twentieth-Century German Prose.
248A. Hermann Hesse. (4) Mr. Mileck (F)
248B. Thomas Mann. (4) Mr. Mileck (W)
248C. Franz Kafka. (4) Mr. Politzer (Sp)

*251. The Theory and Practice of German Tragedy. (4) Mr. George (Sp)

260. Seminar in German Literature. (4)
The Staff (F, W, Sp, Su)
Topic: Der Bildungsroman. Miss Bonwit (F)
Topic: Hölderlin. Mr. Politzer (Sp)

261A—261B. Seminar in German Literature. (4—4)
Three hours of lecture per week. Credit and grade will be awarded upon completion of the full sequence.
The Staff
Topic: 261A. Comparative Study of the Motif—the Middle Ages. Mr. Tubach, Mr. Mann (W)
Topic: 261B. Comparative Study of the Motif—the Age of Enlightenment. Mr. Mann, Mr. Tubach (Sp)

**LINGUISTICS**

270. Introduction to the History of the German Language. (4)
Two 1½-hour lectures per week. Mr. Penzl (W)

271. Historical Phonology and Morphology of German. (4)
Two 1½-hour lectures per week. Required of all candidates for the M.A. with linguistic emphasis. Mr. Penzl (Sp)

273. Gothic. (4)
Two 1½-hour meetings per week. Mr. Penzl (W)

276. Old High German. (4)
Two 1½-hour meetings per week. Mr. Penzl (Su)

* Not to be given, 1968—69.
282. Old Saxon. (4)
Three 1-hour meetings per week. Mr. Palmer (F)

*290. Seminar in Germanic Linguistics. (4)
Prerequisite: consent of instructor. The subject matter of this course will vary from time to time. Among the topics that may be treated are the following:
(1) Early New High German; (2) Modern German Dialects; (3) Proto-Germanic. Two 1½-hour meetings per week.
The Staff (F, W, Sp)

299. Special Study for Graduate Students in
- Literature or Linguistics. (1-8)
The Staff (Su, F, W, Sp)

602. Individual Study. (4)
Independent study, in consultation with the graduate advisor, intended to provide opportunity for Ph.D. candidates to prepare themselves for the qualifying examination. To be taken during the quarter immediately prior to the examination. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

Courses in the Teaching of German

300. The Teaching of German in Elementary and Secondary Schools. (4)
Four 1-hour meetings per week; either lecture, demonstration class, or Language Laboratory. For credential candidates. Open to senior and graduate students.
Mr. Mueller (W)

301A–301B–301C. The Teaching of German in College. (2–1–1)
Lecture and demonstration class. Language Laboratory. For all new teaching assistants. Open to all graduate students. Credit and grade will be awarded upon completion of the full sequence.
Mr. Mueller (F, W, Sp)

*302. The Teaching of German: Methods and Materials. (4)
Four hours of lecture per week. Prerequisite: graduate standing (or upper division standing with consent of instructor). For all teaching assistants and credential candidates. Readings, discussions and examination of German teaching materials and methods, observation of classes in session, practice teaching and survey of aptitude and achievement tests.
Mr. Mueller (F, W, Sp)

Courses in the Teaching of German

16. Elementary German. (0)
Mr. Katz (in charge) (Su, F, W, Sp)

26. Intermediate German. (0)
Mr. Katz (in charge) (Su, F, W, Sp)

Dutch

39. Literature of the Low Lands in English Translation. (4)
Four 1-hour lectures per week. Mr. Snapper (W)

101. Elementary Dutch. (4)
Five 1-hour class meetings and one 1-hour session in the Language Laboratory per week. Open to freshmen.

102. Elementary Dutch. (4)
Five 1-hour class meetings and one 1-hour session in the Language Laboratory per week.
Mr. Snapper (W)

103. Intermediate Dutch. (4)
Five 1-hour class meetings and one 1-hour session in the Language Laboratory per week. Prerequisites: Dutch 102 or equivalent.

104. Intermediate Dutch. (4)
Five 1-hour class meetings and one 1-hour session in the Language Laboratory per week. Prerequisite: Dutch 103 or equivalent.

199. Special Studies in Dutch. (1–4)
(1–4)
One to four hour meetings per week. Prerequisites: Dutch 101, 102, 103 or 104.

Yiddish

39. Yiddish Literature in English Translation. (4)
Four 1-hour lectures per week. Mr. Katz (F)

Related Courses in Other Departments

Linguistics 166. German Morphology and Syntax.


Comparative Literature 210A–210B. Studies in Medieval Literature.

**HISTORY**

(Department Office, 3229 Dwinelle Hall)

Paul J. Alexander, Ph.D., Professor of History.
Thomas G. Barnes, D.Phil., Professor of History.
Walton E. Bean, Ph.D., Professor of History.
Woodbridge Bingham, Ph.D., Professor of History.

* Not to be given, 1968–69.
Woodrow W. Borah, Ph.D., Professor of History.
William J. Bouwsma, Ph.D., Professor of History.
Robert J. Brentano,† Ph.D., Professor of History.
Delmer M. Brown,† Ph.D., Professor of History.
Gene A. Brucker,† Ph.D., Professor of History.
Richard Herr,† Ph.D., Professor of History.
James F. King,‡ Ph.D., Professor of History.
Joseph R. Levenson, Ph.D., Sather Professor of History.
Martin E. Malia,† Ph.D., Professor of History.
Henry F. May,† Ph.D., Margaret Byrne Professor of History.
Nicholas V. Riasanovsky, D.Phil., Professor of History.
Hans W. Rosenberg, Ph.D., Shepard Professor of History.
Wolfgang Sauer, Dr.Phil., Professor of History.
Carl E. Schorske, Ph.D., Professor of History.
H. Franz Schurmann, Ph.D., Professor of History and of Sociology.
Raphael I. Sealey, Ph.D., Professor of History.
Charles G. Sellers, Jr., Ph.D., Professor of History.
Engel Sluiter, Ph.D., Professor of History.
Kenneth M. Stampp,† Ph.D., A. F. and May T. Morrison Professor of History.
George H. Guttridge, M.A., Sather Professor of History, Emeritus.
George F. Hammond, Ph.D., LL.D., Professor of History and Director of the Bancroft Library, Emeritus.
Lawrence A. Harper, J.D., Ph.D., Professor of History, Emeritus.
John D. Hicks, Ph.D., LL.D., A. F. and May T. Morrison Professor of History, Emeritus.
Lawrence Kinnaird, Ph.D., Professor of History, Emeritus.
Franklin C. Palm, Ph.D., Professor of Modern European History, Emeritus.
Raymond J. Sontag, Ph.D., Litt.D., LL.D., Sidney Hellman Ehrman Professor of European History, Emeritus.
Richard M. Abrams,† Ph.D., Associate Professor of History.
Gunther Barth, Ph.D., Associate Professor of History.
Thomas N. Bisson,† Ph.D., Associate Professor of History.
L. Perry Curtis, Jr., D.Phil., Associate Professor of History.
Samuel P. Haber, Ph.D., Associate Professor of History.
Winthrop D. Jordan, Ph.D., Associate Professor of History.
Ira M. Lapidus,† Ph.D., Associate Professor of History.
Lawrence W. Levine, Ph.D., Associate Professor of History.
Leon F. Litwack, Ph.D., Associate Professor of History.
Robert L. Middlekauff,† Ph.D., Associate Professor of History.
George W. Stocking, Jr., Ph.D., Associate Professor of History.
Richard A. Webster, Ph.D., Associate Professor of History.
David E. Bertelson, Ph.D., Assistant Professor of History.
David A. Brading, Ph.D., Assistant Professor of History.
Gerald J. Cavanaugh, Ph.D., Assistant Professor of History.
Gerald D. Feldman, Ph.D., Assistant Professor of History.
Erich S. Gruen, Ph.D., Assistant Professor of History.
Roger Hahn,† Ph.D., Assistant Professor of History.
John L. Heilbrun, Ph.D., Assistant Professor of History.
Eugene F. Ischick, Ph.D., Assistant Professor of History.
Raymond K. Kent, Ph.D., Assistant Professor of History.

† On leave, 1968-69.
‡ On leave, fall quarter, 1968-69.
§ On leave, fall and winter quarters, 1968-69.
¶ Sabbatical in residence, fall quarter, 1968.
Martin A. Klein, † Ph.D., Assistant Professor of History.
Richard F. Kuisel, Ph.D., Assistant Professor of History.
William P. McGheeve, Ph.D., Assistant Professor of History.
Thomas R. Metcalf, † Ph.D., Assistant Professor of History.
Sheldon Rothblatt, Ph.D., Assistant Professor of History.
Irwin Scheiner, † Ph.D., Assistant Professor of History.
William B. Slottman, Ph.D., Assistant Professor of History.
John Masson Smith, Jr., Ph.D., Assistant Professor of History.
Randolph Starn, Ph.D., Assistant Professor of History.
Frederic E. Wakeman, Jr., Ph.D., Assistant Professor of History.
Reginald E. Zelnik, † Ph.D., Assistant Professor of History.

Charles W. Bodemer, Ph.D., Visiting Professor of History.
David G. Marr, M.A., Lecturer in History.
Edward B. Segel, M.A., Lecturer in History.
Martin J. Sherwin, Ph.D., Acting Assistant Professor of History.
Richard E. Willis, M.A., Acting Assistant Professor of History.

Departmental Major Advisers: Consult Department Office.

The Major

The major program in history shall total at least 60 quarter units, and include the following:

1. By the end of the sophomore year: two courses in the series 4A—4B—4C—4D (by permission of the major adviser, History 5 may be substituted for one of these courses. History 4D and 5 cannot both be taken for credit); one of the following: History 17C—17D, or 18A—18B, or 19, or two quarters (10 units) of 33A—33B—33C.

2. In the junior and senior years: a minimum of 5 upper division lecture courses; and in addition, History 101A—101B (Introduction to Historical Method); History 103 (Proseminar). With the consent of the major adviser, additional sections of History 103 may be substituted for one or more of the upper division lecture courses.

Honors At both lower and upper division levels, the department provides special honors work in small groups, with emphasis on more intensive study, group discussion, and written work other than examinations.

Lower Division Honors Courses At the freshman and sophomore level, the department offers four honors courses: History H4C, H4D, History H17A—H17B, and History 33A—33B—33C. Only two sections (10 quarter units) of the latter course will count towards the major. These courses require the consent of the instructor, but are open to qualified students whether or not they intend to major in history.

Upper Division Honors Program Students of junior standing with minimum overall grade-point average of 3.0 who are interested in small group work, independent research and writing, and in a variety of extracurricular activities with other students of similar interests, may apply for the upper division honors program. Admission to the program is open only at the beginning of the fall term each year. Students who will become juniors after the fall quarter should therefore apply at this time. Application forms will be available in the department office, 3229 Dwinelle. They should be filled out no later than the date scheduled for advance enrollment in the fall sequence of History 101, for which prospective candidates in the honors program should also preenroll. All those admitted to the upper division honors program will take this course before participating in the junior honors colloquium on historical thought.

† On leave, 1968–69.
* On leave, spring quarter, 1969.
Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. European Civilization.
Two 1-hour lectures and two 1-hour section meetings per week. Introductory study of periods of major historical significance in the course of European history. Emphasis on class discussions, readings in the sources, and writing of essays.
1A. Ancient. (5) Mr. Sealey (Sp)
1B. Medieval. (5) (-) (F)
1C. Renaissance and Reformation. (5) Mr. Starn (W)
1D. Enlightenment and Revolutions. (5) Mr. Slottman (Sp)

4. European Civilization. (5)
Two 1½-hour discussion groups each week. Limited to ten students per section. An honors course including reading, discussion, and reports, focusing on selected problems in European history since 1648. Prerequisite: consent of instructor.
H4A. Renaissance. (5) Mr. Cavanaugh (Sp)
H4B. Medieval. (5) (-) (F)
4C. Renaissance and Reformation. (5) (-) (W)
4D. Enlightenment and Revolutions. (5) (-) (W)

5. Modern Europe. (5)
Three hours of lecture and one 1-hour section meeting per week. A survey of modern Europe primarily for students not going on in history.
17A–17B. The United States. (3–3)
Prerequisite: sophomore standing.
17A. Two hours of lecture; two term papers. Emphasis on writing. (-) (F)
17B. Three hours of lecture.
Mr. Berman (Su); Mr. Litwack (W)

17C–17D. The United States. (5–5)
Prerequisite: Sophomore standing.
17C. Two hours of lecture and two hours of section meeting per week. (-) (F)
17D. Three hours of lecture and one hour of section meeting per week.
Mr. Berman (Su); Mr. Litwack (W)

H17A–H17B. The United States. (5–5)
Two-and-one-half-hours’ discussion per week. Prerequisite: sophomore standing and consent of instructor. Limited to 10 students per section. An honors course including reading, discussion, and reports, focusing on selected movements and epochs. (-) (F, W)

18A–18B. Latin-American History. (5–5)
Three hours of lecture and one 1-hour section meeting per week. Prerequisite: sophomore standing.
Mr. King (W, Sp)

19. Asian History. (5)
One hour lecture and four hours discussion per week. Students will enroll by choice in sections conducted by faculty members and limited to 20, all sections meeting for weekly lecture by different instructors. Work in sections will include reading, discussion, reports on historical problems. Grading based on section work. Prerequisite: sophomore standing and consent of instructor.
The Staff in Asian History (F)
*19A. Asian Monarchies.
19B. Nationalist Revolutions in Asia.
19C. Identity Formation in Asia. Mr. Irschick
*19D. Urban Societies in Asia.
19E. Asian Classics in National and Cosmopolitan Contexts.
Mr. Levenson
*19F. Landlords and Peasants in Asia.
*19G. Christianity in Asia.
*19H. Social Structure in Asia.
*19I. Formation of States in Asia.
19J. European Imperialism and Asia.
Mr. Wakedman

33A–33B–33C. American Studies. (5–5–5)
Open to sophomores with consent of instructor. Limited to fifteen students. An honors course in the study of American civilization. The class will study significant ideas and issues, drawing on material from history, literature, political science, philosophy, and other fields. The course will emphasize discussion and the writing of essays and will include occasional joint meetings with the staff and students of the two equivalent courses (English 33A–33B–33C and Political Science 33A–33B–33C).
Mr. Bertelson (F, W); (-) (Sp)

Upper Division Courses

Group I—Unrestricted Courses

(Open to all students in the upper division; prerequisites as noted.)

*105A–105B. Asia in the T'ang Period. (5–5)
Three hours of lecture and 1 hour of consultation per week. Prerequisite: some knowledge of early Asian history, China and its neighbors from about 600 to the tenth century; topics concerning political, commercial, and cultural elements in the world of the T'ang Chinese.
Mr. Bingham (F, W)

* Not to be given, 1968–69.

H102). Returning senior honors program students should consult the department office during the registration period for information regarding interviews with the honors Committee to discuss their senior honors theses (H198A–H198B).

Teaching Training
See the Announcement of the School of Education.

Higher Degrees
Students planning to work toward the degrees of M.A. and Ph.D. should address inquiries to the Graduate Secretary, Department of History, for the Department of History bulletin entitled "Higher Degrees in History." The deadline for receipt of applications for graduate admissions is January 15. February 15 is the deadline for receipt of supplementary materials (transcripts, letters of recommendation from two professors who have instructed the applicant in history, results of the Aptitude Test in the Graduate Record Examination). Candidates will be admitted for the fall quarters only.
110A–110B. Ancient Greece. (5–5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Seale

111A–111B. Ancient Rome. (5–5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Gruen (F, W)

*112. The Age of Cicero. (5)

Three hours of lecture and 1 hour of consultation per week. Examination of events, forces, trends involved in fall of Roman Republic in crucial years between deaths of Sulla and Cicero. Analysis of Cicero's speeches, essays and correspondence. Political, social, economic struggles in light of intellectual and cultural currents.

Mr. Gruen

114A–114B. Byzantium. (5–5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Alexander (F, W)

115A–115B. Medieval Europe. (5–5)

Three hours of lecture and 1 hour of consultation per week.

117. European Culture in the Middle Ages. (5)

Three hours of lecture and 1 hour of consultation per week.

*118A–118B. Medieval Institutions. (5–5)

Three hours of lecture and 1 hour of consultation per week.

120. The Renaissance. (5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Starna

*121. The Reformation. (5)

Three hours of lecture and 1 hour of consultation per week.

*122. Age of Absolutism and Enlightenment. (5)

Three hours of lecture and 1 hour of consultation per week.

*123. Modern Europe (1789–1870). (5)

Three hours of lecture and 1 hour of consultation per week.

124. Modern Europe (1870–1914). (5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Feldman (Sp)

125. Modern Europe (1914–Present). (5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Webster (W)

126A–126B. European Economic History Since 1750. (5–5)

Three 1-hour lectures and 1 hour of consultation per week.

(F, W)

127A–127B. European Diplomatic History. (5–5)

Three 1-hour lectures and 1 hour of consultation per week.

Mr. Segel (W, Sp)

128A*–128B–128C. European Intellectual History Since 1400. (5–5–5)

Three hours of lecture and 1 hour of consultation per week. Thought and art considered in their social and political context.

128B: Mr. Schorske (F);

128C: Mr. Schorske (W)

*129A–129B. Social History of Western Europe. (5–5)

Three hours of lecture and 1 hour of consultation per week.

130. Development of Scientific Thought and Technique. (5)

Three hours of lecture and 1 hour of consultation per week.

*130A. Ancient and Medieval Science. (5)

Mr. Hahn (F)

130B. Scientific Revolution (1450–1750). (5)

Mr. Hellbrun (W)

130C. Science since 1750. (5)

Mr. Hellbrun (Sp)

*131. Topics in the History of the Physical Sciences. (5)

Three hours of lecture and 1 hour of consultation per week. Prerequisite: high school or college physics. Intensive study using primary sources wherever possible, of a closely related series of episodes in the development of scientific thought.

132. Topics in the History of Biological Science. (5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Bodemer (Su)

136. Russia.

Three hours of lecture and 1 hour of consultation per week.

136A. Russia to 1613. (5)

Mr. Riasanovsky (F)

136B. Russia 1613–1891. (5)

136C. Russia 1801–1917. (5)

136D. Russia 1917 to Present. (5)

Mr. Riasanovsky (Su)

*137A–137B. Russian Intellectual History. (5–5)

Two 1½-hour discussion group meetings and one hour of consultation per week. A two-quarter program in seminar course in social and political thought, with attention also to literature and philosophy: eighteenth century to 1917. Open to qualified graduates and undergraduates. Limited to 30 students.

Mr. Malia, Mr. Riasanovsky

140A–140B. Habsburg Monarchy and Succession States. (5–5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Slottman (F, W)

*141A. Medieval France. (5)

141B–141C. Modern France. (5–5)

Three hours of lecture and 1 hour of consultation per week.

Mr. Cavanaugh, Mr. Kuisel (F, W)

142. Rise of the Dutch Republic and Empire. (5)

Three hours of lecture and 1 hour of consultation per week. Economic, political, religious, and cultural history of the Netherlands from the Burgundian and Habsburg periods through the Dutch Revolt and Golden Age of the Republic, including overseas expansion and establishment of the Dutch colonial empire.

Mr. Sluiter (F)

143B–143C. Modern Germany. (5–5)

Three hours of lecture and 1 hour of consultation per week.

143B: Mr. Sauer (F);

143C: Mr. ——— (Su); Mr. Sauer (W)

* Not to be given, 1968–69.

§ Approved for one offering only, 1968–69.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>147A-147B</td>
<td>Spain and Portugal</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Herr</td>
</tr>
<tr>
<td>148</td>
<td>Modern Italy</td>
<td>5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Webster</td>
</tr>
<tr>
<td>150A-150B</td>
<td>Medieval England</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Emphasis will be placed on constitutional and intellectual developments. Mr. Brentano (W, Sp)</td>
</tr>
<tr>
<td>151A-151B-151C</td>
<td>Modern Britain (Since 1500).</td>
<td>5-5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Prerequisite: an elementary knowledge of the history of Western Europe. Mr. Brentano (W, Sp)</td>
</tr>
<tr>
<td>152A-152B</td>
<td>Constitutional History of England</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Curtis (Sp)</td>
</tr>
<tr>
<td>154</td>
<td>British Empire and Commonwealth</td>
<td>5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Curtis (Sp)</td>
</tr>
<tr>
<td>156A-156B</td>
<td>Social History of Latin America</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Prerequisite: History 151C or equivalent. Mr. Curtis (Sp)</td>
</tr>
<tr>
<td>157A-157B</td>
<td>The Central Andean Region</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. History of the Andean region, the area that now comprises modern Peru, Bolivia and Ecuador, from the Indian period (fifteenth century) to the present. Mr. Brading (W, Sp)</td>
</tr>
<tr>
<td>160A-160B</td>
<td>Mexico</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Borah (F, W)</td>
</tr>
<tr>
<td>162A-162B</td>
<td>Caribbean Area</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Borah (F, W)</td>
</tr>
<tr>
<td>163A-163B</td>
<td>Brazil</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Shuter</td>
</tr>
<tr>
<td>164</td>
<td>Modern Argentina</td>
<td>5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Shuter</td>
</tr>
<tr>
<td>165A-165B</td>
<td>The Colonial Period and American Revolution</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Jordan (W) Mr. Bertelson (Sp)</td>
</tr>
<tr>
<td>167A</td>
<td>Era of Sectional Conflict</td>
<td>5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Stamp (Sp)</td>
</tr>
<tr>
<td>167B</td>
<td>Reconstruction and the New Nation</td>
<td>5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Stamp (Sp)</td>
</tr>
<tr>
<td>168A-168B</td>
<td>Recent History of the United States</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Barth (F, W)</td>
</tr>
<tr>
<td>170A-170B</td>
<td>The West in United States History</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Bean (W, Sp)</td>
</tr>
<tr>
<td>171A-171B</td>
<td>California</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Curtis (Sp)</td>
</tr>
<tr>
<td>172A-172B</td>
<td>Constitutional History of the United States</td>
<td>3-3</td>
<td>Three hours of lecture and 1 hour of consultation per week. Prerequisite: course 17A-17B or consent of instructor. Mr. Curtis (Sp)</td>
</tr>
<tr>
<td>173A-173B</td>
<td>Diplomatic History of the United States</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Sherwin (W, Sp)</td>
</tr>
<tr>
<td>175A-175B</td>
<td>Intellectual History of the United States</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Haber (Sp)</td>
</tr>
<tr>
<td>176A-176B</td>
<td>History of Science and Technology in American Society</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Haber (Sp)</td>
</tr>
<tr>
<td>180A-180B</td>
<td>Africa</td>
<td>5-5</td>
<td>Three hours of lecture and 1 hour of consultation per week. Mr. Kent (F, W)</td>
</tr>
<tr>
<td>182A-182B</td>
<td>Islamic History</td>
<td>5-5</td>
<td>A history of the Middle East from the 7th to the 13th centuries; the Arab conquests, the Islamic Empire, the successor states, and the formation of Islam as a religion and culture. Mr. Lapidus</td>
</tr>
<tr>
<td>183A-183B</td>
<td>The Middle East</td>
<td>5-5</td>
<td>The background, origins, and rise of the Ottomans; the Ottoman Empire, its Arab provinces, Persia and the modern Middle East. Three hours of lecture and 1 hour of consultation per week. Mr. Smith (W, Sp)</td>
</tr>
</tbody>
</table>

* Not to be given, 1968-69.
184A-184B. China. (5-5) Three hours of lecture and 1 hour of consultation per week. Mr. Levenson (F, W); Mr. Wakeman (W, Sp)

185A-185B. Japan. (5-5) Three hours of lecture and 1 hour of consultation per week. Mr. Scheiner, Mr. Harootunian (Su, F)

186. Southeast Asia. (5) Three hours of lecture and 1 hour of consultation per week. Mr. Marr (W)

187A-187B. India. (5-5) Three hours of lecture and 1 hour of consultation per week. Mr. Irshick, Mr. Metcalf (F, W)

189A-189B. Social History of China and Japan. (5-5) Three hours of lecture and 1 hour of consultation per week. Prerequisite: consent of instructor. 189A. China. 189B. Japan. Mr. Schurrman (W)

Group II—Restricted Courses

COURSES IN HISTORICAL METHOD AND THOUGHT

(Designed primarily for students whose major subject is history.)

101A-101B. Introduction to Historical Method. (5-5) Lengthy individual research projects carried on in seminar sections in limited historical fields, with readings, discussions, etc., on general problems of historical inquiry. The two quarters must be taken consecutively. For seniors and honors program juniors. Credit and grade will be assigned only upon completion of the full sequence. Mr. Smith (F, W); Mr. Rothblatt (W, Sp)

H102. Colloquium on Historical Thought. (5) Consideration of the nature and function of historical thought as manifested in major historical classics and selected historical problems. Required of honors program juniors; open, by permission of instructor, to nonhonors program seniors upon completion of History 101A-101B. Mr. Caspary (Su)

PROSEMINARS IN HISTORY

103. Proseminar: Problems in Interpretation and Research in the Several Fields of History. (5) One 2 to 3-hour meeting or two 1 1/2-hour meetings per week. Designed primarily to give majors in history elementary training in historical criticism and research. Emphasis will be placed on writing and discussion. With consent of instructor may be repeated without duplication of credit. Prerequisite: consent of instructor.

103A. Ancient. Mr. Gruen (F); Mr. Sealey (W)
103B. Europe. Mr. Riesenber, Mr. Schorske (Su); Mr. Feldman, Mr. Segel, Mr. Slottman, Mr. Starn (F); Mr. Cavaugne (W); Mr. Caspary, Mr. Hale, Mr. Kuiple, Mr. Slottman, Mr. Webster (Sp)

* Not to be given, 1968-69.

Consult SCHEDULE OF CLASSES.

LIMITED ENROLLMENT LECTURE COURSES

104. Special Topics in the Various Fields of History. (5) Three to four hours per week. Designed primarily to permit the instructor to deal with a topic with which he is especially concerned, usually more restricted than the subject matter of a regular lecture course. A combination of informal lectures, class discussions, term papers, and examinations, with all grading by the instructor himself. Limited to 25 to 30 students. Instructors and subjects to vary.

Instructors and topics 1968-69 will be announced in SCHEDULE OF CLASSES.

HONORS COURSES

H198A-H198B. Senior Honors. (5-5) Limited to senior honors candidates. Direct study centering upon the preparation of an honors thesis. Supervisors will be assigned to each student after consultation with the honors committee. Credit and grade will be assigned upon completion of the full sequence. The Staff (F, W, Sp)

199. Special Study for Advanced Students. (4-5) Restricted to senior honors students.

Graduate Courses

(Concerning conditions for admission to graduate courses, see p. 159.)

Group I. Bibliography and Historiography Courses

280. Advanced Studies in the Sources and General Literature of the Several Fields of History. (5) One 2 to 3-hour meeting per week.

280A. Ancient. Mr. Sealey (F); Mr. Gruen (W)
280B. Europe. Mr. Brucker, — (Su); Mr. Bouwsma, Mr. Cavaugne (W); Mr. Rosenburg, Mr. Segel, Mr. Webster (F), Mr. Caspary, Mr. Feldman, Mr. Hale (W); Mr. Slottman, Mr. Alexander, Mr. Cavaugne, —, Mr. Sauer (Sp)

* Not to be given, 1968-69.
GROUP I. Fields of Study

History of Science

125. Required Courses. (5-5)

a. Ancient Greece and Rome. (5-5)
   Mr. Sealey (Sp, W)

b. Economic History. (5-5)
   Mr. Cipolla (F); Mr. Landauer (W, Sp)

181A-281B. Paleography and Other Auxiliary Sciences. (5-5)

Group II. Research Seminars

185. Research Seminars. (5-5)

The following research seminars extend over two consecutive quarters. A final grade will be assigned upon completion of both quarters’ work. One 2- to 3-hour meeting per week.

285A. Ancient Greece and Rome. (5-5)
   Mr. Sealey (Sp, W)

285B. Economic History. (Economics 112A-112B) (5-5)
   112A, Mr. Cipolla (F); 112B, — — 3  (W)

285S. History of Science. (5-5)
   Mr. Heilbron (W, Sp)

285T. Economic History. (5-5)
   Mr. Sluiter (Sp)

XIIA. 281B. Paleography and Other Auxiliary Sciences. (5-5)
One 2- to 3-hour meeting per week.

13. Historical Method and Theory. (5)

One 2- to 3-hour meeting per week. Designed specially for candidates for higher degrees in History. Stress is laid on practical exercises.

Mr. Sontag (F); Mr. Levenson (W)

GROUP IV. Teaching and Research Assistance

298. Professional Preparation: Teaching. (6)
   The Staff (F, W, Sp)

299. Professional Preparation: Research. (6)
   The Staff (F, W, Sp)

HISTORY OF SCIENCE

The following courses are acceptable for major credit in history and most of them are acceptable for major credit in philosophy as well. (For details see the cross-listings in the philosophy and history sections of this bulletin: 103S, 130A, 130B, 130C, 131, 132, 178A, 178B, 280S, 285S. Students interested in graduate programs in the history of science should consult the adviser.)

ECONOMIC HISTORY

The following courses are acceptable for major credit in history. (For details see the listings in Economics. Students interested in graduate programs in economic history should consult the adviser.)

Economic History of Europe. (Economics 112A–112B) (5-5)
   112A, Mr. Cipolla (F); 112B, — — 3  (W)

Economic History of the United States. (Economics 113) (5-5)
   Mr. Sutch, Mr. Landauer (F, Sp)

Topics in Economic History. (Economics 210A–210B–210C–210D) (5-5)
   210A, Mr. Roehl (W); 210B, Mr. Cipolla (F);
   210C, Mr. Fishlow (Sp); 210D

* Not to be given, 1968–69.
Medieval Studies  The Committee on Medieval Studies in conjunction with the Department of History plans to offer interdisciplinary work in medieval studies during the academic year 1968–69.

IDS 110. Historical Design. (5)

IDS 181. Introduction to Thomas Aquinas' Summa Theologiae. (4)

IDS 281. Critical Moments in the Evolution of Medieval Thought. (4)

See Interdepartmental Studies for the complete description of these courses.

HUMANITIES

Jack D'Amico, Ph.D., Assistant Professor of English.
Vincent H. Duckles, Ph.D., Professor of Music.
Richard Herr, Ph.D., Professor of History.
Howard E. Hugo, Ph.D., Associate Professor of English (Chairman of the Field Major)
Henry Okun, M.A., Lecturer in Art.
Randolph Stam, Ph.D., Assistant Professor of History.

Major Adviser: Mr. Hugo.

The Field Major: See the Announcement of the College of Letters and Science.

Letters and Science List: for regulations governing this list, see page 80.

Senior Seminars

Prerequisite: restricted to seniors in the humanities field major.

191. Literature. (5)

Two 2-hour meetings per week. Informal lectures, discussions and supervised preparation of papers. Study of selected works in English and in translation, related to a period or theme determined by the instructor. Discussion of critical criteria; universality individuality, and literary tradition; the forms, functions and limitations of language.

Mr. D’Amico (F); Mr. Hugo (W)

192. Fine Arts. (5)

Two 2-hour meetings per week. Analytical and critical methods in music, the visual arts, and the dramatic arts, exemplified through detailed study of selected works; the roles of form and content in different media.

Mr. Duckles (F); ——— (Sp)

193. Topics in the History of Culture. (5)

Two 2-hour meetings a week. An analysis of the historical context in which were produced the works of art, literature, and music which form the subject of other senior humanities courses.

Mr. D’Amico (F); Mr. Hugo (W)

HUNGARIAN

(For courses in the Hungarian language and literature, see listing under Department of Slavic Languages and Literatures.)

INTERDEPARTMENTAL STUDIES

105. Elements of Digital Computers. (4)

Three 1-hour lectures per week. Prerequisite: Physics 4C; Introduction to digital logic elements, memory elements, and recording methods. Emphasis on factors which influence the logical design and organization of digital computers.

Mr. Graham, Mr. Pirtle (Sp)

110. Historical Design. (5)

Two-hour lecture and 3-hour laboratory per week. Prerequisite: for history students—History 103C; for design students—Design 128A. This course involves the presentation of historical problems in the form of nontraditional symbols. Students of communicative design and history will work together to produce two dimensional models of riots and insurrections in France and Britain since the 1730's.

Mr. Curtis (History) (W); Mr. Wolf (Design); (W)

175. A Nontechnical Introduction to Operations Research. (4)

Four-hour lecture per week. The course introduces to students in professional schools, basic concepts of systems science and operations research. A number of mathematical models and conceptual ideas are presented with illustrations and evaluations of the applications of operations research in government, business, education, etc.

Mr. Churchman (Sp)

181. Introduction to Thomas Aquinas' Summa Theologiae. (4)

Three-hour lectures per week. The method and the doctrine.

Mr. Gilson (W)

§ Approved for one offering only, 1968–69.
250. Experimental Helminthology. (5)
Two 2-hour lecture and discussion periods and one 4-hour laboratory per week. Prerequisite: content of instructor; Zoology 156 or Entomology 150, or equivalent recommended. Review and integration of advances in helminthology, with emphasis on physiological and immunological aspects. Laboratory devoted to special projects on selected aspects of helminth biology. Mr. Simmons, Mr. Weinmann (F).

5281. Critical Moments in the Evolution of Medieval Thought. (4)
Two-hour lecture per week. Prerequisite: a command of Latin, of medieval European history or philosophy and the consent of instructor. A faculty-student colloquium or seminar, depending on the participants, will present papers in discussion with Professor Etienne Gilson.

Mr. Gilson (W)

ITALIAN

(Department Office, 5125 Dwinelle Hall)

Enrico De Negri, Dottore in Lettere, Professor of Italian.

Arnolfo B. Ferruolo, Dottore in Lettere, Professor of Italian (Chairman of the Department).

Michele De Filippis, Ph.D., Professor of Italian, Emeritus.

Louise George Clubb, Ph.D., Associate Professor of Italian and of Comparative Literature.

Nicolás J. Perella, Ph.D., Associate Professor of Italian.

Gustavo Costa, Dottore in Lettere, Associate Professor of Italian.

Ruggiero Stefanini, Dottore in Lettere, Associate Professor of Italian.

Rudolf Brändli, Dr.Phil., Assistant Professor of Italian.

Mario D’Amico, Dottore in Lettere, Lecturer in Italian.

Catherine Feucht, B.A., Lecturer in Italian.

Cecilia Ross, Ph.D., Lecturer in Italian.

Departmental Major Adviser: Mr. Stefanini.

Departmental Graduate Adviser: Mr. Perella.

The department offers a program of courses designed to lead to proficiency in the Italian language and to a critical appreciation of the rich literary heritage of Italy from Dante Alighieri to the present. It also provides courses of Italian literature in English translation. At the graduate level, students will find ample opportunity for advanced work in philology as well as in literature. Mindful of the interrelationship that exists between the various cultural disciplines, the department allows for programs that include courses in other fields. A Chair of Italian Culture, established in 1928, is occupied every year by an outstanding Italian scholar or creative artist. A departmental library of texts, periodicals, and reference books supplements the excellent Italian collection of the General Library.

The Major

Lower Division 1, 2, 3, 4, 5A–5B, or their equivalents. Recommended: Comparative Literature 41A–41B–41C; English 44A–44B–44C; History 4A–4B–4C–4D; Philosophy 25A–25B–25C; other courses in the Humanities.

Upper Division 40 units of upper division courses in the department including: 101A–101B; 103A–103B. Recommended: Appropriate courses in art, classics, comparative literature, English, French, German, history, music, philosophy, Portuguese, Spanish.

1 On leave, fall quarter, 1968–69.
5281. Critical Moments in the Evolution of Medieval Thought. (4)
Two-hour lecture per week. Prerequisite: a command of Latin, of medieval European history or philosophy and the consent of instructor. A faculty-student colloquium or seminar, depending on the participants, will present papers in discussion with Professor Etienne Gilson.

Mr. Gilson (W)
Honors Program  An honors program is open to senior students who have a 3.0 overall grade-point average and a 3.5 grade-point average in upper division courses in Italian. The honors program will include, in addition to the requirements for the major, Italian H195 for two quarters, and a comprehensive examination.

Preparation for Graduate Study  A foundation in literature and languages is of primary importance for students contemplating graduate work. In the program for the M.A. degree in Italian a knowledge of Latin and a second Romance language is recommended. The program for the Ph.D. degree requires a reading knowledge of Latin, French, and Spanish.

Graduate Study

The M.A. Program  Requirements: 36 units of upper division and graduate courses in Italian of which at least 20 must be in graduate courses. Italian 200 is required. (With the consent of the graduate adviser, a maximum of 4 units may be taken outside the department.) A written and oral comprehensive examination.

The Ph.D. Program  For information on the Ph.D. program, apply at the departmental office.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. Elementary Italian. (4)
   Five 1-hour meetings per week.
   Mr. Ferruolo in charge (Su, F, W, Sp)

2. Elementary Italian. (4)
   Five 1-hour meetings per week. Prerequisite: Italian 1 or the equivalent.
   Mr. Ferruolo in charge (Su, F, W, Sp)

3. Intermediate Italian. (5)
   Five 1-hour meetings per week. Prerequisite: Italian 2 or the equivalent.
   Mr. Ferruolo in charge (Su, F, W, Sp)

4. Intermediate Italian. (5)
   Five 1-hour meetings per week. Prerequisite: Italian 3 or the equivalent.
   Mr. Ferruolo in charge (Su, F, W, Sp)

5A–5B. Advanced Italian. (4–4)
   Five 1-hour meetings per week. Prerequisite: Italian 4 or the equivalent.
   Mr. Stefanini in charge (Su, F, W, Sp)

   Three 1-hour lectures per week. The most important authors from the origins to the present, with lectures in English and readings of representative works in translation.
   39A. Early Italian literature and Dante Alighieri.
      Mrs. Clubb, Mr. Costa, Mr. Ferruolo, Mr. Farella (Su, F, W, Sp)
   39B. Boccaccio, Petrarch and the Renaissance.
      Mr. Costa, Mr. Ferruolo (W, Sp)
   39C. Modern Italian literature.
      + Mr. Costa (Su, Sp)

Upper Division Courses

   Sequence beginning (F, Sp)
   Three 1-hour meetings per week. Prerequisite: Italian 5B or the equivalent.
   Mr. Brandli, Mr. D’Amico

103A–103B. Introduction to Italian Literature.
   Three 1-hour lectures per week. Designed primarily for seniors majoring in Italian. An introduction to the chief currents and authors of Italian Literature with selected readings.
   103A: Mr. Brandli (F); 103B: Mr. Brandli (W)

109A–109B–109C. Dante’s “Divina Commedia.”
   (4–4–4)
   Two 1½-hour lectures per week.
   109A. Inferno.
      Mr. Stefanini (F)
   109B. Purgatorio.
      Mr. De Negri (W)
   109C. Paradiso.
      Mr. De Negri (Sp)

*110A–110B. Italian Literature of the Thirteenth and Fourteenth Centuries. (4–4)
   Three 1-hour lectures per week.
   110A. Emphasis on the “Stil Nuovo” and Dante’s minor works.
      Mr. Stefanini (F)
   110B. Emphasis on Boccaccio’s Decameron and Petrarch’s Rime.
      Mr. Stefanini (W)

*111. Italian Literature of the Fifteenth Century.
   (4)
   Three 1-hour lectures and 1-hour conference period per week. Humanism and the Early Renaissance.
   Mr. Ferruolo (Sp)

112A–112B. Italian Literature of the Sixteenth Century. (4–4)
   Three 1-hour lectures and 1-hour conference per week.
   112A. The High Renaissance.
      Mr. Ferruolo (F)
   112B. The Late Renaissance.
      Mr. Ferruolo (W)

© Not to be given, 1968–69.
114. Italian Literature of the Eighteenth Century. (4)
Three 1-hour lectures and one 1-hour conference period per week. Emphasis on the works of Vico, Goldoni, Parini, and Alfieri. Mr. Costa (F)

115A-115B. Italian Literature from 1800 to 1850. (4-4)
Three 1-hour lectures and one 1-hour conference period per week.
115A. From Neoclassicism to Romanticism.
Mr. Perella (W)
115B. Romanticism.
Mr. Perella (Sp)

116. Italian Literature from 1850 to 1900. (4)
Three 1-hour lectures per week. Main trends in poetry and prose.
Mr. Perella (F)

117A-117B. Italian Literature of the Twentieth Century. (4-4)
Three 1-hour lectures per week and a 1-hour conference per week.
117A. Poetry and Drama, with emphasis on the Hermetic poets and Pirandello.
Mr. D’Amico (W)
117B. The Novel from Svevo to the present.
Mr. D’Amico (Sp)

121. Advanced Conversation. (4)
Three hour class meetings per week. Prerequisite: course 101B or the equivalent. Mr. D’Amico (Sp)

H195. Special Study for Honors Candidates. (4)
Individual conferences to be arranged.
The Staff (Mr. Stefanini in charge) (Su, F, W, Sp)

199. Special Study for Undergraduates. (1-5)
Individual conferences to be arranged. Specifically designed for students who wish individually to pursue a program of reading and study not covered by any other course. Restricted to senior honor students. Units of credit to be determined by the instructor.
The Staff (Mr. Stefanini in charge) (F, W, Sp)

Literature Courses in English

130. Dante’s Divine Comedy. (4)
Three 1-hour lectures per week. Prerequisite: consent of instructor. A historical and critical reading of the poem.
Mr. Perella (Sp)

140. Dante, Petrarch, and Boccaccio. (4)
Two 2-hour lectures per week. Prerequisite: consent of instructor. The works of Dante, Petrarch, and Boccaccio and their relation to the Middle Ages and to the Renaissance.
Mrs. Clubb (W)

Graduate Courses and Seminars

200. Italian Syntax and Lexicon. (4)
One 3-hour meeting per week. Required of all candidates for the M.A. in Italian. Mr. Brändli (Sp)

200A-201B. Historical Grammar. (2-2)
One 2-hour meeting per week.
Mr. Stefanini (F, W)

202. Early Italian Texts. (4)
Two 1½-hour meetings per week.
Mr. Stefanini (W)

203. Methods of Literary Study and Stylistic Analysis. (4)
Two 1½-hour meetings per week. Mr. Costa (F)

204. Seminar on Italian Literary Criticism. (4)
Two 1½-hour meetings per week. Course may be repeated for credit when topic changes.
Mr. Costa (W)

209. Seminar on the “Divina Commedia.” (4)
Two 1½-hour meetings per week.
Mr. De Negri (W)

211. Seminar on Petrarch. (4)
One 3-hour meeting per week. The fundamental aspects of Petrarch’s work in relation to the rise and development of humanism.
Mr. Perella (W)

213. Seminar on Boccaccio and the Novella. (4)
One 3-hour meeting per week. The various types of the Italian novella from Boccaccio to Bandello. The evolution of the genre and its forms.
Mr. Costa (Sp)

215. Chivalric Poetry in Italy. (4)
One 3-hour meeting per week. The relationship between the genre and its French medieval sources, with a study of its evolution in Italy, through Pulci, Boiardo, and Ariosto.
Mrs. Clubb (F)

217. Seminar on the Renaissance. (4)
Two 1½-hour meetings per week. Course may be repeated for credit when topic changes.
Mrs. Clubb (W)

218. The Age of the Baroque. (4)
Two 1½-hour meetings per week. Emphasis on the pastoral drama, Marino, and the Marinisti.
Mr. Costa (Sp)

223. Seminar on Contemporary Italian Literature. (4)
Two 1½-hour meetings per week. Course may be repeated for credit when topic changes.

225. The Italian Lyric. (4)
Three 1-hour meetings per week. The relationship between the genre and its French medieval sources, with a study of its evolution in Italy, through Pulci, Boiardo, and Ariosto.
Mr. Perella (W)

299. Special Study for Graduate Students. (2-6)
Individual conferences to be arranged, specifically designed for students who wish individually to pursue a special program of study and research not covered by any other course or seminar. Units of credit to be determined by the instructor.
The Staff (Mr. Perella in charge) (F, W, Sp, Su)

601. Individual Study for Master’s Candidates. (1-8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Perella in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Perella in charge) (Su, F, W, Sp)

* Not to be given, 1968–69.
ITALIAN; JOURNALISM

1G. Beginning Italian for Graduate Students.
   (No credit) Mrs. Ross (Su, F)

2G. Advanced Italian for Graduate Students.
   (No credit) Mrs. Ross (W)

General Interest Courses for Upper Division Students

Italian
103A—103B, Introduction to Italian Literature; 109A—109B—109C, Dante's *Divina Commedia*; 110A—110B, Italian Literature of the Thirteenth and Fourteenth Centuries; 111, Italian Literature of the Fifteenth Century; 112A—112B, Italian Literature of the Sixteenth Century; 114, Italian Literature of the Eighteenth Century; 115A—115B, Italian Literature from 1800 to 1850; 116, Italian Literature from 1850 to 1900; 117A—117B, Italian Literature of the Twentieth Century; 130, Dante's *Divine Comedy*; 140, Dante, Petrarch, and Boccaccio.

■ JOURNALISM

(Loaner Office, 318 Sproul Hall)

Joseph P. Lyford, B.A., Professor of Journalism.
Albert G. Pickerell, Ph.D., Professor of Journalism (Chairman of the Department).
Douglas A. Fuchs, Ph.D., Assistant Professor of Journalism.

Pete S. Steffens, M.A., Assistant Professor of Journalism.
Edward Arnow, M.A., Lecturer in Journalism.
Herbert A. Jacobs, B.S., Lecturer in Journalism.

Graduate Adviser: Mr. Pickerell.
Adviser for Individual Major in Journalistic Studies: Mr. Fuchs.

Undergraduate Individual Major

An individual major in journalistic studies, leading to the degree of Bachelor of Arts, is available to qualified students who have journalistic interests and objectives. Honor status is required. Such individual programs may be approved upon petition to the Dean of the College of Letters and Science, following consultation with the departmental adviser. A selection of courses (not more than six) from the offering of the School of Journalism and no fewer than three relevant courses in other disciplines ordinarily constitutes such a major. Students majoring in other departments may also elect certain journalism courses in preparation for graduate study or leading to careers in journalism. These courses may be taken in combination with a major in one of the social sciences or humanities, such as economics, English, history, political science, anthropology, sociology and the field major in social sciences. Other curricula also are suitable and the student may wish to consult the department before selecting a major. The department also offers a variety of courses at the undergraduate level as general interest electives.

Graduate Program

For information about graduate work leading to the degree of Master of Journalism (M.J.) see page 91 of this catalogue. For more detailed information, see the Information Bulletin of the School of Journalism, available from the School office, 318 Sproul Hall.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Course

21. Introduction to Journalism. (4)

One 1½-hour lecture and one 1½-hour laboratory per week. Conference periods and reports. Survey of journalistic principles and practices: journalistic writing, including its evolutionary developments, its social and its compositional problems. Mr. Arnow (F, W, Sp)

Upper Division Courses

131. The Journalistic Process. (5)

One 1-hour lecture and two 2-hour laboratory per week. Prerequisite: course 21 or the equivalent. Operation, organization and administration of the news function, with emphasis upon the responsibilities of the reporter and editor. Mrs. Ross (Su, F, W, Sp)
140. History of American Journalism. (5)  
Four hours of lecture and discussion per week. Lecture and laboratory. Monitored reading assignments and reports. Political, social, economic, technological and cultural revolution of the press. [Su, F, Sp]  

141. The Mass Media and Society. (5)  
Two 1¾-hour lectures and discussion per week. Critical analysis and discussion of the interplay between media and social conditions. Approaches to and analysis of the study of social change. Mr. Lyford [W]  

147. Research in Mass Communication. (5)  
Two 1½-hour lectures/discussions per week. Prerequisite: consent of instructor. Recent reports of mass communication research with special attention to methodology of quantitative research. Mr. Fuchs [W]  

151. The Journalist as Social Critic. (5)  
Three hours lecture and discussion per week. Historical survey of significant reporting by outstanding journalists from Benjamin Franklin to the present. Special attention to the approach to problems of social change. Mr. Steffens [Sp]  

152. Periodical Journalism. (5)  
Four hours of lecture, discussion and laboratory per week. Prerequisite: upper division standing and consent of instructor. Study of the magazine: its publishing and editing functions. Mr. Fuchs [Sp]  

165. The Press, the Law and the Constitution. (5)  
Three hours lecture and discussion per week. Historical development of freedom of the press, with analysis of rights and restrictions. Mr. Pickerell [F]  

171. Advertising. (5)  
Two 1½-hour lectures/discussions per week. Prerequisite: course 21 or its equivalent. Broad treatment of theories and practices in mass-media advertising, especially social functions; psychology and research in advertising. Mr. Fuchs [Sp]  

184. Reporting of Public Affairs. (5)  
Three hours of lecture and discussion per week. Problems of news gathering and analysis of governmental functions, with emphasis upon judicial, legislative and administrative procedures at the city and county level. Mr. Lyford, Mr. Jacobs [W]  

190. Comparative World Journalism. (5)  
Three hours of lecture and discussion per week. Examination of international news flow in nations and regions, with attention to sources of information, to media characteristics and conditions of performances. [Su, W]  

195. The Critical Review. (5)  
Three hours of lecture and discussion per week. Prerequisite: senior or graduate standing and consent of instructor. Theory and technique of evaluating the arts and urban environment. Mr. Jacobs [F]  

196. Government Information Programs. (5)  
Three one-hour sessions per week. Prerequisite: senior or graduate standing and consent of instructor. Activities of governments and organizations in the field of international information and propaganda; development of international information, including role of the mass media in economic and international development. [W]  

H198. Honors Program in Journalism. (4–6)  
Two hours tutorial per week. Prerequisite: senior standing, total grade-point average of not less than 3, and consent of committee in charge. Intensive examination of a topic with written and oral reports. The Staff [F, W, Sp, Su]  

199. Special Study in Journalism for Advanced Students. (2–5)  
One hour tutorial once or twice per week. Prerequisites: senior standing and grade-point average of not less than 3. The Staff [F, W, Sp, Su]  

Graduate Courses  

200A—200B—200C. Advanced Reporting. (3–3–4)  
One hour lecture, four hours of laboratory per week. Theory and practice of the news function and process, visual and written, through lectures, laboratory and writing assignments. Seminars in conjunction. Core sequence: required of all students electing Plan A.  

200A. Theory and practice of gathering and writing, with emphasis on in-depth reporting. In conjunction with two half-quarter seminars, 201 (1) and 239 (1). The Staff [Mr. Jacobs in charge] [F]  

200B. Continuation of lectures and writing assignments, with one laboratory per week devoted to evaluation and editing of news. In conjunction with two half-quarter seminars, 289 (1) and 264 (1). The Staff [Mr. Jacobs in charge] [W]  

200C. Intensive reporting in specialized fields of government, science, education, etc. In conjunction with two half-quarter seminars, 241 (1) and 296 (1). The Staff [Mr. Jacobs in charge] [Sp]  

201. Seminar in Communication Research Methods. (1)  
Two hours discussion per week for first five weeks of the quarter. Techniques of communication research. Study of quantitative and qualitative analysis, survey and experimental research design. Mr. Fuchs [F]  

220. Public Affairs in Perspective. (4)  
One hour tutorial once or twice per week. The opinion function in columns and commentary, interpretative reporting, editorials and editorial crusades. [Su, F]  

225A—225B. Reporting on the American Community and Urban Affairs. (4–4)  
Weekly three-hour meetings.  

225A. An examination of the structure and political and social character of selected communities and methods of the journalist in appraising and writing about them. Field work, individual study projects. Mr. Lyford [F]  

225B. Prerequisite: 225A or consent of instructor. Art and method of journalistic inquiry into nature of basic urban problems; emphasis on education, health and welfare; housing and administrative government. Students meet with instructor frequently to discuss progress of field work. Mr. Lyford [W]  

231. Communication Theory. (4)  
Three-hour seminar per week. Study of the broad field of communication theory, with special emphasis on the effects of mass communication. Mr. Fuchs [W]
239. Seminar in History of the Mass Media. (1)
Two hours per week lecture and discussion for second five weeks of the quarter. Social and technological evolution of the press and broadcasting. (F)

240. History of Anglo-American Journalism. (4)
Two 1½-hour lectures and discussion per week. Development of newspaper and periodical journalism, including important personalities. (W)

One 2-hour class per week during second five weeks of the quarter. Current ethical standards and problems of the media. (Su)

251. Literature of Journalism. (4)
One two-hour seminar and one hour consultation per week. Guided research on outstanding men whose journalistic work is of lasting historic and literary worth. (F)

252. Advanced Magazine Article Writing. (4)
Three hours per week discussion and laboratory. Research and preparation of nonfiction articles for general and specialized publications. Attention to editing and marketing. (Sp)

Two 1½-hour lectures and discussion sessions per week. Analysis of the place of mass media in shaping of public opinion; propaganda and information techniques of the mass media and other agencies. (W)

264. Seminar in Legal Aspects of Mass Communications. (1)
One 2-hour discussion per week during second five weeks of the quarter. Summary of legal problems of publishing; freedom of information and rights of access. (Sp)

265. The Law of Mass Communications. (4)
Two 1½-hour lectures and discussion sessions and one hour consultation per week. Inquiry into contemporary legal controls affecting press, broadcasting and films. (Sp)

270. Economic Organization of the Press. (4)
Two 1½-hour lectures per week. Seminar analyzing the business practices and financial structure of the press and its relationship to the community in which it operates. (Sp)

280. Broadcast Writing. (4)
One 1½-hour lecture and one ½-hour laboratory per week. Study of radio and television techniques, and practice of script writing. (Sp)

289. Seminar in Comparative World Journalism. (1)
Two hours per week lecture and discussion for first five weeks of the quarter. Study of various press systems and of news flow across national borders. (W)

290. International Communications—Foreign Press. (4)
Two 1½-hour lectures and discussion per week. Cultural, economic, social and political influences in development of national press systems; barriers to international communication; role of mass media in national development. (Sp)

295. Critical Writing. (4)
Three hours lecture and discussion per week. Field study and written assignments. Principles and practice of reviewing the arts and evaluating factors in cultural environment. (Sp)

296. Seminar in International Information. (1)
One 2-hour seminar and one hour consultation per week during second five weeks of the quarter. Study of government information agencies and propaganda. (Sp)

299. Individual Study in Mass Communications. (2–6)
One 3-hour meeting per week, individual conferences; approximately 4 hours or more field work. Three units required of all students who elect Plan B of graduate study. Supervised research projects and reports. (Sp)

**LANDSCAPE ARCHITECTURE**

For information on courses and faculty in Landscape Architecture, see listing under Environmental Design: Landscape Architecture.

**LAW**

(Department Office, 225 Law Building)

Richard M. Buxbaum, A.B., LL.B., LL.M., Professor of Law
Jesse H. Choper, B.S., LL.B., Professor of Law.
Robert H. Cole, A.B., LL.B., Professor of Law.
Rex A. Collings, Jr., M.A., LL.B., Professor of Law.
Ronan E. Degnan, B.S.L., LL.B., Professor of Law.
Bernard L. Diamond, A.B., M.D., Professor of Law and of Criminology.
Albert A. Ehrenzweig, J.D., J.S.D., Walter Perry Johnson Professor of Law.
John C. Fleming, D.Phil., D.C.L., Professor of Law.

* Not to be given, 1968–69.
The following list indicates the courses usually offered each academic year, although changes in instructors and in course offerings are often necessary. After the title of each course is the credit value in semester units in parentheses, a brief description of the subject matter, and the names of the faculty who usually teach the course. Note: The term of instruction for the School of Law is fifteen weeks rather than ten weeks. Therefore, the units in Law, only, are indicated as semester units.

For requirements of the School of Law, see the ANNOUNCEMENT OF THE SCHOOL OF LAW.
First Year

200A-200B. Contracts. (3-3)
The law of contracts, dealing with the problems of formation, operation and termination.
Mr. Bernstein, Mr. Eisenberg, Mr. Laube, Mr. Sweet

202A-202B. Criminal Law and Procedure. (2-3)
An introduction to criminal law and procedure.
Mr. Foote, Mr. Johnson, Mr. Smith, Mr. Stolz

206A-206B. Pleading and Procedure in Civil Cases. (3-3)
The principles of pleading under the code system and the federal rules; modern trial practice, including venue, process, the jury; sufficiency of the evidence, instructions, verdicts, new trials, judgments; appellate procedure.
Mr. Degnan, Mr. Louisell, Mr. Stolz, Mr. Vetter, Mr. Weiner

208A-208B. Property. (3-3)
An introduction to the law of real property including estates and other interests in land, real property marketing and conveyancing, land-use control, and landlord-tenant problems.
Mr. Coens, Mr. Heyman, Mr. Riesenfeld, Mr. Sullivan, Mr. Wilkins

212A-212B. Torts. (3-3)
The law of civil injuries, including both intended and unintended interference with personal and property interests as well as liability without fault.
Mr. Cole, Mr. Fleming, Mr. Goodman, Mr. Barnett

214A-214B. Introduction to Law. (1-1)
Small group and individual instruction in legal research and legal writing, including the preparation of legal memoranda and appellate briefs.

Law Associates

Second Year

219. The Legal Process. (2)
A detailed examination of particular legal problems that illustrate the functions of and the relationship between the courts, the legislature, administrative agencies, and other public and private law-making institutions.
Mr. Stolz

220A-220B. Basic Business Associations. (2-2)
A basic course on the organization of business in sole proprietorship, partnership, and corporate forms; the relationship of management to shareholders, and of shareholders inter se; shareholder's actions; and introductory matters of corporate finance such as the issue of shares, dividends and capital information.
Mr. Eisenberg

222A-222B. Business Associations, Corporations. (3-3)
An introduction to the law of agency and partnership, and the study of corporations, including management-shareholder relations, shareholders' suits, issue of shares, dividends, and capital creation and reduction.
Mr. Choper, Mr. Buxbaum

224A-224B. Constitutional Law. (3-3)
Analysis of the judicial process in constitutional cases; due process and other constitutional limitations on the powers of government; division of powers between the national government and the states.
Mr. Cole, Mr. Choper, Mr. Goodman

228. Legal Accounting. (2)
An introduction to accounting techniques and interpretation of financial statements, with special emphasis on selected basic accounting problems in the fields of partnerships, corporations, taxation, and trusts.

232. Security Transactions. (2)
The law of security devices, covering real property, chattel and other property security, the principles of suretyship and the rules relating to marshaling assets and allocation of ultimate loss.
Mr. Hetland

234A-234B. Estates and Trusts. (2-2)
The law of intestate succession and wills; the nature, creation and termination of trusts; future interests, powers of appointment and perpetuities; problems of construction; administration of trusts and decedents' estates.
Mr. Halbach

236A-236B. Basic Income Tax. (2-2)
A survey of the statutory, judicial, and administrative material concerning the federal income tax as applicable to individuals, trusts, partnerships, and corporations.
Mr. Kragen

237A-237B. Income Taxation. (3-2)
A study of statutory, judicial, and administrative material concerning federal income tax as applied to individuals, trusts, and business enterprises including partnerships and corporations.
Mr. Kragen, Mr. McNulty, Mr. Stone

Third Year

239. Psychiatry and the Criminal Law. (2)
Legal, philosophical, and behavioral science aspects of criminal responsibility; historical development of the concept of mens rea; the psychology of punishment and guilt; problems of the criminal responsibility of the mentally ill.
Mr. Diamond

240. Administrative Law. (2)
Continuation of the study of administrative procedure, with special emphasis upon problems encountered in dealing with a selected group of government agencies.
Mr. Newman

241. International Business Transactions. (2)
Selected problems relating to the organization and operation of enterprises engaged in international business activities and the reciprocal relations of such enterprises with domestic, foreign and supranational government agencies.
Mr. Wilkins

242. International and Maritime Law. (2)
The law governing foreign and maritime commerce, including territorial and other aspects of jurisdiction, status and immunities of recognized and unrecognized foreign states and governments, freedom of navigation, effect of maritime treaties and principal maritime transactions.
Mr. Riesenfeld

244. Creditors' Remedies. (3)
Enforcement of judgments, fraudulent conveyances, general assignments, creditors' agreements, bankruptcy, and arrangements.
Mr. Laube, Mr. Riesenfeld
245. Comparative Jurisprudence. (2)
A comparison of the world’s legal systems with reference to their ideologies, historical bases, sources, and techniques; critical analysis of the “schools” of jurisprudence and of legal concepts; practical problems in comparative law and jurisprudence.

Mr. Ehrenzweig

246. Conflict of Laws. (3)
Jurisdiction and choice of law in cases involving international, interstate and state-federal conflicts, particularly in the law of judgments, procedure, torts, workmen’s compensation, contracts, property, domestic relations, estates, and business associations.

Mr. Bernstein, Mr. Ehrenzweig, Mrs. Kay, Mr. McNulty

247. Securities Regulation. (2)
Legal and financial aspects of financing business enterprise under federal and state securities acts; regulation of trading in securities under the Securities Exchange Act of 1934; and regulation of investment companies.

Mr. Vetter

248. Selected Problems in Business Planning. (2)
Investigation of problems relating to the organization, financing, and operation of partnerships and corporations. Business plans are devised and legal instruments drafted, analyzed and discussed with the cooperation of members of the corporate bar. Open only to students who have completed courses 222A-222B and 237A-237B or their equivalents.

Mr. Jennings

249A. Sales. (2)
Legal problems stemming from the distribution of goods; generally the rights and duties of buyers and sellers and the remedies available to them.

Mr. Fleming

249B. Sales and Sales Financing. (3)
Same as Law 249A except that the legal problems involved with the financing of the sales transaction are included.

Mr. Hetland

250. Basic Evidence. (2)
The fundamental questions of evidence and theory of proof, including hearsay, business records, documentary privilege, communications, self-incrimination, relevance, presumptions, and judicial notice. Emphasis is on the making and preservation of proof; does not include manner of examination, cross-examination, or impeachment of witnesses.

Mr. Degnan

250A–250B. Evidence. (2-2)
The rules relating to the presentation in court of material for the tribunal by means of documents and the examination of witnesses.

Mr. Degnan, Mr. Louisell, Mr. Sherry

251A. Jurisprudence. (2)
Critical analysis of the “schools” of jurisprudence (terminology and psychology); legal “concepts,” psychology of the laws of crimes and torts in the light of current and potential reform.

Mr. Wilkins

252. Selected Problems in Constitutional Laws. (2)
Legal problems relating to constitutional law and constitutional litigation.

Mr. Smith

253. Family Law. (3)
Marriage, annulment, divorce and separation; parent and child; adoption and legitimation; minors’ contracts; guardian and ward; the Juvenile Court.

Mr. Noonan, Mr. Foote, Mrs. Kay

254. Federal Jurisdiction. (3)
Jurisdiction of the federal courts, including the scope of the judicial power of the United States, original jurisdiction of the district courts, removal of causes, the incidents of concurrent jurisdiction, and the appellate jurisdiction of the Circuit Courts of Appeal and the Supreme Court.

Mr. Smith

255. Remedies. (3)
Introduction to the forms of judicial remedies, principles governing their scope and availability, and consideration of grounds for choosing between alternative remedies. Includes general principles of damages, specific performance, and injunction.

Mr. Collings, Mr. Degnan

256. Land Development and Security. (2)
Real property investments including business form, title and tax problems of commercial property development.

Mr. Einman

257. Insurance. (2)
General principles and current trends in the law and business of insurance.

259. International Conflicts Law. (2)
Treating the law of the United Nations, the European Economic Communities, NATO, OAS, etc, with emphasis on the understanding of the basic charters and documents in the context of international law and developed through practice and interpretation. It is recommended (but not required) that students have studied Law 242.

259. International Conflicts Law. (2)
Selected topics from the conflicts law of the United States in comparison with the conflicts laws of other countries; some of the sessions to be combined with those of the classes on International Business Transactions on various business aspects. It is recommended (but not required) that students have studied either Law 245 or Law 242.

Mr. Ehrenzweig

260. Land Planning. (2)
Problems and cases on public regulation of land use including planning, zoning, subdivision control, preservation of open spaces, urban renewal and rehabilitation, and metropolitan problems amenable to solution through the use of such devices.

Mr. Heyman

260B. Land Planning. (2)
Problems and cases on public regulation of land use, including planning, zoning, subdivision control, preservation of open spaces, urban renewal and rehabilitation, and metropolitan problems amenable to solution through the use of such devices.

Mr. Sullivan

261. Selected Problems in Marital Property and Family Law. (2)
Intensive analytical treatment of topics drawn from problems arising out of property and other interspousal or parental relationships during the existence of the marriage and on its dissolution. Emphasis is placed on developing the skills of research, analysis, and writing.

Mr. Kay

262. Labor Law. (3)
The law governing relations between employer and employee and the impact of state and federal legislation in the area of collective bargaining, including the law of the collective agreement, the strike, the boycott, and picketing.

Mr. Feller, Mr. Vetter
263. Negotiation, Conciliation, Arbitration. (2)

The law and practice of these techniques in the prevention and settlement of disputes in all fields of the law, including contracts, torts, labor relations, etc.

264. Modern Social Legislation. (2)

Legal, legislative, and economic problems in legislation designed to assure adequate minimum standards of living. Special consideration is given to old-age, survivors' and disability insurance, unemployment insurance, health insurance, welfare men's compensation, and social assistance. Mr. Feller

266. Legislation. (2)

Essential characteristics of the modern legislative process; problems and methods of legislative drafting. Mr. Stone

267. Canon Law. (2)

This seminar will examine the canon law of the Catholic Church as a legal system, with particular emphasis on the matrimonial tribunals of the Church. While some attention will be given substantive law, the main focus will be on function, sanction and obligation in the canonical system. The fundamental questions to be approached are: What are the characteristics of a legal system? What are the appropriate criteria of efficiency for the canonical system. Mr. Noonan

268. State and Local Government Law. (2)

Relationship of state, county, and city government; problems of finance, contract, property, and tort in local government; state and local taxation. Mr. Sato

269. State and Local Taxation. (2)

The course is a study of substantive provisions and procedure relating to property tax, bank and corporation income tax, sales and use tax, and other local taxes; attention will be given interstate tax problems, such as allocation of income among the states, jurisdiction to tax, and commerce clause restrictions. Mr. Sato

270. Antitrust Law. (2)

Legal and economic problems of restraint of trade and monopoly; pricing and other marketing practices; Federal Trade Commission and private litigation. Mr. Buxbaum, Mr. Sullivan

270A. Government Control of Business. (2)

The course deals with the maintenance of workable competition under the antitrust laws and the control by federal, state, and local governments over industries where regulatory measures are deemed necessary. Emphasis is placed upon the impact of technology and upon the patent system of the United States as well as the regulation of specific industries such as transportation and communication.

271A–271B. Trial Practice. (1–2)

Study in strategy and tactics in civil litigation, including trial moot court. Mr. Hetland, Mr. Heafey

273A–273B. Criminal Procedure and Practice. (3–3)

A study of criminal procedure and its application from the law of arrest and preliminary proceedings through trial and appellate review.

274. Restitution. (2)

Restitution at law and in equity as an alternative remedy for tort; legal and equitable remedies in contracts induced by fraud or mistake and in contracts unenforceable because of various types of defect.

275. Selected Problems in Contracts. (2)

A selected enrollment seminar on the law office prelitigation cycle: drafting of contracts, legal memoranda, opinion letters and legal reports to clients; oral presentations, office interviews and conferences; stress upon fact discrimination and development of drafting skills. Mr. Sweet

276. Copyright and Unfair Competition. (2)

Statutory and common law protection of literary, musical, and artistic works, including the principles of unfair competition and trademark protection. Mr. Fleming

277. Advanced Study in Criminal Law. (2)

Advanced study of law of crimes, including federal crimes, with individual research in selected areas. Mr. Collins

278. Selected Problems in Criminal Law and Administration. (2)

Legal problems relating to the criminal law and its administration. Open also to graduate students in the School of Criminology. Mr. Sherry

279. Natural Resources Law. (2)

Acquisition of water rights; federal and state legislation affecting the use of water; interstate water problems; acquisition of mineral rights by location and by lease. Mr. Sato

280. Oil and Gas Law. (2)

Study of various problems relating to oil and gas, including conveyances, leases, unitization and pooling, taxation, and legislative control over extraction. Mr. Sato

281. Estate Planning and Taxation. (3)

The study of estate, gift, and inheritance taxation; advanced study of trusts, future interests and powers of appointment; the impact of income, gift and death taxes upon inter vivos and testamentary planning of substantial estates. Mrs. Barton

282. Estate and Gift Taxation. (2)

The statutory, judicial, and administrative material respecting the federal estate and gift taxes, with references to parallel state taxes.

283. Selected Problems in Estate Planning. (2)

Selected problems in estate analysis and planning, tax-conscious drafting of wills and trusts utilizing future interests, class gifts and powers of appointment; planning of insurance and disposition of business interests. Primary emphasis will be on individual work in planning an estate, from interview to drafting of documents. Open only to students who have completed courses 230, 234A–234B, 237A–237B, and either 281 or 282. Mr. Friedman

284. Selected Problems in the Taxation of Business Enterprise. (2)

Selected federal and state income and other tax problems of business enterprise are prepared, analyzed, and discussed with the cooperation of tax practitioners. Open only to students who have completed courses 222A–222B, 228, and 237A–237B, or their equivalents. Mr. Kragen
290. International Tax. (2)
A seminar devoted to a consideration of the tax
problems incident to the engaging by a U.S. resident
(individual or corporate) in business activities outside
of the U.S. and of ways in which such problems are
eliminated or ameliorated. There will be some dis-
cussion of appropriate tax policy in this area.

Mr. Kragen

Additional Courses for Postgraduate Students
285A–285B. Seminar in Administrative Law and
Procedure. (2–2) Mr. Newman, Mr. Stolz
286A–286B. Seminar in Business Associations.
(2–2) Mr. Buxbaum, Mr. Jennings, Mr. McNulty
287A–287B. Seminar in Commercial Transactions.
(2–2) Mr. Fleming, Mr. Laube, Mr. Riesenfeld, Mr. Sweet
288A–288B. Seminar in Constitutional Law. (2–2)
Mr. Chaper, Mr. Cole, Mr. Foote, Mr. Goodman, Mr. Heyman
289A–289B. Seminar in Criminal Law and
Procedure. (2–2) Mr. Collings, Mr. Foote, Mr. Kadish, Mr. Sherry
290A–290B. Seminar in International and Maritime
Law. (2–2) Mr. Buxbaum, Mr. Riesenfeld

(2–2) Mr. Feller, Mr. Vetter
292. Seminar in Legal Education. (1)
The Staff (Mr. Newman in charge)
293A–293B. Seminar in Legal History and
Jurisprudence. (2–2) Mr. Ehrenzweig, Mr. Riesenfeld
294A–294B. Seminar in Legislation and Legislative
Procedure. (2–2) Mr. Newman, Mr. Stone
(2–2) Mr. Degnan, Mr. Louisell
296A–296B. Seminar in Property and Trust
Administration. (2–2) Mr. Halbach, Mr. Hetland, Mr. Heyman, Mrs. Kay
297A–297B. Seminar in Public Finance and
Taxation. (2–2) Mr. Kragen, Mr. Sato
298A–298B. Seminar in Roman and Comparative
Law. (2–2) Mr. Ehrenzweig, Mr. Riesenfeld
299A–299B. Research in Legal Problems. (1–5) The Staff (Mr. Degnan in charge)

Library}

LIBRARIANSHIP

(Department Office, 425 Library)

J. Periam Danton, Ph.D., Professor of Librarianship.
M. E. Maron, Ph.D., Professor of Librarianship and Associate Director of the Institute
of Library Research.
Raynard Coe Swank, Ph.D., Professor of Librarianship (Chairman of the Department).
Donald Coney, M.A. in L.S., Professor of Librarianship and University Librarian,-
Emeritus.
Edward A. Wight, Ph.D., Professor of Librarianship, Emeritus.
Ray E. Held, Ph.D. Associate Professor of Librarianship.
Anne Ethelyn Markley, M.A., in L.S., Associate Professor of Librarianship.
Fredric John Mosher, Ph.D., Associate Professor of Librarianship.
Robert D. Harlan, Ph.D., Assistant Professor of Librarianship.
Patrick C. Wilson, Ph.D., Assistant Professor of Librarianship.

Mark H. Baer, M.L., Lecturer in Librarianship.
Kelley L. Cartwright, M.L.S., Lecturer in Librarianship.
Mae J. Durham, B.L.S., Lecturer in Librarianship.
Grete W. Frugé, Certificate in Librarianship, Lecturer in Librarianship.
Bertha Hellum, Certificate in Librarianship, Lecturer in Librarianship.
John D. Henderson, Certificate in Librarianship, Lecturer in Librarianship.
Dan F. Henke, M.L., Professor of Law and Law Librarian.
Suzanne Hildenbrand, M.S. in L.S., Lecturer in Librarianship.
Donald W. Koeppl, D.L.S., Lecturer in Librarianship.
Roger Levenson, A.B., Lecturer in Librarianship.

For information...

201. Form and Motion

One 3-hour lecture, 2 hours per week. Materials of all forms and motions of pleading and
aprobation. Character, methods of pleading.

202. Development of Jurisprudence

Three 3-hour lecture periods per week. Materials of all forms and motions of pleading and
aprobation. Early forms. Development of pleading, early development of pleading and
motion, modern methods.

203. History of Federal Law

Europe. (1)
(Formerly 226A)
One 2-hour lecture
101 (formerly 211)

204. History of Federal Law

Sixteenth Century
(Formerly 226B)
One 2-hour lecture
101 (formerly 211)

205. Reading and Discussion

The Staff (Mr. Newman in charge)

211. Problems in the Library

(Formerly 226C)
One 2-hour lecture
101 (formerly 211)

212. Problems in the Library

United States
(Formerly 228)
One 2-hour lecture
101 (formerly 211)

213. Problems in the Library

United States
(Formerly 228)
One 2-hour lecture
101 (formerly 211)
200. Forms and Movements of Publication. (3)
One 2-hour lecture per week. The origins in history and present uses of the various materials with which libraries and other information agencies are concerned. Changing concepts of publication. New methods of recording and disseminating knowledge.
Mr. Swank

202. Development of the Book. (3)
Three 1-hour lectures and two 1-hour exhibit periods per week. Materials and techniques of book production. Early records and the manuscript period. Development of paper, type, and binding. Letterpress, offset, rotogravure and other printing methods.
Mr. Harlan, Mr. Mosher, Mr. Levenson

203A. Origins of Printing and Publishing in Europe. (3)
(Formerly 226A)
One 2-hour lecture per week. Prerequisite: course 202 (formerly 211).
Mr. Mosher

203B. History of Books and Printing from the Sixteenth Century. (3)
(Formerly 226B)
One 2-hour lecture per week. Prerequisite: course 202 (formerly 211).
Mr. Harlan, Mr. Mosher

203C. History of Printing and Publishing in the United States. (3)
(Formerly 226C)
One 2-hour lecture per week. Prerequisite: course 202 (formerly 211).
Mr. Mosher

205. Reading and Reading Interests. (3)
(Formerly 215)
Two 1½-hour lectures per week. Reading interests, habits, and needs of different types and groups of readers. The nature of reading, problems of reading, selection of reading by children, young people, college students, and public library patrons. The role of the library in adult education.

207. Problems in Reading. (3)
(Formerly 228)
One 2-hour lecture per week. Prerequisite: course 205 (formerly 215). Analysis of reading of college students and the general adult population; characteristics and interests of readers, distribution and content of publications, methods of stimulating reading, and the effects of reading; the library and adult education.

209. Library in the Community. (3)
(Formerly 238)
One 3-hour lecture per week. Prerequisite: courses 283A, 284A, or 286A (formerly 207, 206, and 208). Analysis of the community for the librarian. Relationships between various factors and library use. Methods of relating the library with the community.
Mr. Wight

216A. Selection and Acquisition of Library Materials. (3)
(Formerly 204)
Three 1-hour lectures per week. Theories, principles, and practice of selecting books and other library materials. Techniques of acquisition by public, school, academic and special libraries.
Miss Hildenbrand

216B. Special Problems in the Selection of Materials and Evaluation of Collections. (3)
(Formerly 205)
Three 1-hour lectures per week. Prerequisite: course 216A (formerly 204). Problems in selecting records, motion pictures, maps, and other library material in special format; special problems in selecting material in particular subject fields; methods of evaluating library collections and the effectiveness of the selection process.
Mr. Henderson

220A. Reference I. (3)
(Formerly 202A)
Three 1-hour lectures and one 1-hour laboratory per week. Introduction to reference service and general reference sources.
Mr. Harlan, Mr. Held, Mr. Mosher, Mrs. Whouley

222A. Government Publications. (3)
Three 1-hour lectures per week. Prerequisite: courses 220C (formerly 202C), or 220B (formerly 202B) and consent of instructor. Advanced reference: an elective designed for students interested in reference work in a large, general public or academic library.
Mr. Harlan, Mr. Held, Mr. Mosher, Mrs. Whouley

For information on programs offered, please see the ANNOUNCEMENT OF THE SCHOOL OF LIBRARIANSHIP.

Ralph M. Shoffner, M.S., Lecturer in Librarianship.
Mary Whouley, M.L.S., Lecturer in Librarianship.
224B. Foreign National Bibliography. (3)
Three 1-hour lectures per week. Prerequisite: course 250C (formerly 202C), or 220B (formerly 202B) and consent of instructor. A study of the current and retrospective bibliographical coverage of the major publishing nations of the world, exclusive of the United States and the United Kingdom.

224. Scientific and Technical Literature. (3)
(Formerly 217)
Two 1/2-hour lectures per week. Prerequisite: course 220B (formerly 202B). Reference and bibliographical sources, information needs, and dissemination of literature in science and technology.

Mr. Baer

225. Law Librarianship: Legal Research, Reference, and Bibliography. (3)
(Formerly 216)
Two 1/2-hour lectures per week. Prerequisite: open to students in the School of Librarianship and to third-year students in the School of Law. Introduction to legal bibliography; cases and reports, statutes, administrative regulations and decisions, legislative history, legal citations and digests, legal periodicals and indexes, secondary materials, legal bibliography tools.

Mr. Henke

228A. Children's Literature. (3)
(Formerly 209A)
Three 1-hour lectures per week. Historical backgrounds and development; twentieth-century trends; criticism and evaluation; trends in use of illustration.

Mrs. Durham

228B. Library Work with Children and Young Adults. (3)
(Formerly 209B)
Three 1-hour lectures per week. Prerequisite: course 228A (formerly 209A). Reading interests; types of library material; levels of reading ability; book selection, library programs.

Mrs. Durham

228C. Children's Literature; Oral Interpretation. (3)
(Formerly 210)
One 1-hour lecture per week. Prerequisite: Anthropology 166 or Classics 178, or equivalent. Historical development and critical analysis of folklore, legends, myths, and modern imaginative literature: their role in the library program for children and young adults.

Mrs. Durham

230. Bibliographical Organization. (3)
(Formerly 213)
Three 1-hour lectures per week. Principles governing construction, use, and evaluation of systems for the organization of written texts and other graphic records. Forms and functions of bibliographical instruments (catalogs, bibliographies, indexes), conventional and nonconventional, problems of description, identification, and classification of content.

Mr. Wilson

238. The Analysis of Content. (3)
(Formerly 240)
One 2-hour lecture per week. Prerequisite: course 251B (formerly 201B) and consent of the instructor. Problems in the analysis and description of the intellectual content of written texts. Methods and results of identification, comparison, classification, and reduction of content.

Mr. Wilson

240. Introduction to the Information Sciences. (3)
(Formerly 241)
Two 1/2-hour lectures per week. The library problem from the viewpoint of the information sciences, including those techniques and machines that deal with information and information processing. Relevance of the conceptual and physical tools of the information sciences to information analysis, indexing, retrieval, and dissemination.

Mr. Maron

244A. Seminar in Current Developments in the Information Sciences. (3)
(Formerly 272)
One 2-hour lecture per week. Prerequisite: course 240 (formerly 241) or the equivalent. Knowledge of computers and information processing techniques and consent of instructor. A survey and analysis of current work in the information sciences. An examination of on-going work concerning: content analysis and identification; library automation; evaluation of information systems; hardware developments; national information networks and centralized data banks; and related subjects.

Mr. Maron

244B. Seminar in Mechanized Documentation Techniques. (3)
(Formerly 274)
One 2-hour lecture per week. Prerequisite: knowledge of logic, probability and statistics, computers and information processing techniques, and consent of instructor. A survey and examination of selected studies on the following topics: automatic data reduction; automatic indexing; automatic classification; natural language data processing; and related subjects.

Mr. Maron

244C. Seminar in Automatic Literature Searching: Theory and Current Studies. (3)
(Formerly 278)
One 2-hour lecture per week. Prerequisite: knowledge of logic, probability and statistics, and consent of instructor. The development and testing of theories concerning automatic literature searching.

Mr. Maron

244D. Seminar in Automatic Data Retrieval and Question Answering. (3)
(Formerly 276)
One 2-hour lecture per week. Prerequisite: knowledge of mathematical logic, probability and statistics, computer and information processing, and consent of instructor. A survey and analysis of current data retrieval and question answering systems. An examination of some of the major logical, linguistic, programming and file organization problems relating to automatic question answering.

Mr. Maron

251A. Classification and Subject Cataloging. (3)
(Formerly 201A)
Three 1-hour lectures and three 2-hour laboratories per week. Survey of the history, theory, methods, and principles of organizing library materials for use. Classification and subject cataloging.

Mrs. Frugé, Miss Hildenbrand, Miss Markley

251B. Descriptive Cataloging. (3)
(Formerly 201B)
Three 1-hour lectures and three 2-hour laboratories per week. Prerequisite: course 251A (formerly 201A). Descriptive cataloging: standard techniques of identification and description of bibliographic units. Integration and control of catalog entries.

Mrs. Frugé, Miss Hildenbrand, Miss Markley

251E. Special Problems in Descriptive Cataloging, GIIS. (3)
(Formerly 201C)
Three 1-hour lectures per week. Prerequisite: Library maintenance of information and analysis of selected studies in the field of descriptive cataloging.

Miss Frugé

252. Advanced Cataloging. (3)
(Formerly 215)
Two 2-hour lectures per week. Prerequisites: cataloging with knowledge of computers and information processing techniques and consent of instructor.

Mr. Maron

253. Advanced Classification. (3)
(Formerly 219)
One 2-hour lecture per week. Prerequisites: cataloging with knowledge of computers and information processing techniques and consent of instructor.

Miss Frugé

254. Description Bibliography. (3)
(Formerly 204A)
One 2-hour lecture per week. Bibliographical description and analysis, based on selected studies in the field of bibliography. Focus on American, individual and international literature.

Mr. Maron

255. Subject Bibliography. (3)
(Formerly 205)
One 2-hour lecture per week. Bibliographical description and analysis, based on selected studies in the field of bibliography. Focus on American, individual and international literature.

Mr. Maron

256. Historical Bibliography. (3)
(Formerly 206)
One two-hour lecture per week. Introduction to the history of bibliography, its development, and procedures for library maintenance of information and analysis of selected studies in the field of bibliographical description and analysis.

Mr. Maron

257. Special Indexing. (3)
Three 1-hour lectures per week. Prerequisite: course 240 (formerly 201B). Development and analysis of current bibliographic and other indexing systems. Focus on selected subjects for library maintenance of information and technical bibliographical analysis.

Mr. Maron

262. History of Library Science. (3)
(Formerly 224)
Two 2-hour lectures per week. The development of library science, including bibliographical analysis, library automation and selected studies in the field of current research in the history of library science.

Mr. Maron

263. History of American Libraries. (3)
(Formerly 225)
One 2-hour lecture per week. The development of library science, including bibliographical analysis, library automation and selected studies in the field of current research in the history of American libraries.

Mr. Maron
251C. Special Problems and Policies of Library Cataloging. (3)
(Formerly 201C)
Three 1-hour lectures and three 2-hour laboratories per week. Prerequisite: course 251B (formerly 201B). Library materials requiring special description and analysis; films, phonorecords, music, monographs in series, maps, art representations, etc. Arrangement of library catalogs. The cataloging department. Current problems. Literature of cataloging and classification.

Mrs. Frugé, Miss Hildenbrand, Miss Markley

252. Advanced Cataloging. (3)
(Formerly 218)
One 2-hour lecture per week. Prerequisite: course 251C (formerly 201C). Modern trends and problems in cataloging with emphasis on cooperative cataloging, cataloging policies, and the cataloging of manuscripts and other special classes of library materials; study of areas of investigation and research in the field of cataloging; discussion and reports.

Miss Markley

253. Advanced Classification. (3)
(Formerly 219)
One 2-hour lecture per week. Prerequisite: course 251C (formerly 201C). History and theory of classification; comparative study of library classification systems leading, in the latter half of the quarter, to intensive study and use of the Library of Congress system; individual problem or paper.

Miss Markley, Mr. Wilson

254. Descriptive Bibliography. (3)
(Formerly 220A)
One 2-hour lecture per week. Prerequisites: courses 202, 220B, 251B, (formerly 211, 220B, 218B). The history and analytical bibliography as methods of investigation, based on McKerrow and Esdaile; methods of bibliographical description, based on Bowers; study of the bibliography of book rarities, with emphasis on American and Western imprints.

Mr. Harlan, Miss Markley

255. Subject Bibliography. (3)
(Formerly 220B)
One 2-hour lecture per week. Prerequisite: courses 220B, 251A, 251B (formerly 218, 218A, 218B). The history of bibliographical organization, methodology of enumerative bibliography, including form, style, and procedure; individual oral and written reports on the status of bibliographical control in selected subject fields, including location of special library collections and related research materials.

Miss Markley, Mr. Wilson

257. Special Indexing Schemes and Methods. (3)
Three 1-hour lectures per week. Prerequisite: course 340 (formerly 215). Theory and applications of recently developed schemes for providing subject access to documents and data through coordinate, statistical, and other indexing methods.

Mr. Cartwright

262. History of Libraries. (3)
(Formerly 224)
Two 1-hour lectures per week. A historical introduction to the libraries of the Western world, from antiquity to the present.

Mr. Held

263A. History of Ancient and Medieval Libraries. (3)
(Formerly 225A)
Two 2-hour lectures per week. Prerequisite: course 262 (formerly 224).

Mr. Held

263B. History of Scholarly Libraries. (3)
(Formerly 225B)
Two 1½-hour lectures per week. Prerequisite: course 262 (formerly 224).

Mr. Danton

263C. History of Popular Libraries. (3)
(Formerly 225C)
One 2-hour lecture per week. Prerequisite: course 263 (formerly 224).

Mr. Held

270. Library Administration. (3)
(Formerly 230)
Two 1½-hour lectures per week. Prerequisites: courses 228A, 224A, or 286A (formerly 207, 206, and 208). The basic advanced course in the principles and practice of library administration. Analysis of the organization and management of modern libraries of various types. Prerequisite to courses 282B, 286C (formerly 234, 232).

Mr. Koopp

273. Introduction to Information System Design. (3)
(Formerly 246)
One 2-hour lecture per week. Prerequisite: courses 220B, 251B, (formerly 202B, 201B). The design and analysis of information systems. Special coding and indexing procedures, punched cards, and microfilm. Application of data processing equipment in libraries.

Mr. Shoffner

282A. Municipal and County Libraries. (3)
(Formerly 207)
Two 1½-hour lectures per week. Government, objectives, organization, and administration of municipal, county, and regional public libraries. Library service programs in relation to varying community patterns. Lectures, readings, reports, field trips.

Mr. Wight

282B. Problems in Public Library Administration. (3)
(Formerly 234)
One 3-hour lecture per week. Prerequisite: courses 270, 282A (formerly 230, 207). Application of the principles of public administration to the management of selected operations of public libraries. Problems adapted to interests of students. Required of all candidates for advanced degrees who intend to specialize in the public library field.

Mr. Wight

284A. School Libraries. (3)
(Formerly 206)
Two 1½-hour lectures per week. Prerequisite: consent of instructor. A general survey of elementary and secondary school libraries. Emphasis on the function, administration, organization, services, materials, and the planning and equipment of school libraries in relation to the modern school. Lectures, committee and individual reports, reading, class discussions, and field trips.

Mrs. Durham

284B. Supervision of School Libraries. (3)
(Formerly 236)
Two 1½-hour lectures per week. Prerequisite: course 284A (formerly 206). Development and management of school libraries in districts with multiple school libraries; techniques of personnel administration; development and evaluation of service programs, relationships of supervisor of school libraries with total educational program.
284C. Library Curricular Materials. (3)
(Formerly 237)
Two 1½-hour lectures per week. Prerequisite: course 284A (formerly 206). The program for evaluation, selection, and uses of curricular materials; problems of the supervisor of school libraries in working with coordinators, supervisors, and librarians in the curriculum program.

286A. College and University Libraries. (3)
(Formerly 208)
Two 1½-hour lectures per week. Prerequisite: consent of instructor. A general introduction to the organization and administration of college and university libraries and their place in the institutions of which they are a part. Problems and practices with respect to the library’s government, functions, staff, collections, finances, and building are considered by means of written assignments, readings, and class discussion. Mr. Swank

286B. Book Collecting for University Libraries. (3)
(Formerly 221)
One 2-hour lecture per week. Prerequisite: courses 216A, 286A (formerly 204, 208). Problems connected with the acquisition, development, and maintenance of the book, periodical, and other collections of university libraries. Required of all candidates for advanced degrees who intend to specialize in the college and university library field. Mr. Danton

286C. University Library Administration. (3)
(Formerly 232)
One 2-hour lecture per week. Prerequisite: courses 270, 286A (formerly 230, 208) or equivalent as determined by instructor. Required of all candidates for advanced degrees who intend to specialize in the college and university library field. Study of current issues in personnel, finance, service, and the organization of materials and work. Individual projects, work periods, consultation, reports, and class discussion. Mr. Swank

291. Seminar in Comparative Librarianship. (3)
(Formerly 260)
Two 1-hour lectures per week. Prerequisite: consent of instructor. Main streams of library development in selected areas of the world—their underlying social and political causes. Mr. Danton

293. Seminar in Library Education. (3)
(Formerly 265)
Two 1-hour lectures per week. Prerequisite: consent of instructor. Origins, development, and effects of education for librarianship in Europe and the United States. Mr. Danton

295A–295B. Research in Librarianship. (3–3)
(Formerly 251A–251B)
One 2-hour lecture per week. Prerequisite: required of doctoral students during first year in residence. Role of research in librarianship; literature and bibliography of librarianship; reading, analysis, and discussion of representative examples of research reports; design of studies, with emphasis in second quarter on design of thesis projects. 295A graded "in progress." Mr. Swank

298. Directed Individual Research. (1–4)
Prerequisite: consent of instructor.
The Staff (Mr. Swank in charge)

299. Special Study. (3–9)
Prerequisite: consent of instructor. Individual direction of student's selection, planning, and writing of a dissertation. The Staff (Mr. Swank in charge)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. and D.L.S. degrees. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mr. Swank in charge)

IDS 175. A Nontechnical Introduction to Operations Research. (4)
See Interdepartmental Studies for the complete description of this course.

LINGUISTICS

(Department Office, 2337 Dwinelle Hall)

Madison S. Beeler, ** Ph.D., Professor of Linguistics.
Wallace L. Chafe, Ph.D., Professor of Linguistics (Vice-Chairman of the Department).
C. Douglas Chrétién, Ph.D., Professor of Linguistics.
Murray B. Emeneau, Ph.D., Professor of General Linguistics and of Sanskrit.
Mary R. Haas, Ph.D., Professor of Linguistics.
Yakov Malkiel, ** Ph.D., Professor of Linguistics and of Romance Philology.
David W. Reed, Ph.D., Professor of Linguistics (Chairman of the Department).
William S.-Y. Wang, Ph.D., Professor of Linguistics.
Terrence S. Kaufman, Ph.D., Assistant Professor of Linguistics.
Barend A. van Nooten, Ph.D., Assistant Professor of Linguistics and of Sanskrit.
Karl E. Zimmer, Ph.D., Assistant Professor of Linguistics.

** Humanities Research Fellowship Program for fall quarter, 1968.
**1 Humanities Research Fellowship Program for fall and winter quarters, 1968–69.
LINGUISTICS / 375

Jesse O. Sawyer, Ph.D., Lecturer in Linguistics and Director, Language Laboratory.
Richard Stanley, S.B., Acting Assistant Professor of Linguistics.

Department Major Advisers: Mr. Sawyer, Mr. van Nooten.
Graduate Advisers: Mr. Emeneau (Sanskrit); Miss Haas, Mr. Wang, Mr. Zimmer.

The Department of Linguistics is dedicated to a broad and eclectic approach to linguistic study. It is taken as axiomatic that undergraduates will develop technique in articulatory phonetics and in analysis of phonological and grammatical structures as well as in methods of historical and comparative reconstruction growing out of the Indo-European tradition. Linguistics 20 presents, in brief and introductory form, all of the themes developed in the undergraduate major curriculum. The upper division requirements consist essentially of two sequences: descriptive (105, 106, 115, 116, 125 and 166) and historical or comparative (145, 155 and 165). Linguistic theory is introduced in the senior year (185) when the basic linguistic skills have been mastered.

The Major

Required: 1. Any one of the following: (a) Linguistics 20 with a grade of A— or better, (b) Linguistics 105 and 145, or (c) Linguistics 106 and 145.
2. Linguistics 115.
3. Linguistics 116 and 125.
4. Linguistics 155 or 165.
5. A course in the structure of a single language, such as Linguistics 166 or 190A or English 110A or Oriental Languages 139A. (A complete list of courses acceptable in meeting this requirement may be obtained from the major adviser.)
6. A course that emphasizes the relationship between linguistics and another discipline, such as Anthropology 165A, 165B; Philosophy 133A; Psychology 131 and 131L; or Speech 164A. (A complete list of courses acceptable in meeting this requirement may be obtained from the major adviser.)
7. Enough additional courses to complete 36 upper division units in linguistics (not including as part of the 36 units the course offered to meet requirement 6 or Linguistics 105, 106 or 145).

Honors Program Those whose overall grade-point average is 3.0 or higher at the end of the junior year may elect to take the senior honors course in Linguistics (H195). This consists of 2 or more units per quarter for at least two quarters. Under the direction of a faculty member, the student carries out an approved program of independent study in which he attains a reasonable mastery of an appropriate linguistic topic. As evidence of each quarter’s work, he must submit an acceptable term paper summarizing critically the material he has covered.

Preparation for Graduate Study in Linguistics A graduate student in linguistics should have had an undergraduate major in linguistics, a foreign language, or some equivalent acceptable to the department. He should be prepared to pass the required language reading examinations early in his graduate career.

Graduate Programs

Master’s Degree in Linguistics The program follows Plan II, as described in Chapter III of this catalogue. The student must pass a reading examination in either French or German. Before the comprehensive final examination he must submit two scholarly papers on different subjects, prepared either in a course or independently, acceptable to the examination committee. The final examination is administered at or near the end of the course work by this committee, which has three members, one chosen from
Language Courses

Courses in specific languages are offered by the departments of Classics (Greek, Latin); English (Celtic, Old English, Middle English); French (French, Old French); German (Dutch, German, Gothic, Old High German, Middle High German); Italian; Near Eastern Languages (Akkadian, Arabic, Armenian, Coptic, Egyptian, Hebrew, Hindi, Persian, Sumerian, Syriac, Tamil, Telugu, Turkish, Urdu); Oriental Languages (Cantonese, Classical Chinese, Indonesian/Malay, Japanese, Korean, Mandarin, Mongolian, Old Turkish, Tibetan); Romance Philology (Late Latin, Old Provençal); Scandinavian (Danish, Norwegian, Swedish, Old Icelandic, Old Swedish); Slavic (Bulgarian, Czech, Polish, Russian, Serbo-Croatian, Ukrainian, Old Church Slavic, Hungarian); Spanish and Portuguese (Spanish, Portuguese, Old Spanish). See also list of Related Courses in Other Departments, p. 349.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Course

20. Language and Linguistics. (5)

Three 1%-hour lectures and one 1%-hour section meeting per week. Prerequisite: sophomore standing. How languages differ from one another in form and content; the structure of language. How languages change; the reconstruction of former languages. The languages of the world and their relationships.

Mr. Wang (F), Mr. Reed (Sp)

Upper Division Courses

Upper division status or consent of instructor is prerequisite to all upper division courses. Graduate students may enter upper division courses with consent of the instructor without meeting all of the prerequisites.

105. Descriptive Linguistics. (5)

Three 1%-hour lectures and one 1%-hour section meeting per week. Mr. van Nooten (Su); Mr. Zimmer (W)

106. Transformational Grammar. (5)

Three 1%-hour lectures and one 1%-hour section meeting per week. Transformations are rules of grammar relating deep structure of language to surface structure. The form of the rules is discussed; their use illustrated in a variety of languages; implications with respect to general principles or organization of human language are examined. Mr. Zimmer (Sp)

115. Articulatory Phonetics. (5)

Three 1%-hour lectures and one 1%-hour section meeting per week. Prerequisite: Linguistics 20 with a grade of A- or better, or 105 or 106. Training in the ability to discriminate and write down speech sounds. Extensive use will be made of dictation by native speakers and tapes in the Language Laboratory.

Mr. Stanley (W)
116. Phonology. (4)
Three 1½-hour lectures per week. Prerequisite: Linguistics 115. Properties of phonological systems; nature and component analysis; phonetic variation in the shapes of morphemes; the phonological component of a linguistic description; phonotactics, and distributional groupings, within the phonological component. Mr. Sawyer (F). —— (Sp)

125. Linguistic Analysis. (4)
Three 1½-hour lectures per week. Prerequisite: Linguistics 115. — (F); Mr. Kaufman (Sp)

135. Linguistic Structures. (4)
Three 1½-hour lectures per week. Prerequisite: Linguistics 115. Mr. Stanley (Sp)

145. Comparative and Historical Linguistics. (4)
Two 1½-hour lectures per week. Mr. Chretien (F)

155. Geographical and Social Dialects. (4)
Two 1½-hour lectures per week. Prerequisite: Linguistics 20 with a grade of A— or better, or 105 or 106. Mr. Reed (F)

156. American English. (4)
Three 1½-hour lectures per week. General description of the English language in America. Comparisons with British English, American regional dialects. Mr. Reed (W)

165. Indo-European Comparative Linguistics. (4)
Three 1½-hour lectures per week. Prerequisite: Linguistics 20 with a grade of A— or better, or 105 or 106 and a fair knowledge of at least one of the older Indo-European languages (e.g., Latin) and one of the modern Indo-European languages other than English or a Romance language. Mr. Beeler (Su)

166. German Morphology and Syntax. (4)
Three 1½-hour lectures per week. Prerequisite: upper division status and a reading knowledge of German or consent of instructor. Mr. Zimmer (sp)

175. American Indian Languages. (4)
Three 1½-hour lectures per week. Miss Haas (Sp)

185. Linguistic Theories. (4)
Three 1½-hour lectures per week. Prerequisite: Linguistics 116 and 125, one of which may be taken concurrently. Mr. Stanley (W)

190A-190B. Elementary Sanskrit. (4-4)
Three 1½-hour lectures per week. Sequence, beginning (Su) and (F).

191. Advanced Sanskrit. (4)
Three 1½-hour lectures per week. Prerequisite: course 190A-190B. The texts to be read will vary from quarter to quarter. The course may be repeated at least twice with the consent of instructor. Mr. Emeneau (F, W, Sp)

193. Linguistic Theories of the Hindus. (4)
Three 1½-hour lectures per week. Prerequisite: course 190A. A brief and general survey of Indian grammar from its inception in the Vedas until the semantic speculations of the Middle Ages; followed by a more intensive study of part of Pāṇini’s grammar, to show its structure, rules and sensitivity. Mr. van Nooten (Su, Sp)

H195. Special Study for Honors Candidates. (2-5)
The Staff (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (2-5)
Restricted to senior honor students.
The Staff (Su, F, W, Sp)

Graduate Courses

Senior standing and permission of the instructor are prerequisite to all graduate courses in Linguistics. (Some courses may be repeated with consent of instructor.)

211A–211B. Linguistic Field Methods. (4-4)
Two 2-hour section meetings per week. Sequence beginning in the fall and winter. Prerequisite: Linguistics 125 and 135. May be taken concurrently with 135. Recommended: Linguistics 175.

Mr. Chafe (F, W); Mr. Kaufman (W, Sp)

221. Advanced Linguistic Theory. (4)
Two 1½-hour section meetings per week. Mr. Chafe (F)

222. Acoustic Phonetics. (4)
Two 1½-hour section meetings per week. Prerequisite: course 115 or its equivalent. Mr. Wang (F)

223. Advanced Phonological Analysis. (4)
Two 1½-hour section meetings per week. Prerequisite: course 115. Mr. Wang (W)

224. Advanced Grammatical Analysis. (4)
Two 1½-hour section meetings per week. Prerequisite: course 125.

Mr. Kaufman (F)

225. Semantic Analysis. (4)
Two 1½-hour section meetings per week. Mr. Chafe (Sp)

226. Typology and Language Universals. (4)
Two 1½-hour section meetings per week.

Miss Haas (F)

231. Linguistics of India. (4)
Two 1½-hour section meetings per week.

Mr. Emeneau (F)

232. Linguistics of the Pacific. (4)
Two 1½-hour section meetings per week.

Mr. Chretien (W)

233. Germanic Linguistics. (4)
Two 1½-hour lectures per week. Prerequisite: at least one of the older Germanic languages. Phonology, morphology, and lexicography of the Germanic languages; the reconstruction of Proto-Germanic; Proto-Germanic and Indo-European.

Mr. Beeler (Sp)

234. Advanced Sanskrit. (2-6)
Such texts are read as are suited to the student's needs. Pali and Prakrit also will be studied as the occasion arises. This course may be repeated for credit with the consent of the instructor.

Mr. Emeneau (F, W, Sp)

235. Romance Historical Phonology. (4)
A 2½-hour lecture per week. Prerequisite: graduate standing and consent of instructor.

* Not to be given, 1968–69.
378 / LINGUISTICS

problems of Romance historical and comparative phonology, with full attention to their methodological applications. Mr. Malkiel (F)

*236. Romance Historical Inflection. (4)
A 2%-hour lecture per week. Prerequisite: graduate standing and consent of instructor. The key problems of Romance historical and comparative inflection, with full attention to their methodological applications. Mr. Malkiel (W)

237. Romance Historical Derivation. (4)
A 2%-hour lecture per week. Prerequisite: graduate standing and consent of instructor. The key problems of Romance historical and comparative derivation, with full attention to their methodological applications. Mr. Malkiel (Sp)

*238. Comparative Grammar of Latin and Greek. (4)
Two 1%-hour lectures per week. Prerequisite: at least an elementary knowledge of both Latin and Greek or permission of the instructor. Mr. Beeler (Sp)

241. Linguistic Reconstruction. (4)
Two 1%-hour section meetings per week. Mr. Chretien (Sp)

242. Advanced Diachronic Linguistics. (4)
Two 1%-hour section meetings per week. Miss Haas (W)

*243. Advanced Dialectology. (4)
Two 1%-hour section meetings per week. Prerequisite: course 155 and a reading knowledge of French or German or one other Modern European language. Mr. Reed (F)

*244. Advanced Indo-European Comparative Linguistics. (4)
Two 1%-hour section meetings per week. Mr. Beeler (W)

*245. American Linguistic Geography. (4)
Two 1%-hour section meetings per week. Analysis of American dialect materials. Mr. Reed (F)

251. Ethnolinguistics. (4)
Two 1%-hour section meetings per week. Mr. Kaufman (W)

252. Applied Linguistics. (4)
Two 1%-hour section meetings per week. Mr. Sawyer (Sp)

*253. Stylistics. (4)
Two 1%-hour section meetings per week. Mr. Emeneau (W)

6255. Cybernetics of Nonverbal Communication. (4)
Two 1%-hour lectures per week. Prerequisite: course 20 or 105 or consent of instructor. A linguistically oriented interdisciplinary introduction to the study of nonverbal communication, including para-language, facial displays, gestures, topics include: the distinction between natural nonverbal behavior and speech surrogates (e.g., writing; drum signals); a comparison of human communicative behavior with various animal communication systems. Mr. Diebold, Jr. (Su)

*261. Computational Linguistics. (4)
Two 1%-hour section meetings per week. The use of electronic computers in linguistics. Mr. Wang (Sp)

*262. Statistical Linguistics. (4)
Two 1%-hour meetings per week. Mr. Chretien (Sp)

263. Mathematical Linguistics. (4)
Two 1%-hour meetings per week. Mr. Stanley (Sp)

281. History of Linguistics. (4)
Two 1%-hour section meetings per week. Mr. Zimmer (W)

291. Problems in Field Linguistics. (4-6)
Two 1%-hour section meetings per week. Miss Haas (Sp)

298. Special Study. (2-6)
The Staff (F, W, Sp, Su)

299. Directed Research. (2-8)
The Staff (F, W, Sp, Su)

601. Individual Study for Master’s Students. (1-8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8) Prerequisite: one full year of graduate work at Berkeley or consent of graduate adviser.
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Su, F, W, Sp)

Related Courses in Other Departments

Language in Culture (Anthropology 165A)
Language in Society (Anthropology 165B)
Language and the Individual (Anthropology 165C)
Advanced Development: Psycholinguistics (Education 216C)
Foreign Language Teaching—Research (Education 231C)
Linguistics in Language—Arts (Education 231J)

Language (English 25)
The English Language (English 110A-110B)
Structure of English (English 205)

History of the English Language (English 270)
The Old English Language (English 270)
The Middle English Language (English 270)
The Modern English Language (English 270)
Introduction to Descriptive German Grammar (German 145)
Introduction to the History of the German Language (German 270)

* Not to be given, 1968-69.
§ Approved for one offering only, summer, 1968.
Historical Phonology and Morphology of German (German 271)
Gothic (German 273)
Old High German (German 276)
Old Saxon (German 282)
Seminar in Germanic Linguistics (German 290)
The Origin and Development of Hindi and Urdu (Near Eastern Languages 192)
Languages of Eastern Asia (Oriental Languages 100)
Chinese Dialectology (Oriental Languages 125)
Phonology of Ancient Chinese (Oriental Languages 135)
Japanese Grammar (Oriental Languages 139A-139B)
Chinese Grammar (Oriental Languages 145)
Malayo-Polynesian Linguistics (Oriental Languages 208)
Seminar in Chinese Linguistics (Oriental Languages 236)
Seminar in Japanese Linguistics (Oriental Languages 239)
Philosophy of Language (Philosophy 133A)
Introductory Psychology of Language (Psychology 131)
Laboratory in the Psychology of Language (Psychology 131L)
Psychology of Language and Communication (Psychology 132)

Developmental Psychology: Language Learning, Cognition (Psychology 240B)
Linguistic History of the Roman Empire (Roman Philology 200)
Late Latin Language and Literature (Roman Philology 201)
General Romance Linguistics (Roman Philology 202)
Romance Dialect Geography (Roman Philology 205)
Peninsular Spanish Dialectology (Roman Philology 207)
Romance Etymology (Roman Philology 208)
Romance Derivation and Composition (Roman Philology 210)
Scandinavian Dialects (Scandinavian 215)
Seminar in Scandinavian Linguistics (Scandinavian 250)
Comparative Slavic Linguistics (Slavic Languages and Literatures 220)
Fundamentals of Speech Behavior (Speech 15)
General Phonetics (Speech 150)
Contrastive Language Analysis: English as a Second Language (Speech 155)
Speech Development (child language) (Speech 156)
Speech and Society (Speech 164A, 164B)
Advanced Contrastive Language Analysis: English as a Second Language (Speech 255)
Studies in Speech Behavior (Speech 260)

Group in Linguistics
One evening each month faculty and graduate students from Bay Area colleges and
universities meet to hear and discuss a paper presenting results of original research
by a faculty member or visiting lecturer.

Survey of California and Other Indian Languages
The Survey of California and Other Indian Languages, a subunit of the Department
of Linguistics, provides means and facilities for advanced students and staff to carry
out research and field study in American Indian languages. Research projects cover
a wide range of interests, including grammatical, semantic, comparative, and ethno-
linguistic topics.

Linguistic Atlas of the Pacific Coast
A collection of 300 field-transcribed interviews and over 1500 shorter questionnaires
containing dialect information on the English language in California and Nevada
is being edited. The collection is available for specialized study by qualified students.

Phonological Research Facilities
The department has recently developed a laboratory facility for instruction and
research in physical phonetics. The facility includes the conventional instruments for
the recording and spectrographic analysis of speech as well as more specialized equip-
ment for the study of the physiology and acoustics of speech production and perception. The precise physical observations which can be obtained from such study are an essential ingredient of inquiry into how the sounds of language are organized and used.

**LOGIC AND THE METHODOLOGY OF SCIENCE**

(Group Office, 247 Campbell Hall)

Ernest W. Adams, Ph.D., *Professor of Philosophy.*

John W. Addison Jr., Ph.D., *Associate Professor of Mathematics.*

David Blackwell, † Ph.D., *Professor of Statistics.*

Yuen Ren Chao, Ph.D., Litt.D., *Agassiz Professor of Oriental Languages and Literature, Emeritus.*

Charles S. Chihara, Ph.D., *Assistant Professor of Philosophy.*

Stephen A. Cook, Ph.D., *Assistant Professor of Mathematics.*

William Craig, † Ph.D., *Professor of Philosophy.*

Lester E. Dubins, Ph.D., *Professor of Mathematics and of Statistics.*

John C. Harsanyi, Ph.D., *Professor of Business Administration and of Economics.*

Leon A. Henkin, † Ph.D., *Professor of Mathematics.*

Ralph N. McKenzie, Ph.D., *Assistant Professor of Mathematics.*

Benson Mates, Ph.D., *Professor of Philosophy.*

Raphael M. Robinson, † Ph.D., *Professor of Mathematics.*

Robert Robinson Ph.D., *Assistant Professor of Mathematics.*

Jack H. Silver, Ph.D., *Assistant Professor of Mathematics.*

Robert M. Solovay, † Ph.D., *Associate Professor of Mathematics.*

Alfred Tarski, Ph.D., *Professor of Mathematics.*

Robert L. Vaught, Ph.D., *Professor of Mathematics.*

*Chairman:* Mr. Vaught.

*Graduate Adviser:* Mr. Chihara.

In 1958 the University of California instituted on its Berkeley campus a pioneering interdisciplinary program of study and research leading to the Ph.D. degree in logic and the methodology of science. Although the Department of Mathematics and the Department of Philosophy at Berkeley each offers a Ph.D. degree toward which a student may write a dissertation in logic, the interdisciplinary program is designed for those with a broad interest in logic and the methodology of science who wish to explore the subject in both its mathematical and philosophical aspects. "Methodology of science" is here understood to mean "metascience," the study of the methods of the sciences by logical and mathematical means. The program is administered by the Group in Logic and the Methodology of Science, an interdepartmental group which cooperates closely with both the Department of Mathematics and the Department of Philosophy.

**Preparation** For admission to the graduate program the student shall have completed an undergraduate major in philosophy, or in mathematics, or a joint major in both, including at least one full year upper division course in logic. In addition, he shall have completed (a) at least one upper division course in some science, and (b) at least one full year upper division course in mathematics (other than logic) if his undergraduate major was philosophy, or in philosophy (other than logic) if his undergraduate major was mathematics. Exceptions to these requirements are permitted only at the discretion of the graduate adviser. Before advancement to candi-

† On leave, 1968–69.

†† Miller Professorship, 1968–69.

††† On leave, fall, winter quarters, 1968–69.
and preferably early in the student’s doctoral career, written examinations in two foreign languages must be passed; students may choose from the following: French, German, or Russian. Students should prepare themselves for the language requirement in their undergraduate years.

Further information about the program, including a full statement of the requirements for advancement to candidacy, is given in the Announcement of the Group in Logic and the Methodology of Science, which is available upon request from the Group Office.

Courses Courses are chosen with the advice of the graduate adviser from among the offerings of the various departments of the University. In addition to the departments of Mathematics and Philosophy, attention is especially directed to courses in the various science departments, in statistics, and in linguistics.

Logic Colloquium. (No credit) Reports on current research and scholarly work by members of the staff, visitors, and graduate students. The Staff (F, W, Sp, Su)

Other Departments with Related Programs

Department of Mathematics and Department of Philosophy

MATHEMATICS

(Department Office, 301 Campbell Hall)

William G. Bade, Ph.D., Professor of Mathematics.
Hans J. Bremermann, Ph.D., Professor of Mathematics.
Paul L. Chambre, Ph.D., Professor of Mathematics and of Nuclear Engineering.
Shiing-Shen Chern,† D.Sc., Professor of Mathematics.
Heinz O. Cordes, Ph.D., Professor of Mathematics.
René J. De Vogelaere, Ph.D., Professor of Mathematics.
Stephen P. Diliberto, Ph.D., Professor of Mathematics.
Lester E. Dubins,† Ph.D., Professor of Mathematics and of Statistics.
István Fáry, Docteur es Sciences, Professor of Mathematics.
Jacob Feldman, Ph.D., Professor of Mathematics.
Alfred L. Foster,† Ph.D., Professor of Mathematics.
David Gale,† Ph.D., Professor of Mathematics and of Operations Research.
Phillip A. Griffiths, Ph.D., Professor of Mathematics.
Henry Helson,† Ph.D., Professor of Mathematics.
Leon A. Henkin,† Ph.D., Professor of Mathematics.
Morris W. Hirsch,† Ph.D., Professor of Mathematics.
Gerhard P. Hochschild,∗ Ph.D., Professor of Mathematics.
Tosio Kato,† D.Sc., Professor of Mathematics.
John L. Kelley, Ph.D., Professor of Mathematics.
Shosshichi Kobayashi, Ph.D., Professor of Mathematics.
R. Sherman Lehman,† Ph.D., Professor of Mathematics.
Derrick H. Lehmer, Ph.D., Professor of Mathematics.
Hans Lewy, Ph.D., Professor of Mathematics.
Michel Loeve,† Docteur es Sciences, Professor of Mathematics and of Statistics.
Calvin C. Moore, Ph.D., Professor of Mathematics.
Charles B. Morrey, Jr.,† Ph.D., Professor of Mathematics.
Anthony P. Morse, Ph.D., Professor of Mathematics.
Edmund Pinney, Ph.D., Professor of Mathematics.
Murray H. Protter, Ph.D., Professor of Mathematics.

† On leave, 1968–69.
‡ On leave, fall quarter, 1968.
∗ On leave, spring quarter, 1969.
‡‡ Appointment to the Miller Institute for Basic Research in Science, 1968–69.
Raphael M. Robinson,** Ph.D., Professor of Mathematics.
Maxwell A. Rosenlicht,† Ph.D., Professor of Mathematics.
Ichiro Satake, Ph.D., Professor of Mathematics.
Abraham Seidenberg,‡ Ph.D., Professor of Mathematics.
Stephen Smale,§ Ph.D., Professor of Mathematics.
Robert M. Solovay,¶ Ph.D., Professor of Mathematics.
Edwin H. Spanier,¶ Ph.D., Professor of Mathematics.
John R. Stallings, Jr., Ph.D., Professor of Mathematics.
Alfred Tarski, Ph.D., Professor of Mathematics.
Abraham H. Taub,** Ph.D., Professor of Mathematics.
P. Emery Thomas, Ph.D., Professor of Mathematics.
Robert L. Vaught, Ph.D., Professor of Mathematics.
Frantisek Wolf,¶ Ph.D., Professor of Mathematics.
Joseph A. Wolf,¶ Ph.D., Professor of Mathematics.
Thomas Buck, Ph.D., Professor of Mathematics, Emeritus.
Griffith C. Evans, Ph.D., LL.D., Professor of Mathematics, Emeritus.
Raymond H. Sciobereti, Ph.D., Associate Professor of Mathematics, Emeritus.
John W. Addison, Jr., Ph.D., Associate Professor of Mathematics.
Glen E. Bredon, Ph.D., Associate Professor of Mathematics.
Andrew P. Ogg, † Ph.D., Associate Professor of Mathematics.
Beresford N. Parlett, Ph.D., Associate Professor of Computer Science.
Charles C. Pugh,‡ Ph.D., Associate Professor of Mathematics.
John L. Rhodes,§ Ph.D., Associate Professor of Mathematics.
Donald E. Sarason,¶ Ph.D., Associate Professor of Mathematics.
William W. Adams,¶ Ph.D., Assistant Professor of Mathematics.
George Bergman,‡ Ph.D., Assistant Professor of Mathematics.
Robert B. Brown,¶ Ph.D., Assistant Professor of Mathematics.
William Casselman, Ph.D., Assistant Professor of Mathematics.
Stephen A. Cook, Ph.D., Assistant Professor of Mathematics.
Alfred Gray, Ph.D., Assistant Professor of Mathematics.
Frederick P. Greenleaf, Ph.D., Assistant Professor of Mathematics.
Benjamin Halpern, Ph.D., Assistant Professor of Mathematics.
Theodore Kaczynski, Ph.D., Assistant Professor of Mathematics.
Bernard R. Kripke,¶ Ph.D., Assistant Professor of Mathematics.
I. A. K. Kupka, Ph.D., Assistant Professor of Mathematics.
Oscar E. Lanford, III, Ph.D., Assistant Professor of Mathematics.
Gene Lewis, Ph.D., Assistant Professor of Mathematics.
Saul Lubkin, Ph.D., Assistant Professor of Mathematics.
O. Carruth McGehee, Ph.D., Assistant Professor of Mathematics.
Ralph McKenzie, Ph.D., Assistant Professor of Mathematics.
C. Keith Miller,¶ Ph.D., Assistant Professor of Mathematics.
Stuart M. Newberger, Ph.D., Assistant Professor of Mathematics.
Marc A. Rieffel, Ph.D., Assistant Professor of Mathematics.
Robert W. Robinson, Ph.D., Assistant Professor of Mathematics.
Haskell Rosenthal,¶ Ph.D., Assistant Professor of Mathematics.
Michael Schlessinger, Ph.D., Assistant Professor of Mathematics.
Bernard Berlowitz, Ph.D., Instructor in Mathematics.

** Appointment to the Miller Institute for Basic Research in Science, 1968–69.
† On leave, 1968–69.
‡ On leave, fall quarter, 1968.
§ On leave, winter quarter, 1969.
¶ On leave, spring quarter, 1969.
¶ On leave, fall and winter quarter, 1968–69.
§ On leave, fall and spring, 1968–69.

The major in Mathematics is designed to prepare students to obtain a strong background in mathematics and to provide opportunities for them to specialize in fields of specific interest. The major is oriented to students who are oriented toward graduate work in mathematics, or toward careers as mathematicians, or toward teaching mathematics at the secondary school level.

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Leonard A. Asimow, Ph.D., Lecturer in Mathematics.
Fred Galvin, M.A., Acting Instructor in Mathematics.
Tsit-Yuen Lam, Ph.D., Lecturer in Mathematics.
Jens Lund, M.A., Lecturer in Mathematics.
Jerrold Marsden, Ph.D., Lecturer in Mathematics.
Loren D. Olsen, B.A., Acting Instructor in Mathematics.
Wasbek F. Pfeffer, Ph.D., Assistant Professor of Mathematics at Davis.
Nolan Wallach, Ph.D., Lecturer in Mathematics.

The major in mathematics in Berkeley offers an undergraduate the opportunity to obtain a strong, well-rounded background in mathematics. The department is large and has members of the faculty working in most fields of current mathematical research. The faculty is strongly oriented toward research and courses required of majors are oriented toward theory. The department offers a major in mathematics for teachers, with emphasis on excellence rather than size of program.

The Major

1A–1B–1C or 11A–11B; 11C–12A–12B; 104A; 113A; 113B; 104B or 185; 130 or 140; 134 or 135; three additional upper division courses. Courses 111 and 190A–190B–190C are not acceptable as part of the major. Courses 120A and 185 cannot both be offered as part of the major.

The attention of mathematics majors who expect to work in digital computing or to take further study in computer sciences is called to Mathematics 104B, 113C, 125A, 128A, 128B, and 185; Computer Science 2; Statistics 134; and Electrical Engineering 148, 152, 153.

The attention of students interested in logic is directed to Philosophy 12A, 12B, and Mathematics 125A, 125B. Statistics 100A, 100B, 100C, and Physics 105A, 105B are of interest to many mathematics majors.

Subject to the requirement of competence in the major, and with the approval of the adviser, the student may count not more than two theoretical courses in astronomy, physics, statistics, or other sciences toward his major requirements in mathematics.

Major in Mathematics for Teachers Required: 1A–1B–1C or 11A–11B; 11C–12A–12B; Philosophy 12A; Statistics 20; and special sections of: 113A–113B–113C; 115A; 130; 132; 134; 160; one additional upper division mathematics course (not 111, or 190A, 190B, 190C).

A student in the major in mathematics for teachers, after receiving his degree, may apply to enter the internship program in the School of Education in order to complete work for the teacher's credential. Students may also obtain a teacher's credential by

† On leave, 1968–69.
‡ On leave, fall and spring, 1968–69.
completing the requirements for the regular mathematics major and following this by a fifth year in the School of Education.

Honors Program In addition to completing the regular major requirements, a student in the honors program must: (a) earn a grade-point average of at least 3.5 in upper division and graduate mathematics courses; (b) complete Mathematics 117; (c) pass a graduate mathematics course with a grade of A; (d) receive the recommendation of his major adviser.

Preparation for Graduate Study For entrance to the graduate school in mathematics at Berkeley, a student is required to have completed the equivalent of the Berkeley mathematics major with a better than B average in upper division mathematics. Students preparing for graduate work are strongly advised to acquire a reading knowledge of two of the three foreign languages: French, German, and Russian. This proficiency is required for Ph.D. candidates, but the graduate program does not leave time for language study. There is no language requirement for the M.A. degree.

It is desirable for students preparing for graduate work to take some graduate courses while still in undergraduate status; Mathematics 202A, 202B, 250A, and 250B are recommended. A pamphlet giving more specific information on requirements for higher degrees is available at the department office.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1A—1B—1C. Analytic Geometry and Calculus. (4—4—4) Two 1-hour lectures and two 1-hour problem sessions per week. Prerequisite: two years of high school algebra, plane geometry, plane trigonometry. Elements of analytic geometry, introduction to differential and integral calculus with applications. (1A—1B—1C covers the material of old semester 3A-3B and two-thirds of 4A.)

1A: Loeve (Su); Bade, McGehee (F); Wagoner (W); — — (Sp); 1B: — — (Su); — — (F); Chern, McGehee (W); Wagoner (Sp); 1C: — — (Su); Wallach (F); — — (W); Chern, McGehee (Sp)

10. Mathematics for Liberal Arts Students. (4) Three 1-hour lectures and one 1-hour problem session per week. Prerequisite: not open to students who have had 1A, 16A, or a more advanced course, but course 10 may be followed by one of these courses. Concepts of modern mathematics for students who have no technical background. The topics are chosen by the instructor and vary from quarter to quarter. Course 10 is not a remedial course in algebra and trigonometry. Mr. Thomas (W)

11A—11B. Calculus. (4—4) Two 1-hour lectures and two 1-hour problem sessions per week. Prerequisite: analytic geometry in addition to the prerequisite for 1A. This course covers the material of 1A, 1B, 1C for students who have studied analytic geometry.

11A: Hirsch (Su); Addison, Vaught (F); Lanford (W); — — (Sp); 11B: — — (Su); — — (F); Addison, Spanier (W); Lanford (Sp)

H11A—H11B. Calculus. (4—4) Three 1-hour lectures and one 1-hour problem session per week. Prerequisite: analytic geometry in addition to the prerequisite for 1A. Honors course corresponding to 11A, 11B, for able students with strong mathematical background and interest. Emphasis on theory, rigor, and hard problems. Recommended as preparation for the major, particularly for honors candidates. H11A: Stallings (F); H11B: Stallings (W)

11C. Linear Algebra. (4) Two 1-hour lectures and two 1-hour problem sessions per week. Prerequisite: 1C or 11B. Students may not receive credit for both 11C and 111. Vectors in R^n, vector spaces, matrices, linear mappings, linear maps and matrices, determinants, scalar products and orthogonality, polynomials and matrices, triangulation of matrices and minor maps.

Wu (Su); Protter, Small (F); Wallach (W); Spanier (Sp)

H11C. Linear Algebra. (4) Three 1-hour lectures and one 1-hour problem session per week. Prerequisite: H11C, or 11C and permission of instructor, or 11B and permission of instructor. Students may not receive credit for both H11C and 111. Honors course corresponding to 11C for able students with strong mathematical background and interest. Emphasis on theory, rigor and hard problems. Recommended as preparation for the major, particularly for honors candidates. G. Moore (F); Stallings (Sp)

12A. Calculus of Several Variables. (4) Two 1-hour lectures and two 1-hour problem sessions per week. Prerequisite: 11C. Partial differentiation, multiple integration, implicit function theorems, transformations, the theorems of Green and Stokes.

— (Su); Feldman (F); Protter, Small (W); Wallach (Sp)

H12A. Calculus of Several Variables. (4) Three 1-hour lectures and one 1-hour problem session per week. Prerequisite: H11C, or 11C and permission of instructor. Honors course corresponding to 12A for able students with strong mathematical background and interest. Emphasis on theory, rigor and hard problems. Recommended as preparation for the major, particularly for honors candidates. Mr. Moore (W).
12B. Differential Equations and Infinite Series. (4)
Two 1-hour lectures and two 1-hour problem sessions per week. Prerequisite: 12A. Ordinary differential equations, convergence of infinite series (including uniform convergence), power series, series solutions of differential equations, Fourier series, Laplace transforms, continuity of trigonometric functions, theory of differentiation, Riemann integration, continuity of trigonometric functions, theory of differentiation, Riemann integration, introduction to the Theory of Probability and Statistics. (Statistics 100A-100B-100C)

104A. Introductory Analysis. (4)
Three hours of lecture per week. Prerequisite: course 12B or consent of instructor. Sets and functions, real numbers, metric spaces, continuous functions, theory of differentiation, Riemann integration, interchange of order of limit operations. Students who have completed H12B have covered the material of this course.

Hirsch, Pugh (Su); Feldman, Greenleaf, Lehman (F); Gray (W); Bade (Sp)

104B. Intermediate Analysis. (4)
Three hours of lecture per week. Prerequisite: course 104A. Approximation to continuous functions, Arzela's theorem, fundamental theorems of partial differentiation, implicit function theorems, existence theorems, multiple integrals, change of variable, further topics. (Su); (F); Lehman (W); (Sp)

105. Integration. (4)
Three hours of lecture per week. Prerequisite: course 104A. Lebesgue integral and measure, convergence theorems, Fubini's theorem, functions of bounded variation, absolutely continuous functions, connection between integration and differentiation. (F); Bremermann (W); (Sp)

111. Introduction to Linear Algebra. (4)
Three hours of lecture per week. Prerequisite: course 111C. For students in engineering, physical sciences, social sciences, statistics. May not be counted for credit in addition to 113C. Vector spaces, linear transformations, matrices, characteristic values, quadratic forms. Kato (Su); Morse (F); Rieffel (W); (Sp)

113A. Introduction to Abstract Algebra. (4)
Three hours of lecture per week. Prerequisite: course 111C. Sets, equivalence relations, integral domains, mathematical induction, rings, fields, field of quotients, unique factorization for integers and polynomials, real and complex numbers. Lewis (Su); Berlowitz, Fary, Helson, Satake (F); Cook, Rosenthal, Seidenberg, Wu (W); Bremermann, Small (Sp)

113B. Groups and Vector Spaces. (4)
Three hours of lecture per week. Prerequisite: course 113A. Groups, homomorphisms, subgroups, cosets, factor groups. Vector spaces, linear transformations, matrices, null space, rank, linear equations. Smale (Su); Lewis (F); Berlowitz, Fary, Helson, Satake (W); Rosenthal, Seidenberg, Wu (Sp)

113C. Linear Algebra. (4)
Three hours of lecture per week. Prerequisite: course 113B. Dual vector spaces, determinants, characteristic values, similarity, canonical forms, unitary spaces, unitary similarity, quadratic forms. Bergman (Su); Rieffel (F); (W); Berlowitz, Satake, Schmid (Sp)

115A. Introduction to Number Theory. (4)
Three hours of lecture per week. Prerequisite: course 111C. Divisibility, congruences, numerical functions, theory of primes. Lehman (F); Adams (W); (Sp)

115B. Topics in Number Theory. (4)
Three hours of lecture per week. Prerequisite: course 115A. Topics selected from: Diophantine analysis, continued fractions, partitions, quadratic fields, asymptotic distributions, additive problems. Lehman (F); Adams (W); (W)

117. Mathematical Problems Seminar. (4)
Three hours of lecture per week. Prerequisite: upper division standing in mathematics and consent of the instructor. An undergraduate seminar in methods of attack on nonroutine mathematical problems. May include reports and discussions by students on topics taken from journals or from texts not used in other courses. The field covered varies with the instructor. May be repeated for credit. Bergman (F)

120A-120B-120C. Advanced Calculus for the Applied Sciences. (4-4-4)
Three hours of lecture per week. Prerequisite: course 12B. Primarily for students in the physical sciences.
120A. Complex numbers, analytic functions, singularities, contour integration.

Cordes, Goguen (Su); Greenleaf, Kato, Kobayashi, Pinney (F); — (W), Chambre, Kupka (Sp)

120B. Conformal mapping, differential equations, special functions.

Goguen (Su); — (F), Greenleaf, Pinney (W); — (Sp)

120C. Boundary value problems, methods of solution of partial differential equations of mathematical physics.

F. Wolf (Su); — (F); — (W); Greenleaf, Kobayashi (Sp)

123. Ordinary Differential Equations. (4)

Three hours of lecture per week. Prerequisite: course 104A. Some background in linear algebra is recommended. Existence and uniqueness of solutions, linear systems. Other topics selected from: boundary value problems, analytic systems, autonomous systems, Sturm–Liouville theory.

Mr. Miller (W)

125A–125B. Mathematical Logic. (4-4)

Three hours of lecture per week. Prerequisite: course 104A or consent of instructor. Sentential and quantificational logic. Formal grammar, semantical interpretation, formal deduction, and their interrelation. Applications to formalized mathematical theories. Selected topics from model theory or proof theory. 125A: Robinson (Su); Cook, McKenzie (F); R. W. Robinson (W); 125B: Silver (F); — (W); R. W. Robinson (Sp)

126. Introduction to Partial Differential Equations. (4)

Three hours of lecture per week. Prerequisite: course 104A. Classification of second order equations, boundary value problems for elliptic and parabolic equations, initial value problems for hyperbolic equations, existence and uniqueness theorems in simple cases, maximum principles, and a priori bounds, the Fourier transform.

Mr. Prottle (F)

128A. Numerical Analysis. (5)

Three hours of lecture per week and one 3-hour laboratory. Prerequisite: course 128B. Students in computer science should take Computer Science 2 before 128A. Syntax and semantics of ALGOL, interpolation and approximation, discretization of operators, numerical solution of ordinary differential equations. Emphasis on methods appropriate for use with computers.

Widlund (Su); Bremermann, DeVogelaere (F); Kopka, Lehman (W); DeVogelaere (Sp)

128B. Numerical Analysis. (5)

Three hours of lecture per week and one 3-hour laboratory. Prerequisite: courses 128A, and 111 or 113B. Solution of nonlinear equations. Numerical methods for solving systems of linear equations and inverting matrices. Characteristic roots and vectors of matrices. Introduction to numerical solution of partial differential equations. Emphasis on methods appropriate for use with computers.

DeVogelaere (W); — (Sp)

130. The Classical Geometries. (4)

Three hours of lecture per week. Prerequisite: course 113B. Topics chosen from the following list: axioms for affine and projective planes, planes over a division ring, duality, the coordinatization theorem, n-dimensional projective geometry over a field, collineations and correlations, classification of hyperquadrics, the projective group and its subgroups, non-Euclidean geometry, inverse geometry.

— (Su); Casselman (F); Ebin (W); Fary (Sp)

132. Topics in Geometry. (4)

Three hours of lecture per week. Prerequisite: course 113A and consent of instructor. Topics selected from such areas as classical projective geometry, inversive geometry, symplectic geometry, geometric algebra, integral geometry, convexity, and elementary topology. Dubins (W); Casselman (Sp)

133. Algebraic Curves. (4)

Formerly numbered 131

Course 113A. The complex projective plane, simple and singular points of plane algebraic curves, Bezout's theorem, branches, linear series, cubic curves.

Mr. Seldenberg (W)

134. Number Systems. (4)

Three hours of lecture per week. Prerequisite: course 113A. Especially recommended for prospective teachers. Systems of natural numbers, integers, rational numbers, and real numbers developed both axiomially and through set-theoretical construction. Proof by induction and definitions by recursion.

Weinstein (Su); Miller (F); Adams (W); Kaczynski (Sp)

135. Introduction to the Theory of Sets. (4)


— (Su); Kaczynski (F); Brown (W); Silver (Sp)

140. Metric Differential Geometry. (4)

Three hours of lecture per week. Prerequisite: courses 104B, and 113B or 111. Frenet formulas and winding numbers for curves, local theory of surfaces in Euclidean space, global treatment of intrinsic surface geometry.

Chern (Su); Schlessinger (F); — (W); Fary (Sp)

145. Boolean Algebras. (4)

Three hours of lecture per week. Prerequisite: course 125A. Postulates, treatment as rings or lattices, relation to sentential calculus and calculus of classes; infinite operations, atoms; subalgebras, ideals, direct products; representation theorem.

Mr. McKenzie (W)

160. History of Mathematics. (4)

Three hours of lecture per week. Prerequisite: courses 128B and 113A. History of algebra, geometry, analytic geometry, and calculus through the seventeenth century and selected topics from more recent mathematical history.

Mr. Lehmer (W)

162. Tutorial in Upper Division Mathematics. (2)

Two hours of discussion per week in small sections. Prerequisite: consent of instructor. Emphasis is placed on the individual's experience in discovering and explaining mathematics. Examples of subjects which may be covered are: game theory, probability, and the axioms and axiomatic method.

Mr. Lehmer (W)

188. Mathematical Models in Engineering. (4)

Three hours of lecture and two hours of laboratory per week. Prerequisites: courses 113A and 113B. Emphasis on methods for solving systems of linear equations and their applications.

Mr. Protter (F)

190A-190B-190C. Special Study. (1-4-4)

Analysis. (W, Sp)

Three hours of lecture per week. Prerequisite: advanced level mathematics majors and graduate students only. May be taken for any advanced level mathematics course. 190A: Analysis. 190B: Calculus of variations. 190C: Differential equations. (W, Sp)

Mr. Spivak (Su); Schlessinger (F); — (W);

Special Study for the 190B.

Mr. P. W. Robinson (Sp)

191B. Topology. (4)

Two hours of discussion per week in small sections. Prerequisite: courses 113B and 113A. History of algebra, geometry, analytic geometry, and calculus through the seventeenth century and selected topics from more recent mathematical history.

Mr. Lehmer (W)

192. Tutorial in Upper Division Mathematics. (2)

Two hours of discussion per week in small sections. Prerequisite: consent of instructor. Emphasis is placed on the individual's experience in discovering and explaining mathematics. Examples of subjects which may be covered are: game theory, category theory, differential topology, mathematical foundations of quantum mechanics, general theory of ordinary differential equations and classical linear groups.

(2, Sp)
188. Mathematical Models in Physics and Engineering. (4)

Three hours of lecture per week. Prerequisite: courses 113B and 155. Designed primarily for mathematics majors with little or no background in physical sciences. Study of the relationship between mathematical concepts such as discrete and continuous spectra, remedies of linear operators, group invariance, and physical concepts which arise in the study of dynamical systems and wave propagation.

190A–190B–190C. Survey of Algebra and Analysis. (4–4–4)

Three hours of lecture per week. Prerequisite: upper division or graduate standing with specialization outside mathematics and natural science.

190A. Analytic geometry, differential and integral calculus. Holson (Su); —— (F); Bade (W).

190B. Calculus of several variables (partial differentiation, extremum problems), complex numbers and trigonometry, vectors and vector spaces. Brown (W); Bade (Sp).

190C. Difference equations, linear algebra. Duhin (Sp); —— (F); Brown (Sp).

Students who have studied calculus need not take 190A but may enter 190B or 190C.

199. Special Study for Advanced Undergraduates. (1–5)

By appointment. Investigation of special problems under the direction of members of the department. In particular, this course offers an opportunity to students with facility for mathematics to anticipate some of the advanced courses by individual study. Restricted to senior honor students.

Graduate Courses

Introduction to Probability and Statistics at an Advanced Level. (Statistics 200A–200B–200C)

202A. General Topology. (4)

Three hours of lecture per week. Prerequisite: course 104B. Topological spaces, connectedness, separation axioms, Urysohn lemma, compactness, local compactness, paracompactness, Tychonoff theorem.

(Su); Kaczynski, Small (F); Rosenthal (W); Spanier (Sp).

202B. Function Spaces. (4)

Three hours of lecture per week. Prerequisite: course 202A. Convergence theory, uniform spaces, spaces of functions, Arzela-Ascoli theorems, Stone-Weierstrass theorem, further topics selected by the instructor. Lewy (F); Kaczynski (W); Rosenthal (Sp).

203. Measure and Integration. (4)

Three hours of lecture per week. Prerequisite: courses 105 and 202A. General theory of measure and integration, including the Fubini theorems and the Radon-Nikodym theorem.

F. Wolf (Su); Loeve (F); Morse (W); Sarason (Sp).

Stochastic Processes. (Statistics 203A–203B–203C)

205. Theory of Functions of a Complex Variable. (4)

Three hours of lecture per week. Prerequisite: course 205. Representation theorems of Weierstrass and Mittag-Leffler, normal families, conformal mapping and Riemann mapping theorem, analytic continuation. Cordey (Su); Helson (F); Lohm (Sp).

Probability Theory. (Statistics 205A–205B–205C)

206A. Linear Spaces. (4)

Three hours of lecture per week. Prerequisite: courses 105 and 202A. Elementary theory of Banach and Hilbert spaces, Hahn-Banach theorem, closed graph theorem, principle of uniform boundedness, linear functionals and operators, weak convergence, spaces $L^p$ and $C$. Kato (Su); Kelley (F); Feldman (W).

206B. Linear Operators. (4)

Three hours of lecture per week. Prerequisite: course 206A. Spectral theory of compact operators, spectral theorem for bounded self-adjoint operators, commutative Banach algebras. Kato (F); Feldman (Sp).

207. Differential Operators. (4)

Three hours of lecture per week. Prerequisite: course 206B. Differential operators, unbounded symmetric operators, perturbation theory, additional topics selected by the instructor. Mr. Kato (W).

208. Functional Analysis. (4)

Three hours of lecture per week. Prerequisite: course 206A. Locally convex linear topological spaces, distributions, further topics selected by the instructor. Mr. Greenleaf (Sp).

212A–212B. Several Complex Variables. (4–4)

Three hours of lecture per week. Prerequisite: course 205. Power series and analytic functions of several variables, analytic sets and ideals of holomorphic functions, analytic continuation and envelopes of holomorphy, analytic spaces, global problems and sheaf theory. Further topics such as pseudo convexity and the E. Levi problem, embedding theorem for Stein manifolds, proper mapping theorem, normalization theorem, bounded domains in $C^n$.

212A: Kas (F); 212B: Kas (W).


Three hours of lecture per week. Prerequisite: courses 113B and 202A. Fundamental group, covering spaces, simplicial complexes, homology theory and applications. Homotopy groups, fibrations, relations between homotopy and homology, obstruction theory, classification theorems, spectral sequences and applications.

215A: Berger (Su); Ebin, Hsiang (F); Eickem (Sp); 215B: Wagoner (F); Hsiang (W); 215C: Cooke (Sp).

217. Special Functions and Asymptotic Integration. (4)

Three hours of lecture per week. Prerequisite: course 185. Properties of the Bessel, Legendre, and
hypergeometric functions and the asymptotic evaluation of integrals by the method of stationary phase and steepest descents.


Three hours of lecture per week. Prerequisite: courses 111 or 113B, and 185 or 120A (which may be taken concurrently). Ordinary differential equations in the real and complex domains, existence, differentiability of solutions, linear systems with constant and periodic coefficients, analysis of singular points, Poincaré-Bendixson theorem, perturbation theory, Sturm-Liouville theory, Fuchsian equations, asymptotic expansions. Diliberto, sequence beginning (F)

220A–220B–220C. Higher Mathematics for Physical Sciences and Engineering. (4–4–4)

Three hours of lecture per week. Prerequisite: course 185 or 120A, 120B, 120C. Primarily for students in engineering. A qualifying examination will be given during the first class meeting. Students who have passed course 120A–B–C at Berkeley with grade C will be admitted to 220A.

220A. Special Functions of Mathematical Physics. Chambre, Finney (F); Sachs (W)

220B. Partial Differential Equations of Mathematical Physics. Chambre, Finney (W); Sachs (Sp)

*221. Logarithmic and Newtonian Potential. (4)

Three hours of lecture per week. Prerequisite: courses 105 and 185. Harmonic and superharmonic functions, Dirichlet problem, capacity of sets, general potentials.

222A–222B–222C. Partial Differential Equations. (4–4–4)

Three hours of lecture per week. Prerequisite: courses 105, and 185. The theory of initial value and boundary value problems for hyperbolic, parabolic, and elliptic partial differential equations, with emphasis on nonlinear equations. More general types of equations and systems of equations. Cordes, sequence beginning (F)

223A–223B–223C. Modern Applied Mathematics for Physical Sciences. (4–4–4)

Three hours of lecture per week. Prerequisite: courses 104A, 185, and 111 or 113C; Hilbert space theory, linear operators and spectral theory, with applications to mathematical principles of quantum theory, ordinary and partial differential equations and integral equations.

223A: Saylor, Shunk (F); Osher (W); Miller (Sp); 223B: Diliberto (F); Saylor (W); Osher (Sp); 223C: Kupka (F); Diliberto (W); Saylor (F); Wolf (Sp)

225A–225B–225C. Metamathematics. (4–4–4)

Three hours of lecture per week. Prerequisite: courses 125B and 135. Metamathematics of predicate logic. Completeness and compactness theorems. Interpolation theorem, definability, theory of models. Metamathematics of number theory, recursive functions, applications to truth and provability. Undecidable theories. 225A: Addison (F); 225B: Addison (W); 225C: — (Su); Addison (Sp)

* Not to be given, 1968–69.

226. Mathematical Logic and Computers. (4)

Three hours of lecture per week. Prerequisite: course 125A. Boolean functions and switching circuits, deterministic computing machines, Turing machines, introduction to recursive functions and unsolvable combinatorial problems. Mr. Hanf (Su, Sp)

227A–227B. Theory of Recursive Functions. (4–4)

Three hours of lecture per week. Prerequisite: course 225C. Recursive and recursively enumerable sets of natural numbers: characterizations, significance, and classification. Relativization, degrees of unsolvability. The recursion theorem. Constructive ordinals, the hyperarithmetical and analytical hierarchies. Recursive objects of higher type. Mr. R. W. Robinson — (W)

228A–228B–228C. Advanced Numerical Analysis. (5–5–5)

Three hours of lecture and two hours of laboratory per week. Prerequisite: Courses 111 or 113B, and 125B. Discretization and optimum discretization. Iteration methods. Applications to systems of linear, differential, and integral equations. Discussion of convergence, stability, and errors. Additional topics selected by the instructor. Sequence beginning (F)

229A–229B. Theory of Models. (4–4)

Three hours of lecture per week. Prerequisite: course 225C. Syntactical characterization of classes closed under algebraic operations. Ultraproducts and ultralimits, saturated models. Methods for establishing decidability and completeness. Model theory of various languages richer than first-order.

229A: Vaught (F); 229B: Vaught (W)


Three hours of lecture per week. Prerequisite: courses 125A and 135.


235C. Selected topics such as: arithmetic of relations, generalization of continuity hypothesis, inaccessible numbers, constructible sets, ultraproducts, axioms of choice, equivalent forms, and consequences. Set-theoretical equivalence, similar and isomorphic relations.

240A. Differential Geometry. (4)

Three hours of lecture per week. Prerequisite: courses 225C and 235B. Various set theories: comparison of strength, transfinite and natural models, finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. Their measure problem and axioms of strong infinity.

240B. Ring Theory. (4)

Three hours of lecture per week. Prerequisite: courses 225C and 235B. Various set theories: comparison of strength, transfinite and natural models, finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. Their measure problem and axioms of strong infinity.

240C. Field Theory. (4)

Three hours of lecture per week. Prerequisite: courses 225C and 235B. Various set theories: comparison of strength, transfinite and natural models, finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. Their measure problem and axioms of strong infinity.

240D. Group Theory. (4)

Three hours of lecture per week. Prerequisite: courses 225C and 235B. Various set theories: comparison of strength, transfinite and natural models, finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. Their measure problem and axioms of strong infinity.

240E. Metric Spaces and Measure. (4)

Three hours of lecture per week. Prerequisite: courses 225C and 235B. Various set theories: comparison of strength, transfinite and natural models, finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. Their measure problem and axioms of strong infinity.

240F. Topological Groups. (4)

Three hours of lecture per week. Prerequisite: courses 225C and 235B. Various set theories: comparison of strength, transfinite and natural models, finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. Their measure problem and axioms of strong infinity.
### Mathematics / 389

#### 240B–240C. Riemannian Geometry. (4–4)
Three hours of lecture per week. **Prerequisite:** course 240A. Riemannian manifolds, parallelism, geodesics, equations, completeness, curvature, relations between curvature and topology. Further topics such as: general theory of connections, holonomy groups and de Rham decomposition, pinched manifolds, submanifolds, Riemannian geometry of Lie groups. 240B: Otsuki (F); Morrow (W); Kupka (Sp); 240C: Morrow (Sp)

#### 241A. Riemann Surfaces. (4)
Three hours of lecture per week. **Prerequisite:** course 241A. Transcendental methods in algebraic geometry, Kahler manifolds, Hodge and Dolbeault theorems, fiber bundles and characteristic classes in algebraic geometry, abelian varieties and analytic surfaces.

Three hours of lecture per week. **Prerequisite:** courses 113C and 135. General notion of an algebraic structure. Subalgebras; isomorphism; homomorphisms and congruence relations; direct products, free algebras. Applications of general notions to groups, rings, fields, lattices, Boolean algebras, etc.

#### 250A. Groups and Rings. (4)
Three hours of lecture per week. **Prerequisite:** course 113C. Group theory through the Jordan-Hölder-Schreier theorem, homomorphism theorems for rings and modules, structure of modules over principal ideal domains.

#### 250B. Field Theory and Related Topics in Algebra. (4)
Three hours of lecture per week. **Prerequisite:** course 250A. Field theory, including algebraic and transcendental extensions, Galois theory. Topics from ring theory, multilinear algebra.

#### 251. Ring Theory. (4)
Three hours of lecture per week. **Prerequisite:** course 250B. Topics such as: Noetherian rings, rings with descending chain condition, theory of the radical, homological methods.

#### 252. Representation Theory. (4)
Three hours of lecture per week. **Prerequisite:** course 250B. Structure of finite dimensional algebras, applications to representations of finite groups, the classical linear groups.

#### 253. Homological Algebra. (4)
Three hours of lecture per week. **Prerequisite:** course 250B. Modules over a ring, homomorphisms and tensor products of modules, functors and derived functors, homological dimension of rings and modules.

#### 254. Algebraic Number Theory. (4)
Three hours of lecture per week. **Prerequisite:** course 250B. Valuation theory in number fields and relation to ideal theory, local fields, unit theorem and finiteness of class number, ramification theory.

Mr. Berlowitz (F)


Mr. McKenzie, sequence beginning (F)

#### 256A–256B–256C. Algebraic Geometry. (4–4–4)
Three hours of lecture per week. **Prerequisite:** course 250B. Algebraic varieties, dimension, correspondences, normalization, simple points, linear systems, Riemann-Roch theorems for curves, cohomology of coherent sheaves and theory of schemes.

Mr. Schlessinger, sequence beginning (F)

#### 259. Transformation Groups. (4)
Three hours of lecture per week. **Prerequisite:** courses 215A and 240A, or consent of instructor. Topological groups, Haar measure, general theory of topological transformation groups, the existence of slices and applications, the Smith theory of periodic transformations.

Mr. Hsiang (F)

#### 260A. Topological Groups. (4)
Three hours of lecture per week. **Prerequisite:** courses 202A and 250A. General topological groups, Haar measure, compact groups.

Mr. C. Moore (W)

#### 260B. Abstract Harmonic Analysis. (4)
Three hours of lecture per week. **Prerequisite:** courses 206A and 260A. Banach algebras, convolution algebras, group representations.

Mr. C. Moore (Sp)

Three hours of lecture per week. **Prerequisite:** course 240A. Lie groups and Lie algebras, general structure theory; compact, solvable, complex, and semi-simple groups; classification of simple groups, representation theory; further topics such as the theory of symmetric spaces.

Mr. Riedel, sequence beginning (F)

#### 265. Differential Topology. (4)
Three hours of lecture per week. **Prerequisite:** course 240A. Approximation theorems, imbedding theorem, Sard's theorem, tubular neighborhoods, transversality, classifying spaces, cobordism.

Mr. Wagner (F)

#### Markov Processes. (Statistics 265)

#### 270. Mathematical Theory of Fluid Dynamics. (4)
Three hours of lecture per week. Development of the fundamental equations describing the behavior of a fluid continuum followed by the treatment of special topics selected to exhibit different physical situations, analytical techniques and approximate methods of solution.
272. Topics in Differential Topology. (4)
Three hours of lecture per week. Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars. Hence it may be repeated for credit.

273. Topics in the Theory of Functions of a Complex Variable. (4)
Three hours of lecture per week. Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars. Hence it may be repeated for credit.

274. Topics in Algebra. (4)
Three hours of lecture per week. Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars. Hence it may be repeated for credit.

275. Topics in Applied Mathematics. (4)
Three hours of lecture per week. Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars. Hence it may be repeated for credit.

276. Topics in Topology. (4)
Three hours of lecture per week. Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars. Hence it may be repeated for credit.

277. Topics in Differential Geometry. (4)
Three hours of lecture per week. Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars. Hence it may be repeated for credit.

278. Topics in Analysis. (4)
Three hours of lecture per week. Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars. Hence it may be repeated for credit.

Three hours of lecture per week. Prerequisite: course 140 or consent of instructor. Special theory of relativity, spinor representation of the Lorentz group, reformation of classical physical theories in relativistic form, principle of equivalence, Einstein theory of gravitation, cosmological problems. Sequence beginning (F).

290. Seminars. (2–8)
One 2-hour lecture per week. Credit and grade will be awarded at termination of seminar. Topics in foundations of mathematics, theory of numbers, numerical calculations, analysis, geometry, topology, algebra, and their applications, by means of lectures and informal conferences; work based largely on original memoirs.

Kobayashi, Lindezenraus, Sataki, Silver, Stallings, Tarski (W); Bergman, R. W., Robinson, Silver, Tarski, Thomas, Zariski (Sp)
MEDICAL PHYSICS

(Division Office, 103 Donner Laboratory)

Kenneth S. Cole, Ph.D., Sc.D., Professor of Biophysics in Residence.
John W. Gofman, M.D., Ph.D., Professor of Medical Physics and Associate Director of the Lawrence Radiation Laboratory, Livermore.

Hardin B. Jones, Ph.D., Professor of Medical Physics and of Physiology and Assistant Director of the Donner Laboratory.

Thomas H. Jukes, Ph.D., Professor of Medical Physics in Residence.

John H. Lawrence, M.D., Sc.D., Professor of Medical Physics, Director of the Donner Laboratory and Associate Director of the Lawrence Radiation Laboratory.

Robert K. Mortimer, Ph.D., Professor of Medical Physics.

Cornelius A. Tobias, Ph.D., Professor of Medical Physics (Chairman).

John H. Northrop, Ph.D., Sc.D., LL.D., Professor of Medical Microbiology and Immunology, and Professor of Biophysics, Emeritus.


Letters and Science List: for regulations governing this list, see page 80.

Lower Division Course

10. Atomic Radiation and Life. (4)
Three 1-hour lectures per week. Prerequisite: a lower division course in physics, or Contemporary Natural Science 1A–B–C, or a major in natural science. Basic aspects of atomic radiations with examples from biomedical and physical fields. To provide a framework for evaluating the complex changes associated with the atomic age. For liberal arts as well as science students.
Mr. ——— (F); Mr. Mel (Sp)

Upper Division Courses

101. Radiation and Tracer Biophysics. (4)
Three lectures and one laboratory per week. Prerequisite: Physics 2C or 4C, Chemistry 1B, Biology 1G, or equivalents. An introductory course in calculus is recommended. Basic theory of radioactivity, interactions of radiation with matter; radiation detection, radioactive isotopes and their role in evaluation of transport distribution and turnover of metabolites; introductory theory of tracer kinetics. Limited to 24 students.
Mr. Hayes, Mr. Gofman (F); Mr. Nichols, Mr. Mortimer (Sp)

102A–102B. Physics of Biological Systems. (4-4)
Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: Physics 4E; a course in physical chemistry or thermodynamics (may be taken concurrently), Mathematics 2G, an introductory biology course, or consent of instructor.

102A. Biological energetics. Thermodynamics of closed and open systems; electrochemical, electrokinetic, and bioelectric phenomena; physical and biological transport processes.
Mr. McLaren (F)

102B. Biological kinetics. Biophysics of colloidal systems and surfaces; reaction rate theory and biological catalysts; advanced tracer kinetics; systems dynamics.
Mr. McLaren (W)

103. Human Biology. (4)
Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: Contemporary Natural Sci-
121. Molecular Physics and Biological Structure. (5)
Four 1-hour lectures per week and one 1-hour discussion per week. Prerequisite: Biology 1C and Chemistry 110A or the equivalent with consent of instructor. Experimental and theoretical principles of contemporary molecular physics as they are used in understanding biological structures and phenomena associated with structure. To include chemical bonds, the structure of water, molecular complexes, cell organelles, and energy transport. Mr. Glaeser (Sp)

198. Special Study in Medical Physics for Undergraduates. (1-6)
Advanced upper division work in medical physics and biophysics. Introduces students to the topics, techniques, and methods of research. Credit determined by faculty sponsor.
The Staff (Mr. Jones in charge) (Su, F, W, Sp)

Graduate Courses

Cellular Biophysics

201. Lipoproteins and Membrane Structure. (3)
Three 1-hour lectures per week. Lipid-protein interactions; analysis and characterization of lipoproteins; models of lipoprotein structure; organization and function of lipoproteins in membranes, mitochondria, and other subcellular structures.
Mr. Nichols, Mr. Gofman (F)

202. Electrical and Transport Properties of Membrane. (3)
Two 1 1/2-hour lectures per week. Analysis of membrane properties and function; capacitance and conductance; electro-diffusion and ion movement; propagation of nerve impulses; models and theories.
Mr. Cole, Mr. Tobias (W)

203A–203B–203C. Nucleic Acids and Information Transfer. (2–2–2)
Mr. Yoshikawa (F); Mr. Krakow (W); Mr. Jukes (Sp)

204A–204B. Advanced Laboratory in Biophysical Research. (4–4)
Eight hours per week combination lecture and laboratory. Physical properties of biological systems at the atomic, molecular, cellular, and organismal level. Enrollment limited. 204A is not a prerequisite for 204B.
Mr. Glaeser (Su, W)

Radiation Biophysics

211. Molecular Radiation Biology. (3)
Three 1-hour lectures per week. Analysis of the action of ionizing, ultraviolet and visible radiation on cells and viruses in relation to their effects on molecules of biological interest, radiomimetic chemicals, intracellular repair of radiation damage in nucleic acids.
Mr. Haynes (F)

212. Radiation Genetics. (4)
Two lectures and six hours laboratory per week. Prerequisite: Genetics 100 or Zoology 150, course 211 or equivalent with consent of instructor. Genetic effects of radiation, mutation, mitotic recombination, chromosome breakage and rearrangement, genetic effects on populations.
Mr. Mortimer, Mr. Wolff (W)

213. Mammalian Radiation Biology. (3)
Three 1-hour lectures per week. Acute mammalian radiation syndrome; long-term effects; recovery; metabolic and endocrine effects; immunological and hemopoietic effects; effects of internally deposited isotopes; sources of radiation in the environment and public health aspects.
Mr. Jones, Mr. Dobson, Mr. Patt (Sp)

214. Radiological Physics. (3)
Three 1-hour lectures per week. Prerequisite: course 101 and physics 124. Interaction of electromagnetic and particulate radiation with matter, health physics, shielding and dosimetry with special emphasis on neutrons.
Mr. Wallace (Sp)

Theoretical Biophysics

221. Mathematical Models and Methods in Biology. (4)
Three 1-hour lectures and one 1-hour discussion session per week. Review of mathematical tools of biophysics. Analysis, simulation and mathematical models of biological systems. Boolean algebra, application to networks; the axiomatic method; probabilistic analysis; Schwartz distributions, Fourier transforms, applications to compartment analysis, control theory and extraction of signal from noise.
Mr. Bremermann (W)

222. Self-Organizing Systems. (4)
Three 1-hour lectures and one 1-hour discussion session per week. Prerequisite: courses 102A–102B and 221, or consent of instructor. Information theory; physical theory of nerve action; biological servomechanisms; self-organizing systems; memory; learning and logic in neural nets; neuro-radiobiology.
Mr. Tobias (Sp)

223. Non-Equilibrium Thermodynamics. (3)
Two 1 1/2-hour lectures per week. Prerequisite: course 102A or equivalent or consent of instructor. Theoretical foundations of irreversible thermodynamics with application to problems of biological interest.

Medical Physics

231A–231B. Nuclear Medicine. (3–3)
One lecture and one 5-hour laboratory period per week. Prerequisite: course 101 or equivalent and graduate standing in one of the biological or medical sciences. Advanced theory and techniques of nuclear medicine; application of radioactive isotopes to the study of disease processes.
Mr. Lawrence, Mr. Rosenthal, Mr. Winchell (W, Sp)
MILITARY SCIENCE

(Department Office, 151 Harmon Gymnasium)

Kurt G. Radtke, M.B.A., Colonel, Infantry; Professor of Military Science (Chairman of the Department).
David A. Appling, B.S., Major, Ordnance Corps; Associate Professor of Military Science.
Frank D. Brown, B.S., Major, Artillery; Associate Professor of Military Science.
Rupert R. Leohner Jr., B.S., Major, Signal Corps; Associate Professor of Military Science.
Thomas P. Storey, B.B.A., Major, Transportation Corps; Associate Professor of Military Science.

The lower division courses are offered on an elective basis to all qualified male students. The objective of the lower division ROTC curriculum is to provide an understanding of the American defense establishment and its missions and responsibilities; a working knowledge of basic weapons; a foundation in the theory of warfare as exemplified in American military history; and an introduction to military topography and small unit tactics. These courses are designed to give the ROTC student a sense of mission and an understanding of the role of the military, as well as prepare him for entrance into the upper division. Draft deferments may be granted to qualified students. All uniforms, texts, and equipment are issued to the student without expense to him.

The upper division course of instruction is designed to produce junior officers who, by their education, training, and inherent qualities, are suitable for continued development as officers in any arm or service of the United States Army. Development of military leadership is emphasized.

Admission to the upper division courses is by selection from regularly enrolled students who meet the academic and physical requirement and who apply for the regular or two-year program. (For details, see page 58.) A student must qualify for appointment as a second lieutenant prior to reaching twenty-eight years of age. All students accepted for entrance to the upper division ROTC must have at least two more academic years remaining at the University and execute a contract with the Department of the Army.

The professional (upper) division courses are designed to prepare the student for commissioning. The emphasis in the junior year is on leadership development and unit operations at company level and below. The senior year continues the education and training by moving to battalion and higher levels and emphasizing the command and staff functions of an Army officer. Between the junior and senior years, cadets participate in a six-week summer camp at an active military installation.

Students in the first two years must complete 2 units of elective subjects chosen from the fields of effective communication, science comprehension, general psychology,
political development, or political institutions. Students in the last two years must complete 6 units chosen from the same fields.

Those students who have successfully completed the first year of the upper division and who have been selected by the Professor of Military Science and the Chancellor at Berkeley for scholastic excellence and outstanding qualities of leadership may be designated "Distinguished Military Students." These distinguished students may, upon graduation and upon application, receive a direct commission in the Regular Army.

For further information about the Reserve Officers' Training Corps, consult the Professor of Military Science in Room 149 Harmon Gymnasium.

Lower Division Courses

11. Weapons and Marksmanship. (1)
(Formerly numbered 13)
One 1-hour lecture and one 1-hour leadership laboratory. Theory and functioning of military small arms. Fundamentals of marksmanship. Caliber .22 rifle firing. The Staff (F, Sp)

12A–12B. U. S. Defense Establishment. (1-1)
(Formerly numbered 11 and 12)
Prerequisites: course 11 or consent of instructor. One 1-hour lecture, one 1-hour leadership laboratory, Evolution of warfare. Principles of war. Mission and structure of Department of the Army and its operating units. Mission, structure of Departments of Defense, Navy, Air Force. Survey of operations of service departments. The Staff (sequence beginning W)

21. American Military History. (2)
Two 1-hour lectures and one 1-hour leadership laboratory. Survey of American military history from the origin of the American Army to the present. Emphasis on organizational, tactical, logistical, operational, and strategical patterns. The Staff (F)

22. American Military History and Map and Aerial Photograph Reading. (2)
Prerequisites: course 21. Two 1-hour lectures and one 1-hour leadership laboratory. American Military History continued. Basic principles of map reading. Counterinsurgency operations. The Staff (F)

23. Map Reading and Basic Tactics. (2)
Prerequisites: course 22. Two 1-hour lectures and one 1-hour leadership laboratory. Advanced map and aerial photograph reading. Basic military terms. Combat formations. Principles of offensive and defensive combat. Counterinsurgency operations. The Staff (Sp)

Upper Division Courses

131. Military Teaching Principles. (2)
Study of instructional techniques used in planning, presenting, and evaluating military instruction, including practical application of these techniques. Two 1-hour lectures, one 1-hour leadership laboratory. The Staff (F)

132. Leadership, Branches of the Army, Counterinsurgency. (3)
Three 1-hour lectures and one 1-hour leadership laboratory. Basic problems in small-unit leadership. Role of various branches of the Army. Basic principles of counterinsurgency. The Staff (W)

133. Small-Unit Tactics and Communications. (3)
Three 1-hour lectures and one 1-hour leadership laboratory. Principles of offensive and defensive combat. Communications systems, procedures and security. One 3-day field trip to an active installation. The Staff (Sp)

140. Summer Camp. (6)
A field training camp held at an active military installation for a period of six weeks. Subjects include leadership, branch orientation, tactics, communications, physical training, and weapons familiarization. The Staff (Sp)

141. Operations and Logistics. (3)
Three 1-hour lectures and one 1-hour leadership laboratory. Staff organization and function. Staff planning. Staff in combat operations. Military intelligence. Supply and evacuation. Troop movement. Motor transportation. The Staff (F)

142. Army Administration and Military Law. (3)
Three 1-hour lectures and one 1-hour leadership laboratory. Personnel management. Military occupational specialty structure. History of military law. Uniform Code of Military Justice. Moot courts to provide practice in mechanics of military justice. The Staff (W)

143. The Role of the United States in World Affairs and Service Orientation. (2)
Two 1-hour lectures and one 1-hour leadership laboratory. Survey analysis of United States national power. Similar analysis for other areas and nations of the world. Counterinsurgency operations. Customs of the service. The Staff (Sp)

Molecular Biology

(Molecular Biology and Virus Laboratory)

Melvin Calvin, Ph.D., Sc.D., Professor of Molecular Biology and of Chemistry and Director, Laboratory of Chemical Biodynamics.
Michael Doudoroff, Ph.D., Professor of Molecular Biology and of Bacteriology.
Heinz L. Fraenkel-Conrat, M.D., Ph.D., Professor of Molecular Biology.
Donald A. Glaser, Ph.D., Professor of Molecular Biology and of Physics.
C. Arthur Knight,† Ph.D., Professor of Molecular Biology.
Harry Rubin, D.V.M., Professor of Molecular Biology.
Howard K. Schachman, Ph.D., Professor of Molecular Biology and of Biochemistry.
Roger Y. Stanier, Ph.D., Professor of Molecular Biology and of Bacteriology.
Wendell M. Stanley, Ph.D., Sc.D., LL.D., Docteur h.c. (Paris), Professor of Molecular Biology and of Biochemistry and Director of the Virus Laboratory.
Gunther S. Stent, Ph.D., Professor of Molecular Biology and of Bacteriology.
Robley C. Williams, Ph.D., Professor of Molecular Biology and Associate Director of the Virus Laboratory (Chairman of the Department of Molecular Biology).
Michael J. Chamberlin, Ph.D., Associate Professor of Molecular Biology.
Alvin J. Clark,‡ Ph.D., Associate Professor of Molecular Biology and of Bacteriology.
John C. Gerhart,‡ Ph.D., Associate Professor of Molecular Biology.
Richard Calendar Ph.D., Assistant Professor of Molecular Biology.
John R. Roth, Ph.D., Assistant Professor of Molecular Biology.

Marian E. Koshland, Ph.D., Lecturer in Molecular Biology.

The last two decades have witnessed the emergence of remarkable insights into the molecular basis of some central phenomena in biology. As a consequence of these developments an integrated body of knowledge is materializing concerning the common nature of biological systems, as distinct from compilations of isolated facts about particular systems of organisms. Traditional boundaries between biological disciplines are disappearing. The recent creation of the Department of Molecular Biology recognizes the impact of these developments on the education of graduate students. The department emphasizes in its instruction and research the newer concepts, at the molecular level, that are common to the study of living forms from microbes to man. At the same time it recognizes that great diversity exists in the characteristics of organisms and it seeks in its educational program to define those areas where explanation at the molecular level is pertinent to a fuller understanding of such diversity.

Preparation for Graduate Study Students interested in pursuing graduate work in molecular biology are advised to obtain a strong background in chemistry, physics, and mathematics, and to be familiar with the basic concepts of biology. Biochemistry and genetics form the specific foundation for much of the instructional work in the department. Common preparation required of all students, as exemplified by course offerings at Berkeley:

<table>
<thead>
<tr>
<th>Courses</th>
<th>Quarter Units</th>
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</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td></td>
</tr>
<tr>
<td>General (4A–4B–4C)</td>
<td>15</td>
</tr>
<tr>
<td>Organic (8A–8B)</td>
<td>8</td>
</tr>
<tr>
<td>Physical (110A–110B)</td>
<td>6</td>
</tr>
<tr>
<td>Biochemistry (102, 102L or 100A–100B–100C)</td>
<td>9</td>
</tr>
<tr>
<td>Physics</td>
<td></td>
</tr>
<tr>
<td>General (Physics 4A–4B–4C–4D)</td>
<td>15</td>
</tr>
</tbody>
</table>

† On leave, 1968–69.
‡ On leave in residence, 1968–69.
+++ On leave, winter and spring quarters, 1969.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Quarter Units</th>
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<tbody>
<tr>
<td>Mathematics</td>
<td></td>
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<tr>
<td>Calculus (Math. 1A–1B–1C)</td>
<td>12</td>
</tr>
<tr>
<td>Biology</td>
<td></td>
</tr>
<tr>
<td>General (Biology 1A–1B–1C)</td>
<td>15</td>
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<tr>
<td>Additional</td>
<td></td>
</tr>
<tr>
<td>Undergraduate work including genetics</td>
<td>9</td>
</tr>
</tbody>
</table>
Those students who are deficient in their preparation when they enter the graduate program in molecular biology will be expected to remedy their deficiencies as soon as possible.

The Graduate Major for the Ph.D. Degree In addition to the basic courses (or their equivalents) listed above, the student will be expected to take courses in at least two of the following areas of specialization, such courses normally comprising 36 quarter units of work approved by the graduate adviser: (1) biological ultrastructure; (2) biological macromolecules; (3) molecular and microbial genetics; (4) cellular regulation and growth; (5) the biology of viruses; (6) the biology of bacteria; (7) bioenergetics; (8) pathways of cellular metabolism.

Demonstration of a reading knowledge of one foreign language chosen from French, German, Japanese, and Russian is required before the qualifying examination can be taken. The student must pass a qualifying examination in which he is expected to show familiarity in the special areas he has chosen.

Further information is available from the graduate adviser in 229 Molecular Biology–Virology Laboratory.

Letters and Science List: for regulations governing this list, see page 80.

Upper Division Courses

110. Molecular Basis of Heredity. (4)
Three 1-hour lectures per week. Prerequisite: Chemistry 8A-8B; Biology 1A-1B-1C. An introduction to the molecular basis of the structure and function of the hereditary substance of living forms, with particular emphasis on insights gained from the study of viruses and bacteria. Mr. Stent (Sp)

*111. Introduction to Molecular Virology. (4)
Four 1-hour lectures per week. Prerequisite: organic chemistry and an elementary course in biology. Consideration of viruses as infectious particles having chemical, physical, and hereditary characteristics. To be offered on a pass/not pass basis. Mr. Knight (F)

199. Special Study for Advanced Undergraduates. (1-3)
Meetings to be arranged. Reading and conference under the direction of a staff member. Restricted to senior honor students. The Staff (Mr. Rubin in charge) (Su, F, W, Sp)

Graduate Courses

200. Special Topics in Molecular Biology. (1-3)
One hour lecture per week per 1 unit of credit. Prerequisite: consent of instructor. A course dealing with the areas of current interest in molecular biology. May be repeated for credit.
The Staff (Mr. Williams in charge) (F, W, Sp)

201A–201B. Introduction to Molecular Biology. (4-4)
Four 1-hour lectures per week. Prerequisite: Biology 1A-1B-1C or equivalent, or Bacteriology 100A; Biochemistry 100A or 103, and a course in physical chemistry (these courses may be taken concurrently); one year of college mathematics or consent of the instructor. Two-semester sequence beginning in the fall.
201A. Genetic and functional characteristics of prokaryotic cells and of viruses, biosynthesis of nucleic acids and proteins, macromolecules, metabolic regulation.
Mr. Chamberlin, Mr. Glaser, Mr. Stanier (F)

201B. Fine structure and organization of eukaryotic cells. Molecular and cellular processes involved in the formation and function of differentiated multicellular systems.
Mr. Rubin, Mr. Williams, ———— (W)

211. Macromolecular Biophysics Laboratory. (6)
One lecture period and 12 hours of laboratory work per week. Prerequisite: Biochemistry 206 and consent of instructor. Experimental techniques used in the isolation, characterization, and study of the structure, synthesis, and interactions of macromolecules of biological interest. Mr. Chamberlin (Sp)

*220A–220B. Biology of Viruses. (3–3)
Three 1-hour lectures per week. Prerequisite: Biology 1A–1B–1C or equivalent, or Bacteriology 100A; Biochemistry 100A or 103 (may be taken concurrently); one year of college mathematics.
Two-quarter sequence beginning in the fall.
220A. Structure, dynamics of growth, and genetics of bacteriophage, and other aspects of bacteriophage-host interaction. ———— (F)
220B. Structure, growth dynamics, and cellular effects of animal viruses. ———— (W)

*221. General Virology Laboratory. (5)
One lecture period and 9 hours of laboratory work per week. Prerequisite: course 201A or 220A or 111, or consent of the instructor. Techniques used in research on bacterial, animal, and plant viruses.
Mr. Clark, Mr. Roth (F)

230. Bacterial Genetics Laboratory. (5)
Two 1-hour lecture periods and 9 hours of laboratory work per week. Prerequisite: course 231 or consent of instructor. Experimental techniques used in research on the genetics of bacteria.
Mr. Clark, Mr. Roth (Sp)

231. Bacterial Genetics. (3)
Three 1-hour lectures per week. Prerequisite: course 231A or 220A, or consent of instructor. An advanced course in bacterial genetics emphasizing current concepts.
Mr. Clark, Mr. Roth (Sp)

280. Research. (1-12)
Individual research under the supervision of a staff member.
The Staff (Mr. Stanley in charge) (Su, F, W, Sp)

* Not to be given, 1968–69.
290. Seminar. (1)
Recent topics in molecular biology. Topics will be announced in advance of each quarter. Enrollment in more than one section is permitted.
The Staff (F, W, Sp)

299. Special Study for Graduate Students. (1-5)
Meetings to be arranged. Reading and conferences under the direction of a staff member.
The Staff (Mr. Stanley in charge) (Su, F, W, Sp)

MUSIC

(Department Office, 104 Morrison Hall)

David D. Boyden, M.A., Mus.D. (h.c.), Professor of Music.
Charles C. Cushing, M.A., Professor of Music.
William D. Denny, M.A., Professor of Music (Vice-Chairman of the Department).
Vincent H. Buckles, Ph.D., Professor of Music and Head of the Music Library.
Arnold Elston, Ph.D., Professor of Music.
Daniel Heartz, Ph.D., Professor of Music.
Andrew W. Imbrie, M.A., Professor of Music.
Joseph Kerman, Ph.D., Professor of Music.
Lawrence Moe, Ph.D., Professor of Music and University Organist (Chairman of the Department).
Joaquin Nin-Culmell, Professor of Music.
Edgar H. Sparks, Ph.D., Professor of Music.
Richard L. Crocker, Ph.D., Associate Professor of Music.
Alan Curtis, Ph.D., Associate Professor of Music.
Philip Brett, Ph.D., Assistant Professor of Music.
James E. Cunningham, M.M., Assistant Professor of Music.
Jean-Claude Eloy, Assistant Professor of Music.
Edwin Dugger, M.F.A., Assistant Professor of Music.
Richard Felciano, Ph.D., Assistant Professor of Music.
Michael Senturia, A.B., Assistant Professor of Music.

Bernhard Abramowitsch, Lecturer in Music (Piano).
James Berdahl, M.A., Lecturer in Music and Director of Bands.
Estelle Caen, Lecturer in Music (Piano).
Jacqueline R. Clark, A.B., Lecturer in Music.
Elizabeth Davidson, M.A., Lecturer in Music.
Philip Fath, Lecturer in Music (Clarinet).
Michael Isador, A.B., Lecturer in Music (Piano).
Mary Groom Jones, Lecturer in Music.
Merrill Jordan, Lecturer in Music (Flute).
George H. Kyme, Ph.D., Lecturer in Music and Supervisor of the Teaching of Music.
David Lawton, A.B., Acting Assistant Professor of Music.
Daniel Livesay, A.B., Lecturer in Music (Trombone).
Margaret Lucchesi, M.A., Lecturer in Music (Percussion).
James Matheson, A.B., Lecturer in Music (Oboe).
James McKissic, B.S., Lecturer in Music.
Raymond Ojeda, Lecturer in Music (Bassoon).
Detlev Olshausen, A.B., Lecturer in Music (Viola).
Marjorie Gear Petray, A.B., Lecturer in Music.
Judith Poska, Lecturer in Music.

† On leave, 1968–69.
‡ On leave, fall quarter, 1968.
§ On leave, spring quarter, 1969.
** Humanities Research Fellowship Program, winter quarter, 1969.
Herman Reinberg, Lecturer in Music (Violoncello).
Rudolph Saltzer, D.M.A., Visiting Professor of Music for the summer quarter.
Earl Saxton, M.A., Lecturer in Music (French Horn).
David Schneider, Lecturer in Music (Violin).
Verne M. Sellin, B.S., Lecturer in Music.
Abe Sherman, A.B., Lecturer in Music.
Philip Shoptaugh, Lecturer in Music (Trumpet).
E. Rollin Silfies, M.A., Lecturer in Music for the spring quarter.
John M. Swackhamer, A.B., Lecturer in Music.

Departmental Major Advisers: Mr. Boyden, Mr. Brett, Mr. Denny.
Graduate Advisers: Composition, Mr. Nin-Culmell (M.A. and Ph.D.); History and Literature, Mr. Kerman (Ph.D.), Mr. Crocker (M.A).

Music Education Adviser: Mr. Elston.

The Department of Music at Berkeley is concerned with the cultivation of music in the University, by means of concerts, lectures, and courses offered for general students as well as for music majors in the three principal branches of musical endeavor. The Theory courses provide an introduction to the materials of musical composition through ear training, harmony, counterpoint, and analysis. The History and Literature courses present a comprehensive survey of the evolution of Western music and detailed study of the chief periods of its development. The Performance courses offer, through group performance, the study of standard, little-known, and new works representative of the repertoire for orchestra, chorus, chamber groups, and band.

The department will consider recommending to the Dean a reduction of the minimum unit load for those students who wish to pursue intensive vocal or instrumental study and to take longer than the usual four years to obtain the A.B. degree. Practice rooms are available without charge to students.

Students interested in graduate study are advised to become acquainted with the regulations of the Graduate Division. A background in foreign languages is essential: for the M.A. degree one foreign language, normally French or German; for the Ph.D. degree, option in research, French, German, and liturgical Latin; option in composition, French or German and one other language. Graduate study is offered in the theory, history, and composition of music; the value of a thorough undergraduate preparation cannot be overemphasized.

An advisory examination in piano and musicianship will be given during the advance enrollment period. Results of this examination will determine assignment to sections in elementary and intermediate courses. Students should consult the CIRCULAR FOR NEW UNDERGRADUATES for more detailed information. Entering undergraduates, including those transferring from other institutions, must take this examination, and should consult with the appropriate adviser before enrolling in any music course.

All students who wish either to audit or to enroll in performance courses are required to make appointments for auditions during the advance enrollment period.

The Major

First Year Courses A–B; 1A–1B.


Third and Fourth Years (a) Theory—Course 101A–101B. History and Literature—One course from the group 114–119. Performance—Three courses from the group 141–149, preferably in sequence. (b) Additional courses to complete from the mini-

† On leave, 1968–69.
Honors Program  Adviser: Mr. Boyden. Honor students majoring in music are requested to consult the adviser concerning privileges which may be accorded them. The Honors Seminar (course H195) is required of seniors who wish to obtain honors at graduation.

Teacher Training  Consult Mr. Elston. Attention is called to the following recommended courses: Orchestration (course 109A), Conducting (course 112A–112B), both of which may be used as elective courses for the major in the series 101–199; Vocal and Technique (course 428), and Stringed Instruments (course 429A), Wind Instruments (course 429B). See also the Announcement of the School of Education.

Higher Degrees

All graduate students should consult a graduate adviser during the advance enrollment period and take the advisory and language examinations scheduled at that time. Graduate students should consult Chapter III of this catalogue and the special announcements issued by this department concerning the M.A. and Ph.D. degrees.

Medieval Studies  Students who are interested in specializing in medieval studies should consult Chapter III of this catalogue.

Letters and Science List: for regulations governing this list, see page 80.

Group I

Courses open to all students in the University.

THEORY

Lower Division Courses

10. Basic Musicianship. (2)
Three 1-hour meetings per week. Fundamentals of music, including notation, sight singing, ear training, and beginning linear analysis. For general students. The Staff (Mrs. Clark in charge) (Su, F, W, Sp)

Three 1-hour meetings per week. A writing course, based on traditional harmony. Beginning linear and vertical analysis. For general students. Sequence beginning (F) Mr. Sherman

Upper Division Course

110. Basic Musicianship. (2)
Three 1-hour meetings per week. Prerequisite: course 10 or consent of instructor. A continuation of course 10 for students who wish to gain additional facility. The Staff (Mrs. Clark in charge) (Su, F, W, Sp)

HISTORY AND LITERATURE

Lower Division Course

27. Introduction to Music. (4)
Two 1-hour lectures, one 1-hour listening section, and one 1-hour discussion section per week. Lectures, demonstrations, and supervised listening dealing with the rudiments of music. Mr. Sparks (Su), Mr. Heartz (F); Mr. Crocker (W)

Upper Division Courses

127A. History of Music. (4)
Two 1-hour lectures, one 1-hour listening section, and one 1-hour discussion section per week. Prerequisite: course 27. The evolution of musical style from early times to Beethoven. Mr. Saltzer (Su); Mr. Heartz (W)

127B. History of Music. (4)
Two 1-hour lectures, one 1-hour listening section, and one 1-hour discussion section per week. Prerequisite: course 27 or consent of instructor. The evolution of musical style from Beethoven to the present day. Mr. Heartz (Sp)

128A. Opera. (4)
Three 1-hour lectures per week. Prerequisite: course 27. A study of twentieth-century operas, such as Pelléas, Elektra, Oedipus Rex, L'Enfant et les Sortilèges, Wozzeck, Moses and Aaron. Mr. Elston (Sp)

128B. The Symphonies of Beethoven. (4)
Three 1-hour lectures per week. Prerequisite: course 27. Mr. Denny (Sp)

128C. Contemporary Music. (4)
Three 1-hour lectures per week. Prerequisite: course 27. Mr. Felciano (F)

128D. J. S. Bach. (4)
Three 1-hour lectures per week. Prerequisite: course 27. Mr. Curtis (Su)

128E. Mozart. (4)
Three 1-hour lectures per week. Prerequisite: course 27. Mr. Kerman (W)
4 0 0 / MUSIC

**128F. Symphonic Literature of the Nineteenth Century. (4)**
Three 1-hour lectures per week. Prerequisite: course 27.
Mr. Swackhamer (F)

128G. Monteverdi. (4)
Three 1-hour lectures per week. Prerequisite: course 27.
Mr. Curtis (F)

128H. G. F. Handel. (4)
Three hours of lectures per week. Prerequisite: course 27.
Mr. Boyden (W)

PERFORMANCE
Audition for enrollment in any performance course will be required during the period of advance enrollment. Further information may be obtained at the departmental office.

All courses in this group may be repeated twice without duplication of credit. These courses should be taken in a three-quarter sequence.

**Lower Division Courses**

§40. Opera Workshop. (2)
Prerequisite: consent of instructor.
Mr. Popper (W, Sp)

41. University Symphony Orchestra. (2)
Two 2-hour rehearsals per week.
Mr. Lawton (F, W, Sp)

42. University Chamber Band. (2)
Two 1 1/2-hour rehearsals and one section hour per week.
Mr. Berdahl (F)

43. University Concert Band. (2)
Two 1 1/2-hour rehearsals and one section hour per week.
Mr. Berdahl (W, Sp)

44. University Chorus. (2)
Two 1 1/2-hour rehearsals and one section hour per week.
Mr. Berdahl (Sp)

48. Piano Ensemble. (2)
One 3-hour meeting per week. Study and interpretation of four- and eight-hand piano literature.
Mr. McKissic, Mrs. Petray (F, W, Sp)

**Upper Division Courses**

§140. Opera Workshop. (2)
Prerequisite: consent of instructor.
Mr. Popper (W, Sp)

* Not to be given, 1968–69.
† Approved for one offering only, 1968–69.

141. Advanced University Symphony Orchestra. (2)
Prerequisite: consent of instructor.
Mr. Lawton (F, W, Sp)

142. Advanced University Chamber Band. (2)
Prerequisite: consent of instructor.
Mr. Berdahl (F)

143. Advanced University Concert Band. (2)
Prerequisite: consent of instructor.
Mr. Berdahl (W, Sp)

144. Advanced University Chorus. (2)
Prerequisite: six units in course 44. Primarily concerned with major works for chorus and orchestra.
Mr. Sultzzer (Su); Mr. Cunningham (F, W, Sp)

145. Advanced Repertory Chorus. (2)
Prerequisite: six units in course 45. Primarily concerned with lesser-known significant choral literature.
Miss Davidson (F, W, Sp)

146. Advanced Chamber Music Ensemble. (2)
Prerequisite: consent of instructor.
Mr. Denny (Su); Mr. Berdahl, Miss Poska (F, W, Sp)

148. Advanced Piano Ensemble. (2)
Mr. McKissic, Mrs. Petray (F, W, Sp)

149. Collegium Musicum. (2)
Performance of Renaissance and Baroque music for voice and instruments.
Mr. Curtis (F, W, Sp)

**Group II**

Courses primarily for students whose major subject is music.

**Lower Division Courses**

A. Musicianship. (4)
Five 1-hour classes per week for ear training, sight singing, dictation, and an introduction to the literature of music.
The Staff (Mr. Sherman in charge) (F, Sp)

B–C. Musicianship. (2–2)
Three 1-hour classes per week for ear training, sight singing, and dictation. Sequence beginning (F, W).
The Staff (Mr. Sherman in charge)

1A–1B. Harmony. (4–4)
Three 1-hour classes per week for written and keyboard work. Sequence beginning (F, W).
The Staff (Mr. Imbrie in charge)

D–E. Musicianship. (2–2)
A continuation of course A–B–C, which is prerequisite.
Sequence beginning (F, W).
The Staff (Mrs. Petray in charge)

2A–2B–2C. Harmony. (4–4–4)
A continuation of courses 1A–1B, which is prerequisite.
Sequence beginning (F, W).
The Staff (Mr. Elston in charge)
21A–21B–21C. Development of Musical Style. (4–4–4)
The following courses will be given in rotation. Prerequisite: courses 2C and 21C or consent of instructor.

114. Music in the Fourteenth Century. (4)
A study of sacred and secular polyphony from the motets of Philippe de Vitry through the song forms of Guillaume de Machaut, his contemporaries and successors, up to 1400.

Mr. Crocker (Sp)

115. Music and Poetry of the English Renaissance. (2)
Prerequisite: Major in English or music, or consent of instructor. English music, from the carol to the madrigal and “creative musick,” and English poetry, from late medieval forms to the sonnet and the masque, will be studied to show their relationships. Must be taken concurrently with English 115.

Mr. Moe (Sp)

116A. The Symphonies of Mozart. (4)
Mr. Senturia

116B. The Concertos of Mozart. (4)
Mr. Eloy

116C. Seventeenth-century Venetian Opera. (4)
Mr. Moe

116E. The Performance of Baroque Music. (4)
Prerequisite: experience in playing an instrument or in singing. Three class hours per week.

Mr. Curtis (Sp)

116F. The Organ Music of J. S. Bach. (4)
Mr. Moe

116G. The Organ Music of Bach. (4)
Mr. Moe

117A. Nin-Culmell (Sp)
Mr. Denny

117B. The Works of C. P. E. Bach. (4)
Mr. Kerman (Sp)

118A. The String Quartets of Beethoven. (4)
Mr. Moe

118B. Piano Music of the Romantic Period. (4)
Mr. Kerman (Sp)

118C. Piano Technique. (4)
Mr. Denny

118D. Haydn. (4)
Mr. Kerman (Sp)

118E. Verdi. (4)
Mr. Moe

Prerequisite: courses 121B and 121C or the equivalent. Although courses 118F–118G are planned as a sequence, course 118G may be taken without 118F if the instructor consents. A study of the major composers and chief developments in music from the death of Beethoven to the death of Wagner.

Sequence beginning (F) Mr. Kerman

119A. Operetta. (4)
Mr. Moe

119B. Orchestration. (4)
Mr. Moe

119C. The String Quartets of Beethoven. (4)
Mr. Moe

119D. Chamber Music of the Twentieth Century. (4)
Mr. Moe

119E. Contemporary Music. (4)
Mr. Moe

160A–160B. Proseminar in Music History and Criticism. (4–4)
Prerequisite: courses 121A–121B–121C and one course in the series 115–119. An introduction to advanced work in music history and criticism, building on the students’ previous experience of musical literature.

* Not to be given, 1968–69.
§ To be offered 1968–69 only.
ture, history, theory, and analysis. A limited number of selected topics will be studied by means of lectures, discussions, and reports.

Sequence beginning (W)
Mr. Kerman (W); Mr. Crocker (Sp)

Honors and Special Studies Courses

H195. Honors Seminar. (4)
Two 1½-hour meetings per week. Open to senior honor students who have at least a 3.2 average in the major.
Mr. Boyden (Sp)

198. Group Special Study for Advanced Undergraduates. (2 or 4)
Restricted to senior honor students. Not to serve in lieu of regular courses of instruction.
The Staff (Mr. Denny in charge) (F, W, Sp)

199. Special Study for Advanced Undergraduates. (2 or 4)
Restricted to senior honor students. Not to serve in lieu of regular courses of instruction.
The Staff (Mr. Denny in charge) (F, W, Sp)

Graduate Courses

Consent of the instructor must be obtained before enrollment in any graduate course. For further conditions concerning admission to graduate courses, see page 139.

200A–200C. Introduction to Musical Scholarship. (4–4)
Bibliography, research methods, and individual projects typically drawn on manuscripts and early prints in the University of California Music Library. Sequence beginning (F), Mr. Dudaes (F, W, Sp)

200B. Principles of Notation. (4)
Three 1-hour meetings per week. Mr. Sparks (Sp)

One 3-hour meeting per week. The topic for 1968–69 will be studies in twentieth-century rhythm.
Mr. Elston (F)

203. Seminar in Composition. (4)
One 3-hour meeting per week.
Mr. Feliciano, Mr. Imbrie (F, W, Sp)

204. Studies in Musical Analysis. (4)
One 3-hour meeting per week.
Mr. Eloy (W); Mr. Dugger (Sp)

*205A–205B. The History of Theory. (4–4)
Sequence beginning (F), Mr. Crocker

208. Proseminar in Music History. (4)
Two 1½-hour meetings per week.
208A. Chant and Related Forms. Mr. Crocker (F)
208B. Cantus-firmus Polyphony and Related Forms. Mr. Brett (W)
208C. Humanism, Reformation, and Counter-reform.
Mr. Kerman (Sp)

*208D. The Seventeenth Century. Mr. Boyden (F)
*208E. The Eighteenth Century. Mr. Boyden (W)

*208F. Romanticism: C.F.E. Bach to Wagner.
Mr. Sparks (Sp)

*212. Seminar: Medieval Studies. (4)
One 3-hour meeting per week. Mr. Crocker (W)

One 3-hour meeting per week. Mr. Sparks (Sp)

*215. Seminar: Research in Music History. (4)
Mr. Kerman

One 3-hour meeting per week. Mr. Boyden (Sp)

One 3-hour meeting per week. The topic for 1968–69 will be Mozart opera. This research seminar extends over two consecutive quarters. A final grade will be assigned upon completion of both quarters.
Beginning (W) Mr. Heurtz

One 3-hour meeting per week. The topic for 1968–69 will be the origins and evolution of Wagner's musical style. This research seminar extends over two consecutive quarters. A final grade will be assigned upon completion of both quarters.
Beginning (F), Mr. Abraham (F, W)

220. Seminar: Problems in Criticism. (4)
Mr. Kerman (F)

*225. Seminar: History of Musical Instruments. (4)
Mr. Curtis

298. Group Special Studies. (4–8)
The Staff (Mr. Crocker in charge) (F, W); (Mr. Sparks in charge) (Sp)

299. Special Study. (2–8)
Open to properly qualified graduate students for research or creative work. Such work shall not serve in lieu of regular courses of instruction.
The Staff (Mr. Kerman in charge) (Su, F, W, Sp)

601. Individual Study for Master's Students. (1–8)
Preparation for the comprehensive or language requirements in consultation with the field adviser. May not be used for unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Crocker in charge)

602. Individual Study for Doctoral Students. (1–8)
Study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Kerman in charge)

Professional Courses

405A–405B–405C. Elementary Piano. (1½–1½–1½)
Required of music majors who do not pass the entrance examination in piano. Graded on a pass/not pass basis only.
Sequence beginning each quarter, Miss Camden

* Not to be given, 1968–69.
405D-405E-405F. Elementary Piano. (1½-1½-1½)

Required of music majors who do not pass the entrance examination in piano. Prerequisite: course 405C. Graded on a pass/not pass basis only.

Sequence beginning each quarter, Miss Caen.

428A-428B-428C. Vocal Technique. (2-2-2)

Three 1-hour meetings per week. Prerequisite: some ability at the piano. May be repeated once without duplication of credit. Principles of vocal and choral technique; voice-testing; care of adolescent voices; transposition; evaluation of teaching materials. Sequence beginning (F), Mrs. Jones.

NATURAL SCIENCE

Melvin Calvin, Ph.D., Professor of Chemistry.
Robert H. Haynes, Ph.D., Associate Professor of Medical Physics and of Biophysics.
John E. Hearst, Ph.D., Associate Professor of Chemistry.
William A. Jensen, Ph.D., Professor of Botany.
Robert Karplus, Ph.D., Professor of Physics.
Walter D. Knight, Ph.D., Professor of Physics.
Watson M. Laetsch, Ph.D., Assistant Professor of Botany.
Henry Rapoport, Ph.D., Professor of Chemistry.
John O. Rasmussen, Ph.D., Professor of Chemistry.
Frederick Reif, Ph.D., Professor of Physics.
Patricia St. Lawrence, Ph.D., Associate Professor of Genetics.
Herbert L. Strauss, Ph.D., Associate Professor of Chemistry.
Richard C. Strohman, Ph.D., Associate Professor of Zoology.

1A-1B-1C. Contemporary Natural Science. (4-4-4)

Three 1-hour lectures and two 1-hour discussion sections per week. This course, intended primarily for students who are not majoring in one of the natural sciences, is an integrated presentation spanning the areas of physics, chemistry, and biology. It is designed to stress fundamental concepts, to indicate what modern scientists do, and to point out occasional philosophical or social implications. Credit for this course will be given ordinarily only if all three quarters are passed by the student, and if the student has had no prior college course in either physics or biology. Exceptions can be made with consent of instructor upon approval of the Dean. The course satisfies the Letters and Science breadth requirements in both the physical and biological sciences (groups A and B). Sequence beginning (F), Mr. Karplus, Mr. Rapoport, Mr. Jensen.

NAVAL SCIENCE

(Department Office, 25 Callaghan Hall)

The officers of instruction in this department are commissioned officers of the United States Navy and Marine Corps especially selected by the Navy and the University of California for teaching the Naval Science curriculum.

Roy D. Miller, B.S., Colonel, U. S. Marine Corps, Professor of Naval Science (Chairman of the Department).
Louis B. Fields, B.S., Commander, U. S. Navy, Associate Professor of Naval Science.
Hans S. Haupt, B.S., Major, U. S. Marine Corps, Assistant Professor of Naval Science.
John C. Kennedy, B.S., Lieutenant, U. S. Navy, Assistant Professor of Naval Science.
Richard Klippert, B.S., Lieutenant, U. S. Navy, Assistant Professor of Naval Science.
Frederic D. Winslow, B.E.E., Lieutenant, U. S. Navy, Assistant Professor of Naval Science.
The Department of Naval Science and the Naval Reserve Officers Training Corps (NROTC) offer programs of instruction leading to Regular or Reserve commissions in the U. S. Navy and the U. S. Marine Corps.

The Contract program offers a commission in the Navy or Marine Corps Reserve. This program is entered during the fall quarter of either the freshman or junior year. Entering freshmen are selected locally from voluntary applicants during registration week. All other applicants should contact the Professor of Naval Science for information concerning entry into the NROTC program early in the winter quarter of their sophomore year. The Navy supplies uniforms and Naval Science textbooks to these students, and pays $50 per month to upper division students. Contract students participate in one summer cruise between their junior and senior years, and upon graduation serve three years on active duty.

The Regular program offers a commission in the Regular Navy or Marine Corps. Students are selected by the Navy Department on the basis of a nationwide competitive examination, and are designated Reserve Midshipmen. These midshipmen receive a scholarship including tuition, uniforms, all textbooks, and pay of $50 per month through their normal college career. They participate in three summer cruises to gain concurrent field experience, and upon graduation serve four years on active duty. Commissions are also available in the U. S. Navy Supply Corps and Civil Engineering Corps.

All NROTC students are classified 1-D for selective service. For further details, contact the Professor of Naval Science in Callaghan Hall.

Navy Science courses are the same for both regular and contract students with 33 hours required. All courses meet three times a week with a two-hour laboratory session which includes one hour drill at 1200 Thursday. Second-year NROTC students are required to take Psychology 30 in lieu of a naval science course during fall quarter.

Lower Division Courses

(All courses required.)

1. The Naval Service. (3)

Three 1-hour lectures per week and two 1-hour laboratories per week. Development of customs, traditions and terminology in the Navy Service. Organizational relationships in the Navy and Department of Defense. Functional elements of the modern Navy and its relevant equipments. Individual responsibilities of the Naval Officer toward discipline, leadership, education, communications, law and security. Laboratory work includes military drill, problems in leadership, demonstration and operation of various equipments. Lt. Winslow (F)

2A–2B. History of Seapower. (3–3)

Three 1-hour lectures and two 1-hour laboratories. The military, political and economic aspects of seapower. Development of naval war and geopolitical theories. Use of seapower as one means of achieving national objectives and its effects on international conflicts. Possible uses of the principles of naval warfare in the war-peace continuum of the future. Guest lecturers from various departments discuss individual leaders, battles and technologies. Laboratory work includes discussion, examination and use of evolving equipments, maneuvers and doctrines. 2A. Ancient times to Civil War. 2B. Civil War to present.

3A–3B. Naval Weapons Systems. (3–3)

Three 1-hour lectures and two 1-hour laboratories per week. The study of design, control and delivery functions of various naval weapons systems. Laboratory work includes demonstrations and use of various systems at naval facilities in the local area. 3A. Emphasis on current systems used in air, surface, and subsurface warfare. 3B. Nuclear weapons systems and space technology. Sequence beginning in the winter, Lt. (j.g.) Mickelsen (W, Sp)

Upper Division Courses

(Six courses required.)

111. Naval Operations. (3)

Three 1-hour lectures and two 1-hour laboratories per week. The study of various fleet operations and current developments in fleet concepts and doctrines. The application of communications and electronics theory to fleet tactical and strategic communications. Meteorological effects on fleet operations. Lt. Klippert (F)

112A–112B. Navigation. (3–3)

Three 1-hour lectures and two 1-hour laboratories per week. Prerequisite: Trigonometry. 112A is prerequisite to 112B.

112A. The principles and practice of terrestrial navigation and the application of electronic navigation and piloting. Laboratory work includes application of principles covered in the readings and lectures. Nautical rules of the road, meteorology.

112B. Nautical Astronomy. The principles of celestial navigation. The laboratory work includes the various methods of solution of celestial problems and sight reduction. Lt. Klippert (W, Sp)
121. Marine Engineering. (3)
Three 1-hour lectures and two 1-hour laboratories per week. The course acquaints students with 33 1-hour lectures and two 1-hour laboratories per month. The course is divided into three sections. The elements of personnel management are introduced. Laboratory work includes practical leadership and management from the junior officer standpoint and the uniform code of military justice. (3)

122. Marine Engineering and an Introduction to Naval Management. (3)
Three 1-hour lectures and two 1-hour laboratories per week. The course is divided into three sections. The elements of personnel management are introduced. Laboratory work includes practical leadership and management from the junior officer standpoint and the uniform code of military justice. (3)

123. Principles and Problems of Naval Leadership and Management. (3)
Three 1-hour lectures and two 1-hour laboratories per week. The course is divided into three sections. The elements of personnel management are introduced. Laboratory work includes practical leadership and management from the junior officer standpoint and the uniform code of military justice. (3)

Three 1-hour lectures and two 1-hour laboratories per week. The course is divided into three sections. The elements of personnel management are introduced. Laboratory work includes practical leadership and command of junior midshipmen on the drill field. (3–3–3)

Three 1-hour lectures and two 1-hour laboratories per week. The course is divided into three sections. The elements of personnel management are introduced. Laboratory work includes practical leadership and command of junior midshipmen on the drill field. (3–3)

156. Leadership and the Uniform Code of Military Justice. (3)
Three 1-hour lectures and one 2-hour laboratory per week. The course is divided into three sections. The elements of personnel management are introduced. Laboratory work includes practical leadership and management in military organizations. The course also includes a brief study of the procedures of military law under the Uniform Code of Military Justice. (3)

NEAR EASTERN LANGUAGES

(Department Office, 1229 Dwinelle Hall)

William M. Brinner, Ph.D., Professor of Near Eastern Languages (Chairman of the Department).
Walter J. Fischel, Ph.D., Professor of Semitic Languages and Literature.
Jonas C. Greenfield, Ph.D., Professor of Semitic Languages.
Henry L. F. Lutz, Ph.D., D.D., LL.D., Professor of Egyptology and Assyriology.

Emeritus.
Robert Alter, Ph.D., Associate Professor of Hebrew and Comparative Literature.
Mounah A. Khouri, Ph.D., Associate Professor of Arabic.
Anne D. Kilmer, Ph.D., Associate Professor of Assyriology.
Hamid Algar, Ph.D., Assistant Professor of Near Eastern Languages.
Ariel A. Bloch, Ph.D., Assistant Professor of Near Eastern Languages.
Talat Tekin, Ph.D., Assistant Professor of Turkish.

Francis I. Andersen, Ph.D., Visiting Professor of Hebrew.
Florence I. Faerstein, M.A., Associate in Hebrew.
Victor R. Gold, Ph.D., Visiting Professor of Semitic Languages.
Charlotte Grosman, Associate in Hebrew.

** Humanities Research Fellowship Program.
*** Humanities Research Fellowship Program for spring quarter.
Jacob Milgrom, D.H.L., Acting Associate Professor of Hebrew and Bible.
Bruce R. Pray, M.A., Acting Assistant Professor of South Asian Languages.
David S. Winston, Ph.D., Visiting Associate Professor of Semitic Languages.
Gordon C. Roadarmel, M.A., Acting Assistant Professor of South Asian Languages and Literature.
Maurice B. Salib, B.A., Associate in Arabic.
Gerard G. Salinger, Ph.D., Lecturer in Near Eastern Languages.
Ruggero Stefanini, Dottore in Lettere, Associate Professor of Anatolian Studies and of Italian.

Departmental Major Advisers: Near East, Ariel A. Bloch; South Asia, Gordon C. Roadarmel.
Graduate Advisers: Near East, Anne D. Kilmer, South Asia, Gordon C. Roadarmel.

Instruction in the Department of Near Eastern Languages is concerned with the languages and civilizations of the ancient, medieval, and modern Near East, and South Asia. The department offers specialized training in Assyriology, Egyptology, Hittitology, Iranian Studies, Judaic and Islamic Studies, Turkish, and South Asian languages and cultures. For students from other disciplines, the department provides a wide variety of courses to supplement such related fields as linguistics, history, political science, comparative literature, and anthropology. Many of the department's courses are restricted to a small number of students, thus affording an opportunity for close contact with the instructing staff. To those not studying the languages, the lecture courses offer a comprehensive body of information on past and present Near Eastern and South Asian civilizations.

Cooperative arrangements between the University and the nearby Graduate Theological Union enable students in the Department to use the extensive library holdings of the Union and to supplement their programs with selected courses in Palestinian archaeology, Biblical studies, and Semitic epigraphy and philology.

The Major

I. In Arabic, Hebrew, Persian, Turkish, Hindi, and Urdu: Prerequisite: the elementary courses in the language, or their equivalents. It is recommended that these be taken in the freshman year.

The major requires 37 upper division language units plus 8 upper division lecture units, for a complete total of 45 units. The distribution of courses should be determined in consultation with the major adviser. With the consent of the department, portions of the requirement may be fulfilled by related courses in other departments.

II. In Assyriology, Hittitology, Old Iranian Studies, and Egyptology: A basic reading knowledge of German is recommended. The major requires 36 upper division language units plus 8 upper division lecture units.

Honors Program In addition to completing the regular requirements for the major, a candidate for graduation with honors must (a) have a 3.0 grade-point average overall and within the department and (b) complete the Honors Course H198, in which he will prepare an honors thesis in his senior year.

Graduate Study

Graduate programs leading to the M.A. and Ph.D. degrees are offered in the following languages and literatures: Arabic, Hebrew, Persian, Hindi, Urdu, and Turkish; and in the following special fields of the Near East: Altaic studies, Assyriology, Biblical and Judaic studies, Old Iranian studies, comparative Semitics, Egyptology, Hittitology, and Islamic studies.
Degrees

Applicants for graduate study should have fulfilled the equivalent of the departmental requirements for the A.B. or be prepared to satisfy these requirements before advancement to candidacy.

The M.A. degree is obtained according to Plan II. In addition to the plan’s requirements, the student must pass a reading examination in French or German (or Russian for Persian, South Asian and Altaic Studies). A written final examination is required of each student to test (a) his working knowledge of the pertinent languages—one major language and at least one minor language in the department—according to his field of concentration; (b) his general knowledge of the relevant history and civilization of his area; and (c) his knowledge of other subjects specified in the program.

Admission to candidacy in the Ph.D. program depends on successful completion of the following requirements: (1) a reading examination in the European language not taken for the M.A. degree; (2) both the written and oral sections of the qualifying examination; and (3) submission of research or seminar reports written in the course of graduate work.

After admission to candidacy, the student completes his dissertation according to Plan B.

For further details, consult the regulations of the Graduate Division and the Graduate Adviser in 1229 Dwinelle Hall.

Letters and Science List: for regulations governing this list, see page 80.

Undergraduate Courses Not Requiring Knowledge of Area Languages

Near Eastern

Lower Division Courses

10. Languages and Cultures of the Near East. (4)
Three 1-hour lectures per week. The growth, structure, and differentiation of ethnic, religious and language groups in the Arab states, Israel, Turkey, and Iran.
Mr. Brinner (Sp)

Three 1-hour lectures per week. A survey of the Hebrew literary achievement in translation, from the Bible to Bialik.
Mr. Fischel (W)

Upper Division Courses

150A-150B-150C. The History of Ancient Israel.
(4-4-4)
Three 1-hour lectures per week. 150A, the Patriarchal age through the age of Solomon; 150B, the Divided Kingdom through the Persian period; 150C, the Hellenistic and Talmudic periods. Sequence beginning in the fall, but one quarter is not a prerequisite for another.
Mr. Milgrom (F, W, Sp)

151. Jewish Civilization. (4)
Three 1-hour lectures per week. The social, religious and cultural aspects of Jewish life in the main centers of Asia, Africa, and Europe from the time of the coming of Islam to the nineteenth century.
Mr. Fischel (Sp)

152A-152B-152C. The Literature of Ancient Israel.
(4-4-4)
Three 1-hour meetings per week. The literary genre of the Biblical and Postbiblical literature: codes, poetry, prophecy, proverbs, and liturgy.
152A. Biblical codes, early poetry and narrative.
152B. Biblical prophecy, liturgy and proverbs.
152C. The Apocrypha and Hellenistic literature. Sequence beginning in the fall, but one quarter is not a prerequisite for another.
Mr. Milgrom (F, W, Sp)

160A-160B. Culture of Iran in Islamic Times.
(4-4)
Three 1-hour meetings per week. A general survey of Iranian cultural history from the beginning of the Islamic era, with special emphasis on religious and philosophical currents. 160A, from the downfall of the Sasanid empire to the establishment of the Samanid dynasty; 160B, from the Ghaznavids to the nineteenth century.
Mr. Algar (F, W)

161A-161B. The Religions of Ancient Iran. (3-3)
Two 1-hour lectures per week. Principally devoted to the study of Zoroastrianism and Manichaeanism.
Sequence beginning (F)

162A-162B. Introduction to the Comparative Study of the Iranian Languages. (3-3)
Two 1-hour lectures per week. Prerequisite: consent of instructor and familiarity with at least one classical Indo-European language or with the processes of comparative philology. Survey of the languages of the Iranian branch of the Indo-European family of languages.
Sequence beginning (F)

163A-163B. History of Persian Literature. (4-4)
Three 1-hour lectures per week. 163A. Classical Persian literature from Firdaws of the fifteenth century. Mr. Algar (F) 163B. Persian literature from the fifteenth century to the contemporary period. Mr. Algar (W)

164A-164B. Civilization of Ancient Iran. (3-3)
Two 1-hour lectures per week. The civilization of the Iranian nations from the beginning to the rise of Islam.
Sequence beginning (F)

* Not to be given, 1968–69.
† Given in alternate years.
‡ Given every three years.
**165A—165B—165C. Armenian Civilization. (3—3—2)**
165A—165B, two 1-hour meetings per week; 165C, one 1-hour meeting per week. 165A—165B, a survey of the history of Armenia from the Urartian period to modern times with special emphasis on the Armenian cultural heritage; 165C, a survey of Armenian literature from its beginning to modern times. (F, W, Sp)

**168A—168B. Survey of Turkish Literature. (4—4)**
Three 1-hour lectures per week. Turkish literature in translation from its origins in folklore through classical literature to the literature of the modern period. Mr. Tekin (F, W, Sp)

**170A—170B. Religion and Cosmology of Ancient Mesopotamia. (4—4)**
Three 1-hour lectures per week. Discussion of original sources bearing on the religious beliefs and practices of the ancient Mesopotamians. (F, W)

**171A—171B—171C. Ancient Western Asia. (4—4—4)**
Three 1-hour lectures per week. Civilization of Mesopotamia and adjacent regions from its origins to the period of the Persian Empire. Mrs. Kilmer, Mr. Greenfield (F, W, Sp)

**172A—172B. Ancient Mesopotamian Documents and Literature. (4—4)**
Three 1-hour lectures per week. A study of the writings on clay tablets (in translation). A survey of a selection of literary, legal, economic, epistolary, educational, scientific, historiographic, divinatory, and religious texts. Mrs. Kilmer (F, W)

Three 1-hour lectures per week. The history and institutions of ancient Egypt from its earliest period to the Hellenistic period. Mr. Leask (F, W, Sp)

**180A—180B. Islamic Civilization. (4—4)**
Three 1-hour lectures per week. The political, legal, and social institutions of Islam will be critically studied in an historical framework. Mr. Bronner (F, W)

**182A—182B. Survey of Arabic Literature. (4—4)**
Three 1-hour meetings per week. Developments in classical and modern Arabic literature with emphasis on representative authors and works from the pre-Islamic period to the present. (F, W)

Graduate Course

**602. Individual Study for Doctoral Students. (1—8)**
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (F, W, Sp, Su)

### South Asian

**Upper Division Courses**

**191A—191B—191C. Literary and Cultural Traditions of India. (4—4—4)**
Three 1-hour lectures per week. The development of certain basic concepts and ideas as illustrated by ancient, classical, medieval, and modern Indian literature. Analogies will also be drawn from the other arts. Mr. Roadarmel (F, W, Sp)

**192. The Origin and Development of Hindi and Urdu. (3)**
Two 1-hour meetings per week. The historical and linguistic background of modern Hindi and Urdu. Mr. Fray (Sp)

### Arabic

**Lower Division Courses**

**1A—1B—1C. Elementary Arabic. (4—4—5)**
Five 1-hour recitation sessions and one 1-hour laboratory per week. Sequence beginning (F). Mr. Saahib (F, W, Sp)

**10. Intensive Elementary Arabic. (10)**
Ten 1-hour lectures, five 1-hour drill sessions and five 1-hour laboratories per week. Prerequisite: Not open to students who have taken Arabic 1A—1B—1C. (Su)

**Upper Division Courses**

**100A—100B—100C. Intermediate Arabic. (5—4—4)**
Five 1-hour recitation sessions and two 1-hour drill sessions per week. Prerequisite: course 1A—1B—1C, or course 10, or equivalent. Sequence beginning (F). The Staff (F, W, Sp)

**101A—101B—101C. Selected Readings from Classical and Modern Arabic. (3—3—3)**
Two 1-hour meetings per week. Prerequisite: course 100A—100B—100C or equivalent. Mr. Bloch (F, W, Sp)

**102A—102B—102C. Early Islamic Texts. (3—3—3)**
Two 1-hour meetings per week. Prerequisite: course 101A—101B—101C or equivalent. Mr. Bloch (F, W, Sp)

**103A—103B—103C. Classical Arabic Poetry. (3—3—3)**
Two 1-hour meetings per week. Prerequisite: course 102A—102B—102C or equivalent. Mr. Khouri (F, W, Sp)

**104A—104B—104C. Literature and Thought of the Abbasid Period. (3—3—3)**
Two 1-hour meetings per week. Prerequisite: course 101A—101B—101C or equivalent. Mr. Salinger (F, W, Sp)

**105A—105B—105C—105D—105E. Modern Arabic Literature. (3—3—3—3—3)**
Two 1-hour meetings per week. 105A—105B, Novel and Drama. (3-3) Mr. Khouri (F, W)
105C. Short Story and Essay. (3) Mr. Khouri (Sp)
105D—105E. Poetry. (3—3) Mr. Khouri (F, W)

**106A—106B—106C. Grammar Review and Composition. (3—3—3)**
Two 1-hour meetings per week. Prerequisite: course 101A—101B—101C or equivalent. Mr. Bloch (F, W, Sp)

* Not to be given, 1968—69.
† Given in alternate years.
**NEAR EASTERN LANGUAGES**

**H198. Senior Honors. (2)**
Prerequisite: limited to senior honors candidates. Directed study centering upon preparation of an honors thesis. The Staff (F, W, Sp)

**199. Special Study for Advanced Undergraduates. (1–5)**
Restricted to senior honor students. The Staff (F, W, Sp)

**Graduate Courses**

**200A–200B–200C. Classical Armenian. (2–2–2)**
Two 1-hour meetings per week. Prerequisite: working knowledge of modern Armenian or of one of the early Indo-European languages, such as Latin, Greek, or Sanskrit. May be repeated for additional credit. The structure of classical Armenian and its place among the Indo-European languages. (F, W, Sp)

**290. Special Study. (1–5)**
The Staff (F, W, Sp)

**Cuneiform**

**Upper Division Courses**

**100A–100B–100C. Elementary Akkadian. (4–4–4)**
Three 1-hour meetings per week. Introduction to Akkadian grammar, reading of selected Cuneiform texts. Sequence beginning (F). Mrs. Kilmer (F, W, Sp)

Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit. Reading of texts selected on an individual basis. Sequence beginning (F). Mrs. Kilmer (F, W, Sp)

**102A–102B–102C. Elementary Sumerian. (4–4–4)**
(Formerly numbered 210A–210B–210C) Three 1-hour meetings per week. Prerequisite: course 100A–100B–100C or consent of instructor. Introduction to Sumerian grammar. (F, W, Sp)

Three 1-hour meetings per week. Introduction to Cuneiform Hittite language and grammar with reading of selected historical and religious texts. Sequence beginning (F). Mr. Stefanini (F, W, Sp)

**H198. Senior Honors. (2)**
Prerequisite: limited to senior honors candidates. Directed study centering upon preparation of an honors thesis. The Staff (F, W, Sp)

**199. Special Study for Advanced Undergraduates. (1–5)**
Restricted to senior honor students. The Staff (F, W, Sp)

**Armenian**

**Lower Division Course**

**1A–1B–1C. Elementary Modern Armenian. (5–5–4)**
Five 1-hour recitation sessions per week. Sequence beginning (F). (F, W, Sp)

**Upper Division Courses**

**100A–100B–100C. Intermediate Modern Armenian. (4–3–3)**
Five 1-hour recitation sessions per week. Prerequisite: course 1A–1B–1C or consent of instructor. Sequence beginning (F). (F, W, Sp)

* Not to be given, 1968–69.
Two 1-hour meetings per week. Prerequisite: course 102A–102B–102C or consent of instructor. Selected Cuneiform texts. May be repeated for additional credit.
Sequence beginning (F). ——— (F, W, Sp)

290. Special Study. (1–5)
The Staff (F, W, Sp)

291. Seminar. (2)
Students may receive credit for more than one seminar in the same quarter. May be repeated for additional credit with consent of instructor.
The Staff (F, W, Sp)

Dravidian

Lower Division Courses

1A–1B–1C. Elementary Tamil. (4–4–5)
Five 1-hour recitation sessions and two 1-hour lectures per week.
Sequence beginning (F). ——— (F, W, Sp)

10. Intensive Elementary Tamil. (10)
Five 3-hour meetings and five hours of language laboratory work per week. Not open to students who have taken 1A–1B–1C.
(Su)

Upper Division Course

100A–100B–100C. Studies in Dravidian Languages. (5–4–4)
Four 1-hour meetings per week. Prerequisite: course 1A–1B–1C or equivalent. May be repeated for additional credit. Sequence beginning (F).
(F, W, Sp)

Graduate Courses

290. Special Study. (1–5)
The Staff (F, W, Sp)

291. Seminar. (2)
Students may receive credit for more than one seminar in the same quarter. May be repeated for additional credit with consent of instructor.
The Staff (F, W, Sp)

Egyptian

Upper Division Courses

* 100A–100B–100C. Elementary Egyptian. (4–4–4)
Three 1-hour meetings per week. Middle Egyptian grammar and texts. Sequence beginning (F). Mr. Lesko (F, W, Sp)

Three 1-hour meetings per week. Prerequisite: course 100A–100B–100C, or equivalent. Readings in Middle Egyptian hieroglyphic and hieratic texts. Introduction to Old Egyptian. May be repeated for additional credit. Sequence beginning (F). Mr. Lesko (F, W, Sp)

102A–102B–102C. Elementary Coptic. (4–4–4)
Three 1-hour meetings per week.
Mr. Lesko (F, W, Sp)

H198. Senior Honors. (2)
Prerequisite: limited to senior honors candidates. Directed study centering upon preparation of an honors thesis.
The Staff (F, W, Sp)

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students.
The Staff (F, W, Sp)

Graduate Courses

Two 1-hour meetings per week. Prerequisite: Egyptian 102A–102B–102C or consent of instructor. May be repeated for additional credit.
Mr. Lesko (F, W, Sp)

201A–201B–201C. Later Stages of Egyptian. (3–3–3)
Three 1-hour meetings per week. Prerequisite: course 101A–101B–101C and 102A–102B–102C or equivalent. Introduction to late Egyptian and Demotic. Sequence beginning (F). ——— (F, W, Sp)

Three 1-hour meetings per week. Prerequisite: concurrent or previous enrollment in course 201A-201B-201C or consent of instructor. May be repeated for additional credit. Philological analysis of texts of a single genre and period. Sequence beginning (F). ——— (F, W, Sp)

290. Special Study. (1–5)
The Staff (F, W, Sp)

291. Seminar. (2)
Students may receive credit for more than one seminar in the same quarter. May be repeated for additional credit with consent of instructor.
The Staff (F, W, Sp)

Hebrew

Lower Division Courses

1A–1B–1C. Elementary Hebrew. (4–4–5)
Five 1-hour recitation sessions and one 1-hour laboratory per week. Sequence beginning in the fall.
Mrs. Grosman (F, W, Sp)

* 10. Intensive Elementary Hebrew. (10)
Ten 1-hour lectures, five 1-hour drill sessions and five 1-hour laboratories per week. ——— (Su)

(Formerly numbered 100A–100B–100C)
Five 1-hour recitation sessions per week. Prerequisite: course 1A–1B–1C, or equivalent. Sequence beginning (F). Miss Faerstein (F, W, Sp)

Upper Division Courses

100A–100B–100C. Advanced Hebrew. (4–4–4)
Four 1-hour meetings per week. Prerequisite: course 20A–20B–20C or equivalent.
The Staff (F, W, Sp)

Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit with consent of instructor.
Mr. Milgrom (F, W, Sp)

* Not to be given, 1968–69.
102A–102B–102C. Early Postbiblical Hebrew Texts. 
(3–3–3)
Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit with consent of instructor.
Mr. Fischel (F, W, Sp)

103A–103B–103C. Medieval Hebrew Texts. (3–3–3)
Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit with consent of instructor.
Miss Rosenberg (F, W, Sp)

104A–104B–104C. Modern Hebrew Texts. (3–3–3)
Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit with consent of instructor.
Mr. Alter (F, W, Sp)

Two 1-hour meetings per week. Prerequisite: course 104A–104B–104C and either 101A–101B–101C, 102A–102B–102C or 103A–103B–103C. —— (F, W, Sp)

**H198. Senior Honors. (2)
Prerequisite: limited to senior honors candidates.
Directed study centering upon preparation of an honors thesis. The Staff (F, W, Sp)

199. Special Study for Advanced Undergraduates. 
(1–5)
Restricted to senior honors students.
The Staff (F, W, Sp)

Graduate Courses

201A–201B–201C. Advanced Biblical Hebrew. 
(3–3–3)
Two 1-hour meetings per week. Prerequisite: courses 101A–101B–101C and 105A–105B–105C or equivalent.

(3–3–3)
Two 1-hour meetings per week. Prerequisite: courses 102A–102B–102C and 105A–105B–105C or equivalent.

(3–3–3)
Two 1-hour meetings per week. Prerequisite: courses 103A–103B–103C and 105A–105B–105C or equivalent. Miss Rosenberg (F, W, Sp)

204A–204B–204C. Advanced Modern Hebrew. 
(3–3–3)
Two 1-hour meetings per week. Prerequisite: courses 105A–105B–105C and one of the following: 101A–101B–101C, 102A–102B–102C or 103A–103B–103C, or equivalents.
Miss Rosenberg, Mr. Alter (F, W, Sp)

*205. Studies in Hebrew Linguistics. (3)
Two 1-hour meetings per week. Prerequisite: consent of instructor. (Sp)

290. Special Study. (1–5)
The Staff (F, W, Sp)

291. Seminar. (2)
Students may receive credit for more than one seminar in the same quarter. May be repeated for additional credit with consent of the instructor.
The Staff (F, W, Sp)

**Hindi-Urdu**

**Lower Division Courses**

1A–1B–1C. Elementary Hindi-Urdu. (4–4–5)
Seven 1-hour sessions and two 1-hour laboratories per week. Sequence beginning (F).
Mr. Roadarmel (F, W, Sp)

10. Intensive Elementary Hindi-Urdu. (10)
Five 3-hour meetings and five hours of language laboratory work per week.

**Upper Division Courses**

100A–100B–100C. Intermediate Hindi-Urdu. 
(5–4–4)
Five 1-hour meetings per week. Prerequisite: course 1A–1B–1C or equivalent.
Sequence beginning (F). Mr. Pray (F, W, Sp)

(3–3–3)
Three 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit. A is not a prerequisite for B, nor B for C.

*102A–102B–102C. Readings in Hindi Expository Prose. (3–3–3)
Three 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. Study of nonliterary writings. May be repeated for additional credit. A is not a prerequisite for B, nor B for C.

*103A–103B–103C. Advanced Hindi Conversation. 
(3–3–3)
Three 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit. A is not a prerequisite for B, nor B for C.

*111A–111B–111C. Advanced Urdu. (4–4–4)
Five 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit. Texts selected according to individual requirements. Sequence beginning (F).
Mr. Pray (F, W, Sp)

*149A–149B–149C. Studies in South Asian Languages. (2–4, 2–4, 2–4)
Two to four meetings per week. Prerequisite: consent of instructor. Directed study in South Asian languages other than Hindi-Urdu.
The Staff (F, W, Sp)

150. Intensive Intermediate Hindi-Urdu. (10)
Five 3-hour meetings and five hours of language laboratory work per week. Prerequisite: not open to students who have taken Hindi-Urdu 100A–100B–100C.

* Not to be given, 1968–69.
Two 1-hour meetings per week. Prerequisite: course 101A–101B–101C or consent of instructor. 
(F, W, Sp) 

103A–103B–103C. Classical Persian Poetry. (3–3–3)
Two 1-hour meetings per week. Prerequisite: course 101A–101B–101C or consent of instructor. 
(F, W, Sp) 

*110A–110B–110C. Middle Persian. (3–3–3)
Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit. Manichean Middle Persian texts, with an introduction to Pahlavi. 
(F, W, Sp) 

*111A–111B–111C. Old Iranian. (3–3–3)
Two 1-hour meetings per week. Prerequisite: consent of the instructor. May be repeated for additional credit. Texts from the Vendidad and the Yashnas; Achaemenid inscriptions. 
(F, W, Sp) 

H198. Senior Honors. (2)
Prerequisite: limited to senior honors candidates. Directed study centering upon preparation of an honors thesis. The Staff (F, W, Sp) 

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students. The Staff (F, W, Sp) 

Graduate Courses

Two 1-hour recitation sessions per week. Prerequisite: 28 units of upper division work. Different sections offering a variety of texts from all periods of the literature. May be repeated for additional credit. 
(F, W, Sp) 

*201A–201B–201C. Iranian Philology. (3–3–3)
Two 1-hour meetings per week. Prerequisite: course 110A–110B–110C or 111A–111B–111C, or consent of instructor. May be repeated for additional credit. Reading of texts in Avestan, Western Middle Iranian, and Sogdian taken from Zoroastrian, Manichaean and Buddhist texts. 
(F, W, Sp) 

290. Special Study. (1–5)
The Staff (F, W, Sp) 

291. Seminar. (2)
Students may receive credit for more than one seminar in the same quarter. May be repeated for additional credit with consent of instructor. The Staff (F, W, Sp) 

Semitics

Upper Division Courses

*100A–100B–100C. Aramaic. (3–3–3)
Two 1-hour meetings per week. Prerequisite: Hebrew 100A–100B–100C or consent of instructor. Biblical and Ancient Aramaic, including study of the Aramaic parts of Daniel and Ezra and the inscriptions and papyri from Syria, Egypt, Mesopotamia, and the Persian Empire. Sequence beginning: (F). 
Mr. Bloch, ——— (F, W, Sp) 

§ Not to be given, 1968–69. 
§ Approved for one offering only, 1968–69. 

NUTRITION

Graduate Courses

16A–18C. Elements of Nutrition. Five 1-hour recitation sessions per week. 

Turkish

Lower Division

16A–18C. Elements of Nutrition. Five 1-hour recitation sessions per week. 

George M. Beals 
Doris H. Callow 

* Not to be given, 1968–69. 
§ Approved for one offering only, 1968–69.

Two 1-hour meetings per week. Prerequisite: Biblical Aramaic or consent of instructor. Morphology and syntax of the Syriac language. Readings in the Syriac translation of the Bible and in Syriac literature. Sequence beginning (F).

Mr. Bloch, Mr. Gold (F, W, Sp)

H198. Senior Honors. (2)

Prerequisite: limited to senior honors candidates. Directed study centering upon preparation of an honors thesis.

The Staff (F, W, Sp)

199. Special Study for Advanced Undergraduates. (1–5)

Restricted to senior honors students.

The Staff (F, W, Sp)

Graduate Courses


Two 1-hour meetings per week. Prerequisite: 18 upper division units in a Semitic language or consent of instructor. Studies in Comparative morphology and lexicography of the Semitic languages and the historical development of the various languages. Sequence beginning (F).

(F, W, Sp)


Two 1-hour meetings per week. Prerequisite: Hebrew 100A–100B–100C, or equivalent. Study of the Ugaritic languages and literature (found at Ras Shamra in Syria) with special reference to the development of early Hebrew literature. Sequence beginning (F).

Mr. Andersen (F, W, Sp)


Two 1-hour meetings per week. Prerequisite: advanced status in Hebrew. Study of the Hebrew, Moabite, Phoenician, and Punic inscriptions with reference to epigraphy, language, style, and literary relations. Sequence beginning (F).

Mr. Greenfield (F, W, Sp)

290. Special Study. (1–5)

The Staff (F, W, Sp)

291. Seminar. (2)

Students may receive credit for more than one seminar in the same quarter. May be repeated for additional credit with consent of instructor.

The Staff (F, W, Sp)

Lower Division Course

1A–1B–1C. Elementary Modern Turkish. (4–4–5)

Five 1-hour recitation sessions per week. Sequence beginning (F).

Mr. Tekin (in charge) (F, W, Sp)

NUTRITIONAL SCIENCES

(Department Office, 119 Morgan Hall)

George M. Briggs, Ph.D., Professor of Nutrition (Chairman of the Department).

Doris H. Calloway, Ph.D., Professor of Nutrition.

* Not to be given, 1968–69.
Undergraduate Programs

The Department of Nutritional Sciences in the College of Agricultural Sciences offers two majors—dietetics, and food and nutritional sciences—under the agricultural sciences curriculum (see page 145), as follows:

**DIETETICS**

This field of study prepares students for hospital internship programs required for membership in the American Dietetics Association and for graduate work in nutrition. Study programs are flexible within the major requirements to permit the student to prepare for a research-oriented career, or for one with emphasis on administrative and therapeutic dietetics.

Major requirements:

- **Humanities and Social Sciences**, 36 units as follows: economics (4); English, speech, or comparative literature (8); psychology (4); additional courses (20).

- **Physical Sciences and Mathematics**, 28 units as follows: chemistry—inorganic with laboratory (12) and organic with laboratory (8); additional courses (8).

- **Biological and Agricultural Sciences**, 23 units as follows: bacteriology with laboratory (5); biochemistry (4); physiology with laboratory (5); additional courses (9).
Major Field, 49 units as follows: introduction to nutritional sciences (5); food science (14); human nutrition (5); therapeutic nutrition (4); experimental nutrition (6); quantity food service (15).

Additional courses, 44 units.

Total units, 180.

Certain courses may be required in satisfaction of the above. The undergraduate adviser will provide this information and any other details about the major.

FOOD AND NUTRITIONAL SCIENCES

This major provides basic preparation in the natural and physical sciences for various types of research and technical positions in government, industry, or institutions, or for graduate study in food science, nutrition, or other related fields with special emphasis leading to teaching and research in academic institutions. Major requirements:

Humanities and Social Sciences, 36 units as follows: English, speech, or comparative literature (8); additional courses (28).

Physical Sciences and Mathematics, 44 units as follows: chemistry—inorganic with laboratory (12), organic with laboratory (8), and quantitative (4); calculus and/or statistics (8); physics with laboratory (12).

Biological and Agricultural Sciences, 36 units as follows: bacteriology with laboratory (5); biochemistry with laboratory (8); biology (5); physiology (5); additional courses (13).

Major Field, 29 units as follows: introduction to nutritional sciences (5); food chemistry (4); experimental nutrition (6); human nutrition (5); additional upper division courses (9).

Additional courses, 35 units.

Total units, 180.

Certain courses may be required in satisfaction of the above. The undergraduate adviser will provide this information and any other details about the major.

To graduate in one of the above majors, the students must have at least a C average in all required nutritional sciences courses. Those who do not maintain such an average may be required to withdraw from the major.

Graduate Programs

Since primary emphasis in the graduate program is placed on a biochemical and physiological approach to problems in experimental and human nutrition and food science, it is essential that the prospective graduate student present an adequate background in such fields as chemistry (including introductory, quantitative, and organic, with laboratories), mathematics (calculus and/or statistics), one year of physics with laboratory, at least one quarter of physiology with laboratory, bacteriology with laboratory, and a course in biochemistry with laboratory. An otherwise qualified student may be admitted with one or two deficiencies, but he will be expected to make these up as early as possible in his graduate study.

The M.S. degree is given usually in nutrition or food science. Most students take their Ph.D. degree in nutrition; however, other majors available include comparative biochemistry, agricultural chemistry, microbiology, or other group programs to which individual faculty members belong. Within the general framework of the requirements of the Graduate Division and those of the particular graduate group in which the student will work, his program is based on his own individual needs and interests. Emphasis is placed on individual research, course 299, and each student is expected to write a thesis based on the results of this research.

All beginning graduate students take course 201 in order to gain experience in critically evaluating scientific and technical literature, and presenting oral reports.
Each graduate student is expected to attend the weekly staff seminar, and to take additional units in seminars as agreed upon with his major adviser and one of the graduate advisers. Training is oriented to laboratory sciences and is aimed particularly at preparing the student for a career in teaching and independent research. For further details, consult your graduate adviser.

Nutritional Sciences

Lower Division Courses

1. Introduction to Nutritional Sciences. (5)
   Lectures, 5 hours per week. Prerequisite: Chemistry 1A or Biochemistry 102, or equivalent. Introduction to the chemical, biochemical, and physiological aspects of compounds in foods and their nutritional significance. The Staff (Mr. Stokstad in charge) (Sp)

10. Survey of Nutritional Sciences. (5)
   Lectures, 5 hours per week. Primarily for non-majors. Broad aspects of nutritional science and food components and their importance to life and mankind. Not open to students who have had course 1.
   Mrs. Ostwald (F); — (W)

11A–11B–11C. Experimental Food Study. (2–2–2)
   Lectures, 2 hours per week. Prerequisite: course 1; Chemistry 8A or 12A (may be taken concurrently). Composition and nutritive value of foods; chemical and physical changes in preparation, preservation, and storage. Sequence, beginning (F).
   Miss Kennedy (F, W, Sp)

12A–12B–12C. Experimental Food Study Laboratory. (2–2–2)
   Laboratory, 6 hours per week. Prerequisite: course 11A–11B–11C to be taken concurrently. (Primarily for majors in dietetics.) Chemical and physical changes involved in food preparation, preservation, and storage as they affect acceptability. Sequence beginning (F). Miss Kennedy (F, W, Sp)

Upper Division Courses

100. Economics of Food and Nutrients. (5)
   Lectures, 3 hours per week; discussion groups and field trips, 6 hours per week. Prerequisite: one course in economics or agricultural economics (may be taken concurrently), or consent of instructor. Availability and utilization of food as affected by economic and other relevant factors in relation to current and projected world and local nutritional problems. — (W)

101A. Food Analysis. (3)
   Lecture, 1 hour per week; laboratory, 6 hours per week. Prerequisite: course 11A and Chemistry 1C, 8B; or Chemistry 1C and 8D with grade of at least B. Principles of quantitative analysis applied to food materials; chemical analysis of typical carbohydrates, fat, and protein foods. Miss Kennedy (F)

101B. Advanced Food Analysis. (5)
   Lectures, 2 hours per week; laboratory, 9 hours per week. Prerequisite: course 101A, or Chemistry 5 with a grade of at least B. Given in even-numbered years. Official analytical methods and legal standards for foods. Examination for deterioration and adulteration.
   Miss Kennedy (Sp)

106. Food Chemistry. (2)
   Lectures, 2 hours per week. Prerequisite: Biochemistry 102, or equivalent. Chemistry of food proteins, carbohydrates, fats, and other constituents of foods.
   The Staff (Mr. Brown in charge) (W)

106L. Food Chemistry Laboratory. (2)
   Laboratory, 6 hours per week. Prerequisite: courses 106L (to be taken concurrently), and Biochemistry 105L.
   The Staff (Mr. Brown in charge) (W)

107. Advanced Food Chemistry. (2)
   Lectures, 2 hours per week. Prerequisite: course 106. The composition of foods and the chemical and biochemical changes occurring in foods during ripening, in post-harvest physiology, processing, and storage.
   Mr. Mackinney (Sp)

107L. Advanced Food Chemistry Laboratory. (2)
   Laboratory, 6 hours per week. Prerequisite: courses 106L and 107 (to be taken concurrently).
   Mr. Joslyn (Sp)

108. Introduction to Food Research. (2)
   Lecture, 2 hours per week. Prerequisite: course 101A or Chemistry 5. Proseminar on current research in the chemistry of food composition, preparation, and control.
   Mr. Joslyn (Sp)

108L. Introduction to Food Research Laboratory. (2)
   Laboratory, 6 hours per week. Prerequisite: courses 105 and 108 (to be taken concurrently).
   Mr. Joslyn (Sp)

121. Problems of Quantity Food Service. (5)
   Lectures, 5 hours per week. Prerequisite: course 120. Food standards and sanitary handling, quantity food purchasing and preparation, institution food service equipment, food service personnel classification.
   Mrs. McMasters (F)

122. Quantity Food Production and Service Laboratory. (5)
   Lectures, 2 hours per week; laboratory, 8 hours per week. Prerequisite: course 121. Laboratory and additional discussion periods and outside assignments, covering the practical application of theoretical content of course 121.
   Mrs. McMasters (W)

123. Institutional Food Service Organization and Management. (5)
   Lectures, 3 hours per week; laboratory, 6 hours per week. Prerequisite: course 122. Recommended one course each in personnel management and accounting. Administration of quantity food service units; menu planning, purchasing practices, staffing design and layout, work simplification.
   Mrs. McMasters (Sp)

140. Nutrition. (5)
   Lectures, 5 hours per week. Prerequisite: Chemistry 1A or high school chemistry; Physiology 1A. Primarily for students not majoring in nutritional science. Not open for credit to students who have taken course 160. Essential nutrients and their functions in human nutrition.
   Miss Williams (Sp)
144. Laboratory Methods in Metabolism. (6)

Lectures, 3 hours per week; laboratory, 9 hours per week. Prerequisite: course 101A or Chemistry 5; Biochemistry 102 (may be taken concurrently). Introduction to quantitative chemical methods used in nutrition research.

Miss Williams (Sp)

150. Experimental Nutrition. (3)

Lecture, 3 hours per week. Prerequisite: course 108, or a course in physiology or zoology, or consent of instructor. Principles and experimental aspects of biochemistry and physiology as applied to nutritional sciences.

Mr. Lyman (Sp)

150L. Experimental Nutrition Laboratory. (3)

Laboratory, 6 hours per week; discussion, 1 hour per week. Prerequisite: course 150L (may be taken concurrently); Biochemistry 102L. Quantitative laboratory techniques used in research in nutrition.

Mrs. Ostwald (Sp)

151. Vitamins and Minerals. (3)

Lectures, 3 hours per week. Prerequisite: course 150 or consent of instructor. Chemistry, distribution, and metabolism of vitamins and minerals in animals.

Mr. Lyman (F)

151L. Vitamins and Minerals Laboratory. (3)

Laboratory, 6 hours per week; discussion, 1 hour per week. Prerequisite: course 150L, 151 (to be taken concurrently), or consent of instructor.

Mr. Lyman (F)

160. Human Nutrition. (5)

Lectures, 5 hours per week. Prerequisite: course 151, or consent of instructor. Scientific principles of meeting the metabolic and nutritional needs of normal individuals throughout the life span.

Mr. Margen (W)

160L. Human Nutrition Laboratory. (3)

Laboratory, 6 hours per week; discussion, 1 hour per week. Prerequisite: courses 106L, and 160 (to be taken concurrently).

Miss Williams, Mr. Margen (W)

161. Therapeutic Nutrition. (3)

Lectures, 3 hours per week. Prerequisite: course 160. Biochemical, physiological, and nutritional basis for therapeutic treatment of various conditions and diseases in man by dietary means. Mrs. Calloway (Sp)

161L. Therapeutic Nutrition Laboratory. (1)

Laboratory, 3 hours per week. Prerequisite: course 161 (to be taken concurrently).

Mrs. Calloway (Sp)

198. Directed Group Study. (1-5)

Prerequisite: consent of instructor. The Staff (Mr. Stokstad in charge) (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1-5)

Prerequisite: senior standing, 3.0 grade-point average, and approval of the adviser. The Staff (Mr. Stokstad in charge) (Su, F, W, Sp)

Graduate Courses

201A–201B–201C. Seminar in Nutrition. (1-1-1)

(Formerly numbered 201A–201B) Discussion group, 1 hour per week. Prerequisite: intended primarily for first-year graduate students. Introduction to research in nutritional sciences considered in historical perspective.

201A, Mr. Brown (F); 201B, Mr. Brown (W); 201C, Mr. Brown (Sp)

205. Biochemical Aspects of Protein Nutrition. (3)

Lectures, 3 hours per week. Prerequisite: Biochemistry 100A–100B–100C, or 102, or consent of instructor. Nutrition of proteins relative to their structure and chemical properties. Mr. Brown (Sp)

211. Research Methods in Nutritional Sciences. (5)

Lecture, 1 hour per week; laboratory, 12 hours per week. Prerequisite: graduate standing and consent of instructor. Advanced experimental techniques in food science and nutrition; application of chromatography, radioisotopes, and physical and chemical measurements to individual problems in nutritional science research. Students may select special problems of their interest. (W)

219. Vitamin Analysis. (5)

Lectures, 3 hours per week; laboratory, 6 hours per week. Prerequisite: courses 160, 160L; and consent of instructor. Chemical, physical, microbiological, and biological assay methods for vitamins. Individual problems pertaining to animal tissue analysis; comparison of new methods with standard procedures. Miss Williams (Sp)

290. Advanced Seminars in Nutritional Sciences. (1)

One 1-hour meeting per week. Prerequisite: open to qualified graduate students. May be repeated for credit. More than one section may be taken simultaneously. Advanced study in various fields of nutritional sciences. Topics will vary depending on interests of qualified graduate students and availability of staff.

The Staff (Mr. Stokstad in charge) (Su, F, W, Sp)

299. Research in Food and Nutrition. (1-12)

The Staff (Mr. Stokstad in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Mr. Stokstad in charge) (Su, F, W, Sp)

Staff Seminar in Nutritional Sciences. (No credit)

The Staff (F, W, Sp)

Family Sociology

Upper Division Courses

137. Marriage and the Family. (4)

Lectures, 4 hours per week. Contemporary family life, with attention to personality development and mental health; psychological interpretations of social and sexual roles; cultural contrasts and marriage; dynamics of marriage interaction and parent-child relationships. Mr. Landis (W, Sp)

* Not to be given, 1988–89.
138. *The Contemporary American Family.* (4)
Lectures, 4 hours per week. Impact of modern culture upon the family, with emphasis upon family types, member relationships, family dynamics in relation to personality, social change, and social values.
Mr. Landis (W)

139. Sociology of Child Development. (4)
Lectures, 4 hours per week. Various social factors, social groupings, and social contexts in relation to the social development of the child. Mr. Landis (W)

Graduate Course

237. Seminar in Family Sociology. (1–4)
Mr. Landis (Sp)

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**OPTOMETRY**

(Department Office, 101 Optometry Building)

Merton C. Flom, Ph.D., *Professor of Physiological Optics and Optometry.*
Elwin Marg, Ph.D., *Professor of Physiological Optics and Optometry.*
Meredith W. Morgan, Ph.D., *Professor of Physiological Optics and Optometry (Chairman of the Department).*

Kenneth B. Stoddard, Ph.D., *Professor of Physiological Optics and Optometry (Emeritus).*
Darrell B. Carter, O.D., Ph.D., *Associate Clinical Professor of Optometry.*
Robert B. Mandell, O.D., Ph.D., *Associate Professor of Physiological Optics and Optometry.*

Henry B. Peters, M.A., *Associate Professor of Optometry.*
Jack T. Hobson, B.S., *Assistant Professor of Optometry (Emeritus).*
Marshall B. Atkinson, M.D., *Assistant Clinical Professor of Optometry.*
Elizabeth Caloroso, B.S., *Assistant Clinical Professor of Optometry.*
Morton D. Sarver, M.S., *Assistant Clinical Professor of Optometry.*

Kermit Kors, M.Opt., *Clinical Instructor in Optometry.*

Harvey Arnold, B.S., *Clinical Instructor in Optometry.*
Roy H. Brandreth, B.S., *Clinical Instructor in Optometry.*
James T. Crosby, Jr., B.S., *Clinical Instructor in Optometry.*
Ferd T. Elvin, A.B., *Clinical Instructor in Optometry.*

Irving Fatt, Ph.D., *Professor of Engineering Sciences.*
Allen N. Fried, M.Opt., *Clinical Instructor in Optometry.*
Robert F. Harrigan, B.S., *Clinical Instructor in Optometry.*
Monroe J. Hirsch, Ph.D., *Clinical Instructor in Optometry.*
Frank V. Johnson, Jr., M.Opt., *Clinical Instructor in Optometry.*

George Keranen, M.D., *Lecturer in Optometry.*
Robert W. Lester, A.B., *Clinical Instructor in Optometry.*
Leon Lewis, M.D., *Lecturer in Pathology and Medicine.*
Edwin B. Mehr, A.B., *Clinical Instructor in Optometry.*
Leonard Osias, B.S., *Clinical Instructor in Optometry.*
William R. Pinkerton, M.Opt., *Clinical Instructor in Optometry.*
Edward Tamler, M.D., *Lecturer in Ocular Pathology.*
Ralph Wick, O.D., *Lecturer in Optometry.*

The Department of Optometry prepares students for professional practice. The curriculum requires four years based on two years of preprofessional education and terminates in the degree, Doctor of Optometry. For details, consult the ANNOUNCEMENT OF THE SCHOOL OF OPTOMETRY, available at 101 Optometry Building.

* Not to be given, 1968–69.
† In residence spring quarter, 1969.
‡ In residence fall quarter, 1968.
§ In residence winter quarter, 1969.
During the period from 1966-1969, the optometry program will be in a state of transition from a three- to a four-year program. Consult the Dean, School of Optometry, for details.

**Physiological Optics**

Physiological optics is a field of study leading to the M.S. and Ph.D. degrees. The program is administered by the Group in Physiological Optics, representing faculty from the School of Optometry.

Those interested in this graduate program should familiarize themselves with the regulations of the Graduate Division and, in addition, should contact the adviser of the Group in Physiological Optics as early as possible. Admission to this program requires a bachelor's degree in physics, physiology, physiological optics, psychology or optometry, or a doctor's degree in medicine or optometry.

**Graduate Major** Courses 204, 206, and 208 are required of all graduate students and should be completed as early as possible. The first two years of graduate study are normally spent preparing for the departmental examination. This preparation should include passing of at least one foreign language examination, and the completion of seminars and other courses which will provide an appropriate background.

For further details on the requirements for the M.S. and Ph.D., please consult the adviser of the Group in Physiological Optics.

*Letters and Science List:* for regulations governing this list, see page 80.

**Optometry**

**Upper Division Courses**

100. *History of Optometry.* (2)

Two 1-hour lecture per week. *Prerequisite: junior standing.* The profession of optometry, its history and present status. Mr. Morgan (F)

104. *Ophthalmic Optics.* (3)

Two 1-hour lectures and one 3-hour laboratory per week. *Prerequisite: Physics 106A.* History of the development of lenses and spectacles; optical properties of lens materials; the theory and design of spectacle lenses. Laboratory exercises in lens-cutting, edging, beveling, drilling, mounting, neutralization, and frame-fitting and adjusting. Mr. Peters (Sp)

105. *Ophthalmic Optics.* (3)

Two 1-hour lectures and one 3-hour laboratory per week. *Prerequisite: Optometry 104.* Continuation of Optometry 104. Mr. Peters (F)

127. *Refraction of the Eye.* (5)

Three 1-hour lectures, two 2-hour laboratories per week. *Prerequisite: Physiological Optics 102.* Optical and biological variables determining the refractive state of the eye. Lectures and laboratory assignments on subjective and objective techniques of measurement and methods of correcting refractive anomalies; skia metry, keratometry, ophthalmoscopy, visual acuity, subjective refraction, amplitude of accommodation. Mr. Peters (F)

128. *Introduction to Pathology.* (3)

Two 1½-hour lectures per week. *Prerequisite: Physiology 112-113.* Basic pathological processes in human development, senescence and disease. A correlated survey of disturbed function in disorders of visceral systems, including disturbances of electrolyte and fluid balance and of metabolism. Mr. Lewis (W)

130. *Optometric Analysis.* (5)

Three 1½-hour lectures and two 2-hour laboratories per week. *Prerequisite: Optometry 107.* Routine examination and case analysis; interrogation and case history, motility, phorometry, versions, vergences, relative accommodation and the various techniques for the analysis of optometric data. Introduction to clinical observations. Mr. Carter (W)

131. *Clinical Manifestations of Disease and Pharmacological Influences on Disease and Function.* (3)

Two 1½-hour lectures per week. *Prerequisite: Optometry 128.* A survey of disease processes and systematic disorders with special reference to ocular implications and manifestations. The role of modern drugs on therapy and side effects of drug use, especially as they relate to the eye and vision. Mr. Lewis (Sp)

133. *Anomalies of Binocular Vision.* (5)

Four 1-hour lectures and one 2-hour laboratory. *Prerequisite: Optometry 127.* Detection, measurement, classification, etiology, symptomatology, signs and prognosis of the latent and manifest disorders of binocular fixation, both comitant and noncomitant; orthoptics and visual training. Clinical observations. Mr. Flom (Sp)

150A-150B-150C. *Ocular Disease.* (3-4-4)

Two 1-hour lectures and one 2-hour laboratory per week. *Prerequisite: Optometry 128 and 131.* Introduction to ocular diseases and their optometric detection; symptomatology and signs of ocular disease. External examination of the eye, pupillary reactions. Internal examination of the eye, ophthalmoscopy, biomicroscopy, tonometry, visual fields. Sequence beginning (F), Mr. Atkinson, Mr. Carter (F, W, Sp)
152. Advanced Geometric Optics. (5)

Five 1-hour lectures. Prerequisite: Physics 106A. Gaussian optics. Aberrations and methods of correction, chromatic aberration and dispersion, oblique astigmatism, "corrective curve" lenses, design and characteristics of ophthalmic instruments.

Mr. Mandell (F)

158A.-158B. Vision Rehabilitation. (4-4)

Three 1-hour lectures and two 1-hour laboratory per week. Prerequisite: Optometry 127 and 453. Aniseikonia, low vision and geriatric optometry. Orthoptics, pleoptics and pediatric optometry.

Sequence beginning (W).

Mr. Peters, Mr. Mandell (W); Mr. Flom (Sp)

161. Contact Lenses. (5)

Three 1-hour lectures and two 3-hour laboratories per week. Prerequisite: Optometry 105 and 454. Historical development, physical and optical properties of contact lenses and their adaptation to the human eye, with emphasis on the anatomical and physiological implications.

Mr. Sarver (Sp)

†1177. Public Health Optometry. (4)

Two 1/2-hour lectures and field trips. Prerequisite: consent of instructor. Vision performance: screening methods, establishment and evaluation of standards, importance in industry, schools and vehicle operation; eye safety programs; methods of supplying vision care by means of government assistance, in the armed forces, in health clinics and hospitals, group practices and prepaid and insurance programs.

Mr. Peters (Sp)

†1178. Applied Psychology for Optometrists. (2)

Two 1-hour lectures per week. Prerequisite: senior standing in Optometry. Patient management and communication, oral and written; suggestion and hypnosis.

Mr. Sherriffs (F)

†1185. Practice Management. (4)

Three 1-hour lectures per week and two field trips per quarter. Prerequisite: senior standing in Optometry. Laws governing the practice of optometry. The establishment and management of an optometric practice; economics, taxes, insurance, accounting methods, office design, mode of practice, practice administration, and patient relations; professional organizations and societies.

Mr. Sarver (W)

Professional Courses

410. Introduction to Clinical Optometry. (2-6)

One 1-hour lecture and 4- to 20-hour laboratory per week. (depending on number of units.) Prerequisite: consent of instructor. Lectures and clinical practice in the technique and interpretation of clinical data.

Mr. Peters and Staff (Su)

412. Contact Lens Clinic. (2)

Three 1-hour clinics per week. Prerequisite: consent of the instructor. Clinical practice and the techniques of fitting contact lenses.

Mr. Lester (Su)

453. Optometry Clinic. (3)

One 1-hour lecture, one 4-hour clinic, and one 2-hour dispensary per week. Prerequisite: junior standing in optometry. Optometry clinic. Examination and prescribing for clinical patients. Dispensing of eye wear.

Mr. Peters and Staff (F)

454. Optometry Clinic. (4)

Two 1-hour lectures, one 4-hour clinic, and one 2-hour dispensary per week. Prerequisite: Optometry 450. Examination and prescribing of lenses to clinical patients, special problems in ophthalmic optics.

Mr. Peters and Staff (W)

455. Optometry Clinic. (4)

Two 1-hour lectures, one 4-hour clinic, and one 2-hour dispensary per week. Prerequisite: Optometry 454. Continuation of Optometry 454.

Mr. Peters and Staff (Sp)

†1480A-1480B-1480C. Advanced Optometry Clinic. (5-5-5)

Three 4-hour clinics and one 3-hour dispensary per week. Prerequisite: Optometry 455. Optometric examination of patients in the clinic performed independently by student clinicians under the supervision of the clinic staff: refraction and dispensing.

Sequence, beginning (F), Mr. Peters and Staff (F, W, Sp)

†1483A-1483B-1483C. Special Clinical Practice. (5-5-5)

Six 2-hour clinics per week. Prerequisite: Optometry 454 and 161. Clinical practice in contact lenses, aniseikonia, subnormal vision, strabismus, orthoptics, and the detection of ocular abnormalities.

Sequence, beginning (F), Mr. Peters and Staff (F, W, Sp)

†1486A-1486B. Clinical Colloquia. (2–2)

One 2-hour seminar per week. Prerequisite: senior standing. Analysis and discussion of representative cases encompassing diagnosis, etiology, prognosis, treatment, referral, consultation and professional communication.

Sequence, beginning (W), Mr. Morgan (W, Sp)

499. Special Study. (1–5)

One 1-hour class per week. Prerequisite: senior standing in Optometry. Independent study in Optometry.

Mr. Carter (F, W, Sp, Su)

Physiological Optics

Upper Division Courses

101. Anatomy of Eye and Orbit. (5)

Three 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: Anatomy 108. The microscopic and microscopic anatomy of the orbit, its content and adjacent structures. The cranial nerves associated with vision and their cortical connections. The blood supply to the eye and orbit. The physiology of the eye.

102. Dioptrics of the Eye. (5)

Four 1-hour lectures and one 2-hour laboratory per week. Prerequisite: Physics 106A. The eye as an optical instrument; image forming properties, optical defects, and image quality; dimensions; optical constants, schematic eyes, cardinal points, ametropia; accommodation, retinal image size, blur circles, defraction, aberrations, scatter, and absorption.

125. Vegetative Functions of the Eye. (5)

Three 1-hour lectures and two 2-hour laboratory per week. Prerequisite: Physiological Optics 102. Consideration of the physiology of the cornea and
129. Motility of the Eye. (5)
Three 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: consent of instructor. Detailed consideration of ocular movements; specification of direction of regard, line of sight, visual axes, center of rotation, primary position; kinematics of the eye, Listing's Law; action of the extracocular muscles; types of movements, reflex, saccadic, pursuit, versions, vergences; accommodation; accommodative-convergence; convergence accommodation. (W)

132. Visual Stimuli. (5)
Three 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: consent of instructor. Study of visual stimuli, their nature and specification; radiometry, photometry, colorimetry; illumination; light sources; atmospheric scatter; effects of radiation. Color vision. Mr. Mandell (Sp)

151. Monocular Sensory Processes of Vision. (5)
Three 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: consent of instructor. Action of visible light on the retina, visual pigments and electrical phenomena. Light sense: sensitivity, threshold, differential thresholds, luminosity curves. Effects of stimulation: single and periodic, critical frequency of flicker, light and dark adaptation, after-images, spatial and temporal induction. Form sense: visual acuity. Perception of motion. Mr. Marg (F)

160. Binocular Vision and Space Perception. (5)
Three 1 1/2-hour lectures and one 2-hour laboratory per week. Prerequisite: consent of instructor. Binocular integration; horopter, correspondence, figure-ground relations, perception of size, shape, direction, motion, time, and complex patterns; information theory. Mr. Flom (W)

175. Recent Advances in Physiological Optics. (1)
One 1-hour class per week. Prerequisite: consent of instructor. Recent advances in physiological optics and optometry. Mr. Marg (Sp)

199. Independent Study. (1-5)
One 1-hour class per week. Prerequisite: senior standing in optometry; consent of instructor. Independent study in physiological optics. Students, with consent of Dean, will elect either Physiological Optics 199 or Optometry 499. Mr. Marg (F, W, Sp, Su)

Graduate Courses

201A. Seminar in Physiological Optics. (2)
One 2-hour seminar per week. Prerequisite: consent of instructor. Can be repeated for credit. Graduate seminar in physiological optics. Mr. Flom (F)

201B. Seminar in Physiological Optics. (2)
One 2-hour seminar per week. Prerequisite: consent of instructor. Can be repeated for credit. Graduate seminar in physiological optics. Mr. Marg (W)

201C. Seminar in Physiological Optics. (2)
One 2-hour seminar per week. Prerequisite: consent of instructor. Can be repeated for credit. Graduate seminar in physiological optics. (Sp)

204. Optical Image Formation in the Eye. (4)
Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: grad student standing in physiological optics. Lectures and laboratory demonstrations. Measurement of optical properties of simple and compound eyes. Image quality and resolution. Optometric instrumentation. (F)

206. The Oculomotor System. (4)
Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: consent of instructor. Lectures and laboratory demonstrations on the neural mechanisms underlying the sensory and central processes of visual perception. Mr. Flom (W)

208. Neurosensory Physiology of Vision. (4)
Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: consent of instructor. Lecture and laboratory demonstrations on the neural mechanisms underlying the sensory and central processes of visual perception. Mr. Marg (Sp)

291A. Physiology of the Cornea and Sclera. (2)
Two 1-hour lectures per week. Prerequisite: grad student standing and a course in calculus. Detailed analysis of the cornea and sclera including histology, permeability, diffusion, metabolism, and mechanical properties. The optical properties of the cornea. Mr. Fatt (Sp)

299. Research in Physiological Optics. (2-8)
Varied. Prerequisite: consent of instructor. Research. Mr. Morgan in charge (F, W, Sp, Su)

601. Individual Study for Master's Students. (1-8)
Prerequisite: consent of instructor. Individual study for the comprehensive requirements in consultation with the adviser in physiological optics. Units may not be used to meet either unit or residence requirements for the master's degree. Must be taken on a satisfactory/unsatisfactory basis. Mr. Mandell (F, W, Sp, Su)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the adviser in physiological optics, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required for the Ph.D. May not be used for unit or residence requirements. Must be taken on a satisfactory/unsatisfactory basis. Mr. Flom (F, W, Sp, Su)

* To be given for the first time in 1969-70.
ORIENTAL LANGUAGES

(Department Office, 102 Durant Hall)

Cyril Birch, Ph.D., Professor of Oriental Languages.
Peter A. Boodberg, Ph.D., Agassiz Professor of Oriental Languages and Literature.
Denzel Carr, Ph.D., Professor of Oriental Languages, Emeritus.
Kun Chang, Ph.D., Professor of Oriental Languages.
Shih-Hsiang Chen, B.Litt., Professor of Chinese and of Comparative Literature.
Michael C. Rogers, Ph.D., Professor of Oriental Languages (Chairman of the Department).
Edward H. Schafer, Ph.D., Professor of Oriental Languages.
Yuen Ren Chao, Ph.D., Litt.D., LL.D., Agassiz Professor of Oriental Languages and Literature, Emeritus.
James E. Bosson, Ph.D., Associate Professor of Oriental Languages.
Haruo Aoki, Ph.D., Assistant Professor of Oriental Languages.
Francis T. Motofuji, Ph.D., Assistant Professor of Oriental Languages.

Ching-mao Cheng, M.A., Acting Assistant Professor of Oriental Languages.
John C. Jamieson, M.A., Acting Assistant Professor of Oriental Languages.
Lewis R. Lancaster, M.Th., Acting Assistant Professor of Oriental Languages.
Susumu W. Nakamura, M.A., Lecturer in Oriental Languages.

Departmental Major Advisers: Mr. Chang (Chinese); Mr. Nakamura (Japanese); Mr. Bosson (Altaic Languages).
Graduate Advisers: Mr. Schafer (Chinese); Mr. Motofuji (Japanese); Mr. Bosson (Altaic Studies).

The Department of Oriental Languages at Berkeley offers a thorough training in the classical and modern languages and literatures of Eastern Asia. The three undergraduate major programs emphasize respectively Chinese, Japanese and Altaic languages. In all cases the student proceeds from initial acquisition of a facility in the spoken language to a reading knowledge of both modern and classical forms. Individual upper division courses stress the philological, linguistic or literary study of Oriental cultures, and the student is encouraged to select courses that will provide him an insight into each of these disciplines. The department also emphasizes the study of a particular Oriental culture in its broader geographical context. A survey course on the nature and distribution of the main languages of Eastern Asia is required of all majors, and concentration on one language is supplemented by introductory study of a second Oriental language in the major program.

The Major

EMPHASIS ON CHINESE

Lower Division.—1C, 2C, 3C, 4C, 5C, 6C. One quarter of another Oriental language (if this is an upper division course, the credits may be included in the required 36 upper division units, below); Linguistics 20.

Upper Division.—100, 103 and one other upper division course in Classical Chinese; 106 and one other upper division course in Modern Chinese; 133A–133B (for students expecting to proceed to the M.A. or Ph.D. degree in Oriental languages with emphasis on Chinese). Additional courses in Chinese to make a total of 36 upper division units (with the approval of the adviser, either one or two lecture courses may be counted among these).

† On leave, fall quarter, 1968.
‡ On leave, winter and spring quarters, 1969.
EMPHASIS ON JAPANESE

**Lower Division.**—1J, 2J, 3J, 4J, 5J, 6J, 5C, 6C, Linguistics 20.

**Upper Division.**—100, 109 and one other upper division course in Modern Japanese; 129A and one other upper division course in Classical Japanese; 131. Additional courses in Japanese for a total of 36 upper division units (with the approval of the adviser, either one or two lecture courses may be counted among these).

EMPHASIS ON ALTAIC LANGUAGES

**Lower Division.**—Oriental Languages 1K–2K–3K (Korean) or Near Eastern Languages Turkish 1A–1B–1C (in some cases Oriental Languages 1J–2J–3J may be substituted); Linguistics 20.

**Upper Division.**—100, 144A–144B–144C, 154A–154B–154C, and other relevant courses as designated by the adviser (e.g., 142M, 177A–177B, 178A–178B; Near Eastern Languages Turkish 100A–100B–100C and 168A–168B) to make a total of 36 upper division units.

RECOMMENDED FOR ALL MAJORS

**Lower Division:** Art ID; History 19.


Honors Program

An undergraduate student who has completed 21 units of language courses in the department and has an overall grade-point average of 3.0, may apply to the departmental chairman for admission to the honors program. If accepted, his curriculum will then differ from that of other candidates for the A.B. degree in that he will be permitted to take from 1 to 6 units of H195 (honors course) which will count toward the major, in lieu of other language courses he might offer for the degree. While enrolled in this course he will do independent and advanced work under the guidance of appropriate members of the staff. At the same time he will prepare himself to take a comprehensive examination in the last semester of his senior year.

Graduate Programs

M.A. and Ph.D. programs are offered in Chinese Language and Literature and in Japanese Language and Literature. The M.A. degree is offered in Altaic Language and Literature, with emphasis on Mongolian.

**M.A. Degree**

The first three or four quarters are spent in course work and outside reading designed to broaden the prospective candidate’s understanding of the total culture he is studying. A comprehensive examination on the language, literature and cultural history must be passed before admission to candidacy.

One year of study (i.e., two quarters subsequent to fulfillment of the A.B. requirement) of a second Oriental language is included in the M.A. program, and prospective candidates are required to demonstrate a reading knowledge of either French or German (with the additional option, for students taking Altaic languages, of Russian) as early as possible in their first year of graduate study.

In preparation of his M.A. thesis the candidate is advised to emphasize quality rather than quantity, and to choose a topic which he explores thoroughly rather than a broad subject permitting only general treatment. Textual or linguistic study in the broadest sense should constitute a major element in preparation of the thesis.
### Lower Division Courses

**Duplication of Credit.**—A student will not be allowed unit credit for that part of elementary and intermediate courses in this department which duplicates courses previously completed in secondary school or in another institution of collegiate grade. The first unit of secondary school credit in a language is equivalent to the first quarter course; each successive unit of credit in the same language is equal to one additional course (5-4 credits) in a sequence of four quarter courses in college.

#### 1C. Elementary Chinese. (5)
- Five 1-hour lectures and two 1-hour laboratories per week. Introduction to Mandarin.  
  - Instructor: Mr. Jamieson, Mr. Chang (F)

#### 2C. Elementary Chinese. (5)
- Five 1-hour lectures and two 1-hour laboratories per week. Prerequisite: course 1C. Mandarin continued.  
  - Instructor: Mr. Jamieson, Mr. Chang (W)

#### 3C. Elementary Chinese. (4)
- Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 2C. Mandarin continued.  
  - Instructor: Mr. Jamieson, Mr. Chang (Sp)

#### 4C. Intermediate Chinese. (4)
- (Formerly numbered 3C)
  - Four 1-hour lectures and one 1-hour sectional discussion per week. Prerequisite: course 3C. Mandarin continued.  
  - Instructor: Mr. Birch, Mr. Cheng (F)

#### 5C. Intermediate Chinese. (4)
- Four 1-hour lectures per week. Prerequisite: course 4C. Mandarin continued.  
  - Instructor: Mr. Chang (W)

#### 6C. Intermediate Chinese. (4)
- Three hours of class and two hours of laboratory per week. Prerequisite: courses 5C, 5J or with consent of instructor 12B. Introduction to Classical Chinese.  
  - Instructor: Mr. Schafer (Sp)

#### 1J. Elementary Japanese. (5)
- Five 1-hour lectures and two 1-hour laboratories per week. Introduction to Modern Japanese.  
  - Instructor: Mr. Aoki, Mr. Nakamura (F)

#### 2J. Elementary Japanese. (5)
- Five 1-hour lectures and two 1-hour laboratories per week. Prerequisite: course 1J. Modern Japanese continued.  
  - Instructor: Mr. Aoki, Mr. Motofuji (W)

#### 3J. Elementary Japanese. (4)
- Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 2J. Modern Japanese continued.  
  - Instructor: Mr. Aoki, Mr. Motofuji (Sp)

#### 4J. Intermediate Japanese. (4)
- (Formerly numbered 3J)
  - Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 3J. Modern Japanese continued.  
  - Instructor: Mr. Nakamura (F)

### 5J. Intermediate Japanese. (4)
- Four 1-hour lectures per week. Prerequisite: course 4J.  
  - Instructor: Mr. Nakamura (W)

### 6J. Intermediate Japanese. (4)
- (Formerly numbered 4J)
  - Three 1-hour lectures per week. Prerequisite: course 5J. An introduction to the classical language.  
  - Instructor: Mr. Nakamura (Sp)

#### 1K. Elementary Korean. (5)
- Five 1-hour lectures and two 1-hour laboratories per week.  
  - Instructor: Mr. Rogers (F)

#### 2K. Elementary Korean (continued). (5)
- Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 1K.  
  - Instructor: Mr. Rogers (W)

#### 3K. Elementary Korean (continued). (4)
- Three 1½-hour lectures per week. Prerequisite: course 2K.  
  - Instructor: Mr. Rogers (Sp)

#### 1M/1. Malay/Indonesian. (5)
- Five 1-hour lectures and two 1-hour laboratories per week. An introduction to the official languages of Indonesia and Malaysia; a foundation for the study of Malayo-Polynesian languages in general or Classical Malay.  
  - Instructor: Mr. Schafer (Sp)

#### 2M/1. Malay/Indonesian (continued). (5)
- (Formerly numbered 18)
  - Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 1M/1.  
  - Instructor: Mr. Rogers (Sp)

#### 3M/1. Malay/Indonesian (continued). (4)
- Three 1-hour lectures and one 2-hour drill session per week. Prerequisite: course 2M/1.  
  - Instructor: Mr. Rogers (Sp)

#### 11C. Intensive Intermediate Mandarin. (12)
- Eighteen hours of lecture and five hours of laboratory per week. Prerequisite: courses 1C, 2C, 3C or the equivalent with the consent of instructor. Equivalent to 4C, 5C, 6C in regular session.  
  - Instructor: Mr. Rogers (Sp)

#### 11J. Intensive Beginning Japanese. (14)
- Twenty hours of lecture and five hours of laboratory per week. Lectures, drill sessions, and laboratory. Equivalent to 1J, 2J, 3J in regular sessions.  
  - Instructor: Mr. Rogers (Sp)

#### 12A-12B. Elementary Classical Chinese. (3-3)
- Five 1-hour recitation sessions per week. Prerequisite: 12A is prerequisite to 12B.  
  - Instructor: Mr. Boodberg (F, W)

#### 13. Introduction to the Study of Chinese

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<th>Characters. (4)</th>
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<tr>
<td>Two 1½-hour lectures per week. Prerequisite: none.</td>
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<td>Instructor: Mr. Boodberg (Sp)</td>
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#### 16A-16B. Mandarin Composition. (3-3)
- Two 1-hour lectures per week. Prerequisite: course 4C. Translation into Mandarin and free composition in Mandarin.  
  - Instructor: Mr. Cheng (W, Sp)

#### 19. Japanese Composition. (3)
- Two 1-hour meetings per week. Prerequisite: course 5J. Translation into Japanese and free composition in Japanese.  
  - Instructor: Mr. Nakamura (Sp)

§ Approved for one offering only, 1968-69.
Courses in which no knowledge of Oriental languages is required

22. Indonesian Civilization. (4)
Three 1-hour lectures per week. A survey of Indonesian civilization and the effects of contacts with Indian, Islamic, and Western cultures. Emphasis on Hinduism, Buddhism, and Islam. ———— (Sp)

38A–38B–38C. Great Books of Eastern Asia. (1–1–1)
One 1-hour lecture per week. Prerequisite: course 38A is not prerequisite to course 38B; courses 38A, 38B are not prerequisite to course 38C. Lectures and readings on the great classics of Eastern Asia, in English translation. Mr. Boodberg (F, W, Sp)

Upper Division Courses

100. Languages of Eastern Asia. (4)
Three 1-hour lectures per week. Prerequisite: junior standing and Linguistics 20 or consent of instructor. Required of all majors in Oriental languages. A survey course on the nature and distribution of the main languages of Eastern Asia. ———— (F, W, Sp)

*103. Classical Chinese: Medieval Texts (Cultural and Literary). (4)
Three 1-hour lectures per week. Prerequisite: course 6C or 12B. Mr. Schafer (F)

Three 1-hour lectures per week. Prerequisite: course 103 and 8 additional units of upper division Chinese or Japanese. Topics and texts will vary from year to year, normally in sequence: prose (F), poetry (W), philosophy (Sp). Mr. Boodberg (F, W, Sp)

105. Advanced Mandarin. (4)
Three 1-hour lectures per week. Prerequisite: course 5C. Reading and discussion in Modern Mandarin. Designed to increase competence in the handling of the modern language. Mr. Jamieson (Sp)

106. Contemporary Chinese Writers. (5)
Three 1½-hour lectures per week. Prerequisite: course 5C and 6C. Readings in all genres of Chinese literature since 1917. Mr. Cheng (F)

107. Intermediate Korean. (4)
Three 1-hour lectures per week. Prerequisite: course 3K. May be repeated for credit. Mr. Rogers (F, W, Sp)

108. Classical Malay Literature. (4)
(Formerly numbered 108)
Three 1-hour lectures per week. Prerequisite: course 3M/I. Readings of Sejarah Melayu and other standard texts in Roman and Arabic characters. Mr. Aoki (W)

109. Advanced Japanese. (4)
(Formerly numbered 109)
Three 1-hour lectures per week. Prerequisite: course 5J. Readings in Modern Japanese. Mr. Nakamura (F)

110A–110B–110C. Readings in Chinese Buddhist Texts. (4–4–4)
Two 1½-hour lectures per week. Prerequisite: one upper division course in Classical Chinese. 110A is not prerequisite to 110B; 110A–110B are not prerequisite to 110C. Mr. Lancaster (F, W, Sp)

113. Classical Chinese: Historical Texts. (4)
(Formerly numbered 103)
Three 1-hour lectures per week. Prerequisite: course 103. Mr. Schafer (W)

Two 1½-hour lectures per week. Prerequisite: course 5J. Mr. Cheng (Sp)

118. Introduction to Malay-Polynesian Linguistics. (4)
Three 1-hour lectures per week. Prerequisite: course 3M/I, an equivalent knowledge of one Malay-Polynesian language, or Linguistics 130 or 145. ———— (W)

*119. Readings in Modern Japanese: Expository Prose. (4)
(Formerly numbered 109)
Three 1-hour lectures per week. Prerequisite: course 109. Mr. Aoki (W)

120. Reading of Chinese Buddhist Texts. (4)
Two 1½-hour lectures per week. 120A. Prerequisite: course 5C. Texts on social and political problems. Mr. Cheng (W)
120B. Prerequisite: course 106 or 124A. Texts of literary and philosophical interest. Mr. Chen (Sp)

125. Chinese Dialectology. (4)
Two 1½-hour lectures per week. Prerequisite: course 106 and Linguistics 20. Mr. Chang (F)

Two 1½-hour lectures per week. 129A. Prerequisite: course 6J. 129B. Prerequisite: course 6J; course 129A is not prerequisite to 129B. ———— (F, W)

129C–129D. Readings in Classical Japanese Literature: Verse and Drama. (4–4)
129C. Three 1-hour lectures per week. Prerequisite: course 6J. Course 129A–129B is not prerequisite to course 129C. Verse. ———— (Sp)
129D. Two 1½-hour lectures per week. Prerequisite: course 6J. Courses 129A–129B, 129C are not prerequisite to course 129D. Drama. Mr. Motofuji (W)

131. Japanese Bibliography. (4)
Three 1-hour lectures per week. Prerequisite: courses 6J and 109. ———— (W)

133A–133B. Chinese Bibliography. (4–4)
Three 1-hour lectures per week. Prerequisite: course 103. 133A is prerequisite to 133B. Open to seniors. Mr. Irwin (W, Sp)

* Not to be given, 1968–69.
134A–134B. Cantonese. (4–4)
Three 1-hour lectures per week. Prerequisite: course 106. Not open to students with previous experience in standard Cantonese. ——— (F, W)

135. Phonology of Ancient Chinese. (4)
Two 1½-hour lectures per week. Prerequisite: course 103. Mr. Chang (W)

137. Korean Bibliography and Research Method. (4)
Two 1½-hour lectures per week. Prerequisite: courses 3K and 103 or consent of instructor. Survey and analysis of major source works from the Three Kingdoms period through the Yi Dynasty.
Mr. Jamieson (W)

*139A–*139B. Japanese Grammar. (4–4)
Mr. Aoki (W, Sp)

*143. Classical Chinese: Canonical and Philosophical Texts. (4)
(Formerly numbered 113)
Three 1-hour lectures per week. Prerequisite: course 105.
Mr. Schäfer (Sp)

144A–144B–144C. Introduction to Mongolian. (5–5–4)
Four 1-hour lectures per week. An introduction to the official language of the Mongolian People's Republic (Khalkha), Graded readings in literary and expository texts.
Mr. Bosson (F, W, Sp)

145. Chinese Grammar. (4)
(Formerly numbered 123)
Two 1½-hour lectures per week. Prerequisite: course 106 and Linguistics 20.
Mr. Chang (Sp)

149A–149B. Advanced Colloquial Japanese. (4–4)
Three 1-hour lectures per week. Prerequisite: courses 149A is not prerequisite to 149B. Training in the active use of colloquial Japanese. 149B will include lectures in Japanese on elements of Japanese culture.
Mr. Nakamura (W, Sp)

*153. Introduction to Chinese Philology. (4)
Three 1-hour lectures. Prerequisite: course 103.
Mr. Schäfer (F)

Three 1½-hour lectures per week. Continued reading and exercises in Khalkha, together with an introduction to the orthography and grammar of Literary Mongolian in Vertical Script. Selected prose texts from the 17th century to the present in both Cyrillic Script and Vertical Script.
Mr. Bosson (F, W, Sp)

*156. Readings in Chinese Vernacular Literature. (4)
Three 1-hour lectures per week. Prerequisite: course 106.
Mr. Birch (W)

159. Readings in Contemporary Japanese Literature. (5)
Three 1½-hour lectures per week. Prerequisite: course 109.
Mr. Motofuji (Sp)

*164A–*164B–*164C. Tibetan. (4–4–3)
164A–164B. Two 1½-hour lectures per week. Prerequisite: consent of instructor. Introduction to the grammar of standard literary Tibetan; graded readings in Tibetan prose from literary and historical sources.
Mr. Bosson (F, W)
164C. One 2-hour lecture per week. Prerequisite: course 164A–164B.
Mr. Bosson (Sp)

Two 1½-hour lectures per week. Prerequisite: 164A–164B–164C. Emphasis on doctrinal Buddhist Texts.
Mr. Lancaster (F, W, Sp)

176. Old Turkish. Uighur. (4)
Two 1½-hour lectures per week. Prerequisite: NEL Old Turkish (3 quarters).
Mr. Bosson (Sp)

177A–177B. Manchu. (4–4)
Three 1½-hour lectures per week. Prerequisite: junior standing; consent of instructor. An introduction to literary Manchu; reading of selected prose texts.
Mr. Bosson (W, Sp)

*178A–*178B. Survey of Mongolian Languages. (4–4)
Three 1-hour lectures per week. Prerequisite: courses 144A–144B–144C. The linguistic classification of the Mongolian languages will be discussed in connection with a detailed study and comparison of their phonological and morphological peculiarities.
Mr. Bosson (F, W)

179. Burait. (4)
Three 1-hour lectures per week. Prerequisite: course 178A–178B. An introduction to the standard modern Burait literary language; reading of selected prose texts.
Mr. Bosson (Sp)

184. Advanced Tibetan. (2)
Two 1-hour lectures per week. Prerequisite: 174A–174B–174C. Extensive reading in historical and literary texts. The course may be repeated for credit.
Mr. Bosson (F)

187. Philological Laboratory. (4)
Three 1-hour lectures per week. Philological analysis of an Oriental language, using textual material.

*191A–*191B–*191C. Masterpieces of Chinese Literature and Literary Criticism. (4–4–4)
Two 1½-hour lectures per week. Prerequisite: course 191A. Verse.
Mr. Chen (F, W, Sp)
191B. Prerequisite: course 191A is not prerequisite to course 191B. Belles lettres. Mr. Chen (W)
191C. Prerequisite: courses 191A, 191B are not prerequisite to course 191C. Essays and classical fiction.
Mr. Chen (Sp)

*194. Sino-Altaica. (4)
Three 1-hour lectures per week. Prerequisite: 24 units of Chinese language courses. Problems in texts pertaining to the history of the Chinese frontier with special reference to China's early relations with Altaic-speaking people.
Mr. Boodberg (F)

H195. Honors Course. (1–6)
Hours to be arranged. Limited to senior honor candidates in Oriental languages.

* Not to be given, 1968–69.

*195. Preparatory Course. Here to be arranged.

199. Special Independent Study. Here to be arranged in Oriental languages.

122A–122B. Survey of Chinese Literature and Literary Criticism. (4)
Two 1-hour lectures per week. Prerequisite: consent of instructor.

122. History of Japanese Literature. Three 1-hour lectures per week. Prerequisite: junior standing, and knowledge of Chinese literature and references in English.


144. Korea. Mr. Bosson, Prerequisite: Development of Chinese influence.

145. Mongol. Mr. Bosson, Prerequisite: Development of Chinese influence.

146. Modern Japan. Reading in English works of Japanese fiction of the 20th century.

*193. Reading in Chinese Translation. Three 1-hour lectures per week. Prerequisites: familiarity with Chinese literature by means of an English translation.

171. The Development of the English Language. East (4)
Three 1-hour lectures per week. Prerequisites: familiarity with English literature.

112 Survey of Chinese Literature. Three 1-hour lectures per week. Prerequisite: 122. Required of students in English.
Prerequisite: junior standing. Knowledge of an Oriental language not required.

112A-112B. Survey of Chinese Classical Literature and Literary Criticism. (4-4)
Two 1½-hour lectures per week. Prerequisite: 112A is not prerequisite to 112B. The general characteristics, main currents and representative authors of Chinese literature in the classical tradition. Texts and references in English translation critically analyzed.
Mr. Chen (F, W)

132. History of Japanese Literature. (4)
Three 1-hour lectures per week. From the beginning to modern times, emphasizing Chinese, Buddhist, and Western influences.
Mr. Motofuji (W)

142. Civilizations of Eastern Asia. (4)
142C. China. Three 1-hour lectures per week. Prerequisite: junior standing. No knowledge of an Oriental language required. Some emphasis on religion, cosmology, kingship and science.
Mr. Schafer (Sp)

142D. Japan. Two 1½-hour lectures per week. Prerequisite: junior standing. No knowledge of an Oriental language required. Emphasis on cultural, literary and religious topics in selected periods.

142K. Korea. Three 1-hour lectures per week. The development of Korean civilization, emphasis on Chinese influence.
Mr. Rogers (F)

142M. Mongolia. Three 1-hour lectures per week. A survey of the historical, cultural, and linguistic development of the Mongols.
Mr. Bosson (F)

152. Modern Japanese Literature in Translation. (4)
Reading in English translations of representative works of Japanese writers from the end of the nineteenth century to the present.
Mr. Motofuji (Sp)

163. Readings in Pacific Literature in English Translation. (4)
Three 1-hour lectures per week. Literature in non-European and non-Asian languages (with the exception of Malay), with selections to be read in English translation. Areas: Philippines, Malay, Indonesia, other Pacific Islands.

171. The Development of Buddhism in the Far East. (4)
Three 1-hour lectures per week. Prerequisite: junior standing. No knowledge of an Oriental language is required.
Mr. Lancaster (Sp)

172. Survey of Chinese Vernacular Literature. (4)
Three 1-hour lectures per week. Fiction and drama from early times to the present with assigned readings in English translation.
Mr. Birch (W)

Graduate Courses
All courses may be repeated for credit with consent of instructor.

206. Chinese Vernacular Literature. (4)
One 2-hour seminar. Detailed study of a text with its literary and historical background.
Mr. Birch (Sp)

208. Malayo-Polynesian Linguistics. (4)
One 2-hour seminar. Prerequisite: course 118. (Sp)

209. Kambun. (4)
One 2-hour seminar.
Mr. Nakamura (Sp)

210. Seminar in Buddhism and Buddhist Texts. (4)
One 2-hour seminar per week. Prerequisite: may be repeated for credit with consent of instructor.
Mr. Lancaster (W)

212. Seminar in Chinese Literary History. (4)
One 2-hour seminar. Textual and aesthetic criticism.
Mr. Chen (F, W)

213. Seminar in Philological Analysis of Ancient Chinese Texts. (4)
One 2-hour seminar.
Mr. Boodberg (*F, W)

216. Texts on the Civilization of Medieval China. (4)
Two 1-hour seminars.
Mr. Schafer (F, W)

217. Seminar in Philological Analysis of Koryo and Yi Dynasty Sources. (4)
One 2-hour seminar.
Mr. Rogers (W, Sp)

224. Readings in Altaic Texts. (4)
One 2-hour seminar.
Mr. Bosson (W, Sp)

229. Seminar in Japanese Literature. (3)
One 2-hour seminar.

236. Seminar in Chinese Linguistics. (4)
One 1-hour seminar. Prerequisite: one or more of the following courses: 125, 135, 145.
Mr. Chang (W)

239. Seminar in Japanese Linguistics. (4)
One 2-hour seminar.
Mr. Aoki (F)

244. Seminar in Altaic Comparative Phonology. (4)
One 2-hour session per week. A laboratory in comparative phonology of the Altaic languages. Each student will concentrate on one specific aspect of the problem.
Mr. Bosson, Mr. Tekin (F, W)

249. Seminar in Modern Japanese Literature. (4)
One 2-hour seminar.
Mr. Motofuji (W)

299. Thesis Preparation and Related Research. (1-8)
(Formerly numbered 250)
Hours to be arranged. Prerequisite: consent of thesis supervisor and graduate adviser.
The Staff (F, W, Sp)
601. Individual Study for Master's Students. (1–8)
Prerequisite: consent of graduate adviser. Individual study for the comprehensive or language requirement in consultation with the graduate adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare for various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the Ph.D. degree. Must be taken on an satisfactory/unsatisfactory basis.
The Staff

[Departmental Major Adviser: Mr. Arnold.
Graduate Adviser: Mr. Durham.]

PALEONTOLOGY

(Department Office, 3 Earth Sciences Building)

J. Wyatt Durham, Ph.D., Professor of Paleontology and Curator of Mesozoic and Cenozoic Invertebrates in the Museum of Paleontology.
Joseph T. Gregory, Ph.D., Professor of Paleontology and Curator of Lower Vertebrates in the Museum of Paleontology.
Robert M. Kleinpell, Ph.D., Professor of Paleontology and Curator of Mesozoic and Tertiary Foraminifera in the Museum of Paleontology.
Donald E. Savage, Ph.D., Professor of Paleontology, Curator of Higher Vertebrates in the Museum of Paleontology, and Director of the Museum of Paleontology (Chairman of the Department).
Charles L. Camp, Ph.D., Professor of Paleontology and Curator of Amphibians and Reptiles in the Museum of Paleontology, Emeritus.
Ralph W. Chaney, Ph.D., Professor of Paleontology and Curator of Paleobotanical Collections in the Museum of Paleontology, Emeritus.
Zach M. Arnold, Ph.D., Associate Professor of Paleontology and Curator of Pleistocene and Recent Microorganisms in the Museum of Paleontology.
William A. Clemens, Jr., Ph.D., Associate Professor of Paleontology and Curator of Mammals in the Museum of Paleontology.
Wayne L. Fry, Ph.D., Associate Professor of Paleontology and Curator of Paleobotany in the Museum of Paleontology.
Samuel P. Welles, Ph.D., Lecturer in Paleontology and Principal Museum Paleontologist in the Museum of Paleontology.

Departmental Major Adviser: Mr. Arnold.
Graduate Adviser: Mr. Durham.

The Department of Paleontology offers education in the fields of invertebrate and vertebrate paleontology, micropaleontology, paleobotany and stratigraphic paleontology. Both the biology of fossil organisms and the geological aspects of their occurrence are emphasized. The undergraduate courses are designed primarily to provide a basis for advanced study. Courses 111, 120 and 125 present, respectively, the basic subject material for the areas of invertebrate paleontology, paleobotany, and vertebrate paleontology. Course 10 presents the broader aspects of paleontology for the nonmajor, and course 101 gives the nonmajor science-oriented advanced students an opportunity to learn some of the paleontological documentations of phylogeny and evolution. Course 170 reviews the history of the development of the science. Students are reminded that opportunities in the field are few without an advanced degree, and if they desire to pursue a career in paleontology they should prepare themselves for graduate study.

† On leave, 1968–69.
The Major

Lower Division  Required: Paleontology 1; Geology 5A–5B; Biology 1A–1B–1C (or 11A–11B, with a grade of B or better each quarter); Chemistry 1A–1B.

Upper Division  Required: Paleontology 111, 112, 120, 125 and at least 20 additional units in upper division or graduate courses in paleontology, geology, zoology, or botany, including Geology 150 or 118 and either Zoology 106 or 108A–108B or 155 or Botany 105 and 110. An advanced course in field geology or a course at a marine biological station or biological camp is strongly recommended.

Honors Program  Honors students may apply to the adviser at the beginning of the senior year for admission to the honors program. Students accepted for this program must complete a thesis (course H195).

Preparation for Graduate Study  Graduate study, with programs leading to both the M.A. and Ph.D. degrees, is a principal activity of the department. Students may emphasize either the biological or the geological aspects of paleontology. Facilities are extensive and education in most paleontological fields is offered. Candidates are expected to acquire a broad familiarity with several fields in paleontology as well as with related subjects outside the department, such as geology, anthropology, zoology, and botany. A reading knowledge of French and German or Russian is essential for efficient advanced work and is required of candidates for the Ph.D. degree.

For further details on the requirements for the M.A. and Ph.D. degrees, please contact the graduate adviser for the department.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. Introduction to Paleontology. (5)
Three 1-hour lectures, two 2-hour laboratories per week; field trip. Fossils: their significance in the study of evolution, their meaning to earth history. Ancient floras and faunas of the world. Genealogies of prominent groups of plants and animals, including the ancestry of man.

The Staff (Mr. Savage, coordinator) (F, Sp)

10. Elements of Paleontology. (4)
Two 1-hour lectures, one discussion-demonstration section per week and one or more field excursions. Not open to students who have taken course 1.

The fossil record as evidence of earth history and organic evolution with emphasis on biological and geological principles.

Mr. Arnold (W, Su)

Upper Division Courses

101. Phylegony and Evolution. (4)
Two 1-hour lectures and one 2-hour demonstration section per week; one or more field trips. Prerequisite: a course in paleontology or in a related science. Paleontology 101 is designed for science-oriented students not majoring in paleontology. Examination and discussion of selected examples from the fossil record of plant and animal groups.

The Staff (Mr. Savage, coordinator) (Sp)

111. Invertebrate Paleontology. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 1 or Biology 1C or 11B, or Geology 5B. Paleobiology, morphology, and systematics of the invertebrates.

Mr. Berry (F)

112. Stratigraphic Paleontology. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 111. Elements of biostratigraphy and the stratigraphic sequence of fossils.

Mr. Kleinpell, Mr. Berry (W)

113. Stratigraphic Chorology of the Cenozoic. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 112. Emphasis on the distribution and interrelationships of diverse marine Cenozoic faunas.

Mr. Kleinpell (Sp)

114. Micropaleontology. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 112 or 113. Principles of advanced stratigraphic paleontology with emphasis on the Foraminifera.

Mr. Kleinpell (F)

115. Paleobiology of Microorganisms. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 114 or consent of instructor. Biological and paleontological principles in the study of microfossils, with emphasis on the Foraminifera.

Mr. Arnold (Sp)

*120. Paleobotany. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: consent of instructor. To be given alternate years with course 220. Advanced study of plants represented in the fossil record. Primarily for students with comprehensive knowledge of earth sciences.

Mr. Fry (F)

121. Floras of the Past. (4)
Two 1-hour lectures, one 3-hour laboratory per week and term report. Prerequisite: course 120, 220, or consent of instructor.

Mr. Fry (W)

* Not to be given, 1968–69.
122. Field Investigations in Paleobotany. (4)
To be offered alternate years, in same years as 120. Lectures, demonstrations and special investigations in the field, preparation of acceptable research paper, examinations. Mr. Fry (Sp)

125. Vertebrate Paleontology. (4)
Three 1-hour lectures and one 3-hour laboratory per week; field trip. Prerequisite: Biology 1A—1B—1C or 11A—11B—11C and Paleontology 1 or Anthropology 1 or elementary geology. Mr. Gregory (Sp)

126. Morphology of the Vertebrate Skeleton. (1)
One 3-hour laboratory per week. Prerequisite: course 125 which should be taken concurrently. Development and morphology of skeleton and dentition. Mr. Gregory (Sp)

*131. Stratigraphy of Superjacent Series of Pacific Coast. (4)
Three 1-hour lectures per week and term report. Prerequisite: course 112. To be given in alternate years with 237. Mr. Durham (F)

136. Paleozoic and Early Mesozoic Stratigraphy of North America. (4)
Three 1-hour lectures and term report. Prerequisite: course 112. To be given alternate years and with course 210. Emphasis on Paleozoic stratigraphy of western North America. Mr. Berry (W)

170. History of Paleontology. (4)
Three 1-hour lectures per week, assigned reading and written report. Prerequisite: senior or graduate standing. Discovery and development of ideas, principles and methods; modern trends and theories. Mr. Gregory (W)

H195. Honors Thesis. (8)
Restricted to candidates for honors with the bachelor's degree. Preparation of a satisfactory report on original research. In evaluating the report emphasis will be placed on composition and style as well as scientific content. The Staff (F, W, Sp)

199. Special Study for Advanced Undergraduates. (1-5)
Restricted to senior honors students in paleontology. Special problem or reading assignments. The Staff (F, W, Sp, Su)

Graduate Courses

210. Principles of Phylogeny and Systematics. (4)
To be given in alternate years with 236. Four hours lecture and seminar per week. Mr. Berry (Sp)

217. Morphology and Systematics of Invertebrates. (4)
Two hours lecture and two 3-hour laboratories per week (alternate years, in same years as 237). Advanced studies in mollusks, echinoids, corals, and other invertebrates. Mr. Durham (W)

220. Advanced Paleobotany. (4)
Two hours lecture and two 3-hour laboratories per week. To be given alternate years with course 120. Prerequisite: advanced training in plant anatomy and systematics. Advanced study of plants represented in the geologic record. Mr. Fry (F)

* Not to be given, 1968-69.

224. Paleontology and Evolution of Fishes. (4)
To be given in alternate years with course 225. One hour lecture and two 3-hour laboratories per week. Prerequisite: comparative anatomy of vertebrates and elementary geology or paleontology. Mr. Gregory (F)

225. Paleontology and Evolution of Amphibians and Reptiles. (4)
To be given in alternate years with 224. One lecture hour and two 3-hour laboratories per week. Prerequisite: comparative anatomy of vertebrates and elementary geology or paleontology. Mr. Gregory (F)

226A-226B. Evolution and Classification of Mammals. (4-4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisites: courses 125 and 126 or comparative anatomy of vertebrates. Mr. Clemens (F, W)

227. History and Paleoecology of Higher Vertebrates. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 226A-226B. Mr. Savage (Sp)

229. Field Studies in Mammalian Stratigraphy. (4)
Lectures, demonstrations, and problem-solving in the field. Term report and examinations. Prerequisite: course 227. Mr. Savage, Mr. Clemens (Su)

236. Paleozoic and Early Mesozoic History of North America. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: consent of instructor. Emphasis on stratigraphic paleontologic problems of the Paleozoic of western North America. Mr. Berry (W)

237. Cenozoic of the Pacific Coast. (5)
Three 1-hour lectures and two 3-hour laboratories per week; week field trip. To be given alternate years. Prerequisite: course 111, 112, and consent of instructor. Studies of original literature and materials on invertebrate paleontology and stratigraphy. Mr. Durham (F)

238. Later Mesozoic of the Pacific Coast. (4)
Three 1-hour lectures and one 3-hour laboratory per week. To be given alternate years. Studies of original literature and materials of Mesozoic invertebrates. Mr. Durham (Sp)

239. Cenozoic History of the West Coast of North America. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Assigned readings. Prerequisite: course 114. To be given in alternate years. Emphasis on correlation, sequence, and relationships of foraminiferal faunas. Mr. Kleinpell (Sp)

250. Seminars in Paleontology. (2)
Advanced study and current literature in various fields of paleontology. Topics vary from year to year. (a) Mr. Berry (F); (b) Mr. Kleinpell (W, V); (c) Mr. Clemens (F, Sp); (d) Mr. Gregory (F); (e) Mr. Durham (W, Sp); (f) Mr. Fry (W, Sp); (g) Mr. Arnold (F, Sp); (h) Mr. Savage (Sp).

299. Research in Paleontology. (1-9)
The Staff (F, W, Sp, Su)
Museum of Paleontology

The University of California Museum and Paleontology was founded by Annie M. Alexander in order to encourage and sponsor research in paleontology at the Berkeley campus. It is the research institute and archive for the staff and students and for qualified visiting scholars. The museum's collections and staff also provide academic and research assistance to other institutes and departments within the University and to scholars around the world.

The very large collections of fossil vertebrates, invertebrates and plants in the Museum of Paleontology were obtained principally from the western United States, but there are excellent specimens and assemblages, many of them unique, from every continent. The high quality and continual growth of the museum's collections reflect an active and diversified field and laboratory research program.

Collections of fossils are housed in the Earth Sciences Building and Campanile at Berkeley and in the University's Storage Facility at Richmond. Requests for utilization of the collections or facilities of the Museum of Paleontology should be addressed to the Director, Room 3, Earth Sciences Building.

PARASITOLOGY

For courses in Parasitology, see Entomology and Parasitology.

PHILOSOPHY

(1) PARASITOLOGY

(2) PHILOSOPHY

(3) Individual Study for Master's Students. (1–8)

Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

(4) Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)

601. Individual Study for Master's Students. (1–8)

Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.

The Staff (Su, F, W, Sp)
The Major


Upper Division 104, 134A.

A total of 52 units is required in the major program. Twenty-seven units are required in the upper division in addition to the two required upper division courses 104 and 134A. The student must take at least two courses in each of groups A, B, and C. The required courses 104 and 134A in groups A and B, respectively, will satisfy the A and B requirements in part, but may not be counted toward satisfaction of the 27-unit requirement.

With the approval of the departmental adviser, 4 units of the major may be taken in another department, provided the course selected is relevant to the major.

Honors Program Students who have achieved honors standing at the end of the junior year will be permitted to enter the departmental honors program in the senior year. This program requires completion with a grade of B or better of one of the following three options: (1) Philosophy H195, Philosophy Tutorial; (2) Philosophy H197, Senior Colloquium; (3) a graduate seminar. With the approval of the departmental honors committee and the instructor in charge, the student will be permitted to enroll in a seminar, approval being based on the adequacy of the student's preparation and the likelihood of his profiting from such study. In addition the student will submit an acceptable thesis, for which no unit credit will be assigned.

Higher Degrees See Chapter III of this catalogue. Attention is called to the requirement of a reading knowledge of French and German for the Ph.D. in philosophy. Students who contemplate advanced study in philosophy should prepare themselves for the requirement in their undergraduate years.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

2. Introduction to Philosophy: Ethical and Political Philosophy. (4)

Three 1-hour lectures per week and one weekly section meeting for discussion and written work.

Mr. Rynin (Su); (F) Mr. Vermazen (W); Mr. Searle (Sp)

4. Introduction to Philosophy: Theory of Knowledge. (4)

Three 1-hour lectures per week and one weekly section meeting for discussion and written work.

Mr. Feyerabend (Su); Mr. Clarke (F)

Mr. Scriven (W); Mr. Stroud (Sp)

11A–11B. Theory of Argument. (4–4)

A study of the concepts and procedures of logic, semantics, and methodology, entering into the construction and criticism of arguments directed towards truth and knowledge.

11A, (W); 11B, (Sp); Mr. Rynin

12A–12B. Introduction to Logic. (4–4)

Two 1-hour lectures and two section meetings per week. Course 12A in itself should not be regarded as a terminal course in logic.

12A, Mr. Mates (Su); Mr. Chihara, Mr. Myro (F); Mr. Adams (W); Mr. Clarke (Sp)

12B, Mr. Myro (Su); Mr. Adams (F); Mr. Chihara (W); Mr. Mates (Sp)

25A. Ancient Philosophy. (5)

Three 1-hour lectures per week and one weekly section meeting.

25B. Medieval P

25C. Modern P

26A. Modern P

26B. Medieval P

27A. Modern P

27B. Medieval P
25B. Medieval and Early Modern Philosophy. (5)
Three 1-hour lectures per week and one weekly section meeting.
Mr. Aschenbrenner (W)

25C. Modern Philosophy to Kant. (5)
Three 1-hour lectures and one section meeting per week.
Mr. Myro (Sp)

Upper Division Courses

General Prerequisites.—Students enrolling in any restricted upper division course must have completed 8 units in courses 2, 4, or 25A, 25B, and 25C, or have completed, under conditions specified below, course 101. Additional prerequisites are indicated in certain courses.

Unrestricted Course

101. Philosophical Theories. (5)
Three 1-hour lectures and one section meeting per week. Fundamental problems in metaphysics and the theory of knowledge. Careful reading and discussion of selected texts of Plato, Hume, Kant and recent authors. Course 101 is open to juniors and seniors who are not majors in philosophy and who have not taken course 4 or its equivalent. It will be accepted as prerequisite for other upper division courses in the department in lieu of course 4.
Mr. Wallace ——— (Su); Mr. Searle (F); Mr. Feyerabend (W); Mr. Scriven (Sp)

Restricted Courses

Group A.—Courses concerned with a critical analysis and appraisal of specific human interests, such as art, literature, morality, religion, science, and society.

104. Ethics. (5)
Three 1½-hour lectures per week. Moral values; the concepts of good and right; the criteria of conduct.
——— (Su); Mr. Vermazen (F); Mr. Myro (Sp)

106. Philosophy in Literature. (5)
Three 1½-hour lectures per week. Philosophical issues as expressed in poetry, drama, and the novel. At the discretion of the instructor, the general prerequisite may be waived for major students in literature or in the fine arts.
Mr. Lichtman (F)

108. Social Philosophy. (5)
Three 1½-hour lectures per week. Fundamental notions involved in the explanation and evaluation of social structures and processes. Basic problems of human personality and values in relation to their social matrix.
Mr. Lichtman (Sp)

112. Philosophy of Religion. (5)
Three 1½-hour lectures per week. The nature and the validity of religious ideas.
——— (F)

*118. Philosophy of Law. (5)
Three 1-hour lectures per week. Philosophical problems arising in the legal context.
——— (Sp)

*124. Theory of Historical Inquiry. (5) ——— (W)

125. Theory of Value. (5)
Three 1½-hour lectures per week. The principles of evaluation in relation to both individual and social problems.
Mr. Rynin (Sp)

126A—126B. Aesthetics. (5)
Three 1-hour lectures per week. Course 126A is not prerequisite to 126B. At the discretion of the instructor, the general prerequisite for upper division courses in philosophy may be waived for major students of literature or the arts. Form, expression, representation, style; interpretation and evaluation.
126A. The Visual Arts. Mr. Vermazen (F)
126B. Literature and Music. Mr. Vermazen (W)

127. Philosophy of History. (5)
Three 1½-hour lectures per week. Theories of history: Augustine, Vico, Hegel, and others.
——— (Su); Mr. Scriven (W)

*128. Political Philosophy. (5)
Three 1½-hour lectures per week. Analysis of political obligation and related problems.
Mr. Lichtman (F)

129. Aesthetic Theories. (5)
Three 1-hour lectures per week. A study of aesthetic theories based on historical and recent materials.
Mr. Aschenbrenner (F)

Group B.—Courses dealing with the methods of reflective thinking and the more general features of experience. Philosophy 11A or 12A is recommended as preparation for courses in this group.

131. Metaphysics. (5)
Three 1½-hour lectures per week.
Mr. Myro (F)

133A—133B. Philosophy of Language. (5–5)
Three 1½-hour lectures per week.
133A. Mr. Searle (W); 133B. Mr. Schiffer (Sp)

134A—134B. Theory of Knowledge. (5–5)
Three 1-hour lectures per week.
134A. Mr. Myro (Su); ——— (F); Mr. Scriven (Sp); 134B. Mr. Stroud (Sp)

140A—*140B. Philosophy of the Natural Sciences. (5–5)
Three 1½-hour lectures per week.
Sequence beginning (W) 140A. Mr. Feyerabend (W); *140B. Mr. Feyerabend (Su)

141. Philosophy of the Social Sciences. (5)
Three 1½-hour lectures per week. Philosophical problems arising in the social sciences, such as the nature and theory of explanation in the social sciences, nature and explanatory power of models, axiomatization, etc.
Mr. Scriven (Sp)

142. Probability and Induction. (5)
Three 1½-hour lectures per week. Different approaches to the foundations of probability; inductive confirmation of scientific theories.
Mr. Adams (Sp)

143A—143B. Logic. (5–5)
Three 1-hour lectures per week. Prerequisite: course 12A—12B or equivalent.
——— 143A (F); 143B (W)

* Not to be given, 1968–69.
144. Philosophy of Mathematics. (5)
Three 1 1/2-hour lectures per week. Foundations of mathematics: logicism, intuitionism, formalism. Set theoretical paradoxes, definition of number, problems of continuum.
Mr. Chihara (F)

150. Anglo-American Philosophy, 1900-1945. (5)
Three 1 1/2-hour lectures per week. Mr. Schiffer (Sp)

151. Anglo-American Philosophy Since 1945. (5)
Three 1 1/2-hour lectures per week. Mr. Chihara (W)

*152. Contemporary Continental Philosophy. (5)
Three 1 1/2-hour lectures per week. Phenomenology, existentialism, and related movements in contemporary European philosophy. (Sp)

159. Semantics. (5)
Three 1 1/2-hour lectures per week. Prerequisite: 8 units of philosophy, or equivalent at the discretion of instructor. Recommended: an acquaintance with the truth-tables techniques of elementary propositional logic. A systematic discussion of the theory of meaning based on the verifiability principle; criteria and procedures for ascertaining the significance of linguistic expressions of the several main types developed against the background of a general theory of signs.
Mr. Rymn (Su)

Group C.—Courses dealing with individual thinkers and epochs in the history of ideas. Course 25A-25B-25C or its equivalent is prerequisite to courses in this group.

160A-160B. Plato. (5-5)
Three 1-hour lectures per week. —160A (F); 160B (W)

161. Aristotle. (5)
Three 1 1/2-hour lectures per week. Mr. Grice (W)

*168. Medieval Philosophy. (5)
Three 1 1/2-hour lectures per week. Mr. Mates (W)

170. Descartes. (5)
Three 1-hour lectures per week. Mr. Schifffer (W)

171. Hobbes. (5)
Three 1-hour lectures per week. Mr. Matson (W)

*172. Spinoza. (5)
Three 1-hour lectures per week. —(W)

173. Leibniz. (5)
Three 1-hour lectures per week. Mr. Matson (Su)

*174. Locke. (5)
Three 1 1/2-hour lectures per week. —(W)

175. Berkeley. (5)
Three 1-hour lectures per week. Mr. Adams (W)

176. Hume. (5)
Three 1 1/2-hour lectures per week. Mr. Stroud (F)

178A-178B. Kant. (5-5)
Three 1-hour lectures per week. Mr. Aschenbrenner, 178 (F) 178B (Sp)

*180. Philosophy of the 19th Century. (5)
Three 1 1/2-hour lectures per week.
Mr. Lichtman (W)

*181. Classical American Philosophy. (5)
Three 1-hour lectures per week. Readings in A. B. Johnson, C. Feirce, W. James, J. Royce, G. Santayana, J. Dewey, and others.
(—(W)

182A-182B. Marxism. (5-5)
Three 1 1/2-hour lectures per week. A critical appraisal of the philosophical foundations and implications of Marx's view of man and society. During the first quarter, particular attention will be devoted to Hegel and Feuerbach and their influence on the development of Marxian thought. Mr. Lichtman (W, Sp)

*183. Materialism and Naturalism. (5)
Three 1-hour lectures per week. Historical and critical studies of the chief philosophical materialists from Democritus to Dewey. (—(W)

*H195. Philosophy Tutorial. (5)
Restricted to senior honor students majoring in philosophy. The department will designate a tutor, with whom the student will meet once a week, submitting written work on topics designated by the tutor. (F, W, Sp)

H197. Senior Colloquium. (5)
Restricted to senior honor students majoring in philosophy. A seminar course for a group of honor students on a topic to be announced. The colloquium will meet once or twice a week. Emphasis on the writing of papers and discussion of them in the colloquium.
Mr. Grice (Sp)

199. Special Studies for Advanced Undergraduates. (1-5)
Restricted to senior honor students.
The Staff (Mr. Lichtman in charge) (F, W, Sp)

Graduate Courses

250. Special Studies. (1-9)
Enrollment is ordinarily restricted to students who have been admitted to candidacy for the doctor's degree. The Staff (Mr. Matson in charge) (F, W, Sp)

290. Seminar. (5)
Advanced study in various fields of philosophy. Topics will vary from year to year.
The Staff (Su, F, W, Sp)

PHYSICAL EDUCATION

(Department Office, 103 Harmon Gymnasium)

Franklin M. Henry, Ph.D., Professor of Physical Education.
Deobold B. Van Dalen, Ph.D., Professor of Physical Education (Chairman of the Department).

* Not to be given, 1968-69.
The undergraduate major in physical education is designed to develop the scientific bases for understanding the functional status of the individual and his ability to engage in motor activity including the motor performance of daily life and those of a recreational, competitive or esthetic nature. The role of athletics, dance and other physical activities, both historical and contemporary, in the United States and certain other cultures is examined.

Departmental Major Advisers: for women, Miss Eckert, Miss Norrie; for men, Mr. Royce (Juniors) and Mr. Wilmore (Seniors).

Graduate Advisers: Mr. Van Dalen, Mr. Henry.

Teacher Education Advisers: for women, Miss Park; for men, Mr. Flanagan.
The Major

Lower Division  High School chemistry or equivalent; Elementary Statistics; Anatomy 25 or 102; Physics 10; Physiology 1; Psychology 1; Physical Education 1, 12, or 26. Recommended: History 4A–4B; Sociology 1.

Upper Division  Physical Education 101, 135A, 105A–B, 110, 130, 120 or 140, 111 or 135B, 6 units selected from: Anthropology 140, 149, 152; Physiology 132, 152, 153; Psychology 140, 142; Sociology 148.

Honors Program  Physical Education H195, or H195 and 200—6 units; Physical Education H196—3 units. One course in the major will be waived with the approval of the adviser.

Teaching Credential  Candidates for the Standard Teaching Credential with a major in physical education see the School of Education Bulletin. Work on a M.A. degree in physical education can be started concurrently.

Preparation for Graduate Study  Students planning to continue toward the M.A. or doctorate degree should include course 135B in their programs. Related courses in anthropology, physiology, and psychology are recommended. Transfer students must complete the equivalent of the undergraduate major.

The Graduate Major

Course 200 is required of all graduate students. For the M.A. degree, either Plan I requiring 30 units and a thesis or Plan II requiring 36 units and a comprehensive final examination may be followed. A program of study with joint majors in education and physical education leads to the Ed.D. degree. Candidates for the latter degree should consult graduate advisers in the School of Education as well as in the Department of Physical Education.

Activities Instructions

The Department of Physical Education offers to all students an opportunity in instructional classes to learn and to improve skills in a wide variety of sports, dance, and gymnastic activities and to maintain or develop physical fitness.

Fees  The incidental fee payable by all students at the time of registration entitles students to use of gymnasiums, swimming pools, towels, showers, lockers, tennis courts, and the athletic fields; also to the use of costumes for certain physical education activities, including swimming.

The fee for ice skating is $8; for bowling, $7; the approximate fee for elementary sailing, $15; for intermediate sailing, $15.

Fines  Fines are imposed for each formal transaction necessitated by failure of the student to comply with the regulations of the department: (a) failure to return equipment or clothing on or before the date posted for such return at the end of each quarter, or at the end of each special session of the University, or failure to return athletic supplies (balls, bats, etc.) on the date of issue, $1 for each twenty-four hours until the full purchase price of the article has been reached; (b) overnight use of dressing locker, $2; (c) failure to renew or close out locker at the end of each quarter, $5.

Lower Division Courses

1. Physical Education Activities for Men (½)
   Sections meet two hours per week.

Letters and Science List: courses 105A, 105B, 110, 111, 130 are included in Letters and Science list of courses. For regulations governing this list, see page 80.
Perceptions, motivation, learning, and emotion as factors in physical activity; reaction time and coordination; the psychology of competition.

Miss Norrie (Sp)

111. Motor Development. (3)
Three 1-hour lectures per week. Prerequisite: Psychology I, course 135A. Motor development from birth to maturity, age changes, sex and individual differences, maturation, and motor learning in childhood and adolescence, relation of motor performance to other aspects of behavior.

Miss Eckert (W)

120. Sports in American Society. (3)
Three 1-hour lectures per week. Prerequisite: Sociology I or equivalent. Interrelationships of sports and physical recreation with other aspects of American culture. Emphasis on the twentieth century.

Mr. Flanagan (F)

130. History and Theories of Physical Education. (4)
Three 1-hour lectures per week and one section meeting. Prerequisite: History 4A or B, or History 17A or B. Sports, dance, and gymnastics in selected historical and contemporary cultures. Political and social influences on theories and practices.

Miss Hoepner (W)

131. Curriculum Development and Administration. (4)
Four 1-hour lectures per week. Prerequisite: course 130. Curriculum development and evaluation in school programs of physical education including the instructional program, intramural sports and interscholastic athletics. Administrative policies and procedures pertaining to staff, facilities, equipment, budget and program.

(Pr)

135A–135B. Measurement and Evaluation in Physical Education. (4–3)
135A. Three 1-hour lectures and 2 hours of laboratory per week. Prerequisite: a course in elementary statistics.

Miss Eckert (F)

135B. Three 1-hour lectures per week. Prerequisite: course 135A. Historical development of evaluation in physical education; measurement of physical abilities and special motor skills; analysis of selected research studies in the field. Inferences from hypothesis testing, correlational and variance analyses and regression. The statistical nature of individual differences and error.

Mr. Henry (W)

140. Community Recreation. (3)
Three 1-hour lectures per week. Prerequisite: Sociology I or equivalent. Nature, scope and significance of recreation in the social and economic life of the American people. History, purpose, organizational patterns and interrelationships of agencies and institutions which serve the recreational needs of the community and the nation.

Miss Hoepner (Sp)

160A–160B. Theory of Dance. (2–2)
One 1-hour lecture and 3 hours of laboratory per week. Prerequisite: course 12 (sections in dance); Psychology I.


Mrs. Biland (F)


Mrs. McComb (Sp)
165A—165B. Theory of Sports Activities. (3-3)
165A. Two 1-hour lectures and 4 hours of laboratory per week. Prerequisite: courses 12 and 26 (sections in individual sports, team sports, track and field). The mechanics of movement in sports for women. Analysis of complex skills. Game structure and strategy. Competition for women. Miss Park (F)
165B. Two 1-hour lectures and 4 hours of laboratory per week. Prerequisite: course 165A, courses 12 and 26 (sections in gymnastics, apparatus, and individual exercise). The mechanics of movement in gymnastic activities for women. Analysis of complex skills in a wide range of gymnastic activities and the analysis of exercise as it is related to gymnastic activities. Miss Park (W)

*171. Conditioning of Athletes and Care of Injuries (Men). (3)
One 1-hour lecture and 2 hours laboratory per week. Prerequisite: course 5; Physiology 1 or Anatomy 25. Conditioning and care of athletes; sleep, diet, health, and activity habits. Care of injuries, with special emphasis on therapy, taping, and protective equipment. Mr. Royce (F)

H195. Honors Course. (3-6)
Individual conferences to be arranged. Special study and/or research in the field of the major. The Staff (Mr. Van Dalen in charge) (Su, F, W, Sp)

H196. Honors Thesis. (3)
Individual conferences to be arranged. The Staff (Mr. Van Dalen in charge) (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (2-4)
Individual conferences to be arranged. Restricted to honor students. The Staff (Mr. Van Dalen in charge) (Su, F, W, Sp)

Professional Course

300. Problems and Methods in Teaching Physical Education. (3)
Three 1-hour lectures per week. Prerequisite: satisfactory score in qualifying examinations in physical education activities; course 101 or 105; 110 or 135A. Analysis of modern, practical and theoretical problems in teaching physical activities to secondary school boys. Study of methods and outcomes and the desirable progression and sequences of skills, especially as applied to developmental activities and individual, dual, and team sports. Mr. Flanagan (Sp)

Graduate Courses

200. Seminar in Physical Education. (3)
One 3-hour meeting per week. Critical review of literature and research methods. (F); Miss Norrie (Su)

201. Seminar in Movement and Body Mechanics. (3)
One 3-hour meeting per week. Prerequisite: course 101. Neurophysiological concepts, physical laws, and kinesiology. Mr. Royce (Sp)

205. Seminar in Physiological Hygiene. (3)
One 3-hour meeting per week. Prerequisite: course 105. Immediate and long-range adaptations of the body to exercise. Physiological limits and work capacities in relation to age, sex, diet, environmental factors, and nature of activity. Mr. Wilmore (Su, F)

210. Seminar in Psychologic Bases of Physical Activity. (3)
One 3-hour meeting per week. Prerequisite: course 110. Kinesthetic perception, motor coordination and learning, motivation, tension, subjective psychological factors, and related topics. Miss Norrie, Mr. Henry (Su, F)

211. Seminar in Motor Development. (3)
One 3-hour meeting per week. Prerequisite: course 111. Contemporary theories of development. Changing motor abilities and behavior from childhood through youth and age. (W)

230. Seminar in Cultural and Historical Foundations of Physical Education. (3)
One 3-hour meeting per week. Prerequisite: course 130. Historical and cultural analyses of athletics, physical exercises and dance in primitive and modern societies. Mr. Van Dalen (Sp)

231. Administration of Physical Education. (3)
One 3-hour meeting per week. Prerequisite: course 131. Administrative and curricular problems in physical education. Mr. Van Dalen (W)

290. Research. (2-6)
Hours to be arranged. The Staff (Mr. Van Dalen in charge) (Su, F, W, Sp)

299. Special Study for Graduate Students. (2-4)
Hours to be arranged. Advanced study of special topics under the direction of a faculty member. The Staff (Mr. Van Dalen in charge) (Su, F, W, Sp)

601. Individual Study for Master's Students. (1-8)
Hours to be arranged. Individual study to prepare for master's comprehensive. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mr. Van Dalen in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)
Hours to be arranged. Individual study in consultation with major field adviser to prepare for doctoral examinations. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Mr. Van Dalen in charge) (Su, F, W, Sp)

**PHYSICS**

(=Department Office, 366 LeConte Hall=)

Luis W. Alvarez, Ph.D., Professor of Physics.
Robert R. Brown, Ph.D., Professor of Physics.
Owen Chamberlain, Ph.D., Professor of Physics.

*Not to be given, 1968-69.*
Geoffrey F. Chew, Ph.D., Professor of Physics.
William Chinowsky, Ph.D., Professor of Physics.
Frank S. Crawford, Ph.D., Professor of Physics.
Kenneth M. Crowe, Ph.D., Professor of Physics.
Sumner P. Davis, Ph.D., Professor of Physics.
William B. Fretter, Ph.D., Professor of Physics.
Donald A. Glaser, Ph.D., Professor of Physics and Molecular Biology.
Gerson Goldhaber, Ph.D., Professor of Physics.
Erwin L. Hahn, Ph.D., Professor of Physics.
August C. Helmholtz, Ph.D., Professor of Physics.
J. David Jackson, Ph.D., Professor of Physics.
Carson D. Jeffries, Ph.D., Professor of Physics.
Robert Karplus, Ph.D., Professor of Physics.
Allan N. Kaufman, Ph.D., Professor of Physics.
Leroy T. Kerth, Ph.D., Professor of Physics.
Arthur F. Kip, Ph.D., Professor of Physics.
Charles Kittel, Ph.D., Professor of Physics.
Walter D. Knight, Ph.D., Professor of Physics.
Wulf B. Kunkel, Ph.D., Professor of Physics.
Edwin M. McMillan, Ph.D., Professor of Physics and Director of the Lawrence Radiation Laboratory.
Stanley Mandelstam, Ph.D., Professor of Physics.
Donald H. Miller, Ph.D., Professor of Physics.
Burton J. Moyer, Ph.D., Professor of Physics.
Alan M. Portis, Ph.D., Professor of Physics.
Wilson M. Powell, Ph.D., Professor of Physics.
John O. Rasmussen,† Ph.D., Professor of Physics and Chemistry.
Frederick Reif, Ph.D., Professor of Physics.
John H. Reynolds, Ph.D., Professor of Physics.
Arthur H. Rosenfeld, Ph.D., Professor of Physics.
Emilio G. Segrè, Ph.D., Professor of Physics.
Howard A. Shugart, Ph.D., Professor of Physics.
Herbert M. Steiner,† Ph.D., Professor of Physics.
M. Lynn Stevenson, Ph.D., Professor of Physics.
Edward Teller, Ph.D., University Professor of Physics.
Robert L. Thornton, Ph.D., Professor of Physics.
Charles H. Townes, Ph.D., Professor at Large.
George H. Trilling, Ph.D., Professor of Physics.
Kenneth M. Watson, Ph.D., Professor of Physics.
Steven Weinberg,† Ph.D., Professor of Physics.
Harvey E. White, Ph.D., Professor of Physics and Director of the Lawrence Hall of Science.
Eyvind Wichmann, Ph.D., Professor of Physics.
Charles Zemach, Ph.D., Professor of Physics.
Raymond T. Birge, Ph.D., L.L.D., Professor of Physics, Emeritus.
Robert B. Brode, Ph.D., Professor of Physics, Emeritus.
Victor F. Lenzen, Ph.D., Professor of Physics, Emeritus.
Leonard B. Loeb, Ph.D., Professor of Physics, Emeritus.
Hiram W. Edwards, Ph.D., Associate Professor of Physics, Emeritus.
Kinsey A. Anderson, Ph.D., Associate Professor of Physics.

† On leave, 1968–69.
The Major

The physics major is designed to give the student a broad and thorough understanding of the fundamentals of physics. The emphasis is, therefore, on this general understanding rather than on specialized skills, although some specialized courses such as Physics 129 or 141 may be taken at the option of the student. Those considering a physics major are urged to consult an adviser early, in order to discuss the content of the major and also the opportunities after graduation. Recent graduates have entered graduate work in a number of scientific fields such as biophysics and geophysics as well as in physics, and others have gone on to jobs in industrial and government laboratories. Students who are considering high school teaching as a career are especially urged to consult with their adviser early.

The prospective physics major is ordinarily required to take the following courses: Physics 4A–4C–4E, Mathematics 1A–1B–1C or 11A–11B and Mathematics 11C–12A–12B (which include differential equations, a prerequisite for much upper division work in physics) and Chemistry 1A–1B, or preferably Chemistry 4A–4B. The preceding physics and mathematics courses, or their equivalent, constitute the minimum preparation for most upper division physics courses.

The physics major includes the following courses: Physics 105A, 105B; Physics 110A, 110B, 110C; Physics 112; Physics 137A, 137B; Physics 111A, 111B, 111C (two of the three courses); two additional upper division courses in physics (excluding 121, 115, 106AB, 132) chosen with the approval of the major adviser; this option will give the student an introduction to some areas of current research. Special programs may be worked out in consultation with the adviser. Completion of the physics major is usually required for admission to graduate work. Additional mathematics from among the courses Mathematics 104A–104B, 120A–120B–120C, 185 is recommended. See below for foreign language requirements for graduate work.

Honors Program Students with a grade-point average of 3.0 or better may consult the major adviser concerning the honors program. This program requires completion of the major and four additional courses of upper division credit (40 units), at least two of which must be courses not required by the major.
of the major, at least three quarters of Physics H197, and the recommendation of the departmental advisers. Special research work, which may be taken as Physics 199 (2 units), may be substituted for one or two quarters of Physics H197.

Physics and Biology  An individual major may be arranged for students who wish to obtain a broad introduction to the physical sciences and their application to biology. Advisers: Mr. Haynes, Mr. Lawrence, Mr. Nichols.

Engineering Physics  The College of Engineering, with the cooperation of the Department of Physics, offers a curriculum in engineering physics leading to the degree of Bachelor of Science. Major Adviser: Mr. Davis.

Graduate Programs

Graduate work leading to the M.A. and Ph.D. degrees is offered in the Department of Physics, with emphasis placed on the Ph.D. In addition to applications and transcripts of undergraduate work, applicants for admission must submit scores on the graduate record examination in physics. Before the opening of their first quarter of graduate work, all admitted students take a written examination which covers the material in the undergraduate physics major. This examination helps the advisers to place students in the proper graduate or undergraduate courses. It is also the written part of the written and oral preliminary examination mentioned below.

Requirements for the Ph.D. include the contents of the following courses: Physics 205A–205B, 210A–210B–210C, 212A–212B, 221A–221B–221C, and Mathematics 223A–223B–223C. In addition, language examinations in two of three languages, French, German, and Russian, must be passed. After successful completion of a preliminary examination, the student may proceed to research work. Research is a major part of the Ph.D. program, and the department offers opportunities in a wide variety of experimental and theoretical fields. The facilities of the Lawrence Radiation Laboratory are available for experimental and theoretical research in high energy and nuclear physics. Work in LeConte and Birge halls includes, among other fields, solid-state physics (both experimental and theoretical), cosmic-ray and space physics, low-temperature physics, mass spectroscopy, optical spectroscopy and atomic beams. Students with special research interests should make inquiry in the department office. After he has made substantial progress on his thesis problem, the Ph.D. candidate must pass an oral qualifying examination in his broad field of research, and after completing the thesis is awarded the Ph.D. degree.

The M.A. degree is offered under Plan II of the Graduate Division. The candidate must successfully complete the preliminary examination mentioned above.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

Courses 4A–4B–4C–4D–4E are fundamental and are designed to meet the needs of students majoring in any of the physical sciences, or who are enrolled in the colleges of Chemistry or Engineering. Physics 6A–6B–6C is designed for premedical students, students in architecture, and students in the biological sciences. Physics 10, 11A–11B, and Contemporary Natural Sciences 1A–1B–1C are recommended for the nonscience major student who desires to gain some understanding of basic physical concepts. These courses fulfill, in part, the natural science requirements of the College of Letters and Science. All students planning to take lower division courses, except Physics 10, 11A–11B, and Contemporary Natural Sciences 1A–1B–1C should have completed trigonometry.

Contemporary Natural Science (Natural Science 1A–1B–1C) (4–4–4)  Sequence beginning (F)

Physics 4A, Mr. Karplus, Mr. Knight, Mr. Reif,

4A. Physics for Scientists and Engineers. (3)

Three 1-hour lectures and one 1-hour discussion section per week. Prerequisites: high school physics or consent of instructor, Mathematics 1A; Mathematics 1B should be taken concurrently. Open to students in all colleges. Physics 4A–4B–4C–4D–4E is required for students in the College of Letters and Science whose major subject is physics, and for students in engineering and chemistry. Elementary
mechanics; vectors; Galilean invariance; conservation of energy and momentum; harmonic oscillator; rigid bodies; inverse square law forces.

Mr. Chizowsky, Mr. Helmholz, Mr. Moyer, Mr. Parker (Su, F, W, Sp)

4B. Physics for Scientists and Engineers. (4)
Three 1-hour lectures, one 1-hour discussion section, and one 3-hour laboratory period per week.
Prerequisite: course 4A; Mathematics 1C should be taken concurrently. Special relativity; electromagnetic induction; Maxwell's equations; waves and oscillations; electromagnetic waves; optics.

Mr. Brown, Mr. Kip, Mr. Parker (Su, F, W, Sp)

4C. Physics for Scientists and Engineers. (4)
Three 1-hour lectures, one 1-hour discussion section, and one 3-hour laboratory period per week.
Prerequisite: course 4B; Mathematics 11C should be taken concurrently. Electromagnetic theory; heat; electric and magnetic properties of matter. Mr. Anderson, Mr. Bingham, Mr. Davis, Mr. Reif (F, W, Sp)

4E. Physics for Scientists and Engineers. (4)
Three 1-hour lectures, one 1-hour discussion section, and one 3-hour laboratory period per week.
Prerequisite: course 4D. Statistical physics; kinetic theory; heat; electric and magnetic properties of matter. Mr. Anderson, Mr. Bingham, Mr. Davis, Mr. Reif (F, W, Sp)

6A-6B-6C. Introductory Physics. (4-4-4)
Three 1-hour lectures, one 1-hour discussion section, and one 3-hour laboratory per week. Prerequisite: Mathematics 16A or consent of the instructor. Mathematics 16B should be taken concurrently with Physics 6A. An introductory physics course using calculus and covering mechanics, electricity and magnetism, optics, heat, thermodynamics, atomic and nuclear physics. Topics of biological interest will be emphasized. Laboratory work to accompany the lectures. Students with credit for Physics 2A, 2B or 2C will receive two units of credit for 6A, 6B, or 6C.

Mr. Helmholz, Mr. Fortis, Mr. Ross (Su, F, W, Sp)

10. Descriptive Introduction to Physics. (4)
Four hours of class per week. Open to students with or without high school physics, but not open to those who have credit for any of 2A-2B-2C, 4A-4B-4C-4D-4E, 6A-6B-6C, 11A-11B, Contemporary Natural Science, or equivalent. A brief presentation of some of the more important phenomena in physics, with experimental illustrations.

Mr. Karpus, Mr. Xerth (Su, F, W, Sp)

11A-11B. Foundations of Physical Sciences. (4-4)
Three 1-hour lectures and one 3-hour laboratory period per week. To receive credit toward the natural sciences requirement of the College of Letters and Science, all quarters must be completed. Not ordinarily open for credit to students who have completed other courses in the departments of Chemistry and Physics. Students who have completed Physics 10 may receive 4 credits on completion of Physical Sciences 11A-11B; sponsored jointly by Chemistry-Physics. Selected related topics such as physical optics, X rays, crystals, stoichiometry, Newtonian mechanics, relativity, kinetic theory, chemical reactions, electromagnetic, quantum theory. Necessary mathematical foundations will be introduced.

Mr. Knight, Mr. Shugart (F)

Three hours of lecture per week. Intended for students with interests in music. No college science or mathematics assumed. A brief introduction to the physical principles encountered in the study of music. The applicable laws of mechanics, fundamentals of sound, harmonic content, principles of sound production in musical instruments, musical scales. Numerous illustrative lecture demonstrations will be given.

Mr. Hahn (Sp)

49. Supplementary work in Lower Division Physics. (1–3) By arrangement.
Students with partial credit in lower division physics courses may, with consent of instructor, complete the credit under this heading.

Instructors in Lower Division Courses (Su, F, W, Sp)

Upper Division Courses
Courses 4A–4B–4C–4D–4E, and differential and integral calculus are prerequisite to all upper division courses except 106A–106B and 132.

Four unit upper division courses may have scheduled one additional hour to the three hours of lecture. See SCHEDULE AND DIRECTORY.

104. Mathematical Methods in Physics. (4)
Prerequisite: senior standing or consent of instructor. Vectors, tensors, matrices, symmetry principles, and invariance principles. Mr. Richards, Mr. Ypsilantis (F)

105A–105B. Analytic Mechanics. (3-3)
Statics, oscillations, central force problems, motion of rigid bodies in three dimensions, accelerated coordinate systems, brief introduction to Lagrange's and Hamilton's equations, normal modes of vibration, mechanics of continuous media.

Mr. Crawford, Mr. Moyer, Mr. Thornton (Su, F, W, Sp)

106A. Geometrical Optics. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 2A–2B–2C. Designed for optometry students. Geometrical methods applied to the optics of mirrors, lenses, and prisms; laboratory work to accompany the course.

Mr. Powell (F)

106B. Physical Optics. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 2A–2B–2C. Physics 106A is not a prerequisite to 106B. Not open for credit to physics majors. Phenomena of diffraction, interference, and polarization of light, and their application; laboratory work to accompany the lectures.

Mr. Powell
110A-110B-110C. Electromagnetism and Optics.  
(3-3-3)  
A course emphasizing applications of electromagnetic theory and problem-solving; electrostatics, magnetostatics, steady and time-varying currents, applications of Maxwell's equations, wave equation, physical optics.  
Sequence beginning (F, W, Sp) 110C not given (Su)  
Mr. Brown, Mr. Davis, Mr. Kerth, Mr. Miller, Mr. Shugar, Mr. Stone  

111A-111B-111C. Modern Physics and Advanced Electromagnetic Laboratory. (2-2-2)  
Four hour laboratory per week. Prerequisite: course 137A or consent of instructor. Advanced laboratory for junior and senior students involving some of the significant experiments of atomic, nuclear, and solid-state physics. Individual work is encouraged. Two quarters required for physics majors; three may be taken for credit.  
Mr. Crowe, Mr. Mollenauer, Mr. Rochlin, Mr. Shapiro (Su, F, W, Sp)  

112. Introduction to Statistical and Thermal Physics. (4)  
Basic concepts of statistical mechanics, conclusions leading to macroscopic thermodynamics and its applications, applications based on microscopic models and Boltzmann factor, phase transformations and chemical equilibrium, quantum distributions, elementary kinetic theory of transport processes, fluctuation phenomena.  
Mr. Chamberlain, Mr. Reif, Mr. Kettel (Su, F, W, Sp)  

115. Introduction to Quantum Mechanics. (4)  
Prerequisite: courses 105A and 121. The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.  
Mr. Halley, Mr. Jeffries, Mr. Reynolds, Mr. Rochlin (Su, F, W)  

121. Introduction to Atomic and Nuclear Physics. (4)  
Intended primarily for engineers. The phenomena of atomic physics; introduction to quantum mechanics; selected topics dealing with nuclei, atoms, molecules, and the solid state.  
Mr. Brown, Mr. Chiao, Mr. Fretter, Mr. Thornton (Su, F, W, Sp)  

124. Introductory Nuclear Physics. (4)  
Prerequisite: course 137A or 121. Not open for credit to those with credit for 129A. Tools of nuclear physics, alpha, beta, and gamma decay, nuclear interactions and structure, brief introduction to particle physics.  
Mr. Ely, Mr. Ross (Su, F, W)  

129A-129B. Nuclear Physics Sequence  
Course. (4-4)  
Prerequisite: course 137A and 137B. Thorough coverage of nuclear physics, employing the elements of quantum mechanics; mesons and high energy phenomena.  
Sequence beginning (W)  
Mr. Crowe, Mr. Rasmussen, Mr. Segre, Mr. Stevenson, Mr. Trilling  

132. Modern Physics. (4)  
Prerequisite: course 2A-2B-2C, 11A-11B, or equivalent or consent of instructor. Not open for credit to students who have completed 121 or 137A.  
A general descriptive course in modern physics; electrons and atoms, periodic table, X rays, spectra, nuclear physics, nuclear energy, solids, fundamental particles.  
Mr. Fretter, Mr. Heilmholz, Mr. Powell (Su, Sp)  

137A-137B-137C. Quantum Mechanics and Its Applications to Atomic Physics. (3-3-3)  
It is recommended that course 105A be taken concurrently with course 137A. Course 137A is not open for credit to students who have completed 121. Introduction to the methods of quantum mechanics with applications to the physics of atoms, molecules, solid state, and nuclei.  
Sequence beginning (Su, F, W, Sp) 137B-C not offered (Su) Mr. Goldhaber, Mr. Jeffries, Mr. Marrus, Mr. Segre, Mr. Steiner, Mr. Ypsilantis  

140. Introduction to Solid-State Physics. (4)  
Prerequisite: course 137A or 121. Not open for credit to those with credit for 141A. 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.  
Mr. Kip, Mr. Rasmussen, Mr. Richards (Su, F, Sp)  

141A-141B. Solid-State Physics. (4-4)  
Prerequisite: course 137A and 137B, or taken concurrently. A thorough introductory course in modern solid-state physics. Crystal symmetry; electromagnetic, elastic, and particle waves in periodic lattices; thermal, magnetic, and dielectric properties; magnetic order; magnetic resonance; theory of metals and semiconductors; superconductivity.  
Sequence beginning (F, W) Mr. Appelbaum, Mr. Kettel, Mr. Fortis  

142. Introduction to Plasma Physics. (4)  
Prerequisite: courses 105A-105B, 110A or consent of instructor. Motion of charged particles in electric and magnetic fields, dynamics of fully ionized plasma from both macroscopic and macroscopic point of view, magnetohydrodynamics, equilibria, waves and instabilities; examples from space sciences and controlled-fusion research.  
Mr. Kunkel (W)  

143. Physics of Ionized Gases. (4)  
Prerequisite: courses 112, 137A, or 121 or consent of instructor; course 142 is recommended. Basic processes in ionized gases, macroscopic description of partially ionized plasma including electronic reactions, radiation and transport phenomena, plasma production and decay. Application to atmospheric and astrophysical sciences, high speed gas dynamics, and electric discharges.  
Mr. Kunkel (Sp)  

H197. Physics Honors Course. (2)  
A proseminar which includes study of a standard book on theoretical physics and reports on current theoretical and experimental problems. May be repeated for credit.  
Staff (Su, F, W, Sp)  

199. Special Study for Advanced Undergraduates. (1-2)  
Restricted to senior honor students. All special work of upper division grade not included in courses announced above. Designed to introduce students to advanced topics and to the technique and methods of research. Unit value to be fixed in each case.  
Staff (Su, F, W, Sp)
205A—205B. Advanced Dynamics. (2—3)
Prerequisite: course 105A—105B, or the equiva­
lent. General principles of analytical mechanics of
particles, systems of particles, and rigid bodies.
Methods of Lagrange, Hamilton, and Jacobi. Gen­
eral treatment of kinematics, including collisions of
relativistic particles. Inversion, symmetry, and con­
servation laws. Small oscillations. Approximate
methods in mechanics.
Mr. Crawford, Mr. Ely, Mr. Judd,
Mr. Rosenfeld, Mr. Shapiro. 205A. (Su, F, W);
205B. (F, W, Sp)

205C. Advanced Dynamics. (4)
Prerequisite: course 205A and 205B. Advanced
topics in classical dynamics, including selections
from: hydrodynamics, magnetohydrodynamics,
type of elasticity, mechanics of periodic structures,
nonlinear mechanics, advanced perturbation theory,
and computational methods.
Mr. Judd (Sp)

208. Interactions of Light with Matter. (4)
Prerequisite: courses 110A—110B—110C and 137A
or 127. Emission, absorption, and propagation of
light treated classically. Limits of classical theory.
Transition to quantum theory through the corre­
spondence principle.
Mr. Crawford, Mr. Davis (F)

209. Modern Optics. (3)
Three hours of lecture per week. Prerequisite:
course 208 and 211, or consent of instructor.
Quantization of electromagnetic fields, quantum theory
of coherence and correlation; interaction of radia­
tion with matter; emission and absorption, coherent
and incoherent scattering; nonlinear optical effects;
type of lasers.
Mr. Chiao, Mr. Shen, Mr. Townes (Sp)

210A—210B—210C. Theory of Electricity and
Magnetism. (3—3—3)
Prerequisite: course 110A—110B—110C and a
working knowledge of differential equations.
Classical description of the electromagnetic field, includ­
ing special relativity and electron theory.
Sequence beginning (Su, F, W, Sp) 210B—C
Mr. Chinowsky, Mr. Miller, Mr. Shen, Mr. Tripp

212A—212B. Statistical Mechanics. (3—3)
Prerequisite: course 112 or equivalent. Credit and
grade will be given only on completion of the full
sequence. Foundations of statistical mechanics; en­
ssemble theory; degenerate systems; systems of in­
teracting particles; nonequilibrium and transport the­
ory; Brownian motion, Boltzmann equation; irrever­
sibility and Onsager relations.
Sequence beginning (F, W)
Mr. Chamberlain, Mr. Hahn, Mr. Kaufman,
Mr. Trilling, Mr. Watson

213. Advanced Statistical Mechanics. (4)
Prerequisite: course 219 or consent of instructor.
Phase transitions, including condensation. De­
scription of normal fluids by analytical methods.
Transport theory and other nonequilibrium phenomena.
Mr. Dewitt, Mr. Watson (Sp)

221A—221B—221C. Quantum Mechanics. (3—3—3)
Three hours of lecture per week. Prerequisite:
course 137A—137B or 115 or equivalent.
221A. Basic assumptions of quantum mechanics;
quantum theory of measurement; matrix me­
chanics; Schroedinger theory; symmetry and in­
variance principles; theory of angular momentum;
stationary state problems; variational principles;
time independent perturbation theory; time de­
dependent perturbation theory; theory of scattering;
many particle formalism; creation and destruc­tion operators.
221B. Time dependent perturbation theory; theory
of scattering; many particle formalism; creation
and destruction operators.
221C. Boson and fermion fields; radiative
processes; the Dirac equation; applications in atomic
physics and beta decay.
Mr. Bardales, Mr. Comminas, Mr. Halpern,
Mr. Marrus, Mr. Schwartz
Sequence beginning (F, W, Sp) (Not given Su)

222. Mathematical Methods of Theoretical
Physics. (4)
The setting up and solution of differential and
integro-differential equations; statistical and alge­
bric methods for the treatment of problems of
physics.
Mr. Wichmann (Sp)

223. Group Theory and Quantum Mechanics. (4)
Three hours of lecture per week. Prerequisite:
course 221A—221B—221C, or consent of instructor.
Introduction to theory of groups and group represen­
tations; brief survey of quantum mechanics of atoms,
molecules and solids, emphasizing applications of
group theoretical methods.
Mr. Cohen, Mr. Halley, Mr. Karplus (F, Sp)

224A—224B—224C. Dynamics of Strong Interactions.
(3—3—3)
Prerequisite: The equivalent of course 221A and
of either 124 or 129A. The theory of strong nuclear
interactions, beginning with the nonrelativistic
Schroedinger equation and leading to the relativistic
analytic S-matrix. A description of hadrons, the
heavy nuclear particles, both stable and unstable;
their origin and their mutual interactions.
Sequence beginning (F) Mr. Chew, Mr. Jackson

230A—230B—230C. Quantum Theory of Fields and
Particles. (3—3—3)
Prerequisite: course 221A—221B—221C or the
equivalent. An introduction to the relativistic quan­
tum mechanics of fields and particles. Symmetry
principles, S-matrix theory. Quantum electrodyn­
amics. Phenomenological theories of weak and
strong interactions.
Not given (Su) Mr. Mandelstan, Mr. Wichmann,
Mr. Weinberg

231. Theory of General Relativity. (4)
An introduction to Einstein’s theory of gravitation
with applications to cosmology and astrophysics.
Mr. Judd, Mr. Weinberg, Mr. Wichmann (W)

(3—3—3)
Three hours of lecture per week. Prerequisite:
course 221A—221B and course 141A—141B or the
equivalents; or consent of instructor. Phonon, mag­
non, plasmon, polaron, and electron fields in solids
and their interactions; superconductivity, many
body techniques; Green’s functions; Brillouin zones
and symmetry; excitons; impurity states; transport
processes; ferromagnetic surfaces; neutron scattering; recoil­
less emission; theoretical methods in magnetic reso­
sequence beginning (F) Mr. Cohen, Mr. Kittelmann.
PHYSICS; PHYSIOLOGY—ANATOMY

242A—242B—242C. Theoretical Plasma Physics. (3—3—3)
Prerequisite: course 210A—210B—210C, 219A—219B, 142; or consent of instructor. Analysis of plasma behavior according to the Vlasov, Fokker-Planck equations, guiding center, and hydromagnetic descriptions. Study of equilibria, stability, linear and nonlinear oscillations, transport, and interaction with radiation. Rigorous kinetic theory.
Sequence beginning (F) Mr. Kaufman, Mr. Watson

245A—245B—245C. Elementary Particles and Resonances. (3—3—3)
Prerequisite: course 221A—221B—221C (221C may be taken concurrently with 245A). For students working on experimental physics of elementary particles and resonances. Classification of their properties according to mass, spin, parity, isotopic spin, unitary spin. Theories and phenomenology of strong and weak interactions. Systematization of experimental data on particle production and decay.
Sequence beginning (F) Mr. Rosenfeld, Mr. Zemach

246. Topics in Scattering Theory. (4)
Prerequisite: course 221A—221B—221C or consent of instructor. Wave packets and asymptotic fields; rearrangement collisions, analytic structure of scattering matrices, application of variational principles.
Mr. Schwartz (Sp)

290. Seminar. (2)
Staff (F, W, Sp)

295. Research. (1—8)
Staff (Su F, W, Sp)

299. Special Study for Graduate Students. (1—4)
Prerequisite: graduate standing. This course is arranged to allow qualified graduate students to investigate possible research fields or to pursue problems of interest through reading or nonlaboratory study under the direction of faculty members who agree to give such supervision.
Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1—8)
Individual study in consultation with the major field adviser intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
Staff (Su, F, W, Sp)

MEDICAL PHYSICS (see page 391)

PHYSIOLOGY—ANATOMY

(Walter J. Freeman, M.D., Professor of Physiology (Chairman of the Department).
Hardin B. Jones, Ph.D., Professor of Medical Physics and of Physiology and Assistant Director of the Donner Laboratory.
Nello Pace, Ph.D., Professor of Physiology and Director of the White Mountain Research Station.
Paola S. Timiras, M.D., Ph.D., Professor of Physiology.
Sherburne F. Cook, Ph.D., Professor of Physiology, Emeritus.
Herbert McLean Evans, M.D., D.med. h.c., Docteur h.c., DScH., LL.D., Professor of Anatomy, Emeritus.
Miriam E. Simpson, M.D., Ph.D., Docteur h.c., LL.D., Professor of Anatomy, Emeritus.
Edward S. Evans, Ph.D., Associate Professor of Anatomy.
Robert I. Macey, Ph.D., Associate Professor of Physiology.
Lester Packer, Ph.D., Associate Professor of Physiology.
Lawson L. Rosenberg, Ph.D., Associate Professor of Physiology.
Herbert H. Srebnik, Ph.D., Associate Professor of Anatomy.
Marian C. Diamond, Ph.D., Assistant Professor of Anatomy.
John G. Forte, Ph.D., Assistant Professor of Physiology.
Charles S. Nicoll, Ph.D., Assistant Professor of Physiology.

Horace Barlow, M.D., Professor of Physiological Optics and Optometry.
Ernest L. Dobson, Ph.D., Lecturer in Medical Physics and in Physiology.
Lola S. Kelly, Ph.D., Lecturer in Medical Physics.
Gerald Westheimer, Ph.D., Professor of Physiological Optics and Optometry.

Department Major Advisers: Mr. Macey, Mr. Nicoll.
Graduate Advisers: Mr. Forte, Mrs. Timiras (Physiology); Mr. Srebnik (Anatomy).

* Not to be given, 1968–69.
Major in Physiology

The curriculum outlined below leads to the A.B. degree in physiology. It is intended to provide a broad understanding of the cellular mechanisms underlying the life process, of the functions of the various parts of living organisms, and of the integrated physiological response of whole organisms to the environments in which they live, together with the functional changes that occur in living organisms with the passage of time during their life span.

The Major  
Biology 1A-1B-1C (5-5-5); Chemistry 1A-1B (4-4); 8A-8B (4-4); Mathematics 1A-1B-1C (4-4-4) recommended, or 16A-16B (4-4); Physics 6A-6B-6C (4-4-4); Physiology 101 (4), 101L (5), 102 (4), 102L (5), 103 (4), 103L (5); 3 additional upper division or graduate courses, which will include two in the department and one in a related biological science. Recommended: 3 additional quarters of course work in either physics, mathematics, or chemistry.

Honors Program  
The student must: (1) maintain a 3.0 grade-point average in his overall college work and in the courses required for the undergraduate major in physiology, (2) complete the undergraduate major in physiology as stipulated above, (3) complete at least 4 units of course 197, and (4) submit a satisfactory thesis based upon the work performed for course 197.

Graduate Major in Physiology

Students qualified for admission may elect a course of work leading either to the M.A. degree or directly to the Ph.D. degree in physiology. The M.A. degree is not a prerequisite for the Ph.D. degree. On the other hand, candidates for either degree must have completed the equivalent of the requirements for the undergraduate major shown above, in addition to the minimum requirements for the particular graduate degree, as follows:

1. The M.A. degree in physiology is to be earned according to Plan I of the Graduate Division, which includes the satisfactory completion of 30 units of course work and a thesis.

2. The Ph.D. degree in physiology. Required: Biochemistry 102 (4); Chemistry 141 (3), 109 (3); Physiology 211 (4), 212 (4); a course in statistics; at least 8 units of upper division or graduate courses in morphology; at least 24 units of course 299; one lecture or seminar course 3 quarters of each 4 quarters in residence following admission to candidacy. Recommended: Physics 132 (4).

Upon completion of Physiology 212 students will be evaluated for continuation toward the Ph.D. degree by means of a comprehensive written examination, which should be taken by the spring quarter of the second year of graduate study. Selection of a major professor should also have been made by that time.

Before advancement to candidacy for the Ph.D. degree the student must demonstrate that he can make an accurate written translation from the physiological scientific literature in two of the three languages: French, German, Russian. The student must also pass an oral qualifying examination to test his general mastery of physiology and at least two other related subjects which are approved by his major professor and the graduate adviser. A dissertation based upon original research in physiology is to be prepared according to Plan B of the Graduate Division.

For further details concerning the graduate degrees please consult the graduate adviser in physiology.

Major in Anatomy (Graduate Only)

In addition to meeting the general requirements of the Graduate Division, the student must have had the following courses, or their equivalents, before admission to the graduate program: Biology 1B-1C (4-4), 16A-16B (4-4), 205A (4-4), either French or German.

1. The Major  
Biology 1A-1B-1C (5-5-5); Chemistry 1A-1B (4-4); 8A-8B (4-4); Mathematics 1A-1B-1C (4-4-4), or 16A-16B (4-4); Physics 6A-6B-6C (4-4-4); Physiology 101 (4), 101L (5), 102 (4), 102L (5), 103 (4), 103L (5); 3 additional upper division or graduate courses, which will include two in the department and one in a related biological science. Recommended: 3 additional quarters of course work in either physics, mathematics, or chemistry.

Honors Program  
The student must: (1) maintain a 3.0 grade-point average in his overall college work and in the courses required for the undergraduate major in physiology, (2) complete the undergraduate major in physiology as stipulated above, (3) complete at least 4 units of course 197, and (4) submit a satisfactory thesis based upon the work performed for course 197.

Graduate Major in Physiology

Students qualified for admission may elect a course of work leading either to the M.A. degree or directly to the Ph.D. degree in physiology. The M.A. degree is not a prerequisite for the Ph.D. degree. On the other hand, candidates for either degree must have completed the equivalent of the requirements for the undergraduate major shown above, in addition to the minimum requirements for the particular graduate degree, as follows:

1. The M.A. degree in physiology is to be earned according to Plan I of the Graduate Division, which includes the satisfactory completion of 30 units of course work and a thesis.

2. The Ph.D. degree in physiology. Required: Biochemistry 102 (4); Chemistry 141 (3), 109 (3); Physiology 211 (4), 212 (4); a course in statistics; at least 8 units of upper division or graduate courses in morphology; at least 24 units of course 299; one lecture or seminar course 3 quarters of each 4 quarters in residence following admission to candidacy. Recommended: Physics 132 (4).

Upon completion of Physiology 212 students will be evaluated for continuation toward the Ph.D. degree by means of a comprehensive written examination, which should be taken by the spring quarter of the second year of graduate study. Selection of a major professor should also have been made by that time.

Before advancement to candidacy for the Ph.D. degree the student must demonstrate that he can make an accurate written translation from the physiological scientific literature in two of the three languages: French, German, Russian. The student must also pass an oral qualifying examination to test his general mastery of physiology and at least two other related subjects which are approved by his major professor and the graduate adviser. A dissertation based upon original research in physiology is to be prepared according to Plan B of the Graduate Division.

For further details concerning the graduate degrees please consult the graduate adviser in physiology.
the graduate degree program in anatomy: Biology 1A–1B–1C (5–5–5); Chemistry 1A–1B–1C (4–4–4), 5 (4), 8A–8B (4–4); Mathematics 1A–1B–1C (4–4–4) recommended, or 16A–16B (4–4); Physics 6A–6B–6C (4–4–4). An adequate reading knowledge of either French or German is also required.

1. The M.A. degree in anatomy is to be earned according to Plan I of the Graduate Division, which includes the satisfactory completion of 30 units of course work and a thesis. Required: course 151 (4), either course 209 (5), or courses 203 (4) and 205A–205B (4–4); at least 12 units of course 299.

2. The Ph.D. degree in anatomy. Required: course 151 (4); courses 209 (5), 203 (4), 205A–205B (4–4); at least 24 units of course 299; Physiology 101 (4), 101L (5), 102 (4), 102L (5), 103 (4) and 103L (5); Biochemistry 102 (4). An adequate reading knowledge of both French and German must be demonstrated before proceeding to the oral qualifying examination, which covers the major subdivisions of anatomy and related fields. A dissertation based upon original research in anatomy is to be prepared according to Plan A of the Graduate Division.

For further details concerning the graduate degrees please consult the graduate adviser in anatomy.

Letters and Science List: for regulations governing this list, see page 80.

### Physiology

#### Lower Division Course

1. **Introductory Physiology. (5)**
   - Three 1-hour lectures, one 1-hour conference, and one 3-hour laboratory per week. Prerequisite: either high school chemistry or a course in college physics or chemistry or biology. Introduction to the mechanisms underlying the life process in man.
   - Su; Mr. Macey (F), Mr. Forte (W)

#### Upper Division Courses

101. **Cell Physiology. (4)**
   - Three 1-2-hour lectures per week. Prerequisite: Biology 1A–1B–1C; Chemistry 8A–8B. Recommended: Biochemistry 102. Intended for majors only. Macromolecular and ultrastructural organization of the cell in relation to synthetic, regulatory, and deteriorative processes.
   - Mr. Packer (F)

101L. **Cell Physiology, Laboratory. (5)**
   - Two 4-hour laboratories per week. Prerequisite: course 101 (should be taken concurrently), or Zoology 104.
   - Mr. E. S. Evans, Mr. Packer (F)

102. **Mammalian Physiology. (4)**
   - (Formerly numbered 112)
   - Three 1-2-hour lectures per week. Prerequisite: course 101 and 101L. Intended for majors. Detailed study of the structure and function of the cardiorespiratory, renal and metabolic systems of the body.
   - Mrs. Timiras, Mr. E. S. Evans, Mr. Forte (W)

102L. **Mammalian Physiology, Laboratory. (5)**
   - (Formerly numbered 112L)
   - Two 4-hour laboratories, and one 1-2-hour conference per week. Prerequisite: course 102 should be taken concurrently.
   - Mrs. Timiras, Mr. E. S. Evans, Mr. Forte (Sp)

103. **Neural and Endocrine Control Mechanisms. (4)**
   - (Formerly numbered 113)
   - Three 1-2-hour lectures per week. Prerequisite: courses 102 and 102L. Detailed study of the structure and function of the neural and endocrine control systems of the body.
   - Mr. Freeman, Mrs. Diamond, Mr. Rosenberg (Sp)

103L. **Neural and Endocrine Control Mechanisms, Laboratory. (5)**
   - (Formerly numbered 113L)
   - One 1-2-hour recitation, and two 4-hour laboratories per week. Prerequisite: course 103 should be taken concurrently.
   - Mr. Freeman, Mrs. Diamond, Mr. Rosenberg (Sp)

110. **Introduction to Neurobiology. (3)**
   - Three 1-2-hour lectures per week. Prerequisite: Biology 1A–1B–1C. The important contributions of neurological, anatomical, physiological, comparative and behavioral studies to the understanding of the nervous system. Properties of neurons and neural systems in terms of structure and function and their evolution.
   - Mr. Westheimer (Sp)

123. **Comparative Physiology. (4)**
   - Three 1-2-hour lectures per week. Prerequisite: Chemistry 8A–8B; Physics 6A–6B–6C; an introductory course in the biological sciences. Comparative survey of physiological function among the various phyla of animals.
   - Mr. Nicoll (Sp)

123L. **Comparative Physiology, Laboratory. (4)**
   - Two 4-hour laboratories per week. Prerequisite: course 123 (should be taken concurrently).
   - Mr. Nicoll (Sp)

131. **Radiation Physiology. (4)**
   - Three 1-2-hour lectures per week. Prerequisite: Chemistry 1A–1B–1C; Physics 6A–6B–6C; an introductory course in the biological sciences. Recommended: Mathematics 16A–16B; Physics 132. Physiological effects of radiation.
   - Mr. Jones, Mr. Dobson, Mrs. Kelly (F)

132. **Environmental Physiology. (4)**
   - Three 1-2-hour lectures per week. Prerequisite: an introductory course in the biological sciences. Physical, chemical and biotic influences of the environment on man, and the adaptive changes in response to environment.
   - Mr. Face (W)
152. Physiology of Human Development. (4)
Three 1½-hour lectures per week. Prerequisite: an introductory course in the biological sciences. Recommended: Anatomy 151. Functional changes in man from prenatal life to maturity.
Mrs. Timiras (W)

153. Physiology of the Aging Process. (4)
Three 1½-hour lectures per week. Prerequisite: an introductory course in the biological sciences. Functional changes in man from maturity to old age.
Mrs. Timiras, Mr. Jones (Sp)

197. Individual Study in Physiology. (2–6)
Individual conferences to be arranged. Prerequisite: at least 8 units of upper division courses in physiology, and senior honor standing. Special library or laboratory projects may be assigned.
The Staff (Mr. Freeman in charge) (Su, F, W, Sp)

Graduate Courses

201. Neurobiology: Cellular Mechanisms. (4)
(Formerly numbered 211)
Two 1-hour lectures and one 4½-hour laboratory per week. Prerequisite: consent of instructor. A lecture and laboratory course on the anatomical, electrical, chemical, and hormonal properties of neurons as the basis for musculoskeletal and neuroendocrine control systems.
Mr. Freeman, Mr. Nicoll (F)

(Formerly numbered 162)
Two 1-hour lectures per week and one 4½-hour laboratory per week. Prerequisite: consent of instructor. A lecture and laboratory course on the organization, interconnections, and interactions of nerve cells; mechanisms of sensory information processing and control of neuromuscular movement.
Mr. Barlow (W)

213. Seminar in Cell Physiology. (1)
(Formerly numbered 203)
One 1-hour lecture per week. Current research on cell structure and function.
Mr. Packer (W)

231. Seminar in Environmental Physiology. (2)
One 1½-hour meeting per week. Prerequisite: courses 113 and 132. Selected topics on the effects of environmental factors on man.
Mr. Pace (F)

233. Space Physiology. (2)
Two 1-hour lectures per week. Prerequisite: courses 113, 132, and 231. Physiological effects experienced by man and other mammals during extraterrestrial flight.
Mr. Pace (Sp)

241. The Endocrine Glands. (3)
(Formerly numbered 141)
Two 1½-hour lectures per week. Prerequisites: course 101, 101L, 102, 102L, 103 and 103L. A course in organic chemistry and in biochemistry. The endocrine glands of mammals and the metabolic reactions mediated by their hormones.
Mr. Rosenberg (F)

242. Seminar in Endocrine Physiology. (3)
Three hours of class per week. Prerequisite: consent of instructor. Selected topics on current research on the endocrine system.
Mr. Rosenberg (W)

261. Seminar in History of Neurophysiology. (2)
Two hours of class per week. Prerequisite: consent of instructor. Selected readings in classical texts of physiology with emphasis on the historical development of ideas about the nervous system.
Mr. Freeman (F)

272. Physiological Transport Processes. (2)
Two 1-hour lectures per week. Prerequisite: differential and integral calculus, elementary physiology. Recommended: Chemistry 110A—HOB.
Mathematical analysis of physiological transport in cells and tissues.
Mr. Macey (W)

281. Seminar in Physiological Action of Drugs. (2)
One 1½-hour meeting per week. Prerequisites: courses 101, 103 and 103L. Mode of action of drugs at the organismic and cellular levels. May be taken more than once for credit.
The Staff (Mr. Freeman in charge) (F, W, Sp)

290. Seminar in Neurobiology. (2)
Prerequisite: consent of instructor. Discussions and readings in special topics, to be varied each quarter. Individual arrangements to be made.
Mrs. Timiras (F)

299. Individual Research in Physiology. (1–12)
Individual arrangement to be made. Prerequisite: consent of instructor. Original research in physiology. The Staff (Mr. Freeman in charge) (Su, F, W, Sp)

491. Physiological Surgery. (2)
One 4½-hour laboratory per week. Prerequisite: courses 103 and 103L, and graduate standing in physiology, or consent of the instructor. Techniques of anesthesia and sterile surgical procedure, with practice in making special physiological research preparations.
Mr. Pace (F)

492. Biological Science Photography. (3)
Two 1-hour lectures, and one 4½-hour laboratory per week. Prerequisite: consent of instructor. Original research in biological science photography, including: gross object, macrographic and microscopic work, and instruction and practice in the use of a scanning electron microscope.
Mr. E. S. Evans (W)

493. Physiological Instrumentation. (4)
Two 1-hour lectures and one 4½-hour laboratory per week. Prerequisite: graduate standing in physiology, or consent of the instructor. Modern physical techniques in physiological research. Topics will cover problems in the detection, amplification, and recording of biochemical phenomena, together with the use and design of transducers.
Mr. Macey (Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major professor, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of the candidate for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Freeman in charge) (Su, F, W, Sp)

Anatomy

Upper Division Courses

104. Functional Human Anatomy. (4)
(Formerly numbered 102)
Two 1½-hour lectures, and one 4½-hour laboratory per week. Prerequisite: a college course in biology or physical sciences and mathematics.
151. Developmental Anatomy. (4)
(Formerly numbered 100)
Three 1-hour lectures, and one 3-hour laboratory per week. Prerequisite: Biology 1A—1B—1C, or Biology 11A—11B. Development of tissues and organs in the mammalian embryo and fetus, including teratological phenomena.
Mr. Srebnik (F)

197. Individual Study in Anatomy. (2–6)
Individual conferences to be arranged. Prerequisite: either course 100 or 102, and senior honor standing. Special library or laboratory projects may be assigned.
The Staff (Mr. Srebnik in charge) (Su, F, W, Sp)

Graduate Courses

203. Functional Neuroanatomy. (4)
(Formerly numbered 203A and 203B)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: consent of instructor. Development, structure (gross and microscopical) and functional relationships of the mammalian nervous system.

204. Cellular and Subcellular Design Principles. (2)
(Formerly numbered 202)
Two 1-hour lectures per week. Prerequisite: consent of instructor. Molecular, physiological and evolutionary determinants of cell and tissue fine structure.
Mr. Satir (Sp)

205A—205B. Systematic and Regional Human Anatomy. (4–4)
Two 1-hour lectures and two 4½-hour laboratories per week. Prerequisite: either course 151 or Zoology 105 or other advanced work in mammalian biology; consent of instructor. Dissection, X-ray, and surface anatomy of the body, with special reference to the functional capacities of the structures examined.
Mr. Srebnik (W, Sp)

209. Histology. (5)
(Formerly numbered 201A and 201B)
Two 1-hour lectures, and two 4-hour laboratories per week. Prerequisite: consent of instructor. Tissues and organs of the mammalian body, including histophysiological and histochecmical aspects.
Mr. E. S. Evans (Sp)

210. Physiological Anatomy of Reproduction. (2)
One 1½-hour meeting per week. Prerequisite: graduate standing in a biological science. Informal conferences and demonstrations. Outside reading required.
Mr. Srebnik (Sp)

211. Seminar in Hematology. (2)
One 1½-hour meeting per week. Prerequisite: graduate standing in a biological science. Selected topics on the humoral control of blood formation.
Mr. E. S. Evans (W)

297. Individual Study in Anatomy. (2–16)
Individual arrangement to be made. Prerequisite: consent of instructor.
The Staff (Mr. E. S. Evans in charge) (Su, F, W, Sp)

299. Individual Research in Anatomy. (1–12)
Individual arrangement to be made. Prerequisite: consent of instructor. Original research in anatomy.
The Staff (Mr. Srebnik in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major professor, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of the candidate for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

PLANT PATHOLOGY

(Department Office, 147 Hilgard Hall)
Kenneth F. Baker, Ph.D., Professor of Plant Pathology.
A. Herbert Gold, Ph.D., Professor of Plant Pathology.
David E. Schlegel, Ph.D., Professor of Plant Pathology.
William C. Snyder, Ph.D., Professor of Plant Pathology (Chairman of the Department).
William N. Takahashi, Ph.D., Professor of Plant Pathology.
Stephen Wilhelm, Ph.D., Professor of Plant Pathology.
Cecil E. Yarwood, Ph.D., Professor of Plant Pathology.
Peter A. Ark, Ph.D., Professor of Plant Pathology, Emeritus.
Max W. Gardner, Ph.D., D.Se (hon. c.), Professor of Plant Pathology, Emeritus.
Thomas E. Rawlins, Ph.D., Professor of Plant Pathology, Emeritus.
H. Earl Thomas, Ph.D., Professor of Plant Pathology, Emeritus.
John R. Parmeter, Jr., Ph.D., Associate Professor of Plant Pathology.
Robert D. Raabe, Ph.D., Associate Professor of Plant Pathology.
Milton N. Schroth, Ph.D., Associate Professor of Plant Pathology.
Albert R. Weinhold, Ph.D., Associate Professor of Plant Pathology.
Fields W. Cobb, Jr., Ph.D., Assistant Professor of Plant Pathology.
Joseph G. Hancock, Jr., Ph.D., Assistant Professor of Plant Pathology.
The field of plant pathology is concerned with the study of plant diseases and the protection of crop plants from disease losses. The subject area is exceptionally broad, embracing the response of the plant to the environment and to disease agents such as bacteria, fungi, seed plants, and viruses, as well as their control. This leads to research on fundamental problems, such as host-parasite physiology or mode of action of fungicides, to applied problems, such as spray control programs or soil treatments, to teaching and extension. Because of this breadth, there is a place for anyone interested in biology.

Undergraduate Program

Although the Department of Plant Pathology in the College of Agricultural Sciences no longer offers an undergraduate major, students who are interested in preparing for this career may do so by selecting plant pathology as their field of emphasis in the agricultural science major, as described under that section of this catalogue. Details concerning the program may be obtained from the undergraduate adviser.

Graduate Programs

The department emphasizes graduate training and offers work leading to both the M.S. and Ph.D. degrees. Students interested in preparing for graduate study may do so by selecting the program described above or develop a broad background in the physical and biological sciences. For further details, consult the graduate adviser.

Upper Division Courses

100. Forest Pathology. (3)
Lecture, 1 hour per week; laboratory, 6 hours per week. Prerequisite: Biology 1A–1B–1C. Diseases of forest plants. Mr. Cobb (Sp)

120. Plant Diseases. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: Biology 1A–1B–1C or consent of instructor. A general course on the nature, cause, and control of plant diseases. Mr. Raabe (F)

199. Special Study for Advanced Undergraduates.
(1–5)
The Staff (Mr. Weinhold in charge) (Su, F, W, Sp)

Graduate Courses

201. Seminar in Plant Pathology. (1)
The Staff (F, W, Sp)

202. Fungi in Relation to Plant Diseases. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: course 120 and consent of instructor. Advanced study of fungi as plant pathogens, with special emphasis on structural and ecological adaptations, patterns of behavior and distribution, mechanisms and significance of variability, and problems in collection, cultivation, and identification. Mr. Parmeter (W)

204. Bacteria in Relation to Plant Diseases. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: course 120; Biochemistry 102; Bacteriology 2 or consent of instructor. Biology and pathogenesis of bacterial diseases of plants. Mr. Schroth (Sp)

206. Viruses in Relation to Plant Diseases. (4)
Lecture, 2 hours per week; laboratory, 6 hours per week. Prerequisite: course 120 or consent of instructor. Characterization of viruses which cause plant disease; environmental factors relating to incidence and field spread of virus infections; approaches to control. Mr. Gold (Sp)

208. Physiology of Plant Virus Infection. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: course 206 or consent of instructor. Detailed consideration of plant virus interactions in virus infections; mechanisms of infection and immunity; morphology and functional responses of cells and tissues to infection. Mr. Schlegel (W)

210. Plant Disease Control. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: course 120. Dosage response relations; graphic methods; control by exclusion, eradication, protection, immunization, and therapy. Mr. Yarwood (F)
212. Advanced Plant Pathology. (4)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: course 120. Principles broadly applicable to fungus, bacterial, virus, and nutritional diseases of plants. Mr. Wilhelm (W)

214. Ecology of Plant Diseases. (4)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: course 120 and consent of instructor. Principles emphasizing the relationship of the physical and biological environment.
Mr. Smith (Sp)

216. Physiology of Plant Pathogens. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: Chemistry 5 and 8A-8B, or equivalent. Recommended: Botany 140; Biochemistry 102. Physiology and biochemistry of plant pathogenic fungi.
Mr. Hanceck (F)

218. Physiology of Plant Diseases. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: Chemistry 5 and 8A-8B, or equivalent. Recommended: Botany 140; Biochemistry 102. Physiology and biochemistry of host-parasite relations.
Mr. Weinhold (W)

220. History and Literature of Plant Pathology. (4)
Lectures, 4 hours per week. Prerequisite: consent of instructor. The development of concepts in plant pathology.
Mr. Baker (F)

222. Epidemiology and Diagnosis of Plant Diseases. (4)
Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: consent of instructor. May be taken twice for credit. Experience in field and laboratory diagnosis of plant diseases.
Mr. Snyder, Mr. Weinhold (F, Sp)

298. Directed Group Study. (1–6)
The Staff (Mr. Takahashi in charge) (Su, F, W, Sp)

299. Research in Plant Pathology. (1–12)
The Staff (Mr. Snyder in charge) (Su, F, W, Sp)

601. Individual Study for Master’s Students. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Snyder in charge) (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. degree. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Snyder in charge) (Su, F, W, Sp)

POLITICAL SCIENCE
(Department Office, 210 Barrows Hall)
Charles Aikin, LL.B., Ph.D., Professor of Political Science.
David E. Apter, Ph.D., Professor of Political Science, Director of the Institute of International Studies.
Eric C. Bellquist, Ph.D., Professor of Political Science.
Ernst B. Haas, Ph.D., Professor of Political Science.
Norman Jacobson, Ph.D., Professor of Political Science.
Victor Jones, Ph.D., Professor of Political Science.
George Lenczowski, LL.M., J.S.D., Professor of Political Science.
Albert Lepawsky, Ph.D., Professor of Political Science.
Leslie Lipson, Ph.D., Professor of Political Science.
Herbert McClosky, Ph.D., Professor of Political Science.
Nelson W. Polsby, Ph.D., Professor of Political Science.
Carl G. Rosberg, D.Phil., Professor of Political Science.
Richard N. Rosecrance, Ph.D., Professor of Political Science.
Robert A. Scalapino, Ph.D., Professor of Political Science.
John Schaar, Ph.D., Professor of Political Science.
Paul Seabury, Ph.D., Professor of Political Science.
Aaron Wildavsky, Ph.D., Professor of Political Science (Chairman of the Department.) Sheldon S. Wolin, Ph.D., Professor of Political Science.
Thomas C. Blaisdell, Jr., Ph.D., Professor of Political Science, Emeritus.
Joseph P. Harris, Ph.D., Professor of Political Science, Emeritus.

† On leave, 1968–69.
Hans Kelsen, Ph.D., D.L., Dr.honoris causa, LL.D., Professor of Political Science, Emeritus.
N. Wing Mah, Ph.D., Professor of Political Science, Emeritus.
Warren F. Ilchman, Ph.D., Associate Professor of Political Science.
Chalmers A. Johnson, Ph.D., Associate Professor of Political Science.
Eugene C. Lee, Ph.D., Associate Professor of Political Science, Director of the Institute of Governmental Studies.
Ralph H. Retzlaff, Ph.D., Associate Professor of Political Science.
Gaylor M. Bonham, Ph.D., Assistant Professor of Political Science.
Jacob Citrin, M.A., Assistant Professor of Political Science.
Iyotindra Das Gupta, Ph.D., Assistant Professor of Political Science.
Giuseppe Di Palma, Ph.D., Assistant Professor of Political Science.
Andrew Janos, Ph.D., Assistant Professor of Political Science.
Todd R. La Porte, Ph.D., Assistant Professor of Political Science.
Michael A. Leiserson, Ph.D., Assistant Professor of Political Science.
Daniel S. Lev, Ph.D., Assistant Professor of Political Science.
Arend Lijphart, Ph.D., Assistant Professor of Political Science.
Andrew S. McFarland, Ph.D., Assistant Professor of Political Science.
Clement H. Moore, Ph.D., Assistant Professor of Political Science.
Hanna Pitkin, Ph.D., Assistant Professor of Political Science.
C. Bingham Powell, Ph.D., Assistant Professor of Political Science.
Michael Rabin, Ph.D., Assistant Professor of Political Science.
Peter Sperlich, Ph.D., Assistant Professor of Political Science.

Virginia Thompson Adloff, Ph.D., Lecturer in Political Science.
Robert M. Axelrod, M.A., Acting Assistant Professor of Political Science.
Robert L. Ayres, A.B., Acting Assistant Professor of Political Science.
William E. Bicker, M.A., Acting Assistant Professor of Political Science.
Robert P. Biller, M.A., Acting Assistant Professor of Political Science.
Joan Bondurant, Ph.D., Lecturer in Political Science.
Gerald Caiden, Ph.D., Visiting Professor of Political Science.
David Daube, Jr., Ph.D., LL.B., Visiting Professor of Political Science and Law.
Margaret W. Fisher, Ph.D., Lecturer in Political Science.
William H. Gardner, M.S., Lecturer in Political Science.
Leroy Graymer, M.A., Lecturer in Political Science.
A. James Gregor, Ph.D., Acting Associate Professor of Political Science.
Kenneth Jowitt, M.A., Acting Assistant Professor of Political Science.
William K. Muir, Ph.D., Acting Associate Professor of Political Science.
Stefan H. Riesenfeld, B.S., LL.B., Dr. Jur., Dott. in giur., S.J.D., Lecturer in Political Science and Emanuel S. Heller Professor of Law.
Eric Siesby, Dr. Jur., Visiting Associate Professor of Political Science.
Merrill Shanks, A.B., Acting Assistant Professor of Political Science.
Michael J. Shapiro, Ph.D., Visiting Assistant Professor of Political Science.
Rodney P. Stiefbold, Ph.D., Visiting Assistant Professor of Political Science.

Departmental Major Advisers: consult departmental office.

The American Institutions Requirement This requirement may be satisfied by completing an approved course, or by passing an examination. See page 30.

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† On leave, 1968–69.
‡ On leave, fall and winter, 1968–69.
§ On leave, fall, 1968.
The Major

Freshman or sophomore year: Political Science 1, 2, 3. Sophomore or junior year: Political Science 101A–101B–101C. Thereafter, any six upper division political science courses.

Students whose major field of interest is political behavior, or who wish to do graduate work, are required to take an approved course in statistics.

It is strongly recommended that majors in political science study allied subjects in the social sciences; and, to that end, majors are advised to include appropriate lower division courses in the program of their freshman and sophomore years, selected from the following departments: Anthropology, Economics, Geography, History, Philosophy, Psychology, and Sociology.

Students planning to emphasize a study of a region or country should begin appropriate language preparation, and students planning graduate work should increase their proficiency in French and/or German or Russian.

Honors Program  Students who, at the end of their junior year, have an overall average of 3.0 or better, are encouraged to apply for admission to the honors program. Students with a lower average may petition for admission. In all cases, admission will be determined by a committee of faculty members in each of the six fields, on the basis of an interview and of the applicant’s overall record. Honor students take a three-quarter sequence during their senior year. The last quarter may be devoted to the writing of a senior thesis. Instruction is in the form of seminars, tutorials, or both. Honors work will be offered in the following broad fields: political theory, international relations, comparative politics, political behavior, law and legal theory, and public administration.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. American Government. (5)
   Two 1-hour lectures and two 1-hour section meetings per week. An introduction to the principles and problems of government and the political process, with particular emphasis on American national government and politics.
   Mr. Polsby (F), Mr. Muir (W), ——— (Sp)

2. Comparative Government. (5)
   Two 1-hour lectures and two 1-hour section meetings per week. A comparative study of constitutional principles, governmental institutions and political processes in selected national governments.
   Mr. Stiefbold (F); Mr. McFarland, Mr. Gehlen, Mr. Jowitt (W); Mr. McFarland, Mr. Lev, Mr. Jowitt (Sp)

3. Political Theory. (5)
   Two 1-hour lectures and two 1-hour section meetings per week. An examination of various theoretical approaches to politics, of basic political problems and proposed solutions to them. An introduction to ways of thinking about politics and an exploration of the language and concepts of political theory.
   ——— (F), Mr. Gregor (W), Mr. Moore (Sp)

5. American Institutions. (4)
   (Formerly numbered 15)
   Two 1½-hour lectures per week. A survey of the powers, structure and operations of government, primarily at the national level. Not open to students who have taken 1. Specifically intended for students who wish to fulfill the institutions part of the American History and Institutions requirement.
   ——— (F, W, Sp, Sn)

33A–33B–33C. American Studies. (5–5–5)
   One 1-hour lecture per week and one 2-hour seminar per week. Open to sophomores with consent of instructor. Limited to fifteen students. An honors course in the study of American culture. The class will study significant ideas and issues, drawing on material from history, literature, political science, philosophy, and other fields. The course will emphasize discussion and the writing of essays and will include occasional joint meetings with the staff and students of the two equivalent courses (English 33A–33B–33C and History 33A–33B–33C).
   Mr. Schaar (F), Mr. Rogin (W, Sp)

Upper Division Courses

Required Course

   One hour of class and three hours of lecture per week. This course provides the foundation for upper division work in the major. It must be taken in the following sequence:

101A. Analytical and theoretical problems of political inquiry such as the nature of knowledge, relations between fact and value, language and symbolic systems, logic of inquiry, forms and structures of scientific knowledge, orientations, approaches, constructs and concepts; the development of political science as a discipline; the relationship of political science to other disciplines.

101B. Specific techniques, procedures, and tools
Specialized Courses

106. The Conduct of American Foreign Relations. (5)
Three 1½-hour lectures per week. Constitutional arrangements, federal-state relations, and national supremacy. The roles of the President in his various capacities, the Senate, the House of Representatives, key committees, and pressure groups. The Department of State and the Foreign Service. The Military, NSC, USIA, other official agencies and public opinion.

107. The American Executive. (5)
Three 1-hour lectures and one 1-hour conference per week. Analysis of principal institutions, functions and problems of the presidency and the federal executive branch. Special attention will be given to topics of presidential leadership, staffing, executive-legislative relations, and policy formation. Comparative references to executive processes in other political systems.

*108. The American Legislative Process. (5)
(Formerly numbered 105)
Three 1-hour lectures and one 1-hour conference per week. A study of the organization and functioning of the legislative bodies, with particular attention to Congress and state legislatures; functions; membership; committee system; executive-legislative relations; pressure groups; lobbying; movement for reform.

109. The American Judiciary. (5)
(Formerly numbered 159A—159B)
Two 1½-hour lectures and one 1-hour conference per week. The nature of the American judicial system, with special emphasis on processes of federal and state courts; constitutional and political aspects of the judicial process.

110. State Governments. (5)
Three 1-hour lectures and one 1-hour conference per week. Comparative study of politics in American states, federal-state relations, elections; policies; administrative problems.

111. Urban Government and Politics. (5)
Two 1½-hour lectures and one 1-hour conference per week. Urbanization and the growth of cities; the metropolitan community; historical development of local government; general patterns of central-local relations; local politics and decision-making; administrative organization and process. A comparative study with emphasis on the United States.

112. Basic Problems in American Government. (5)
Two 1½-hour lectures and one 1-hour conference per week. Selected problems in American government and politics. Readings will include basic theoretical, documentary, and research literature on three to five problems of contemporary public policy and administration. Written work will include one major research paper.

Mr. Leiserson (Sp)

113A–113B. American Political Theory. (5–5)
Two 1½-hour lectures and one 1-hour conference per week. Basic problems of political theory as viewed within the context of American history and institutions.

Mr. Jacobson (F) — (W)

118A–118B–118C. History of Political Theory. (5–5–5)
Three 1-hour lectures, one section meeting, and one 1-hour conference per week. Separate section meetings will be scheduled for undergraduate and graduate students. Major political theories from the Greeks to modern period.

118A. Classical and Medieval theories; Machiaveli and the beginnings of modern political theory.

118B. Political thought during the Reformation; the emergence of liberalism, conservatism, and revolutionary theories.

118C. The examination of major political theories since the mid-nineteenth century; changing conceptions of the nature of theory.

Mr. Leiserson (Sp)

120. International Relations. (5)
Two 1-hour lectures and one 1-hour conference per week. The nature of the international state system, analysis of political, military, cultural, economic and ideological factors affecting the behavior of states and international organizations in world politics.

Mr. Graymer (F); Mr. Rosecrance, Mr. Stiefbold (W); Mr. Haas, Mr. Bonham (Sp)

*121. International Organization. (5)
Two 1½-hour lectures and one 1-hour conference per week. Military security, peaceful change and social economic welfare under the United Nations system.

122A–122B. International Law. (5–5)
Two 1-hour lectures and one 1-hour conference per week. Nature, sources, function and evolution of international law; principal law-making and adjudicatory agencies; international legal personality; treaties and executive agreements; jurisdiction over places and persons. Diplomatic and consular intercourse; treaties and executive agreements; pacific settlement; war and neutrality.

Mr. Stiefbold (Sp)

123. Regional Communities. (5)
Three 1-hour lectures and one 1-hour conference per week. Examination of supranational regional international communities; the processes of political, cultural, economic and military integration occurring within them.

Mr. Bonham (Sp)

Three 1-hour lectures and one 1-hour conference per week. The interrelationships among military strategy, technology, science; relationships between strategic doctrine, national security concepts, and domestic politics.

Mr. Axelrod (F)

* Not to be given, 1968–69.
128. American Foreign Policy. (5)
Three 1%-hour lectures and one 1-hour conference per week. Analysis of competing concepts of the American "national interest" operative since World War I; Wilsonism, isolationism, the Open Door, the Monroe Doctrine, and the Good Neighbor Policy; continentalism; national security, containment and liberation: their relation to substantive policies, and to the character of American democracy.
Mr. Seabury (Sp)

129. Soviet Foreign Policy. (5)
Two 1%-hour lectures and one 1-hour conference per week. Continuity and change in Soviet policy. Soviet theories of world politics. Traditions and sources of external behavior. Areas and fields of activity. Policy formation and implementation: strategy, tactics, and methods. Mr. — (F)

130. Totalitarianism and Dictatorship. (5)
Three 1%-hour lectures and one 1-hour conference per week. Comparative analysis of modern non-democratic political systems in developed and modernizing societies; characteristics of social control, ideology and the nature of coercion in totalitarian systems.
Mr. Janos (Sp)

130A-130B. Comparative Analysis of Political Systems. (5-5)
Two 1%-hour lectures and one 1-hour conference per week. Survey of social and political theory of relevance to comparative studies. Emphasis upon the problem of political development, with a consideration both of established models and of contemporary patterns in the Third World.
Mr. Leiserson (F), — (Sp)

141A-141B. Government and Politics in the Soviet Union. (5-5)
Two 1%-hour lectures and one 1-hour conference per week.
141A. Introduction to Soviet government and politics. Bases of the Soviet system. Political history of the USSR. The Communist Party: objectives, organization, and operational dynamics. Formal institutions of government: federalism, the Soviets, the administrative system. Law, economics, and society as related to government and politics.
Mr. Townsend (F, W, Sp)

141B. A more advanced course based on 141A. Selected themes in Soviet internal politics: elites and functional groups; political leadership, factionalism and succession crises. Prerequisite: 141A or permission of instructor.

141C-141D. Government and Politics in Eastern Europe. (5-5)
Two 1%-hour lectures and one 1-hour conference per week.
141C. A study of the political process in relation to social structure and national diversity. A comparison of Communist and prewar political systems, and an analysis of contemporary political developments.
141D. The rise of the nation state, and the persistence of nationalist aspirations. Relations with the West and the Soviet Union with a particular reference to national communism and "domesticism."
Mr. Jowitt (Sp)

141E-141F. Political Theory in Communist Societies. (5-5)
Two 1%-hour lectures and one 1-hour conference per week. An examination of Marxist or Marxist-Leninist theories of society, the state, and international politics in Communist bloc nations the relationship of neo-Marxist thought to other political systems and concepts, nationalism, existentialism and democratic theory.
Mr. Gregor (Sp)

142A-142B-142C. Government and Politics in the Middle East. (5-5-5)
Three hours of lecture and one 1-hour conference per week.
142A-142B. Evolution and Revolution in the Middle East. Foundations of Islamic society and its political institutions, comparative analysis of the Islamic and Western systems, process of modernization; traditional, constitutional, and revolutionary states; parties, mass organizations, ideologies, and development policies.
Mr. Lenczowski (F, W)
142C. The Middle East in World Affairs. International relations and domestic politics of contemporary states in the Middle East; policies and strategy of major powers; supranational movements; regional political and security organizations. The area comprises Turkey, Iran, Afghanistan, Israel, and the Arab countries.
142A-142B and 142C are offered in alternate years.
Mr. Lenczowski (F)

143A-143B-143C. Government and Politics in Northeast Asia. (5-5-5)
Two 1%-hour lectures and one 1-hour conference per week. The structure and evolution of political institutions in China, Japan, and Korea. Emphasis upon such topics as nationalism, political modernization, and ideology.
Mr. Townsend (F, W, Sp)

143D-143E. Government and Politics in Southeast Asia. (5-5)
Two 1%-hour lectures and one 1-hour conference per week. The structure and evolution of political institutions in Southeast Asia in the post-colonial period.

144. Government and Politics in Great Britain. (5)
Two 1%-hour lectures and one 1-hour conference per week. The British political tradition; evolution from oligarchy to democracy; elections and parties; the constitutional system; parliament, cabinet, and administration; functions of the welfare state.
Mr. Lipson (Sp)

145A-145B. Government and Politics in South Asia. (5-5)
Three 1%-hour lectures and one 1-hour conference per week. A comparative analysis of development and change in the political systems of contemporary South Asia. Attention will be given to the relationship between the political systems and social, cultural, economic and psychological factors in these countries.
Mr. Retzlaff (F, W)

145C. American Role in the Far East. (5)
Three hours of lecture and one 1-hour conference per week. A survey of the role which the United States has played in the Far East through the examination of such topics as America's role in Asiatic Westernization, United States—Far Eastern foreign policy. Oriental attitudes towards America. Evaluation of present-day problems.
Mr. Johnson (W)

* Not to be given, 1968-69.
145E. Political Theory in Non-Western Societies. (5)
Two 1%-hour lectures and one 1-hour conference per week. Analysis of political thought in Far Eastern, South Asian and African societies. The impact of modern Western thought on traditional political theories and values. Emphasis on current ideological trends, nationalist movements, and the impact of modern Western and neo-Marxist thought. 
Mr. Das Gupta (Sp)

146A–146B–146C. Government and Politics in Africa. (5–5–5)
Two 1%-hour lectures and one 1-hour conference per week. Major constituent factors shaping African politics and institutions; concepts and patterns of political change; nationalism, political groups, ideology and nation building.

146B. Political developments in French-speaking Africa west of the Congo River. The French colonial heritage as it has influenced the development of the former French West and Equatorial African Federations. Emphasis will be placed on the internal and international problems facing these newly independent countries in creating national and African unity.
Mrs. Adloff (W)

146C. North Africa. A comparative analysis of the contemporary systems of Tunisia, Algeria, and Morocco; their colonial legacies, their divergent responses to modernization, and their prospects of political development.
Mr. Moore (F)

147A–147B. Government and Politics in Western and Northern Europe. (5–5)

147A. Two 1%-hour lectures and one 1-hour conference per week. An analysis of political behavior and institutions in continental western Europe, focused on selected countries, areas, issues, or analytical problems.
Mr. Powell (F)

147B. 4%-hour per week. Constitutionalism and parliamentarism in the Scandinavian states (F)

Denmark, Finland, Iceland, Norway, and Sweden. Constitutional history and present governmental history and present governmental systems. Inter-Scandinavian cooperation.
Mr. Belkquist (Sp)

148A–148B. Government and Politics in Latin America. (5–5)
Three 1-hour lectures and one 1-hour conference per week. Political institutions, groups and parties in Latin American countries. Basic characteristics of political processes in Latin America; problems of political development and modernization and political change. Comparative study of political systems; institutions, groups and political culture.
Mr. Ayres (F)

150. Comparative Law. (5)
Two 1%-hour lectures and one 1-hour conference per week. Prerequisite: at least one course in public or private law. An introduction to common law, civil law, and Soviet law, and the role of these legal systems in developing governmental processes as well as in the positions of persons within each of them.

151. Legal Theory. (5)
Two 1%-hour lectures and one 1-hour conference per week. Fundamental legal principles, especially from the analytical, historical, philosophical, and sociological points of view. Particular attention will be given to modern theories of the function of law.

152. Legal Institutions. (5)
Three hours of lecture and one 1-hour conference per week. The development and agencies of legal growth since primitive times and the interrelations between law and government. The early legal institutions of Europe and their influence on the modern juridical systems.

*156. Administrative Law. (5)
Two 1%-hour lectures and one 1-hour conference per week. A study of the position of the executive branch of government in the American constitutional system, of the foundation of administrative power, of the area of judicial supervision of administration, and of the liability of public offices and of the state based on misuse of administrative power.
Mr. Aikin


157A. The Federal System.
Mr. Aikin (F)

157B. Civil Liberties.
Mr. Aikin (W)

157C. Judicial Control of the Economy.
Mr. Aikin (Sp)

160. Pressure Groups. (5)
Two 1%-hour lectures and one 1-hour conference per week. Private power and public policy; the nature and sources, strategy and tactics of group power within the context of the American institutional setting. Business, agriculture, labor, religion, the professions as organized power. Ramifications for a democratic society.
Mr. Regin (W)

161A–161B–161C. Political Behavior. (5–5–5)
Two 1%-hour lectures and one 1-hour conference per week. The individual and group aspects of political behavior; social and psychological factors in politics; consideration of available research on voting behavior, ideology, extreme belief and affilia tion, leadership, participation, personality factors, public opinion, and group influence processes.
Mr. Citrin (F, W, Sp)

162A–162B. Public Opinion. (4–4)
The first quarter will treat the nature of public opinion and propaganda and the home, school, and church as basic factors in the opinion forming process. In the second quarter emphasis will be placed upon the media and other instrumentalities of opinion formation. Our overseas information program, Stress upon political implications.
Mr. Belkquist (F, W)

163. Political Parties. (5)
Two 1%-hour lectures, one section meeting, and one 1-hour conference per week. Nature and functions of political parties; origin, development, structure, economic and social composition, internal management and control; role of parties and pressure groups to legislation and administration.

164A–164B–164C. Comparative Political Behavior. (5–5–5)
Two 1%-hour lectures and one 1-hour conference per week. Comparison of styles of political behavior within advanced and developing nations. Attention will be given to similarities and differences between types of Western and non-Western politics.
Mr. Di Palma (F, W, Sp)

* Not to be given, 1968–69.
181. Public Administration. (5)
Three hours of lecture and one 1-hour conference per week. The function of administrative institutions in society; the growth of administration as an art and science; contemporary and comparative forms and theories of organization and bureaucracy; the responsibilities of public servants.
Mr. Jones (F), Mr. Biller (W)

182. Public Policy and the Planning Process. (5)
Two 1½-hour lectures and one 1-hour conference per week. The substantive policies of government in relation to economic, social and political programs; the process of policy formulation; governmental planning; administrative programming in the execution of governmental policies and public projects.
Mr. Lepawsky (Sp)

183. The Public Service in the Modern State. (5)
Two 1½-hour lectures and one 1-hour conference per week. The role of civil servants in society; specialization and professionalization of public employees; human relations in organizations, recruitment and training of public personnel; elements of public personnel administration.
(Sp)

184. Policy and Administration of Public Finances. (5)
Three 1-hour lectures and one 1-hour conference per week. Financial administration in the modern state—American, comparative, historical; fiscal implications of governmental activity; the budget process in public administration; management devices to secure administrative accountability and political responsibility.
(Sp)

186. Administrative Behavior. (5)
Two 1½-hour lectures and one 1-hour conference per week. Concepts of administrative behavior with particular reference to public organization, including decision-making, leadership, small group behavior, and public organization as a social system related to a modern technological culture.
Mr. Biller (F)

187. Comparative National Administration. (5)
Two 1½-hour lectures and one 1-hour conference per week. An inquiry into the structure and functions of public bureaucracies in different political, social, economic, and cultural systems.
Mr. Ichman (F)

188. Science, Technology, and Politics. (5)
Three 1-hour lectures and one 1-hour conference per week. History of science and government in the United States; contemporary structure of science advisory and implementing systems; and perspectives in the uses of science for public objectives.
Mr. La Porte (W)

Honors Program
Honors students will take a three-quarter sequence during their senior year. The last quarter may be devoted to the writing of a senior thesis. Instruction will be in the form of seminars, tutorials, or both. Honors work will be offered each year in the following broad fields.
205. The Politics of Modernization. (4)
One 2-hour session per week. Mr. Apter (W)

206. Political Change in Africa and Latin America. (4)
One 2-hour session and one 1-hour conference per week. Mr. Apter (Sp)

SEMINARS

207A-207B. Revolutionary Change. (4)
One 2-hour session and one 1-hour conference per week. Analysis and comparative study of the occurrence of various forms of revolution in society. Materials are drawn from political philosophy, systems theory, and empirical research.

Mr. Johnson (F, W)

Political Theory

COURSES

213. American Political Theory. (4)
One 2-hour session and one 1-hour conference per week. Prerequisite: course 113A or 113B or consent of instructor. Basic problems of political theory will be examined within the context of American political development.

214A-214B-214C. Colloquium in Political Theory. (4-4-4)
One 2-hour session and one 1-hour conference per week. Required of all theory majors. An intensive examination of the nature and aims of various forms of political theory. Attention will also be given to selected theories in the social sciences and to relevant aspects of philosophy.

(F), Mr. Pitkin (W, Sp)

218A-218B-218C. Colloquium in Political Theory. (4-4-4)
One 2-hour session and one 1-hour conference per week. Required of all theory majors. An intensive examination of the nature and aims of various forms of political theory. Attention will also be given to selected theories in the social sciences and to relevant aspects of philosophy.

(F), Mr. Pitkin (W, Sp)

219A. Perspectives in Political Theory. (4)
One 2-hour session and one 1-hour conference per week. Politics and political theory as science.

Mr. Jacobson (W)

SEMINARS

*214A-214B-214C. Themes in Western Political Theory. (4-4-4)
One 2-hour session and one 1-hour conference per week. Theme to be specified each year.

215. Marxist Theory. (4)
One 2-hour session and one 1-hour conference per week.

Mr. Gregor (Sp)

219B. Perspectives in Political Theory. (4)
One 2-hour session and one 1-hour conference per week. Politics and political theory as science.

Mr. Jacobson (Sp)

International Relations

COURSES

220. Theories of International Relations. (4)
(Formerly numbered 220A)
Two 1½-hour sessions per week. Origin, application and utility of major concepts featured in the study of international relations. Relation of various strands of political and social theory to international relations.

Mr. Rosecrance (F)

221. American Foreign Policy. (4)
One 2-hour session and one 1-hour conference per week. Strategic-military, political, economic, and cultural aspects of American foreign policy.

Mr. Seabury (F)

222. Nationalism and Imperialism. (4)
Two 1½-hour sessions and one 1-hour conference per week. Themes in the theory of nation-building, illustrated with Western and non-Western case studies.

(Sp)

One 2-hour session and one 1-hour conference per week. Survey of methods applicable to systematic research in international relations, with emphasis on quantitative techniques. Relations between research techniques, research concepts and theory-building in international politics.

Mr. Bonham (W)

SEMINARS

*225. International Law. (4)
One 2-hour session and one 1-hour conference per week. Selected problems in modern international law.

Mr. Riesenfeld (Sp)

*226A-226B. International Organization. (4-4)
One 2-hour session and one 1-hour conference per week. First quarter: readings and discussion concerning methodological issues in the study of international integration. Second quarter: papers dealing with specific organizational situations, regional and United Nations.

Mr. Haas (W, Sp)

227A-227B. International Relations and Foreign Policy. (4-4)
One 2-hour session and one 1-hour conference per week. Convergence and interaction among national foreign policies in international politics; the nature of national decision-making in foreign policy; comparison of diplomatic bargaining, military, and other behavioral styles in international politics.

Mr. Seabury (F); Mr. Rosecrance (W)

228. National Security Policy. (4)
One 2-hour session and one 1-hour conference per week. Strategic concepts, theories of national security, and the relationship of conflict-theory to policy planning and national action. Special, but not exclusive, emphasis on United States data and policy problems.

Mr. Rosecrance (W)

Area Studies

COURSES

240A-240B-240C. Western and Northern European Government and Politics. (4-4-4)
One 2-hour session and one 1-hour conference per week.

240A-240B, Mr. Stiefbold (F, W); 240C, Mr. Bellquist (Sp)

241A-241B-241C. The Soviet Union and Eastern Europe. (4-4-4)
One 2-hour session and one 1-hour conference per week.

241A-241B, Mr. Gahlen (W, Sp); 241C, Mr. Janos (Sp)

Area Studies

SEMINARS

240A-240B-240C. Western and Northern European Government and Politics. (4-4-4)
One 2-hour session and one 1-hour conference per week.

240A-240B, Mr. Stiefbold (F, W); 240C, Mr. Bellquist (Sp)

241A-241B-241C. The Soviet Union and Eastern Europe. (4-4-4)
One 2-hour session and one 1-hour conference per week.

241A-241B, Mr. Gahlen (W, Sp); 241C, Mr. Janos (Sp)

Area Studies

SEMINARS

240A-240B-240C. Western and Northern European Government and Politics. (4-4-4)
One 2-hour session and one 1-hour conference per week.

240A-240B, Mr. Stiefbold (F, W); 240C, Mr. Bellquist (Sp)

241A-241B-241C. The Soviet Union and Eastern Europe. (4-4-4)
One 2-hour session and one 1-hour conference per week.

241A-241B, Mr. Gahlen (W, Sp); 241C, Mr. Janos (Sp)

Area Studies

SEMINARS

240A-240B-240C. Western and Northern European Government and Politics. (4-4-4)
One 2-hour session and one 1-hour conference per week.

240A-240B, Mr. Stiefbold (F, W); 240C, Mr. Bellquist (Sp)

241A-241B-241C. The Soviet Union and Eastern Europe. (4-4-4)
One 2-hour session and one 1-hour conference per week.

241A-241B, Mr. Gahlen (W, Sp); 241C, Mr. Janos (Sp)

Area Studies

SEMINARS

240A-240B-240C. Western and Northern European Government and Politics. (4-4-4)
One 2-hour session and one 1-hour conference per week.

240A-240B, Mr. Stiefbold (F, W); 240C, Mr. Bellquist (Sp)

241A-241B-241C. The Soviet Union and Eastern Europe. (4-4-4)
One 2-hour session and one 1-hour conference per week.

241A-241B, Mr. Gahlen (W, Sp); 241C, Mr. Janos (Sp)

Area Studies

SEMINARS

240A-240B-240C. Western and Northern European Government and Politics. (4-4-4)
One 2-hour session and one 1-hour conference per week.

240A-240B, Mr. Stiefbold (F, W); 240C, Mr. Bellquist (Sp)

241A-241B-241C. The Soviet Union and Eastern Europe. (4-4-4)
One 2-hour session and one 1-hour conference per week.

241A-241B, Mr. Gahlen (W, Sp); 241C, Mr. Janos (Sp)
242A–242B. Politics and Diplomacy in the Middle East. (4–4)
One 2-hour session and one 1-hour conference per week.
Mr. Lenczewski (F)

*242C. Political Thought in the Middle East. (4)
(Formerly numbered 218)
Two hours of lecture and one 1-hour conference per week.
Historical survey and analysis of Turkish, Arab, Persian, and Zionist political ideas. Islamic fundamentalism and reformism, impact of Western liberalism, constitutionalism, modern nationalism and its rival ideologies are examined. Emphasis is on the nineteenth and twentieth centuries.
Mr. Lenczewski (Sp)

243A–243B. Contemporary Problems of the Far East. (4–4)
One 2-hour session and one 1-hour conference per week.
Mr. Leiserzon (W); Mr. Johnson (Sp)

243C–*243D. Political Problems of Southeast Asia. (4–4)
One 2-hour session and one 1-hour conference per week.
Mr. Lev (W, Sp)

*244A–244B. China. (4–4)
One 2-hour session and one 1-hour conference per week.
244B. Dr. Mehmet (W)

245A–*245B. South Asian Politics. (4–4)
One 2-hour session and one 1-hour conference per week.
Prerequisite: 145A or consent of instructor.
Mr. Das Gupta (Sp)

246A–246B. African Politics. (4–4)
One 2-hour session and one 1-hour conference per week.

246C. North African Politics. (4)
Prerequisite: A reading knowledge of French is required. Comparative analysis of North African political systems (Morocco, Algeria, Tunisia). Focus on problems of political development, contrasting contemporary and antecedent political structures and capabilities. Analysis of political culture change, of old and new elites, interest groups, and factions with single-party and multiparty systems.
Mr. Moore (W)

One 2-hour session and one 1-hour conference per week.
247A, Mr. Polsby (F); 247B, Mr. Bicker, Mr. Polsby (W); 247C, Mr. McFarland, Mr. Polsby (Sp)

248A–248B. Latin-American Politics. (4–4)
One 2-hour session and one 1-hour conference per week.
Mr. Ayres (W, Sp)

249A. Indian Political Thought. (4)
A study of significant concepts and trends in Indian political thought, with reference to traditional and European influences, and to the contributions of Indian leaders. Attention will be given to nationalism, Hindu polity, Marxist theory, indigenous “socialism,” liberal and humanist elements.
Miss Bondurant (W)

249B. Social and Political Change in South Asia. (4)
An exploration of theories of social change as they relate to political developments in India, Pakistan, and the Himalayan Border States, with emphasis upon India.
Miss Bondurant (Sp)

Public Law and Jurisprudence

SEMINARS

250A–250B–*250C. Comparative Law. (4–4–4)
One 2-hour session and one 1-hour conference per week. Prerequisite: course 150, or at least one course in public or private law. A comparative study of legal processes within Western and Communist systems of law, and an examination of the impact of such systems on the exercise of public power and on the determination of private rights and privileges.

251. Legal Theory. (4)
Two hours of lecture and one 1-hour conference per week.
Selected problems of American, British, and continental European legal theory since the seventeenth century. The emphasis will be on the study of epistemologic, methodological, and substantive questions in their relation to the political environment.

257A–257B–*257C. Constitutional and Administrative Law. (4–4–4)
One 2-hour session and one 1-hour conference per week. Fundamental principles of constitutional law; leading cases; judicial decisions affecting the liabilities, rights, duties, and procedures of governmental officers and agencies.
Mr. Alkin (W, Sp)

*258A–258B. Judicial Administration. (4–4)
One 2-hour session and one 1-hour conference per week. Selected problems.

Political Behavior (American and Comparative)

COURSES

One 2-hour session and one 1-hour conference per week. Comprehensive review of research methods in Political Science, emphasizing actual research techniques and procedures; methods of observation and data collection, survey and experimental design, field studies, sampling, interviewing, questionnaire construction, scaling, data processing and analysis, uses of library and aggregative data.

261A–261B–261C. Political Behavior. (4–4–4)
One 2-hour session and one 1-hour conference per week. Prerequisite: previous work in 161A–161B–161C, or equivalent courses. A comprehensive review of the major topics in political behavior through intensive examination of the theories, findings, and proceedings of the most significant studies in the field.
Mr. McClusky (F, W, Sp)

* Not to be given, 1968–69.
262A–262B. Parties, Public Opinion, and Interest Groups. (4–4)
Two hours of lecture and one 1-hour conference per week.
262A. Some problems of political analysis in the American political system.
Mr. Shanks (W)
262B. Selected topics on the relation of groups to politics.
Mr. Rogin (F), Mr. Shanks (Sp)

SEMINARS

*263A–263B–263C. Research Seminar in Political Behavior. (4–4–4)
One 2-hour session and one 1-hour conference per week. Prerequisite: 161A–161B–161C or 261A–261B–261C. Research seminar on selected topics in political behavior, and the preparation of a research report.

265A–265B. Political Behavior. (4–4)
One 2-hour session per week. Research on special topics of political behavior.
265A. Mr. Citrin (F), Mr. Di Palma (W); 265B. Mr. Muir (W)

267. The Legislative Process. (4)
(Formally numbered 205)
One 2-hour session and one 1-hour conference per week. Research on legislative process and behavior, with attention to legislation and constituency relations.
Mr. Bicker, Mr. Polsby (W)

*268. Local Politics. (4)
One 2-hour session and one 1-hour conference per week. Research on local political processes, decision-making and community power structure.
Mr. Polsby (Sp)

*269. The Executive Process. (4)
One 2-hour session and one 1-hour conference per week. Research on bureaucracy and the executive process.
Mr. Wildavsky (W)

Public Administration and Public Policy
(American and Comparative)

COURSES

270. Public Administration. (4)
One 2-hour session and one 1-hour conference per week. Introduction to the historical and contemporary status of administrative institutions, principles and practices of public administration and the processes of public management.

271. Public Policy. (4)
One 2-hour session and one 1-hour conference per week. The process of public policy-formulation, governmental planning and programming, and administrative decision-making.
Mr. Lepawsky (Sp)

272. Administrative Behavior. (4)
One 2-hour session and one 1-hour conference per week. Theories of administrative and organizational behavior including decision-making, communications, leadership and the functional analysis of public organization. Relation of a public organization to its political and technological environment.
Mr. Biller (W, Sp)

*273. Comparative National Bureaucracy. (4)
One 2-hour session and one 1-hour conference per week. Analytical comparison of administrative systems of various countries in different stages of national development.
Mr. Ichman (Sp)

274. Federalism and Intergovernmental Relations. (4)
One 2-hour session and one 1-hour conference per week. The relationship of constitutional doctrine and political thought to the organization and practice of intergovernmental relations.
Mr. Jones (F)

275. Government and Politics in Metropolitan Areas. (4)
One 2-hour session and one 1-hour conference per week. The social, political, economic, and legal background in which municipal administration is set. The facilities and processes organization, budgeting, accounting, personnel, and management methods of the municipal administrator.
Mr. Lee, Mr. Gardner (F, W)

276. Administration of the Public Service. (4)
One 2-hour session and one 1-hour conference per week. Categories and methods of employment of public servants; problems in public service administration.

278A–278B. Financial Administration and Budgeting. (4–4)
One 2-hour session and one 1-hour conference per week.
278A. Budgets as political instruments. Budgetary calculations and strategies primarily in American national government but also in Soviet and American industrial firms and foreign governments. Core readings and research paper emphasizing theoretical statements about how budgets are and ought to be made.
Mr. Wildavsky (Sp)
278B. Public budgets as instruments of policy making and management. Financial, fiscal, administrative and legislative aspects of budgeting.

*279. Administration of Foreign Policy. (4)
One 2-hour session and one 1-hour conference per week. Advanced research in problems of the conduct and control of foreign policy, the decision-making processes within the National Security Council, the departments of State and Defense and related federal agencies.

280A. Administrative Theory. (4)
One 2-hour session and one 1-hour conference per week. A survey of the literature of organization and management theory, emphasizing the major writers and distinctive contributions of various disciplines.
Mr. LaPorte (F)

* Not to be given, 1968–69.
SEMINARS

280B. Administrative Theory. (4)
One 2-hour session and one 1-hour conference per week. Intensive study of selected areas of organizational and management theory. Mr. La Porte (Sp)

*281A–281B. Research in Public Organization. (4–4)
One 2-hour session and one 1-hour conference per week.
281A. Research design in administrative analysis. Mr. LaPorte (Sp)
281B. Theory and analysis of public organization. Examination of several theoretical perspectives in organizational analysis, model and theory building with emphasis on testing organizational theory. Mr. LaForte (Sp)

*285. Regional Planning and Resources Management. (4)
One 2-hour session and one 1-hour conference per week. Public policies and the planning process as related to regionalism and to the resource-based activities of society; ecological and environmental aspects of public administration; historical and comparative aspects of natural resources administration. Mr. Lepawsky (F)

*287A–287B. Comparative National Administration. (4–4)
One 2-hour session and one 1-hour conference per week. An examination of the public bureaucracies of selected nations, their historical development, relations to the wider political, economic and social systems, organization and central problems and responsibilities. Topic for 1967–68: Administrative Systems of South Asia. Mr. Biller (F)

288. Science and Politics. (4)
One 2-hour session and one 1-hour conference per week. The structure of science and politics, public problems and technological change; the governance of science and technology and the administration of science and technology. Mr. LaForte (W)

Nonfield Courses

Open only to qualified first-year graduate students working towards the M.A. degree.
The Staff (F, W, Sp, Su)

292. Directed Advanced Study. (1–9)
Prerequisite: consent of instructor and graduate adviser. Open to qualified graduate students wishing to pursue special study and research under direction of a member of the staff.
(F, W, Sp, Su)

296. Directed Dissertation Research. (1–9)
Open to qualified students advanced to candidacy for the Ph.D. degree. To be taken on a pass/not pass basis; may be repeated for credit.
The Staff (F, W, Sp, Su)

398. Professional Preparation for Teaching Assistants. (4)
Special study under the direction of a staff member, with emphasis on the teaching of undergraduate courses in political science. Must be taken on a pass/not pass basis.
The Staff (F, W, Sp)

400A–400B–400C. Field Work in the Legislative Process. (4–4–4)
Prerequisite: enrollment limited to persons appointed as Legislative Interns. Supervised full-time research and other work with the California Legislature. Course includes a seminar on the legislative process, under the direction of faculty supervisor.
Mr. Jones (F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

IDS 175. A Nontechnical Introduction to Operations Research. (4)
See interdepartmental Studies for the complete description of this course.

Poultry Husbandry

(100 Poultry Husbandry Laboratory)
Lewis W. Taylor, Ph.D., Professor of Poultry Husbandry, Emeritus.
Samuel Lepkovsky, Ph.D., Professor of Poultry Husbandry, Emeritus.

Poultry Husbandry is no longer offered on the Berkeley campus. Inquiries concerning study in this field may be directed to the Department of Poultry Husbandry on the Davis campus of the University.

* Not be to given, 1968–69.
Frank A. Beach, Jr., Ph.D., D.Sc., Professor of Psychology and Director of the Field Station for Research on Animal Behavior.
Jack Block, Ph.D., Professor of Psychology.
Richard S. Crutchfield, Ph.D., Professor of Psychology.
Edwin E. Ghiselli, Ph.D., Professor of Psychology.
Harrison G. Gough, Ph.D., Professor of Psychology (Chairman of the Department).
Roger W. Heyns, Ph.D., Professor of Psychology.
Sheldon J. Korchin, Ph.D., Professor of Psychology.
David Krech, Ph.D., Professor of Psychology.
Richard S. Lazarus, Ph.D., Professor of Psychology.
Donald W. MacKinnon, Ph.D., Professor of Psychology and Director, Institute of Personality Assessment and Research.
William M. Meredith, Ph.D., Professor of Psychology.
Paul H. Mussen, Ph.D., Professor of Psychology.
Leo J. Postman, Ph.D., Professor of Psychology and Director Institute of Human Learning.
Donald A. Riley, Ph.D., Professor of Psychology.
Mark R. Rosenzweig, Ph.D., Professor of Psychology.
Theodore R. Sarbin, Ph.D., Professor of Psychology and of Criminology.
Alex C. Sherriffs, Ph.D., Professor of Psychology.
Read D. Tuddenham, Ph.D., Professor of Psychology (Vice-Chairman of the Department).
Olga L. Bridgman, M.D., Ph.D., Sc.D., Professor of Psychology, Emeritus.
Clarence W. Brown, Ph.D., Professor of Psychology, Emeritus.
Catherine Landreth, Ph.D., Professor of Psychology, Emeritus.
Jean Walker Macfarlane, Ph.D., Professor of Psychology, Emeritus.
Egerton L. Ballachey, Associate Professor of Psychology.
Hubert S. Coffey, Ph.D., Associate Professor of Psychology.
Martin V. Covington, Ph.D., Associate Professor of Psychology.
Rheem F. Jarrett, Ph.D., Associate Professor of Psychology.
Geoffrey Keppel, Ph.D., Associate Professor of Psychology.
Jonas Langer, Ph.D., Associate Professor of Psychology.
John P. McKee, Ph.D., Associate Professor of Psychology (Vice-Chairman of the Department).
Gerald A. Mendelsohn, Ph.D., Associate Professor of Psychology.
Benbow F. Ritchie, Ph.D., Associate Professor of Psychology.
Edward E. Sampson, Ph.D., Associate Professor of Psychology.
Dan I. Slobin, Ph.D., Associate Professor of Psychology.
Milton R. Blood, Ph.D., Assistant Professor of Psychology.
Philip A. Cowan, Ph.D., Assistant Professor of Psychology.
Kenneth H. Craik, Ph.D., Assistant Professor of Psychology.
Thomas J. Crawford, Ph.D., Assistant Professor of Psychology.
Carl H. Frederiksen, Ph.D., Assistant Professor of Psychology.
William K. Graham, Ph.D., Assistant Professor of Psychology.
Ervin R. Hafter, Ph.D., Assistant Professor of Psychology.
Arnold L. Leiman, Ph.D., Assistant Professor of Psychology.

† On leave, 1968-69.
‡ In residence, fall quarter, 1968.
$ In residence, spring and winter, 1968-69.
‡‡ In residence, spring quarter only, 1968-69.
The Major

Completion of course 1, course 2 or 3, and either of the following courses: Psychology 5, Statistics 2.

Not less than 36 upper division units in psychology, including: (1) either course 103 or 104; (2) two or more courses selected from this sequence: 110A, 110B, 120, 121, 123A, 123B; (3) two or more courses selected from this sequence: 130, 140, 150, 160, 170, 180; (4) two additional courses that meet the following criteria: (a) they shall be from different decades in the list of courses, and (b) they shall have as prerequisites courses listed in (1), (2), or (3) above.

Subject to the provisions of the passed/not passed privilege, any or all of the lower division courses in the major may be accepted with a passed grade, but no courses to be counted toward completion of the upper division 36 units may be taken on a passed/not passed basis except with explicit approval of the major adviser.

Up to 10 of the 36 upper division units, upon approval of the adviser, may be drawn from upper division courses in anthropology, education, genetics, linguistics, mathematics, sociology, speech, or related departments. In requesting approval for such substitution, the student must clearly establish the relationship of the substituted courses to his major program.

Honors Program Each student must fulfill requirements (1), (2), and (3) above before his senior year. He must also take one of the sequences of honors seminars: H190A—B—C, or H191A—B—C, or H192A—B—C, and at least two quarters of H195. Psychology 100 is recommended for students in the honors program.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. General Psychology. (4)
   Three 1-hour lectures and one 1-hour section meeting per week. Introduction to the principal areas, problems, and concepts of psychology.
   Mr. Ballachey (Su); Mr. Mckee (F); Mr. Krech (W); Mr. Ritchie (Sp)

2. Problems and Methods in Experimental and Biological Psychology. (4)
   Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 1. Primarily for majors and prospective majors. Introduction to problems and methods in experimental and biological aspects of psychology.
   Mr. Keppel (F); (W)

3. Problems and Methods in Social and Individual Psychology. (4)
   Three 1-hour lectures and one 1-hour section meeting per week. Prerequisite: course 1. Primarily for majors and prospective majors. Introduction to problems and methods in social, developmental, differential and personality areas of psychology.
   Mr. Harper (Su)

5. Introduction to Psychological Measurements. (5)
   Three 1-hour lectures and two 1-hour section meetings per week. Prerequisite: second-year high school algebra or consent of instructor. Primarily for majors and prospective majors. Not open to students who are taking, or have taken, another course in statistics. (Statistics 2 is equivalent course which will satisfy the major requirement.) Arrays of experimental measurements, central tendencies, variability, correlation, estimation, and testing of hypotheses.
   Mr. Jarrett (Su, F); Mr. Meredith (Sp)
Upper Division Courses

Psychology 1 is prerequisite for all upper division courses. Additional requirements are also stated for certain courses.

*100. History of Psychology. (5)
Three 1½-hour lectures per week.

103. Advanced Statistical Methods in Psychology. (5)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 5 or an equivalent course. Probabilistic considerations involved in the interpretation of psychological data derived from controlled observation; large-sample and small-sample sampling theory frequently employed in psychological research; analysis of variance and linear regression problems in experimental psychology.
Mr. McLaughlin (Su); Mr. Jarrett (W).

104. Theory of Psychological Measurement. (5)
Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: course 5 or an equivalent course. Scaling of psychological measurement; reliability and validity of tests; dimensions of psychological traits.
Mr. Ghiselli (Su, F); Mr. Frederiksen (W).

105. Theory of Multivariate Psychological Experimentation. (5)
Five 1-hour lectures per week. Prerequisite: course 103 or 104. General uses of multiple measurements in psychological research. Multiple prediction methods, confirmatory scoring, stochastic models for psychological tests, theoretical basis of psychometric methods, factor analysis, multidimensional scaling, personnel classification and assignment problems.
Mr. Frederiksen (F).

106. Mathematical Theory of Behavior. (5)
Three 1½-hour lectures per week. Prerequisite: course 103 or 104. History and philosophy of mathematical behavior theory. Rational and stochastic behavior models. Examples from choice, learning, perception, social interaction, psychophysics, preference, and evaluation.
Mr. McLaughlin (W).

107. General Traits and Types of Individuals. (5)
Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: course 103 or 104 or consent of instructor. Introduction to cluster and factor analysis of individual and group differences; methods and findings.
Mr. Meredith (Sp).

110A–110B. Biological Psychology. (4–4)
Two 1½-hour lectures and one 1-hour section meeting per week. Prerequisite: Biology 1A, 1B and 1C, or Physiology 1 and 1L. Relations between behavioral and biological processes. Coordination of behavioral, nervous and endocrine systems; sensory and perceptual processes; physiological processes in motivation, maturation, and learning.
Mr. Routtenberg (Su); Mr. Rosenzweig (F); Mr. Zucker (W).

111A–111B. Laboratory in Biological Psychology. (4–4)
Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: courses 110A–110B and consent of instructor. Experimental studies of relations between behavioral and biological processes.

112. Comparative Behavior Study. (4)
One 3-hour lecture per week. Prerequisite: courses 110A–110B or equivalent, and consent of instructor. Determinants of animal behavior at the various phyletic levels. Analysis of the role of stimulation and neural integration, instincts, and habits.
Mr. Beach (W); Mr. Zucker (Sp).

113. Experiments in Animal Psychology. (4)
One 2-hour lecture and two 3-hour laboratories per week. Prerequisite: consent of instructor. Individual and group research in animal psychology.
Mr. Ritchie (W).

114A–114B. Behavioral Genetics. (3–3)
One 1½-hour lecture and two 2-hour laboratories per week. Prerequisite: courses 110A–110B or equivalent, and consent of instructor. Intensive survey of the evidence regarding the inheritance of behavioral characteristics in animals and man, with emphasis on animal research, implications of behavioral genetics for psychological theory and research design.

120. Learning and Memory. (4)
Two 1½-hour lectures and one 1-hour section meeting per week. Prerequisite: course 5 or an equivalent course. Theoretical and experimental analysis of conditioning, verbal learning, motor learning, and retention.
Mr. Honig (Su); Mr. Riley (F).

121. Concept Learning and Problem Solving. (4)
Two 1½-hour lectures and one 1-hour section meeting per week. Prerequisite: course 5 or an equivalent course. Theoretical and experimental analysis of mediational processes, concept learning, problem solving, and retention.
Mr. Bourne (W).

122. Laboratory in Learning and Problem Solving. (4)
Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: either course 120 or 121 and consent of instructor.
Mr. Honig (Su); Mr. Keppel (Sp).

123A–123B. Sensory and Perceptual Processes. (5–5)
123A. Two 1-hour lectures per week. Lectures and discussion with primary emphasis on psycho-physiological relationships involved in the perception of brightness, color, and form.
123B. Two 2-hour lectures per week. Lectures and discussion of selected topics in auditory psychophysics, with primary emphasis on signal detection and the perceptual effects of binaural listening.
Mr. Jacobs (Su); Mr. Halter (F).
124. Laboratory in Sensory and Perceptual Processes. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 123, and consent of instructor. Laboratory research on selected topics in the psychophysics and psychophysiology of perception.
Mr. Jacobs (Su); Mr. Hafter (Sp)

130. Thinking. (5)
Three 1-2-hour lectures per week. Review of principal concepts and research concerning processes of human thought. Complex problem solving, critical, productive and creative thinking; other related aspects of higher-order cognitive functioning.
Mr. McLaughlin (F)

*131. Introductory Psychology of Language. (4)
Three 1-hour lectures per week. Prerequisite: course 5 or an equivalent course or a background in linguistics. Introduction to psycholinguistics, emphasizing effects of psychological variables on the learning and use of language; influence of language behavior on psychological processes; special attention to psychological applicability of modern linguistic theory and to social psychological aspects of language behavior.

*131L. Laboratory in the Psychology of Language. (1)
One 3-hour laboratory per week. Prerequisite: course 131 and consent of instructor.

132. Psychology of Language and Communication. (5)
Two 1-2-hour lectures and one 3-hour laboratory per week. Prerequisite: consent of instructor. Special topics in language and communication.
Mr. Slobin (W)

133. Psychology of the Unconscious. (5)
Three 1-hour lectures per week. Nature and role of unconscious psychological processes in behavior.
Mr. MacKinnon (Sp)

134. Programmed Instruction and Learning. (5)
Three 1-hour lectures per week. Prerequisite: course 5 or an equivalent course or a background in linguistics. Examines programmed instruction and learning. Survey of available programs, and teaching machines. Role of these methods in a science of instruction. Application to training of cognitive skills in thinking and problem solving.
Mr. Covington (Sp)

140. Developmental Psychology. (5)
Three 1-hour lectures per week. Prerequisite: course 5 or an equivalent course. Survey of theory and research in developmental psychology; growth and development of sensory, motor, cognitive, learning, intellectual functions; personality and social behavior from birth to adulthood.
Mr. Harper (Su); Mr. Rosenberg (F)

141. Laboratory in Developmental Psychology. (2)
Two 3-hour laboratories per week. Prerequisite: course 140, and consent of instructor. Laboratory research on developmental psychology. Group and individual research projects.

*142. Psychology of Infancy. (3)
Two 1-2-hour lectures per week. Prerequisite: course 140. Theory and research on the maturation and learning of the human infant from a developmental comparative point of view.
Mr. Watson (Sp)

143. Advanced Problems in Developmental Psychology. (5)
Three 1-hour lectures per week. Prerequisite: course 140 and consent of instructor. Discussions of theoretical and empirical analyses of selected topics in the development of sensation, perception, learning, ability, cognition, and socialization from birth to maturity.

Courses 172 and 173 are directly relevant to the above courses in developmental psychology.

150. Psychology of Personality. (5)
Two 2-hour lectures and one 1-hour section meeting per week. Prerequisite: course 150, and consent of instructor. Theoretical and methodological issues in the assessment of personality; observational procedures; the interview; problems of test interpretation and psychodiagnosis.
Mr. Craik (W)

152. Behavior Disorders and Their Modifications. (5)
Mr. Mendelson (Su); Mr. Rosenberg (W)

153. Stress and Adjustment. (5)
Three 1-2-hour lectures per week. Prerequisite: course 150, and consent of instructor. Examinations stress theory and research from clinical field and laboratory settings dealing with psychological issues involved in adjustment to life stresses.
Mr. Lazarus (W)

160. Social Psychology. (5)
Three 1-2-hour lectures per week. Survey of social psychology, including language and communication, social interaction, social norms, social roles, leadership, influence of culture and social structure on personality, social attitudes, propaganda, and attitude change.
Mr. Frager (F)

*161. Psychology of Social Problems. (5)
Three 1-hour lectures per week. Primarily for nonmajors. Selected social problems in the light of social psychological research and theory. Such problems as mental illness, prejudice and desegregation, propaganda, delinquency, and social conflict will be treated.
(Credit will not be given for both 160 and 161.)
162. Attitudes, Belief, and Influence Processes. (5)
Three 1%-hour lectures and one 3-hour laboratory per week. Prerequisite: course 5 or an equivalent course, and course 160. Primarily for majors. Nature and measurement of attitudes and beliefs; theory of attitude change; experiments or field studies concerning attitudes and attitude change. Mr. Graham (Su)

163. Small Group Structure and Processes. (5)
Two 1%-hour lectures and two 2-hour laboratories per week. Prerequisite: course 5 or an equivalent course, and course 160. Primarily for majors. Lecture, research laboratory, and sensitivity training groups. Social psychological theories, research methods, and training techniques in the area of small groups. Mr. Sampson (F); Mr. Coffey (W, Sp)

164. Social Structure, Culture, and Personality. (5)
Three 1%-hour lectures per week. Prerequisite: course 150 or 160. Relationships among social structure, culture, and personality. Mr. Hall (Su); Mr. Frager (Sp)

170. Differential Psychology. (5)
Three 1%-hour lectures per week. Prerequisite: course 5 or an equivalent course. Hereeditary and environmental bases of individual differences in intelligence and personality. Family, sex, class and race differences. Mr. Covington (W, Sp)

171. Psychology of Abilities and Aptitudes. (5)
Three 1-hour lectures per week. Prerequisite: course 104; course 170 is recommended. Theory and evaluation of the principal tests of abilities and aptitudes. Historical development of psychological test methods. Mr. Tuddenham (F)

*171L. Laboratory in Abilities and Aptitudes. (2)
Three 1%-hour lectures per week. Prerequisite: course 171 and consent of instructor. (May be taken concurrently with 171.) Laboratory to accompany course 171.

*172. Appraisal of Personality Differences. (5)
Three 1-hour lectures per week. Prerequisite: course 104; course 170 is recommended. Evaluation of methods for the description and measurement of individual differences in personality, including personality inventories, measures of interests and values, projective tests, and approaches to ego-organization.

*172L. Laboratory in Appraisal of Personality Differences. (2)
One 1-hour lecture and one 2-hour laboratory per week. Prerequisite: course 172. (May be taken concurrently with 172.) Laboratory to accompany course 172.

173. Laboratory on Tests of Infants and Preschool Children. (3)
One 1%-hour lecture and two 2-hour laboratories per week. Prerequisite: course 140, and consent of instructor. Mental and cognitive development. Class demonstrations and experience in testing and measuring infants and young children. Mr. Hoinzik (W)

Course 151 is also directly relevant to the above courses in differential psychology.

180. Industrial Psychology. (5)
Three 1%-hour lectures per week. Prerequisite: course 5 or an equivalent course. Primarily for majors. Introduction to the field of industrial psychology, covering fundamental theory and concepts in personnel and social aspects of the field. Mr. Bass (Su); Mr. Blood (Sp)

181. Psychological Problems in Industry. (5)
Three 1%-hour lectures per week. For nonmajors only. Theory and research in industrial psychology. Personnel selection and placement, conditions of work, training, formal and informal organization, communication, leadership. Mr. Bass (Su)

182. Personnel Psychology. (4)
Two 1%-hour lectures and one 2-hour laboratory per week. Prerequisite: course 180. Emphasis on psychological contributions in the development of techniques and practices in personnel management. Mr. Hulin (W)

183A—183B. Social Psychology of Industry. (5—5)
Three 1%-hour lectures per week. Prerequisite: course 180. Psychological approaches to organization theory, with emphasis on the social, motivational, and attitudinal aspects of the work situation. 183A may be taken alone. Mr. Graham (W)

H190A—H190B—H190C. Honors Seminar in Social and Personality Psychology. (4—4—4)
One 2-hour meeting per week. Prerequisite: senior major honor status.
Mr. Crutchfield (F); Mr. Mendelsohn (W); Mr. Bass (Sp)

H191A—H191B—H191C. Honors Seminar in Experimental and Biological Psychology. (4—4—4)
One 2-hour meeting per week. Prerequisite: senior major honor status.
Mr. Ritchie (F); Mr. Keppel (W); Mr. Krench (Sp)

*H192A—H192B—H192C. Honors Seminar in Developmental and Differential Psychology. (4—4—4)
One 2-hour meeting per week. Prerequisite: senior major honor status.

H195. Special Study for Honors Students. (2)
Prerequisite: senior honor status and consent of instructor. The Staff (Su, F, W, Sp)

198. Special Study for Undergraduates. (1—5)
Prerequisite: consent of instructor. Special tutorial or seminar on selected topics. The Staff (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1—5)
Prerequisite: Restricted to senior honor students with adequate preparation in psychology. The Staff (Su, F, W, Sp)

Graduate Courses
Graduate standing and the consent of the instructor are prerequisites for all graduate offerings.

201A—201B—201C. Proseminar in Mathematical Psychology. (5—5—5)
Four and one half hours of lecture per week. Prerequisite: calculus, a course in linear algebra
* Not to be given, 1968-69.
in psychological statistics and experimental design, or consent of instructor. Fundamentals of the quantitative study of behavior. 
Mr. Frederiksen, Mr. Meredith, Mr. McLaughlin

203. Quantitative Methods in Psychology. (3)
Two 1½-hour lectures per week. Quantitative research methods in psychology. Rational and empirical equations, statistical testing of hypotheses. 
Mr. Jarrett (Su, Sp)

210A–210B–210C. Proseminar in Experimental Psychology. (3–3–3)
One 3-hour lecture per week. 
Mr. Postman (W); Mr. Hafner (Sp)

211A–211B–211C. Proseminar in Biological Psychology. (3–3–3)
One 3-hour lecture per week. Current theories and research on relation between biological processes and behavior. 
Mr. Zucker (W)

212A–212B–212C. Measurement in Psychobiological Research. (3–3–3)
One 2-hour lecture and one 3-hour laboratory per week. 
Mr. Hafner (F)

**220A–220B. Proseminar in Learning. (4–4)**
Two 2-hour lectures per week. Current theories and research in conditioning, discrimination learning, transfer of training, verbal learning, memory and problem-solving. 
Mr. Watson (F); Mr. Langer (W)

Five hours of lecture per week. Comprehensive coverage of significant theories and empirical findings on all aspects of developmental psychology. Areas covered will include biological bases of development; comparative studies; learning and perception (fall quarter); the learning of language; cognition (winter); personality and social behavior (spring). 
Mr. Watson (F); Mr. Langer (W)

250. Tutorial in Developmental, Personality, Clinical, Social Psychology. (3)
One 3-hour meeting per week. Required of all graduate students in developmental, personality, clinical, and social psychology, in preparation for advanced graduate work. 
Mr. Langer, Mr. Slobin (F); Mr. Block, Mr. Coffey (W); Mr. Block, Mr. Craik (Sp)

251A–251B–251C. Theory and Method of Clinical Assessment. (4–4–4)
One 2-hour lecture and 8 to 10 hours of field work and supervision. Prerequisite: completion of Psychology 250 and/or consent of instructor. Principles and methods of clinical interviewing, intellectual, objective and projective personality testing. Required of clinical graduate students, normally in second year. Grade awarded upon completion of entire sequence. Others can take one or more quarters of Psychology 298, with instructor's consent. 
Mr. Lerow, Mr. Stein (F); Mr. Stein (W); Mr. Stein (Sp)

252A–252B–252C. Advanced Clinical Psychology. (5–5–5)
Half-time commitment to supervised clinical experience, case conferences, seminars and colloquia in the Psychology Clinic and field settings. Prerequisite: courses 251A–251B–251C and/or consent of instructor. Study of individual psychotherapy, consultation and psychodiagnosis. Required of graduate students in the clinical program, normally to be completed in the third year. Credit and grade will be awarded on completion of the entire sequence. 
Mr. Coffey, Mr. Cowan, Mr. Korchin, Mr. Lenrow, Mr. Stein (F, W); Mr. Coffey, Mr. Korchin, Mr. Lenrow, Mr. Stein (Sp)

253A–253B. Clinical Psychology of Children. (3–3)
Two 1½-hour lectures per week. Prerequisite: consent of instructor. Focus on issues in the treatment of the child and family. The relevance of the field of child development to the study of psychopathology will be emphasized. Normally taken in the third year by students in clinical program with particular interest in children. 
Mr. Cowan (Sp)

260A–260B. History, Theories, and Methods of Social Psychology. (4–4)
Two 2-hour lectures per week. Primarily for second- and third-year graduate students. An intensive analysis of the basic issues and directions of social psychology. 
Mr. Crawford (F); Mr. Frager (W)

271A–271B–271C. Appraisal of the School-Age Child. (5–5–5)
Four hour lectures and six hour laboratories per week. Two 3-hour laboratories or equivalent field work, one hour individual supervision and one 3-hour lecture-discussion per week. Primarily for first-year graduate students. Appraisal of the child under individual supervision, integrating the methods of observation, mental testing and interview. 
Mr. Tuddenham (F, W)

280A–280B–280C. Proseminar in Industrial Psychology. (3–3–3)
One 3-hour lecture per week. Required of first-year graduate students in industrial psychology program. Comprehensive survey of historical and contemporary developments in organization theory, personnel management, employee attitudes, motivation and perception. 
Mr. Graham (F); Mr. Blood (W); Mr. Hulin (Sp)

291. Methodology in Industrial Psychology. (3)
One 3-hour lecture per week. Required of second-year graduate students in the industrial psychology program. Analysis of methodology and research design problems in the field of industrial psychology. 
Mr. Ghiselli (F)

290. Seminars. (3)
(a) Measurement, (b) Biological, (c) Comparative, (d) Learning, (e) Perception, (f) Thinking, (g) Language and Communication, (h) Developmental, (i) Personality, (j) Social, (k) Clinical, (l) Differential, (m) Industrial, (n) Mathematical Models in Learning and in Psychophysics, (o) Analysis of Variance Techniques, (p) Additional seminars on special topics to be announced. 
* Not to be given 1968-69.
298. Directed Study. (1-6)
Special study under the direction of a member of the staff. The Staff (Su, F, W, Sp)

299. Research. (1-6)
Individual research. The Staff (Su, F, W, Sp)

300. Seminar in the Presentation and Teaching of Psychological Material. (3)
Principles and methods of the presentation of psychological material in lectures, demonstrations, publications, etc., with emphasis on the teaching of undergraduate courses in psychology.

401A—401B—401C. Clinical Internship (Psychology Clinic). (3; 3; 3; 12)
Prerequisite: previous field placement and consent of the Head of the Clinic. Individual programs of practice and supervision in the Psychology Clinic maintained by the Department of Psychology for study, treatment and research on problems of mental health. Credit and grade will be awarded on completion of the internship appointment.
The Staff (Mr. Korchin in charge) (F, W, Sp)

402A—402B—402C. Clinical Internship (Off-Campus). (3; 3; 12; 3; 12)
Prerequisite: consent of Clinical Training Committee. Individual programs of practice and supervision in approved off-campus agencies. Credit and grade will be awarded on completion of the internship appointment.

PUBLIC HEALTH

(Department Office, 19 Earl Warren Hall)

Chin Long Chiang, Ph.D., Professor of Biostatistics.
Sanford S. Elberg, Ph.D., Professor of Immunology and Medical Microbiology.
William Griffiths, Ph.D., Professor of Public Health.
Ruth Huenemann, Sc.D., Professor of Public Health Nutrition.
Warren J. Kaufman, Sc.D., Professor of Sanitary and Radiological Engineering and Professor of Sanitary Engineering.
Andie L. Knutson, Ph.D., Professor of Behavioral Sciences.
Percy H. McCaughhey, M.S., Professor of Public Health Engineering and of Sanitary Engineering, and Director of the Sanitary Engineering Research Laboratory.
Stewart H. Madin, D.V.M., Ph.D., Professor of Public Health, Experimental Pathology, Medical Microbiology, and Director of the Naval Biological Laboratory.
William J. Oswald, Ph.D., Professor of Public Health and of Sanitary Engineering.
William C. Reeves, Ph.D., M.P.H., Professor of Epidemiology (Chairman of the Department).
Beryl Roberts, M.Ed., Dr.P.H., Professor of Public Health.
Edward S. Rogers, A.B., M.D., M.P.H., Professor of Public Health and Medical Administration.
William W. Stiles, B.S., M.D., M.P.H., Professor of Public Health.
S. Leonard Syme, Ph.D., Professor of Epidemiology.
Irving R. Tabershaw, B.S., M.D., Professor of Occupational Medicine, and Head of Environmental Health and Safety.
Keith O. Taylor, Ph.B., M.B.A., Professor of Hospital Administration.
Bernard D. Tebbens, Sc.D., Professor of Industrial Hygiene Engineering.
Helen M. Wallace, A.B., M.D., M.P.H., Professor of Maternal and Child Health.
Jacob Yerushalmy, Ph.D., Professor of Biostatistics.
Margaret Beattie, M.A., Gr.P.H., Professor of Public Health, Emeritus.
Jessie M. Bierman, M.D., M.S.P.H., Professor of Maternal and Child Health, Emeritus.
Albert P. Krueger, A.B., M.D., Professor of Bacteriology, Emeritus.
Neil F. Hollinger, Ph.D., Professor of Public Health, Emeritus.
Edith M. Lindsay, Ed.D., Professor of Public Health, Emeritus.
Walter S. Mangold, B.S., Professor of Public Health, Emeritus.
Dorothy Bird Nyswander (Dorothy Nyswander Palmer), Ph.D., Professor of Public Health Education, Emeritus.
John H. Northrup, Ph.D., Sc.D., LL.D., Professor of Bacteriology, Emeritus.
A. Harry Bliss, M.S., M.P.H., Dr. P.A., Associate Professor of Public Health.
Alan Burkhalter, Ph.D., Associate Professor of Toxicology, and Associate Professor of Pharmacology (San Francisco).

Robert C. Cooper, Ph.D., Associate Professor of Public Health.

Judith B. Davis, Ph.D., Associate Professor of Demography.

Neylan A. Vedros, Ph.D., Associate Professor of Medical Microbiology and Immunology, and Associate Director of the Naval Biological Laboratory.

Richard M. Bailey, Ph.D., Assistant Professor of Public Health Administration.

Jean French, Dr.P.H., Assistant Professor of Public Health.

James L. Hardy, Ph.D., Assistant Professor of Medical Virology.

John W. Lawson, Ph.D., Assistant Professor of Medical Microbiology.

Elizabeth Adler, M.P.H., Lecturer in Public Health.

Mary F. Arnold, Dr.P.H., Lecturer in Public Health.

Will H. Aufranc, B.S., M.D., M.P.H., Lecturer in Public Health.

Edward Bird, M.D., M.P.H., Lecturer in Public Health.

Henrik L. Blum, M.D., M.P.H., Clinical Professor of Community Health Planning.

William H. Bruvel, Ph.D., Lecturer in Public Health.

Laurence B. Callan, M.P.H., Lecturer in Public Health.

Constance Carter, M.P.H., Associate in Public Health.


Alfred W. Childs, A.B., M.D., M.P.H., Associate Clinical Professor of Medical Care Administration.

Dorothy F. Conway, M.P.H., Lecturer in Public Health.

W. Clark Cooper, M.D., M.P.H., Professor of Occupational Health in Residence.

Jack Dacre, Ph.D., Lecturer in Public Health.

C. Mayhew Derryberry, Ph.D., Professor of Health Education in Residence.

Robert L. Dimmick, Ph.D., Lecturer in Aerobiology.

Samuel W. Dooley, B.S., M.D., Clinical Professor of Maternal and Child Health.

Victor Eisner, B.A., M.D., M.P.H., Associate Clinical Professor of Maternal and Child Health.

Cecil Entenman, Ph.D., Lecturer in Public Health.

James W. Fester, M.S., Associate in Public Health.

Alan Foord, M.D., M.P.H., Clinical Professor of Maternal and Child Health.

Constance Fraser, M.A., M.P.H., Lecturer in Maternal and Child Health.

Fern E. French, M.A., Dr.P.H., Lecturer in Public Health.

William R. Gaffey, Ph.D., Lecturer in Biostatistics.

Edwin Gold, M.D., Professor of Maternal and Child Health in Residence.


Harold C. Gustafson, Dr.P.H., Lecturer in Public Health.

Lonne W. Hamann, M.P.H., Associate in Health Education.

Mary C. Hampton, M.S., Lecturer in Public Health.

Jean H. Hankin, M.S., M.P.H., Dr.P.H., Lecturer in Public Health.

Harold A. Harper, Ph.D., Lecturer in Public Health, and Professor of Biochemistry (San Francisco).

John M. Hess, Ph.D., Lecturer in Public Health.

Portia Bell Hume, M.D., Lecturer in Public Health, and Associate Clinical Professor of Psychiatry (San Francisco).

Howard N. Jacobson, M.D., Associate Professor of Obstetrics and Gynecology (San Francisco).


James M. Kilker, M.P.H., Lecturer in Public Health.

Alexis J. Kniazeff, Ph.D., D.V.M., Lecturer in Medical Microbiology.
Lower Division Course

5A—5B—5C. Individual and Community Health. (3-3-3)

Three 1-hour lectures per week. Prerequisite: 5A is prerequisite to 5B; 5B to 5C. A survey of the field of health, including field observations and a consideration of the evolution of disease prevention and control; the social, medical, and economic aspects of sickness, disability, and death. 5A, Mr. Stiles (F, W); 5B, Mr. Stiles (W, Sp); 5C, Mr. Stiles (Sp)

Upper Division Courses

102. Organizational Management and Administration of the Health Agency. (2)

One 3-hour lecture-discussion per week. Introduction, through lectures and exercises, to management practices in the health agency. Discussion of the underlying administrative theory.

Miss Arnold, Mr. Hess (F, Sp)

106. Introduction to Human Ecology and Health. (4)

Two 1-hour lectures and one 2-hour lecture per week. Current theories concerning the role of social, economic, and other environmental factors in affecting the health status of individuals and populations, and the social response to these factors.

Mr. Rogers, Miss A. Parker (W)

107. Introduction to Medical Care Administration. (3)

One 1-hour lecture, one 2-hour group discussion per week. Consumer behavior; need and supply; manpower and facilities; organization; financing, planning, and evaluation.

Mr. Childs (F)

108. Medical Care Problems and Programs. (2)

One 2-hour lecture-discussion per week. Review of basic literature of medical care administration and discussion of selected topics in social and economic theory and administrative principles.

Mr. Childs (W, Sp)

110. The Hospital in Contemporary Society. (4)

Two 2-hour lectures per week. Open to upper division and graduate students from any department. The hospital as a social institution, its role and functions in modern society, its relationship to other community agencies and health services. The hospital as a modern complex organization.

Mr. Starkweather, Mrs. Stimson (W)

111. Legal Aspects of Hospital Organization and Administration. (2)

One 2-hour lecture per week. Prerequisite: for students in hospital administration or consent of instructor. Statutes, cases, and readings in law related to hospitals.

Mr. McKay (Sp)

125A. Maternal Health. (2)

One 2-hour lecture per week. Prerequisite: consent of instructor. Public health aspects of care before, during, and after pregnancy. Programs for maternity care.

Mr. Gold (F)
125B. Relationship of Human Growth and Development to MCH Programs. (2)
One 2-hour lecture per week. Prerequisite: graduate standing in Public Health or consent of instructor. Principles of human growth and development in Public Health programs.
Mr. Dooley (Sp)

125C. Mental Retardation and Associated Handicaps. (2)
One 2-hour lecture per week. Prerequisite: consent of instructor. Needs of retarded children and their families; community programs for care of children with mental retardation and related conditions.
Miss Fraser (Sp)

126. Principles of Maternal and Child Health. (2)
(Formerly 126C)
One 2-hour lecture per week. Health and social problems of mothers and children. Mr. Eisner (Sp)

130A–130B. Selected Topics in Health Education. (2–2)
One 2-hour lecture per week; field observations with scheduled conferences. Topic and laboratory demonstrations and field experiences will vary from year to year. 130A, Mr. Griffiths, Miss Roberts (W); 130B, Mr. Griffiths, Miss Roberts (Sp)

131. Introduction to Communications Research Applicable to Educational Aspects of Public Health. (2)
One 1-hour lecture, one 2-hour laboratory per week. Introduction to communications theory and research applicable to educational aspects of public health.
Mr. Bird (F, W, Sp)

132. Planning Health Experiences for the School-Age Child. (3)
One 2-hour lecture, one 1-hour discussion per week; scheduled conferences. Exploration of health education as it pertains to problems and programs related to the school-age child.
Mr. Callan (Sp)

133. Introduction to Group Process. (2)
One 1-hour lecture, one 2-hour laboratory per week. Dynamics of interpersonal relationships.
Mr. Griffiths, Mrs. Ross (W)

134. Community Health Education. (2)
One 2-hour lecture, one 2-hour laboratory per week. Prerequisite: winter quarter; limited to undergraduates; spring quarter: limited to graduate public health students not specializing in public health education. A general introduction to the scope and nature of educational activities in a public health program.
Miss Roberts (W, Sp)

139A. Research Methods in the Behavioral Sciences. (3)
One 2-hour lecture and group discussion, one 2-hour seminar per week. The study of logic, concepts, methods, and techniques of the behavioral sciences as they apply to public health.
Mr. Seiden, Mr. Romano-V (F, W)

139B. Research Methods in the Behavioral Sciences. (3)
One 2-hour seminar and one 2-hour tutorial session per week. Prerequisite: course 139A. Provides field experience in applying research methods as member of interdisciplinary team. Small group field studies are designed and conducted with faculty guidance.
Mr. Seiden, Mr. Romano-V (W, Sp)

144. Nutrition in Public Health. (3)
Two 1¾-hour lecture-discussions per week. Designed for nonnutrition majors. Basic nutrition concepts and their implications for community health.
Miss Murai (Sp)

145. Radiological Aspects of Public Health. (3)
Two 1-hour lectures, one 3-hour laboratory per week. Prerequisite: consent of instructor. Fundamental aspects of radiation biology and ecological cycling of radioisotopes. Radiation detection, monitoring and low-level assaying. Concept of maximal permissible concentration and dose.
Mr. Kaufman (W)

146. Radiological Aspects of Public Health Engineering. (3)
Two 1-hour lectures, one 3-hour laboratory per week. Prerequisite: consent of instructor. Radiation detection, shielding design, monitoring procedures; low-level assaying of food and water; waste disposal, water decontamination, regulation of radiation sources.
Mr. Kaufman (Sp)

149A. Occupational Health and Industrial Hygiene: Sanitary Air Analysis. (3)
One 2-hour lecture, one 3-hour laboratory per week. Prerequisite: course 149A or consent of instructor. Analysis of air quality and other environmental factors affecting the health of people at work.
Mr. Tebbens (W)

149C. Occupational Health and Industrial Hygiene: Industrial Toxicology. (3)
One 2-hour lecture, one 3-hour laboratory per week. Prerequisite: course 149A or consent of instructor. Basic concepts and techniques of toxicology with special emphasis on industrial chemicals.

150. Environmental Health Sciences. (3)
Three 1-hour lectures per week. The elements of public health sanitation and of sanitary control of the environment. Survey of water, air, food, and other factors affecting man's environment.
Mr. Oswald (F)

153. Environmental Sanitation. (3)
Two 1-hour lectures, one 2-hour discussion per week. Prerequisite: consent of instructor. Environmental sanitation in rural and international health; cultural aspects of sanitation; relationship of environmental sanitation to preventive medicine.
Mr. Bliss (Sp)

156A–156B. Microbiology of Water and Waste Water. (3–3)
One 1-hour lecture, two 3-hour laboratories per week. Prerequisite: consent of instructor. Principles of microbiology applicable to the aquatic environment and to waste water.
156A, Mr. Cooper (F); 156B, Mr. Cooper (W)
160A. Introduction to Probability and Statistics in Biology and Public Health. (4)
Three 1-hour lectures per week. Prerequisite: course 160A and one quarter of calculus, or consent of instructor. Continuous probability distributions, multivariate normal distributions, biometrical applications.
Mr. Palmer (Sp)

160B. Introduction to Probability and Statistics in Biology and Public Health. (4)
Three 1-hour lectures, one 3-hour laboratory per week. Prerequisite: course 160B and two quarters of calculus or consent of instructor. Continuous probability distributions, bivariate distributions, regression, correlation, analysis of variance.
Mr. Chiang (W)

160C. Introduction to Probability and Statistics in Biology and Public Health. (4)
Three 1-hour lectures per week. Prerequisite: course 160A. Design of surveys in public health. Questionnaires, interviewing, sampling, and analysis.
Mr. Chiang (Sp)

161A. Introduction to Biostatistics: Vital Statistics. (3)
Three 1-hour lectures per week. Statistical methods in study of human mortality, morbidity and natality. History of vital statistics, critical appraisal of census and vital data, measurement of risk and introduction to life tables.
Mr. Palmer (F)

161B. Introduction to Biostatistics: Life Tables. (3)
Three 1-hour lectures per week. Prerequisite: course 161A. Construction of life tables and their uses. Fertility measures. Cohort studies, medical record systems.
Mr. Palmer (W)

161C. Introduction to Biostatistics: Survey Methods. (3)
Three 1-hour lectures per week. Prerequisite: course 161B. Design of surveys in public health. Questionnaires, interviewing, sampling, and analysis.
Mr. Palmer (W)

162A. Introduction to Public Health Statistics. (3)
Three 1-hour lectures per week. Collection and analysis of vital data, measurements of risk, rate adjustment, introduction to life table, descriptive statistics, statistical inference.
Mr. Yerusalmhy, Mr. Gaffey (F)

162B. Introduction to Public Health Statistics. (3)
Three 1-hour lectures per week. Prerequisite: course 162A or consent of instructor. Statistical inference, regression, correlation, analysis of variance.
Mr. Yerusalmhy, Mr. Gaffey (W)

162C. Introduction to Public Health Statistics. (3)
Three 1-hour lectures per week. Prerequisite: course 162B. Life table methods, follow-up studies, and health surveys.
Mr. Yerusalmhy, Mr. Gaffey (Sp)

Three 1-hour lectures per week. Prerequisite: course 162A or consent of instructor. Evaluation designs, indices and measures, sample designs, analysis.
Mr. Yerusalmhy (Sp)

170A. Demography of Human Mortality. (4)
Four 1-hour lectures per week. Prerequisite: course 161A (may be taken concurrently) or consent of instructor. Trends and differentials in developing and industrial countries, patterns of differential mortality, mortality trends and population quality.
Mrs. Davis (F)

170B. Demography of Human Fertility. (4)
Four 1-hour lectures per week. Prerequisite: course 161A or consent of instructor. Measurement of fertility and replacement; trends and differentials in fertility among developing and industrial countries, factors affecting reproduction; effects of fertility changes on population growth and structure.
Mrs. Davis (W)

171. Selected Topics in Demography. (3)
Three 1-hour lectures per week. Prerequisite: prior background in biologic sciences and microbiology is desirable. An introduction to the uses of epidemiology in public health practice, using selected diseases to illustrate the development of knowledge on disease causation and the application of such knowledge to disease control.
Mr. Reeves, Mr. Syme (W)

180A–180B. Medical Microbiology. (5–5)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: Chemistry 8A–B or 12A–B; Biology 1A, 1B, 1C; Bacteriology 102, 102L. Evidence of immunization against tetanus, diphtheria, and typhoid fever is required at registration. Basic principles of immunology; pathogenesis and immunity in bacterial and other microbial infections of man and animals.
Mr. Elberg, Mr. Vedros, Mr. Lawrence, Miss Larson (W, Sp)

*181. Public Health Microbiology. (5)
Two 1-hour lectures, one 3-hour laboratory discussion, two 3-hour laboratories per week. Prerequisite: course 180A–180B or equivalent. Bio-assay and identification of specific agents in the diagnosis, control and treatment of disease with emphasis on serology and virology.

182. Introduction to the Animal Viruses. (3)
Three 1-hour lectures per week. Prerequisite: course 180A–180B. An introduction to the animal viruses, including pathogenesis, immunity, and virus-host relationship.
Mr. Hardy, Mr. Kniazeff, Mr. Schaefer (Sp)

182L. Laboratory in Virology. (3)
Three 3-hour laboratories per week. Prerequisite: course 182 (may be taken concurrently). A basic laboratory course in animal virology, with emphasis on studies of the biological activities of animal viruses.
Mr. Hardy, Mr. Kniazeff, Mr. Schaefer (Sp)

*183. Hematology. (3)
One 1-hour lecture, one 3-hour laboratory, one 1-hour discussion per week. Prerequisite: Biology 1; Biochemistry 162; course 180A–180B. Fundamentals of hematopoiesis, hemoglobin formation and estimation, blood fluidity and immunohematology.
Mr. Davis (W)

Not to be given 1968–69.
195. Emergency and Disaster Health Services. (2)
One 1-hour lecture, one 2-hour discussion per week. Preparation and technical aspects of emergency and disaster services at the various echelons of governmental control. Particular emphasis on medical, health and related services. Mr. Stiles (Sp)

198. Directed Group Study. (1-5)
The Staff (F, W, Sp)

199. Special Study for Advanced Students. (1-5)
The Staff (F, W, Sp, Su)

Graduate Courses

200A. Public Health Organization and Administration. (3)
Two 1-hour lectures, one 2-hour lecture-discussion per week. Analysis of factors affecting the organization and administration of health services in American society; current organizational patterns in local, national, and international settings; general concepts of organization and management applicable to community practice. Mr. Rogers, Miss Arnold, Miss A. Parker, Mr. Blum (F)

200B. Health Organization in Perspective. (3)
Three 1-hour lectures per week. Prerequisite: course 200A or permission of instructor. Analysis of selected social, political and technical forces affecting organized community health services; illustrated by changes and developments in health service organization in a historical context with emphasis on the relevance of these forces for future health planning. Mr. Rogers, Miss Arnold (F, Sp)

200C. New Frontiers in Community Health. (3)
One 2-hour tutorial or small group discussion per week. Prerequisite: course 102 or equivalent and consent of instructor. Preparation of students to assume specialized positions in the management and organization of health services in local communities. Laboratory sections (including field study) will cover programs such as tuberculosis control and venereal disease control and other areas selected according to current need and student interest. Mr. Leonard, Miss A. Parker (W)

201. Dental Health Administration. (3)
One 2-hour lecture-discussion per week. Prerequisite: D.D.S. degree, or consent of instructor. Special administrative problems and field study of dental programs for health agencies. Mr. Nevitt, Mr. Weiss (Sp)

202. Advanced Theory in Health Administration. (3)
Two 1½-hour seminars per week. Prerequisite: course 102 or equivalent and consent of instructor. Study of current approaches to the theories of administration and complex organization as they relate to health administration. Miss Arnold, Mr. Rogers (W)

203. Legal Basis for Health Administration. (2)
One 3-hour lecture-discussion per week. Statutes, cases, and readings in the legal basis for public health and medical care administration. Mr. McKay (W)

204A. Principles of Public Health Administration. (2)
One 2-hour lecture, one 2-hour discussion per week. Primarily for public health and medical care administration majors. Others by consent of instructor. Structure, functions, and external relations of governmental health agencies. Emphasis is given to organization at the local level. Mr. Blum (W)

204B. Principles of Public Health Practice. (3)
One 2-hour lecture, one 3-hour laboratory per week. Prerequisite: course 200A and 204A or consent of instructor. Principles of organizing and implementing public health programs, using prototype programs for illustrative purposes. Laboratory sections will cover programs such as tuberculosis control and venereal disease control and other areas selected according to current need and student interest. Mr. Leonard, Miss A. Parker (W)

204C. Principles of Community Health Practice. (3)
One 2-hour lecture, one 3-hour laboratory per week. Prerequisite: course 200A and 204B or consent of instructor. Principles of organizing and implementing community health service programs. Laboratory sections (including field study) will cover a broad spectrum of community services concerned with the recognition, comprehensive care, and rehabilitation of the sick and disabled. Mr. Leonard, Mr. Blum, Miss A. Parker, Mr. Childs (Sp)

205. Consultation in Public Health Practice. (2)
One 1-hour seminar per week. Examination of the techniques, goals, and uses of the consultative process in public health practice through the study of theoretical and practical models. The focus is upon methodological issues and distinctions between consultation and other types of problem solving in program management. Mrs. Spencer (Sp)

206. Ecological Theory and Health Organization. (2)
The 2-hour group discussions per week. Prerequisite: consent of instructor. Consideration of theory and research methodology in the context of human organization for health. Mr. Rogers (F, W, Sp)

207. Advanced Medical Care Administration. (4)
The 2-hour group discussions per week. Prerequisite: course 107 or consent of instructor. Selected topics in medical care administration, study of specific programs, and individual projects. Mr. Childs (W)

210. Hospital Programs and Trends. (2)
One 2-hour lecture-discussion per week. Prerequisite: consent of instructor. An introduction to current operations and trends in the hospital field and hospital relationships with public health. Mr. K. Taylor (W)

211. Advanced Study in Hospital Administration. (2)
One 2-hour tutorial or small group discussion per week. Prerequisite: consent of instructor. Open to graduate students from any department. Special study on hospital-related topics. Will differ from quarter to quarter and may be repeated for credit. Mr. K. Taylor, Mrs. Stimson, Mr. Hess, Mr. Starkweather (F, W, Sp)

212A. Hospital Organization and Administration. (2)
One 2-hour lecture, one 2-hour discussion per week. Limited to graduate students in hospital administration. The organization of hospitals with emphasis on administrative functions, governing boards, and departmental organization and relationships. Mr. K. Taylor, Mr. Starkweather (F)
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Hours per week</th>
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<tr>
<td>212A</td>
<td>Hospital Organization and Administration</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>212B</td>
<td>Hospital Organization and Administration</td>
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<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>213A</td>
<td>The Hospital and the Community</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<td>213B</td>
<td>The Patient and Hospital Care</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>214A</td>
<td>Theory and Research in Hospital Administration</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>214B</td>
<td>Theory and Research in Hospital Administration</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>215A</td>
<td>Public Health Nursing Administration</td>
<td>3</td>
<td>1 Lecture, 1 Discussion</td>
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<td>215B</td>
<td>Public Health Nursing Administration</td>
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<td>215C</td>
<td>Public Health Nursing Administration</td>
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<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>216A</td>
<td>Social Welfare and Public Health</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>217A</td>
<td>International Maternal and Child Health</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<td>218A</td>
<td>Theory and Research Applicable to Health Programs</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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<td>219A</td>
<td>Group Work Procedures in Health Education</td>
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<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>220A</td>
<td>Maternal and Child Health</td>
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<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>221A</td>
<td>Nutrition and Public Health</td>
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<td>1 Lecture, 1 Discussion</td>
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<td>222A</td>
<td>International Maternal and Child Health</td>
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<td>1 Lecture, 1 Discussion</td>
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<td>224A</td>
<td>Nutrition and Public Health</td>
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<td>1 Lecture, 1 Discussion</td>
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<tr>
<td>225A</td>
<td>Communication Research Applicable to Health</td>
<td>2</td>
<td>1 Lecture, 1 Discussion</td>
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Prerequisites and Notes:
- Prerequisite: course 212A
- Limited to graduate students in hospital administration
- Detailed study of medical staffs, professional organizations, and the educational and research roles of the hospital.
- Mr. K. Taylor (F)
- Limited to graduate students in hospital administration. Detailed study of medical staffs, professional organizations, and the educational and research roles of the hospital.
- Mr. Starkweather
- Two 1/2-hour lecture-discussions, one 1-hour discussion per week. Prerequisite: course 213A. Limited to graduate students in hospital administration. Organization of the hospital for patient care, with emphasis on nursing. An examination of the patient's needs and relationships with the hospital staff.
- Mr. Stimson (W)
- Two 1/2-hour lecture-discussions, one 1-hour discussion per week. Prerequisite: course 213B. Limited to graduate students in hospital administration. Organization of the hospital for patient care, including psychiatric and geriatric care. Planning and coordination of hospital programs with other health care programs.
- Mr. Stimson (Sp)
- Two 1-hour lectures, one 1-hour discussion per week. Limited to graduate students in hospital administration or consent of instructor. An introduction to administrative theory and research for hospitals and related health organizations, systematic analysis of theory, research methods and techniques.
- Mr. Hess (F)
- Two 1-hour lectures, one 1-hour discussion per week. Prerequisite: course 214A. Limited to graduate students in hospital administration or consent of instructor. An examination of concepts of administrative analysis and the methods and techniques of administrative research.
- Mr. Hess (W)
- Two 1-hour lectures, one 1-hour discussion per week. Prerequisite: course 214B. Limited to graduate students in hospital administration or consent of instructor. Application of selected concepts and methods of administrative analysis and research relevant to the problems of the hospital through individual student projects.
- The Staff (Mr. K. Taylor in charge) (Sp)
234A–234B. Community Organization as an Educational Approach. (3-3)
One 2-hour lecture, one 1-hour discussion per week; 1 week, scheduled conferences. Preerequisite: consent of instructor. Analysis of community organization process, theory and research, and relationship to practice of public health education.
234A. One-half day of field work required.
Mr. Griffiths, Mr. Derryberry (W)
234B. One day of field work required.
Mr. Griffiths, Mr. Derryberry (Sp)

238. Advanced Study in Behavioral Sciences in Public Health. (3)
One 2-hour seminar per week and tutorial. Pre-requisite: major in behavioral sciences in public health, or consent of instructor. Advanced study of theory, logic, design, methods and techniques of behavioral science research, with special reference to public health.
Mr. Knutson (F, W, Sp)

239A–239B. Proseminar in Behavioral Sciences in Public Health. (3-3)
One 3-hour seminar per week. Either A or B may be taken independently. Current developments in the behavioral sciences as they relate to the solution of public health problems.
Mr. Romano-V, Mr. Seiden, Miss Emerson (W)
Mr. Romano-V, Mr. Seiden (Sp)

241. Current Developments in Public Health Nutrition. (3)
Two 1½-hour lecture-discussions per week. Pre-requisite: previous course work in advanced nutrition or consent of instructor. Critical evaluation of current literature related to public health nutrition problems and implications for new programs and research.
Miss Shapiro, Mr. Entenman, Mrs. Conway (Sp)

242. Current Concepts in Metabolism and Clinical Nutrition. (2)
One 2-hour lecture per week. Pre-requisite: previous course work in biochemistry. Recent developments in biochemical and metabolic aspects of nutrition.
Mr. Harper, Mr. Margen, Mr. Entenman, Mrs. Hampton (W)

Two 2-hour discussions per week. Pre-requisite: admission to curriculum in public health nutrition or consent of instructor. Problems and programs in public health nutrition.
Miss Huenemann, Miss Shapiro, Miss Walsh, 243A (F); 243B (W); 243C (Sp)

244. Program Development in Public Health Nutrition. (2)
One 2-hour lecture-discussion per week. Pre-requisite: previous course work in nutrition and biochemistry. Implications of current nutritional findings for public health program planning. Course designed for physicians, nutritionists, and other public health workers meeting prerequisite.
Miss Huenemann, Miss Hankin, Mr. Margen (W)

245. Ecological Aspects of Radiation Control. (3)
Two 1-hour lectures, one 3-hour laboratory per week. Prerequisite: course 146; Medical Physics 101 recommended; courses in plant or animal ecology also desirable. Origin and transport of radionuclides in water, air and earth. Cycling in food chains. Waste management systems. Mr. Kaufman (Sp)

249A. Occupational Health Practices. (3)
Two 2-hour lectures per week. Prerequisite: consent of instructor. Advanced concepts in occupational diseases, occupational disease control and administration of occupational health programs.
Mr. Tebbens, Mr. Tabershaw (W)

249B. Occupational Medical Practices. (3)
One 2-hour lecture, one 5-hour field trip per week. Prerequisite: course 249A. Techniques and standard procedures; special problems.
Mr. Tabershaw, Mr. W. C. Cooper (Sp)

249C. Industrial Hygiene Practices. (3)
Two 3-hour lecture-discussions per week. Prerequisite: course 249A. Advanced techniques in occupational environmental control.
Mr. Tebbens (Sp)

250. Environmental Health Sciences. (3)
Three 1-hour lectures per week. History, science, and practice of environmental sanitation and environmental control.
Mr. Tebbens and Staff (W)

251A. Environmental Health Standards. (4)
Four 1-hour lectures per week. Public health implications of the physical environment.
Mr. Oswald (F)

251B. Environmental Toxicology. (4)
Three 1-hour lectures, one 3-hour laboratory or demonstration per week. Prerequisite: course 251A. Standards, special problems in air, water, food toxicology; measurement and control of chemical hazards. natural and man-made. Mr. Tabershaw (W)

251C. Environmental Health Measurements. (4)
Three 1-hour lectures, one 3-hour laboratory and demonstration per week. Prerequisite: course 251A. Measures of environmental factors; measure of effect on man. Mr. Tebbens (Sp)

253. Environmental Health Administration. (2)
One 1-hour lecture and one 2-hour discussion per week. Prerequisite: consent of instructor. A synthesis of social science and scientific management theory applied to health and safety programs of public and private institutions.
Mr. Bliss (W)

254. Management and Environmental Health and Safety. (2)
One 2-hour lecture-discussion per week. Prerequisite: course 253A of consent of instructor. Policy, organization, and fiscal decisions by management of institutional and industrial programs in environmental health and safety.
Mr. Bliss (Sp)

255A–255B–255C. Environmental Health and Safety. (2–2–2)
One 2-hour lecture-discussion per week. Prerequisite: course 255A prerequisite to 255B; 255B prerequisite to 255C. Principles and theory of the prevention of disease by the control of environmental hazards. Sequence beginning (F), Mr. Bliss
256. Water and Waste Water Biology. (2)
One 3-hour lecture-discussion per week. Prerequisite: course 156A—156B. Group study in the biology of water and waste water. Mr. R. Cooper (Sp)

257. Biological Control Systems. (3)
One 3-hour lecture and demonstration per week. Prerequisite: consent of instructor. Systems of biological organisms for environmental control. Fundamental aspects of energy conversion, food production, water reclamation, and waste disposal in microbiological systems and their relationship to environmental control problems in a modern urban society. Mr. Oswald (W)

258. Sanitary Microbiology. (4)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: Bacteriology 2. Sanitary microbiology of food, water, air, and wastes. Mr. R. Cooper (Sp)

260A—260B—260C. Advanced Probability and Statistics in Biology, Medicine, and Public Health. (3—3—3)
Three 1-hour lectures per week. Prerequisite: 260A: Mathematics 2C, 111, Statistics 100C, or consent of instructor. 260B: course 260A or consent of instructor. 260C: course 260B or consent of the instructor. 260A: Stochastic processes applied to biological and health sciences. 260B: Competing risks, illness processes, migration processes. 260C: Stochastic models of epidemics, accident proneness. Sequence beginning (F), Mr. Chiang

261A—261B—261C. Advanced Biostatistical Methods in Epidemiological and Medical Studies. (3—3—3)
Three 1-hour lectures per week. Prerequisite: 261A: course 161C and 160C or equivalent. 261B: course 261A. 261C: course 261B. 261A: Design, conduct, and analysis of clinical trials, sequential analysis. 261B: Prospective studies, prognostic studies; advanced life table methods. 261C: Retrospective studies; medical diagnosis, evaluation of diagnostic tests. Sequence beginning (F), Mr. Yerushalmy, Mr. Palmer

265A—265B—265C. Advanced Graduate Study in Biostatistics. (3—3-3)
Three 1-hour lectures per week. Prerequisite: course 290 or 261. Limited to advanced graduate students in biostatistics. Recent developments in biostatistical research. Mr. Li, 265A (F), 265B (W), 265C (Sp)

275. Advanced Epidemiology. (3)
Two 2-hour lecture-discussions per week. Prerequisite: prior doctoral degree in biomedical science or consent of instructor. The presentation of epidemiology as a research discipline essential to the description and understanding of the occurrence of disease in human populations. Emphasis is on human ecology as it affects health and disease. Mr. Reeves, Mr. Syme (W)

275L. Advanced Epidemiology Laboratory. (3)
Two 3-hour laboratories per week. Prerequisite: course 275 must be taken concurrently. Analysis of epidemiologic data, including data reduction, interpretation, and preparation of summary analyses. Mr. Reeves, Mr. Stallones (W)

276. Current Problems in Epidemiology. (3)
One 3-hour lecture, one 3-hour discussion per week. Prerequisite: prior doctoral degree in biomedical science or consent of instructor. Group discussion of the transmission cycles and methods of laboratory and field investigations unique and pertinent to an understanding of these two groups of infectious diseases. Mr. Reeves, Mr. R. M. Taylor (F)

277. Epidemiology of Arthropod-borne Diseases and Zoonoses. (3)
One 3-hour discussion per week. Prerequisite: prior doctoral degree in biomedical science or consent of instructor. Group discussion of the transmission cycles and methods of laboratory and field investigations unique and pertinent to an understanding of these two groups of infectious diseases. Mr. Reeves, Mr. Syme (Sp)

278. Epidemiology of Noninfectious Diseases. (3)
One 3-hour discussion per week. Prerequisite: prior doctoral degree in medicine or consent of instructor. Analysis and discussion of selected topics illustrating the theory and practice of the application of epidemiologic methods to the study of noninfectious diseases. Mr. Syme (Sp)

279. Population Genetics and Epidemiology. (3)
Two 1-hour lectures, one 3-hour laboratory per week. Prerequisite: prior doctoral degree in a biomedical course, course 275 and 275L and either course 160A—160B or 162A—162B or equivalent course in biostatistics; or consent of instructor. The intersection of human genetics and epidemiology in relation to human disease. Mr. Reeves, Mr. Stallones (W)

280. Public Health Immunology. (3)
Three 1-hour lectures per week. Prerequisite: course 180A—180B or equivalent. Immunologic bases underlying diagnostic procedures, active and passive immunization, problems of vaccine development and autoimmune disorders. Mr. Tempels (Sp)

281. Medical Mycology. (3)
Two 1-hour lectures, one 3-hour laboratory per week. Prerequisite: course 180A—180B or equivalent and consent of instructor. Characteristics of fungi pathogenic for man and animals. Mr. Vedros (Sp)

282. Experimental Pathology. (4)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: course 180A—180B or equivalent and consent of instructor. Abnormal mammalian biology in relationship to infectious disease and neoplasia. Mr. Madin, Mr. Kniazeff (Sp)

283. Aerobiology. (3)
Two 1-hour lectures, one 1-hour discussion per week. Prerequisites: courses 180A—180B, 182, 182L, or consent of instructor. Characteristics of microbial aerosols and factors which affect their survival in relation to the spread of respiratory infections of man and animals. Mr. Dinnick, Mr. Goldberg (Sp)

* Not to be given 1968—69.
291. Clinical Problems in Public Health. (3)
Two 3-hour discussions per week. Field visits to medical facilities in Bay Area. Prerequisite: prior doctoral degree in medicine or consent of instructor. Selected clinical subjects of major public health importance are considered, emphasizing recent developments in diagnosis, treatment, and prevention. (Sp)

294V. Health Behavior: Individual and Community. (3)
Three 1-hour lectures per week. An introduction to man, culture, and society, with implications for public health: the individual, family, group and community life, dimensions of society and community, social behavior, process of and approaches to behavioral change.
Miss Roberts, Mr. Knutson, Mrs. Gorman (F)

294W. Voluntary Health Agency Programs. (2)
One 2-hour lecture, one 4-hour field observation per week. A study of administrative structure and functions of voluntary health agencies. Special emphasis on review and analysis of major programs.
Miss Roberts, Mr. Rogers, Mr. Weddle (F, W, Sp)

294X. Issues in the School Health Program. (2)
One 2-hour lecture per week plus conference periods. May be repeated for credit. Presentation and discussion of current issues and problems in school health program activities, with emphasis on evaluation.
Mr. Griffiths, Miss J. French, Miss Wallace, Mr. Dooley, Mr. Foord, Miss Roberts (F, W, Sp)

294Y. Family Planning. (2)
One 2-hour lecture per week plus conference periods. Analysis of selected world programs and research in family planning.
Mr. Griffiths, Mr. Dooley, Miss J. French (F)

2942. Problems and Programs in Mental Health. (2)
One 3-hour lecture-discussion per week. Consideration of the nature and extent of mental illness and current concepts of prevention and treatment through community programs.
Mr. Derryberry (F, W, Sp)

295. Seminars. (1-4) The Staff (F, W, Sp)

296. Special Study. (2-8)
These courses will deal with the exploration and development of new subject material.
The Staff (F, W, Sp)

298. Group Study. (1-8)
The Staff (F, W, Sp)

299. Individual Research. (1-8)
The Staff (F, W, Sp)

601. Individual Study for Master's Students. (1-8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (F, W, Sp, Su)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare them-selves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

Note: The following sections have been established for courses 198, 199, 295 through 299, 601 and 602. The courses may be repeated for credit, but some sections may not be given every quarter.

A. Public Health Administration
B. Administrative Medicine
C. Hospital Administration
D. Nursing Administration
E. Public Health Social Work
F. Maternal and Child Health
G. Public Health Education
H. Behavioral Sciences
J. Public Health Nutrition
K. Environmental Health Sciences
L. Biostatistics
M. Demography
N. Epidemiology
P. Medical Microbiology and Immunology

IDS 175. A Nontechnical Introduction to Operations Research. (4)
See Interdepartmental Studies for the complete description of this course.
Curriculum in Range Management

The program in range management is given by an interdepartmental group with representatives from Forestry at Berkeley and from Agronomy and Animal Husbandry at Davis. Through completion of the undergraduate program, students may prepare for careers which focus on the use of grasslands and range areas. Graduates typically find careers in professional land management with private ranch enterprises, or with federal, state, or local governmental agencies. In addition, graduate study in this field leads to careers in research or teaching.

The Major

The first two years provide foundations in the necessary natural sciences and other basic subjects. The last two years of the program include specialized courses which provide the concepts and techniques needed to apply scientific principles to range management problems. The student should plan to spend one of these years at Berkeley to secure courses in range management and forestry and the other at Davis where the required courses in agronomy and animal husbandry are offered. For further details, see the ANNOUNCEMENT OF THE COLLEGE OF AGRICULTURAL SCIENCES, BERKELEY, or the ANNOUNCEMENT OF THE SCHOOL OF FORESTRY AND CONSERVATION, BERKELEY, obtainable without charge from the College or the School. The B.S. degree will be granted upon completion of the following requirements:

1. General University requirements (see introduction to this catalogue);
2. College of Agricultural Sciences requirements (see College section); and
3. Curriculum requirements as follows:

   Humanities and Social Sciences, 36 units as follows: economics (8); English, speech, or comparative literature (8); restricted electives (anthropology, art, foreign language, geography, history, music, philosophy, political science, psychology, sociology; or additional units in economics, English, and speech) (20).

   Physical Sciences and Mathematics, 37 units as follows: chemistry, including organic (15); geology (4); engineering (surveying) (3); mathematics (calculus) (3); physics (8); statistics (4).

   Biological and Agricultural Sciences, 40 units as follows: biology (20); botany (13); genetics (3); soil science (4).

   Major Field, 31 units as follows: agronomy and range management (22); animal science (9).

   Additional courses, 36 units.

   Total units, 180.

Certain courses may be required in satisfaction of the above; see departmental major adviser for list of approved courses.

Graduate Programs

Graduate study in range management is open to students with strong academic preparation in range management, forestry, botany, or zoology. The program leading to the M.S. degree in range management requires from one to two years, depending on the student's earlier academic background. Doctoral programs are available in range-related sciences.
Upper Division Courses

101. Principles of Range Management. (4)
Lectures, three hours per week; discussion, one hour per week. Management and improvement of range lands; interrelationships of livestock grazing, wildlife, timber, water, and soil. Mr. Biswell (W)

105. Summer Field Course. (6)
Required of all students with a major in range management. Four weeks devoted to field studies of range conditions and methods of utilization in various parts of the state. Mr. Heady (Extrasession)

110. Range Plants. (3)
Lectures, two hours per week; laboratory, three hours per week. Systematic relationships and identification of range grasses, forbs, and shrubs; their distribution, growth, forage values, and response to use. Mr. Crampton (F)

111. Range Animal Nutrition and Management. (3)
Two 1½-hour lectures per week. Principles and practices with particular reference to ruminants on wildland ranges. Mr. Weir (W)

113. Range Regulation and Planning. (4)
Lectures, three hours per week; laboratory, three hours per week. Prerequisite: a course in plant community ecology. Composition, structure, and vegetational changes in representative range plant communities; management planning based on interpretation of vegetational sampling, forage production and use, carrying capacity, and range conditions. Mr. Heady (Sp)

199. Special Study for Advanced Undergraduates. (1–5)
Prerequisite: senior standing and consent of instructor. Mr. Heady, Mr. Biswell (W, Sp)

Graduate Courses

201. Seminar in Range Management. (3)
Mr. Biswell, Mr. Heady (W, Sp)

299. Research in Range Management. (1–12)
Mr. Biswell, Mr. Heady (Su, F, W, Sp)

ROMANCE PHILOLOGY

Francis J. Carmody, Ph.D., Professor of French.
Yakov Malkiel, Ph.D., Professor of Romance Philology.
Manfred M. G. Sandmann, Ph.D., Professor of French and Romance Philology.
Ruggero Stefanini, Dottore in Lettere, Assistant Professor of Italian.
Ronald N. Walpole, Ph.D., Professor of French.

Graduate Advisers: Mr. Malkiel (Su); Mr. Stefanini (F, W, Sp).

Graduate Courses

*200. Linguistic History of the Roman Empire. (2)
The spread of Latin over the Western Mediterranean area, and its gradual change into the Romance dialects, with emphasis on substrata and superstrata. Mr. Malkiel (F)

*201. Late Latin Language and Literature. (2)
The internal history of colloquial Latin and Late Latin, down to the Carolingian period, on the basis of original sources. Mr. Sandmann (W)

*202. General Romance Linguistics. (2)
Prerequisite: graduate standing and undergraduate major in languages. Problems of methodology in historical linguistic reconstruction, applied to the major and minor Romance languages. Mr. Malkiel (W)

203A–203B–203C. Old Provençal. (2–2–2)
An introductory study of Old Provençal language and literature, with emphasis on questions of cultural origins and influences. Mr. Walpole

*204. Humanistic Literature in Latin. (2)
Prerequisite: a working knowledge of Latin and consent of instructor. A study of the growth of Humanism through the reading and interpretation of selected Latin texts from Alcuin to Erasmus.

*205. Romance Dialect Geography. (2)
Methods of interpreting linguistic atlases and of using them as a basis for various types of dialectological studies. Mr. Malkiel (Sp)

206. Medieval Latin and Romance Learning. (2)
Prerequisite: consent of instructor. Interpretation of original texts in Latin, Old French, and Old Spanish, and the cultural problems involved in their translation. Mr. Carmody (W)

*207. Peninsular Spanish Dialectology. (2)
Prerequisite: graduate standing and consent of instructor. Problems and methods in the study of the Spanish linguistic areas, in diachronic and synchronic projection. Mr. Malkiel (W)

*208. Romance Etymology. (2)
Prerequisite: graduate standing and consent of instructor. Assumptions and techniques in the study of Romance etymology. Mr. Malkiel (F)

209. The Ancient Languages of the Northern Mediterranean. (2)
Reconstruction of archaic Mediterranean cultures through the analysis of linguistic substrata, with special attention to Romance-speaking areas. Mr. Stefanini (W, Sp)
SCANDINAVIAN

(Department Office, 1305 Dwinelle Hall)

Haakon Hamre, C.Phil., Professor of Scandinavian.
Assar Götrik Janzén, Ph.D., Professor of Scandinavian.
Eric O. Johannesson, Ph.D., Associate Professor of Scandinavian and of Comparative Literature.
Bjørge Gedso Madsen, Ph.D., Associate Professor of Scandinavian.
Lars C. Lönnroth,** Ph.D., Assistant Professor of Scandinavian.
Gregory P. Nybo, Ph.D., Assistant Professor of Scandinavian.
James L. Larson, Ph.D., Assistant Professor of Comparative Literature.
Denna S. Ellingston, Ph.D., Lecturer in Scandinavian.

The Department of Scandinavian offers undergraduate majors in three Scandinavian languages, Danish, Norwegian, and Swedish, and courses in English in Scandinavian literature, ancient and modern.

Duplication of Credit Unit credit will not be allowed for a foreign language course which duplicates any of the first 4 units of secondary school credit in the language or courses completed in another institution of collegiate grade. Duplication of secondary school credit will be determined as follows: the first unit of secondary school credit in a language is considered to be equivalent to the first quarter course in college; each successive unit of credit in the same language is equal to one additional course in a sequence of four quarter courses in college.

The Major

Lower Division 5 courses from the following course sequences: Scandinavian 1A-1B-1C; 3A-3B-3C; 4A-4B-4C; 11A-11B; 13A-13B; 14A-14B; or the equivalents.

Upper Division Courses 9 upper division courses, including at least one of the following sequences: Scandinavian 101A-101B; 103A-103B; 104A-104B; 151A-151B. Two of the upper division courses may be in related work in other departments.

Honors Program Students must complete with distinction the courses required for the major as well as three quarters of course H195. A thesis is also required. For further information, a student should consult the major adviser.

* Not to be given, 1968-69.
** To be given if a sufficient number of students enroll.
** Appointment as Humanities Research Professor, spring quarter.

Related Courses in Other Departments
The Age of Chaucer (English 155).
The Medieval Mind (English 220).
Historical Grammar (French 201A—201B).
Studies in Medieval French Literature (French 202A—202B).
Reading and Interpretation of Typical Old French Texts (French 206A—206B).
Gothic (German 265).
Dante’s Divine Comedy (Italian 109A—109B).
Elementary Phonology and Grammar (Linguistics 100).
Phonetics and Phonemics (Linguistics 130).
Introduction to Indo-European Comparative Grammar (Linguistics 150).
A History of the Spanish Lexicon (Spanish 131).
The Ballad (Spanish 208A—208B).
Old Spanish (Spanish 212A—212B).

HA A C. Ph.D. (German 265)

Phonology (Linguistics 110, 111).
Introduction to Indo-European Comparative Grammar (Linguistics 150).
A History of the Spanish Lexicon (Spanish 131).
The Ballad (Spanish 208A—208B).
Old Spanish (Spanish 212A—212B).

Related Courses in Other Departments
The Age of Chaucer (English 155).
The Medieval Mind (English 220).
Historical Grammar (French 201A—201B).
Studies in Medieval French Literature (French 202A—202B).
Reading and Interpretation of Typical Old French Texts (French 206A—206B).
Gothic (German 265).
Dante’s Divine Comedy (Italian 109A—109B).
Elementary Phonology and Grammar (Linguistics 100).
Phonetics and Phonemics (Linguistics 130).
Introduction to Indo-European Comparative Grammar (Linguistics 150).
A History of the Spanish Lexicon (Spanish 131).
The Ballad (Spanish 208A—208B).
Old Spanish (Spanish 212A—212B).
Graduate Degrees

A. The M.A. in Scandinavian  Prerequisite for admission to full graduate standing is an A.B. degree with an undergraduate major in Scandinavian.

General requirements: 36 units of courses in Scandinavian, including at least 18 units of graduate courses. A minimum of one quarter of graduate seminar work is required. Specific requirements: (a) Old Icelandic: courses 202 and 206. A knowledge of Old Icelandic is required. (b) History of the language. This requirement may be fulfilled by a graduate course in the history of the student’s major language. (c) Composition: a course in advanced composition in the student’s major language. With permission of the graduate adviser, this requirement may be waived.

When these requirements have been met, the student will be given a three-hour written examination. This will, upon successful completion, be followed by a two-hour oral examination. These examinations will test the student’s knowledge of the history of Scandinavian literature with special emphasis on the literature in his major language. The written examination will be based on a reading list submitted by the student and approved by the Graduate Adviser.

B. M.A. in Scandinavian with Linguistic Emphasis  The requirements are identical with those listed under A above, except that course 208 (The Poems of the Poetic Edda) and course 215 (Scandinavian Dialects) must be included in the program. The reading list is also different from that under A, several items in linguistics replacing items in literature.

C. Ph.D. in Scandinavian  Prerequisite to the Ph.D. program is a master’s degree in Scandinavian. For detailed requirements for the Ph.D. degree, please consult the graduate adviser.

The Program with Linguistic Emphasis  Doctoral candidates in this program are required to have a general knowledge of Scandinavian literature. In addition, they will be examined in the following fields: Old Icelandic, Gothic, History of the Scandinavian Languages (with special emphasis on the candidate’s major language), Scandinavian Dialects, and Runology. The candidate must also demonstrate a familiarity with the general principles and methods of comparative and descriptive grammar, including the techniques of modern structural analysis.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1A–1B–1C. Elementary Swedish. (5–5–4)
  Five classroom hours and at least a 1-hour language laboratory per week.
  1A. Elementary grammar, conversation.  Mr. Larson (F)
  1B. Elementary grammar, conversation, easy prose reading.  Mr. Larson (W)
  1C. Elementary grammar, conversation, reading, composition.  Mr. Larson (Sp)

3A–3B–3C. Elementary Norwegian. (5–5–4)
  Five classroom hours and at least a 1-hour language laboratory per week.
  3A. Elementary grammar, conversation.  Mr. Nybo (F)
  3B. Elementary grammar, conversation, easy prose reading.  Mr. Nybo (W)
  3C. Elementary grammar, conversation, reading, composition.  Mr. Nybo (Sp)

4A–4B–4C. Elementary Danish. (5–5–4)
  Five classroom hours and at least a 1-hour language laboratory per week.
  4A. Elementary grammar, conversation.  Mrs. Ellingston (F)
  4B. Elementary grammar, conversation, easy prose reading.  Mrs. Ellingston (W)
  4C. Elementary grammar, conversation, reading, composition.  Mrs. Ellingston (Sp)

5. Intensive Elementary Swedish. (14)

Fiveeen classroom hours and at least 3 hours of language laboratory per week. Elementary grammar, conversation, composition. This course, or the equivalent, is prerequisite for studies at the U.C. Campus in Sweden. Mr. Larson (Su)

11A–11B. Intermediate Swedish. (4–5)

Prerequisite: course 1A–1B–1C or the equivalent. Five classroom hours per week. Intermediate grammar, extensive reading, composition. 11A (F); 11B (W).

13A–13B. Intermediate Norwegian. (4–5)

Prerequisite: course 3A–3B–3C or the equivalent. Intermediate grammar, extensive reading, conversation, composition. Five classroom hours per week. 13A, (F); 13B, (W) Mr. Nybo
Language Courses

101A-101B. Advanced Swedish. (4-5)
Three classroom hours per week. Prerequisite: course 11A-11B or the equivalent. Advanced grammar, with emphasis on syntax and phraseology, reading, conversation, composition. 101A (Sp); 101B (F), Mr. ----

103A-103B. Advanced Norwegian. (4-5)
Three classroom hours per week. Prerequisite: course 13A-13B or the equivalent. Advanced grammar, with emphasis on syntax and phraseology, reading, conversation, composition. 103A (Sp); 103B (F), Mr. Hamre

104A-104B. Advanced Danish. (4-5)
Three classroom hours per week. Prerequisite: course 14A-14B or the equivalent. Advanced grammar, with emphasis on syntax and phraseology, reading, conversation, composition. 104A (Sp); 104B (F), Mr. Madsen

151A-*151B. Modern Swedish Prose. (4-5)
Prerequisite: 23 units of lower division Swedish courses or the equivalent. Intensive reading of selected texts. 151A (W); *151B (Sp), Mr. Janzén

H195. Special Study for Honors Candidates. (2-5)
The Staff (Mr. Nybo in charge) (F, W, Sp)

198. Directed Group Study for Advanced Undergraduates. (2-5)
Prerequisite: at least two years of one of the Scandinavian languages. Advanced reading and interpretation of Modern Scandinavian texts. The Staff (Mr. Madsen in charge) (F, W, Sp)

199. Special Study for Advanced Undergraduates. (2-5)
Restricted to senior honor students. The Staff (Mr. Janzén in charge) (F, W, Sp)

Courses in Scandinavian Literature

Courses listed below require no knowledge of a Scandinavian language. They are open to students with at least a junior standing and, with consent of instructor, to properly qualified students with sophomore standing.

*100A-100B-100C. History of Scandinavian Literature. (4-4-4)
Prerequisite: junior standing or, with consent of instructor, sophomore standing. Survey course: readings of selected works of Danish, Norwegian, and Swedish literature in translation; three 1-hour lectures per week. 100A. From 1300 to 1800. Mr. ---- (F) 100B. From 1800 to 1890 Mr. Nybo (W) 100C. From 1890 to the present. Mr. Nybo (Sp)

106. History of Scandinavian Drama up to 1900. (4)
Three 1-hour lectures per week. Reading of Danish, Norwegian, and Swedish plays in translation; discussions; lectures on the development of the drama. Mr. Madsen (F)

107. The Plays of Ibsen. (5)
Two 2-hour lectures per week. Reading and discussion of Ibsen’s most important plays. Mr. Janzén (W)

108. Strindberg and His Writings. (5)
Two 2-hour lectures per week. Reading and discussion of Strindberg’s works in connection with his biography. Mr. Janzén (Sp)

109. Scandinavian Drama of the Twentieth Century. (4)
Three 1-hour lectures per week. Reading of modern Scandinavian drama in translation; discussions. Mr. Madsen (W)

120A-120B. The Novel in Scandinavia. (4-4)
Three 1-hour lectures per week. Course 120A is not prerequisite to 120B. Reading and discussion of great Scandinavian novels; lectures on the development of the novel. 120B (F), Mr. Nybo, 120A (W), Mr. Johansson

125. Masterpieces of Old Norse Literature. (4)
Three 1-hour lectures per week. Reading and discussion of some of the sagas and representative selections from the Eddas and the Scaldic songs; lectures on Scandinavian literature in the Middle Ages. Mr. ---- (Su)

160. Scandinavian Mythology. (4)
Three 1-hour lectures per week. Critical survey of mythology in ancient Scandinavian. Lectures and readings of selected material in English translation. Mr. ---- (Su, W)

*175. Kierkegaard. (5)
Three 1-hour lectures per week. Prerequisite: good background in literature or philosophy. Kierkegaard the man, the writer, the thinker, and his influence on European writers to the present day. Mr. Johansson (W)

Graduate Courses

Prerequisite: for the literary courses, courses 100A–100B–125, and at least one quarter of seminar work. For advanced study in Scandinavian literature, a general acquaintance with Scandinavian history is strongly advised. For advanced linguistic work, introductory courses to general linguistics, Indo-European comparative grammar, and Germanic linguistics are highly recommended. For doctoral study in linguistics, Gothic (German 263) is required and knowledge of German is desirable.

Language Courses

201. History of the Swedish Language. (4)
Three 1-hour lectures per week. Prerequisite: an A.B. degree with an undergraduate major in Scandinavian. Phonology, historical grammar, texts. Mr. Janzén (Sp)

* Not to be given 1968–69.
202. Old Icelandic. (4)
Three 1-hour lectures per week. Descriptive and historical phonology and grammar, texts. Some attention is given to Old Norwegian. Mr. Janzén (F)

203. History of the Norwegian Language. (4)
Three 1-hour lectures per week. Prerequisite: an A.B. degree with an undergraduate major in Scandinavian. Phonology, historical grammar, texts. Mr. Hamre (F)

204. History of the Danish Language. (4)
Three 1-hour lectures per week. Prerequisite: an A.B. degree with an undergraduate major in Scandinavian. Phonology, historical grammar, texts.

206. Readings of Old Icelandic Texts. (4)
Three 1-hour lectures per week. Prerequisite: course 202 or the equivalent. One Old Icelandic saga and one or two poems of the Edda will normally be read in this course. May be repeated with consent of instructor. Mr. Hamre (W)

208. The Poems of the Poetic Edda. (4)
Three 1-hour lectures per week. Reading of some more important poems with emphasis on the mythological songs. Mr. Hamre (Sp)

215. Scandinavian Dialects. (4)
Three 1-hour lectures per week. A survey of the Scandinavian dialects with special reference to their relation to the standard languages of the different countries. Mr. Hamre (Sp)

250. Seminar in Scandinavian Linguistics. (4)
One 2-hour lecture per week. Conference work on chosen or assigned topics; at least one shorter paper a quarter is normally required. Mr. Janzén, Mr. Hamre (Su)

Literature Courses

200. Proseminar in Bibliography and Literary Methods. (4)
Three 1-hour lectures per week. Training in the use of bibliographical materials for the study of Scandinavian languages and literatures; analysis and interpretation of selected texts with emphasis on literary method and criticism. Mr. Nybo (F)

230. Eighteenth-Century Scandinavian Literature. (4)
Three 1-hour lectures per week. Reading and analysis of representative works. Mr. Larson (F)

231. Romanticism in Scandinavia. (4)
Three 1-hour lectures per week. Reading and analysis of representative works. Mr. Madsen (Sp)

233. Scandinavian Literature of the Twentieth Century. (4)
Three 1-hour lectures per week. Reading and analysis of representative works. Mr. Johannesson (W)

241. Modern Swedish Literature. (4)
Three 1-hour lectures per week. Reading and analysis of representative works. Mr. Johannesson (Sp)

243. Modern Norwegian Literature. (4)
Three 1-hour lectures per week. Reading and analysis of representative works. Mr. Nybo (Sp)

244. Modern Danish Literature. (4)
Three 1-hour lectures per week. Reading and analysis of representative works. Mr. Madsen (W)

251. Seminar in Scandinavian Literature. (4)
One 2-hour lecture per week. Prerequisite: course 100B, 100C, and at least one of the following courses: 106, 109, 125. Mr. Nybo (F, W, Sp, Su)

298. Special Study. (2-6)
Designed for students engaged in exploration of a restricted field, involving the writing of a report. May not be substituted for available seminars or graduate courses.
The Staff (Mr. Nybo in charge) (F, W, Sp, Su)

601. Individual Study for Master's Students. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

SLAVIC LANGUAGES AND LITERATURES

(Department Office, 5416 Dwinelle Hall)

Simon Karlinsky, Ph.D., Professor of Slavic Languages and Literatures (Chairman of the Department).

Oleg A. Maslenikov, Ph.D., Professor of Slavic Languages and Literatures.
Hugh McLean, Ph.D., Professor of Slavic Languages and Literatures.
Czeslaw Milosz, Mag. Jur., Professor of Slavic Languages and Literatures.
Francis J. Whitfield, Ph.D., Professor of Slavic Languages and Literatures.
Cleb Struve, A.B., Professor of Slavic Languages and Literatures, Emeritus.

* Not to be given, 1968–69.
The Department of Slavic Languages and Literatures offers courses of instruction in the several Slavic languages and literatures and for degree programs in the field. Instruction in Czech, Polish, Russian, and Serbo-Croatian ranges from elementary to advanced work in each language. For the first year of Russian language study a choice is offered between non intensive and intensive courses, of which the latter are particularly recommended to students wishing to acquire early an active command of the language and willing to devote the requisite time to that end. In addition, there is a sequence of noncredit courses restricted to graduate students in other departments who need a reading knowledge of Russian for use in their research. Intensive courses in elementary Czech, Polish, and Serbo-Croatian are primarily intended for students who already have some knowledge of another Slavic language or who are otherwise prepared to undertake language courses that proceed at an especially rapid rate. Literature courses cover the history of the several literatures from earliest times to the present. Many courses devoted to individual writers or to particular literary genres or periods are also offered. A large number of them require no knowledge of any foreign language and can be recommended to interested students in other fields, particularly in other modern literatures.

The undergraduate major program usually emphasizes Russian, but honor students may choose Czech, Polish, or Serbo-Croatian as their special field of study. For all students the major program includes an introduction to the cultural history and the literatures of other Slavic peoples and requires at least an elementary knowledge of the Russian language. Courses in the grammatical structure of Russian are especially

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484 / SLAVIC LANGUAGES AND LITERATURES

Joan Delaney, Ph.D., Assistant Professor of Slavic Languages and Literatures.
Robert H. Whitman, Ph.D., Assistant Professor of Slavic Languages and Literatures.
Robert E. Whyte, Ph.D., Assistant Professor of Slavic Languages and Literatures.

Erica Brendel, M.A., Acting Assistant Professor of Slavic Languages and Literatures.
James M. Curtis, M.A., Acting Assistant Professor of Slavic Languages and Literatures.
James J. Emdy, M.A., Associate in Russian.

Michael S. Flier, M.A., Acting Assistant Professor of Slavic Languages and Literatures for the summer quarter.
Olga Hughes, M.A., Lecturer in Russian.

Robert P. Hughes, M.A., Acting Assistant Professor of Slavic Languages and Literatures for the summer quarter.

Andrew O. Jászi, Ph.D., Professor of German.
Serge Kasatkin, M.A., Lecturer in Russian.
Barbara D. Korpan, M.A., Acting Assistant Professor of Russian and of Comparative Literature.
Ema Leskovar, A.B., Associate in Slavic Languages and Literatures.

Ludmilla A. Patrick, M.A., Lecturer in Russian.
Michael K. Pawlikowski, L.L.M., Lecturer in Slavic Languages and Literatures.
András Sándor, B.Litt., Lecturer in Hungarian.
Richard R. Sheldon, Ph.D., Visiting Assistant Professor of Slavic Languages and Literatures for the summer quarter.

Olga Sorokin, Ph.D., Lecturer in Russian.

George A. Spradling, M.A., Associate in Russian.
Vladimir Zbořílek, M.A., Lecturer in Slavic Languages and Literatures.

Departmental Major Advisers: Mr. Kasatkin, Mr. Whitfield.
Departmental Graduate Adviser: ---

The Department of Slavic Languages and Literatures offers courses of instruction in the several Slavic languages and literatures and for degree programs in the field. Instruction in Czech, Polish, Russian, and Serbo-Croatian ranges from elementary to advanced work in each language. For the first year of Russian language study a choice is offered between non intensive and intensive courses, of which the latter are particularly recommended to students wishing to acquire early an active command of the language and willing to devote the requisite time to that end. In addition, there is a sequence of noncredit courses restricted to graduate students in other departments who need a reading knowledge of Russian for use in their research. Intensive courses in elementary Czech, Polish, and Serbo-Croatian are primarily intended for students who already have some knowledge of another Slavic language or who are otherwise prepared to undertake language courses that proceed at an especially rapid rate. Literature courses cover the history of the several literatures from earliest times to the present. Many courses devoted to individual writers or to particular literary genres or periods are also offered. A large number of them require no knowledge of any foreign language and can be recommended to interested students in other fields, particularly in other modern literatures.

The undergraduate major program usually emphasizes Russian, but honor students may choose Czech, Polish, or Serbo-Croatian as their special field of study. For all students the major program includes an introduction to the cultural history and the literatures of other Slavic peoples and requires at least an elementary knowledge of the Russian language. Courses in the grammatical structure of Russian are especially

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recommended to prospective teachers. Honor students are given the opportunity to prepare themselves for graduate studies in a proseminar that forms part of the honors program.

Students intending to do graduate work in the department should begin the study of French and German as early as possible. The M.A. program, while providing for some degree of concentration in either linguistic or literary studies, is intended above all to lay the broad foundations indispensable for advanced graduate work. It is the normal prerequisite for studies leading to the doctorate. Both graduate-degree programs are supported by the regularly announced courses in linguistics and literature, by special-study courses, and by a wide variety of seminars whose topics are announced before the beginning of each quarter.

Under the auspices of the department, courses in non-Slavic languages and literatures of Eastern Europe are given as opportunity and need arise. Thus, topics in Baltic linguistics appear regularly among the department’s seminar offerings. Special attention is directed to the program in Hungarian language, literature, and culture that appears at the end of the following course announcements.

The Major

**Lower Division** Emphasis on Russian: courses 1, 2, 3, 4, 5, 6 or their equivalents; course sequence 45A–45B–45C. Emphasis on a Slavic language other than Russian: courses 1, 2, 3 and 16 units of the other Slavic language; course sequence 45A–45B–45C.

**Upper Division** 45 units, including 15 units in the major language and, for students majoring in Russian, course sequence 125A–128B, course 187 or 188, 5 additional units in Russian literature, and one of the following course sequences: 150A–150B, 160A–160B, or 170A–170B. Students majoring in another Slavic language and literature shall take course sequence 129A–129B, in addition to the 10-unit survey sequence.

**Honors Program** An honors program is open to seniors who have a 3.0 overall grade-point average. The honors program will include course H195 (an honors proseminar) and 10 units, in addition to those required for the major, in upper division language courses. For majors in Russian these are courses 104A–104B or, in special cases and with the permission of the department, courses 125A–125B.

**Preparation for Graduate Study** Candidates for higher degrees must have completed the undergraduate major program in Slavic languages and literatures as required by the department, or must present evidence that they have received equivalent training. Both the M.A. and Ph.D. programs require work in two Slavic languages or literatures, of which one must be Russian. Preparation in other European literatures (especially French, German, English), in comparative literature, in languages (especially French, German, Italian), and in Russian intellectual history is valuable for candidates in literature. For candidates in linguistics, preparation in French, German, Latin or Greek and in general and comparative linguistics is desirable.

**Graduate Programs**

The degree of Master of Arts in Slavic languages and literatures is offered with literary or linguistic emphasis. The student must satisfy the foreign language requirement in either French or German. Students will normally be expected to pursue their studies under Plan II, which requires 36 units of course work approved by the department, of which at least 18 units must be in graduate courses. The final oral comprehensive examination will be preceded by three departmental written examinations. Majors in literature will be examined on the Slavic literature which they have chosen...
for specialization, on a period of emphasis within that literature, and on a second Slavic literature. Majors in linguistics will be examined on the structure and history of the language of specialization, on its relationship to a second modern Slavic language and to Old Church Slavic, and on the general history of the literature of the language of specialization.

The initial requirement for the degree of Doctor of Philosophy in Slavic languages and literatures is the Master of Arts obtained through this department, or evidence of equivalent training. The student must satisfy the foreign language requirement in French and German. As in the master's program, the degree is offered with either literary or linguistic emphasis. Through course work and individual study as approved by the graduate adviser the student prepares for departmental written examinations and for the general oral qualifying examination. The student also presents to the department an acceptable plan for a dissertation. After acceptance of the finished dissertation a final oral examination on the dissertation completes the requirements for the Ph.D. degree.

Letters and Science List: for regulations governing this list, see page 60.

Lower Division Courses

Duplication of Credit Unit credit will not be allowed for a foreign language course which duplicates any of the first 4 units of secondary school credit in the language or courses completed in another institution of collegiate grade. The first unit of secondary school credit in a language is considered to be equivalent to the first quarter course in college; each successive unit of credit in the same language is equal to one additional course in a sequence of four quarter courses in college.

1. Elementary Russian, Beginners' Course. (5)
   Five 1-hour meetings and two 1-hour laboratories per week.
   The Staff (Mr. Whitman in charge) (Su, F, W, Sp)

2. Elementary Russian. (5)
   Five 1-hour meetings and two 1-hour laboratories per week.
   Prerequisite: course 1.
   The Staff (Mr. Emdy in charge) (Su, F, W, Sp)

3. Elementary Russian. (4)
   Five 1-hour meetings and one 1-hour laboratory per week.
   Prerequisite: course 2.
   The Staff (Miss Brendel in charge) (Su, F, W, Sp)

4. Intermediate Russian. (4)
   Five 1-hour meetings and one 1-hour laboratory per week.
   Prerequisite: course 3.
   The Staff (Mr. Spradling in charge) (Su, F, W, Sp)

5. Intermediate Russian. (4)
   Four 1-hour meetings and one 1-hour laboratory per week.
   Prerequisite: course 4.
   Mr. Whitman (in charge) (W)

6. Intermediate Russian. (4)
   Four 1-hour meetings and one 1-hour laboratory per week.
   Prerequisite: course 5.
   Mr. Whitman (in charge) (Sp)

   * Not to be given, 1968-69.

*12A-12B-12C. Elementary Bulgarian. (4-4-4)
   Three 1-hour meetings per week.
   Sequence beginning (F).

21A-21B-21C. Intensive Russian. (8-8-8)
   Ten 1-hour meetings and two 1-hour laboratories per week.
   Sequence beginning (F), Mr. Kasatkin

   Ten 1-hour meetings per week.
   Mrs. Canger (F)

24A-24B. Intermediate Polish. (4-4)
   Four 1-hour meetings per week. Prerequisite: course 24.
   Sequence beginning (W), Mrs. Canger

   Ten 1-hour meetings per week.
   Mr. Whyte (F)

26A-26B. Intermediate Serbo-Croatian. (4-4)
   Four 1-hour meetings per week. Prerequisite: course 24.
   Sequence beginning (W), Mr. Whyte

   Ten 1-hour meetings per week.
   Mr. Zbořílek (F)

30A-30B. Intermediate Czech. (4-4)
   Four 1-hour meetings per week.
   Sequence beginning (W), Mr. Zbořílek

39. Great Writers of Russian Literature. (4)
   Four 1-hour meetings per week. No knowledge of
   Russian is required.
   Mr. Sheldon (Su),
   Mr. Maslenikov (F)

40. Specialized Russian Reading. (4)
   Three 1-hour meetings per week.
   Prerequisite: course 4 or consent of instructor.
   Mr. Flier (Su), Mr. Emdy (F, Sp)

45A-45B-45C. Survey of Russian Literature and
   Intellectual Trends, (4-4-4)
   Formerly course 150A-150B-150C
   Three 1-hour meetings per week. Students in the
   major program are advised to take this course in
   sequence.
   Sequence beginning (F).
   45A. From the eleventh century to 1845.
   Mrs. Hughes
   45B. From 1845 through the nineteenth century.
   Miss Delaney
   45C. The twentieth century.
   Mr. Hughes
Upper Division Courses

103A–103B–103C. Advanced Russian. (5–5–5)
Three 1-hour meetings and one 1-hour laboratory per week. Prerequisite: course 6 or course 21C. Sequence beginning (F), Mr. Maslenikov, Mrs. Hughes, Mr. Kassatkin.

104A–104B–104C. Russian Composition. (5–5–5)
Three 1-hour meetings per week. Prerequisite: course 103C. Sequence beginning (F). Mrs. Hughes, Mr. Kassatkin.

108A–108B. Polish Reading, Grammar, and Composition. (5–5)
Four 1-hour meetings per week. Prerequisite: course 24B. Sequence beginning (F), Mrs. Canger.

112A–112B. Serbo-Croatian Reading, Grammar, and Composition. (5–5)
Four 1-hour meetings per week. Prerequisite: course 26B. Sequence beginning (F), Mr. Whyte.

116A–116B. Czech Reading, Grammar, and Composition. (5–5)
Four 1-hour meetings per week. Prerequisite: course 30B. Sequence beginning (F), Mr. Whyte.

125A–125B. Introduction to Descriptive Russian Grammar. (5–5)
Two 1½-hour meetings per week. Prerequisite or corequisite: course 103A (to 125A), course 103B (to 125B). Phonology, morphology, and syntax of standard literary Russian. Recommended for prospective teachers. Sequence beginning (F).

128A–128B. Readings in Russian Literature. (5–5)
Three 1-hour meetings per week. Prerequisite or corequisite: course 103B (to 128A), course 103C (to 128B). Required for majors in Russian. Sequence beginning (W), Mr. Hughes.

Individual or group conferences. Prerequisite or corequisite: courses 109B or 112B or 116B. Sequence beginning (W), The Staff.

Lecture Courses on Slavic Literatures

Except where otherwise indicated, these courses are given in English and require no knowledge of any other language.

130. Topics in Twentieth Century Russian Literature. (5)
Three 1-hour meetings per week. Variable subject matter. Course may be repeated with the consent of the instructor without duplication of credit. Mr. Hughes (F).

133A–133B–133C. The Russian Novel and its Relations to West European Literatures. (5–5–5)
Two 1½-hour meetings per week. Prerequisite to 133B: 133A or 45A or permission of the instructor; to 133C: 133B or 45B or permission of the instructor. The Staff.

134A. Dostoevsky. (5)
Three 1-hour meetings per week. Miss Brendel (Sp).

134B. Tolstoy. (5)
Three 1-hour meetings per week. Mr. Sheldon (Su).

134C. Chekhov. (5)
Three 1-hour meetings per week. Mr. Sheldon (Su).

134D. Turgenev. (5)
Three 1-hour meetings per week. Miss Delaney (F).

134F. Pushkin. (5)
Three 1-hour meetings per week. Mr. MeLean (W).

134G. Gogol. (5)
Three 1-hour meetings per week. Mr. MeLean (F).

134N. Monographic Studies in Russian Literature. (5)
Three 1-hour meetings per week. Variable subject matter. Course may be repeated with the consent of the instructor without duplication of credit. The Staff.

135. Russian Drama from the Seventeenth Century to the Twentieth. (5)
Three 1-hour meetings per week. (W).

136. Russian Folklore. (5)
Three 1-hour meetings per week. (F).

138. Russian Formalism. (5)
Two 1½-hour meetings per week. Prerequisite: course 103B or equivalent. Miss Korpan (Sp).

143. Introduction to Modern Slavic Literary Theory. (5)
Three 1-hour meetings per week. Miss Korpan (Sp).

150A–150B. Survey of Polish Literature and Intellectual Trends. (5–5)
Three 1-hour meetings per week. Sequence beginning (W), Mr. Milosz.

150A. To 1848.
150B. Since 1848.

155. Polish Romanticism. (5)
Three 1-hour meetings per week. Mr. Milosz.

156. The Polish Theater. (5)
Three 1-hour meetings per week. Mr. Milosz.

159. Contemporary Polish Poetry and Fiction. (5)
Three 1-hour meetings per week. Mr. Milosz.

160A–160B. Survey of Czech and Slovak Literatures. (5–5)
Three 1-hour meetings per week. Sequence beginning (W), Mr. Zbofilek.

* Not to be given 1968–69.
4 8 8
170A—170B. Survey of Serbian and Croatian Literatures. (5—5)
Three 1-hour meetings per week. Sequence beginning (W), Mr. Whyte

187A—187B. Russian Poetry. (5—5)
Three hours of class per week. Prerequisite or corequisite: course 103B or consent of instructor. Survey of techniques of Russian versification and history of Russian poetry. 187A, seventeenth century to 1840; 187B, 1840 to the present. Sequence beginning (W), Mr. Karlinsky, Mrs. Hughes

188. Russian Prose. (5)
Three 1-hour lectures per week. Prerequisite or corequisite: course 103A or consent of instructor. Lecture course given in Russian. Content varies. Course may be repeated without duplication of credit. 
Mr. Karlinsky (Su); Mrs. Hughes (F)

190. Special Study for Advanced Undergraduates. (2—5)
Restricted to honor students. 
The Staff (Su, F, W, Sp)

Graduate Courses

210A—210B. Old Church Slavic. (3—2)
Two 1½-hour meetings per week. Sequence beginning (W), Mr. Whitfield

*220. Comparative Slavic Linguistics. (4)
Two 1½-hour meetings per week. Prerequisite: courses 210A—210B. Mr. Whitfield (F)

226. Historical Russian Grammar. (4)
Three 1-hour meetings per week. Prerequisite: courses 210A—210B. Mr. Whitman (F)

229. Russian Oral Tradition. (4)
Three 1-hour meetings per week. Major emphasis will be placed on the epics, but specimens of other genres of orally transmitted literature will be examined, such as historical songs, religious songs, wedding songs, laments, fairy tales, incantations, riddles, and proverbs.
Mr. McLean (F)

230. Old Russian Literature. (4)
Two 1-hour meetings per week. Lectures are in Russian. Content varies. Course may be repeated with the consent of the instructor without duplication of credit. 
Mr. McLean (W)

One 2-hour meeting per week. Advanced studies in the several fields of Slavic literatures and linguistics. Course content varies. Course may be repeated without duplication of credit.
The Staff (Su, F, W, Sp)

281. Methods of Russian Literary Analysis and Scholarship. (4)
Course designed particularly for new graduate students majoring in literature. Miss Korpan (F)

290. Seminar. (4—4)
One 2-hour meeting per week. Advanced study in Slavic literatures and literatures. Topics will vary from year to year and will be announced at the beginning of each quarter. Two-quarter sequence required for completion in Seminar 290.
The Staff (Su, F, W, Sp)

298. Special Study for Graduate Students. (2—9)
Preliminary exploration of a restricted field involving research and a written report.
The Staff (Su, F, W, Sp)

299. Directed Research. (2—9)
Normally reserved for students directly engaged upon the doctoral dissertation.
The Staff (Su, F, W, Sp)

16—26—36. Russian for Graduate Students. 
(No credit)
Three 1-hour meetings per week. Preparation for graduate reading examinations.
Sequence beginning (F), Mr. Spradling

116—126. Spoken Russian for Graduate Students. 
(No credit)
Three 1-hour meetings per week. Prerequisite: course 103A—103B—103C or its equivalent. Preparation for the Departmental precandidacy examination in spoken Russian. Open only to candidates for graduate degrees in the Department of Slavic Languages and Literatures.
Sequence beginning (W), Mr. Kassatkin, The Staff (Su, F, W, Sp)

601. Individual Study for Master's Students. (1—8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1—8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral dissertation. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

Hungarian Language and Culture Courses

Hungarian 27. Elementary Hungarian. Intensive Course. (8)
Ten 1-hour meetings per week. Mr. Sándor (F)

Hungarian 28A—28B. Intermediate Hungarian. (4—4)
Four 1-hour meetings per week. Prerequisite: course 27. Mr. Sándor. Sequence beginning (W)

HUNGARIAN 185A-185B. Literature. 
Three 1-hour meetings per week.

188. Russian Poetry. (5—5)
Course may be repeated without duplication of credit. Lectures are in Russian. Content varies. Course may be repeated without duplication of credit.
Mr. Whyte (W)

BA.--108. The Field Work 

1A-1B. Social Science Interns 
A critical evaluation of research and the conduct of public policy.

*2. Race and Class in Contemporary Society 

Two 1½-hour meetings per week. Designed to provide experiences in the specification and implementation of public policy in American social and economic life.

HUNGARIAN 100A--100B. The Hungarian Language. 

Up, 100A-100B. The Hungarian Language. 

Two 1½-hour meetings per week. This course provides an introduction to the social sciences, economics, and how social institutions interact to influence life. Emphasis will be placed on the study of government, industrialization, and the development of society. The course will be given in Hungarian.

*210A—210B. Old Church Slavic. 

Two 1-hour meetings per week. Lectures are in Russian. Content varies. Course may be repeated without duplication of credit.
Mr. Kassatkin (F)

*220. Comparative Slavic Linguistics. 

Two 1½-hour meetings per week. Prerequisite: courses 210A—210B. Mr. Whyte (F)

*226. Historical Russian Grammar. 

Three 1-hour meetings per week. Prerequisite: courses 210A—210B. Mr. Whitman (F)

*229. Russian Oral Tradition. 

Three 1-hour meetings per week. Major emphasis will be placed on the epics, but specimens of other genres of orally transmitted literature will be examined, such as historical songs, religious songs, wedding songs, laments, fairy tales, incantations, riddles, and proverbs.
Mr. McLean (F)

*230. Old Russian Literature. 

Two 1-hour meetings per week. Lectures are in Russian. Content varies. Course may be repeated with the consent of the instructor without duplication of credit. 
Mr. McLean (W)


One 2-hour meeting per week. Advanced studies in the several fields of Slavic literatures and linguistics. Course content varies. Course may be repeated without duplication of credit.
The Staff (Su, F, W, Sp)

*281. Methods of Russian Literary Analysis and Scholarship. 

Course designed particularly for new graduate students majoring in literature. Miss Korpan (F)

*290. Seminar. 

One 2-hour meeting per week. Advanced study in Slavic literatures and literatures. Topics will vary from year to year and will be announced at the beginning of each quarter. Two-quarter sequence required for completion in Seminar 290.
The Staff (Su, F, W, Sp)

*298. Special Study for Graduate Students. 

Preliminary exploration of a restricted field involving research and a written report.
The Staff (Su, F, W, Sp)

*299. Directed Research. 

Normally reserved for students directly engaged upon the doctoral dissertation.
The Staff (Su, F, W, Sp)

*16—26—36. Russian for Graduate Students. 

(No credit)
Three 1-hour meetings per week. Preparation for graduate reading examinations.
Sequence beginning (F), Mr. Spradling

*116—126. Spoken Russian for Graduate Students. 

(No credit)
Three 1-hour meetings per week. Prerequisite: course 103A—103B—103C or its equivalent. Preparation for the Departmental precandidacy examination in spoken Russian. Open only to candidates for graduate degrees in the Department of Slavic Languages and Literatures.
Sequence beginning (W), Mr. Kassatkin, The Staff (Su, F, W, Sp)

*601. Individual Study for Master's Students. 

(1—8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)

*602. Individual Study for Doctoral Students. 

(1—8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral dissertation. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Su, F, W, Sp)
Hungarian 185A–185B. Survey of Hungarian Literature. (5-5)
Three 1-hour meetings per week.
Sequence beginning (W). Mr. Sandor

Hungarian 280. Studies in Hungarian Literature. (4)
One 2-hour meeting per week. Advanced studies in Hungarian literature. Mr. Sandor (F, W, Sp)

**SOCIAL SCIENCE**

(Department Office, 750 Barrows Hall)

**The Field Major** See the Announcement of the College of Letters and Science.

### Lower Division Courses

**1A–1B. Social Science and Public Policy. (4–4)**
A critical examination of the interplay between research and teaching in the social sciences and the conduct of public policy.

**2. Race and Culture. (12)**
Four 1½-hour lectures and two 1½-hour discussion periods each week. An interdisciplinary course designed to introduce the student to psychology, anthropology and sociology, and to the applications of these fields to race relations. The course will cover the following topics: psychological factors in the acquisition of prejudice and discriminatory behavior; effects of prejudice and discriminatory behavior upon cognitive and personality development; comparative analysis of cultures focusing on stability and change in caste, racial and ethnic relations; the tension between racism and egalitarianism in American life and its impact on the changing social and economic status of Negroes and other minorities. Mr. Blauner (Sp)

### Upper Division Courses

**100A–100B. The Individual in Organized Society. (5–5)**
Two 1½-hour lectures and discussion periods each week. This course is open to social science field majors and to majors in other departments in the social sciences. Using analytical tools from sociology, economics and political science, the course shows how social institutions both fulfill men’s needs and restrict men, and considers the efficacy and the limitations of the devices which make social organization compatible with basic human freedom. Credit and grade will be awarded upon completion of the full sequence. Mr. Landauer (F, W)

Two 1-hour lectures, one 1-hour discussion period, and one 2-hour cultural program per week. Prerequisite: consent of instructor. An interdisciplinary, experimental course designed to give (1) an understanding of the modern people of India, (2) a comparative view of society and culture, (3) experience in research work. Mr. Kennedy, Mr. Mandelbaum, Mrs. Cormack, Mr. Simmons (F, W, Sp)

**Hungarian 290. Seminar. (4)**
One 2-hour meeting per week. Advanced study in Hungarian language and literature. Topics will vary from year to year and will be announced at the beginning of each quarter. Two-quarter sequence required for completion of work in Seminar 290. Mr. Sandor (F, W; W, Sp)

**Lithuanian 270. Structure of Modern Lithuanian. (4)** Mr. Whitfield (Sp)

### Graduate Courses

**201A–201B–201C. Interdisciplinary Seminar on South Asia. (4–4–4)**
One 2-hour meeting and one consultation hour per week. The seminar will examine the differing theoretical and methodological approaches taken by various disciplines to problems arising in the study of South Asia, a differing problem chosen every year. Problems for 1968–69: The City. Prerequisite: consent of staff. A course on the culture and institutions of the modern city as viewed by a variety of social scientists, architects, city planners, and social workers. Problems in housing, education, welfare, politics, planning, design and the cultures of class, ethnic, and deviant sub-groups will be discussed in lectures. Sections will be devoted to the formulation, design, execution, and supervision of research projects in particular problem areas. Mr. Simmons (F, W, Sp)

Two 1-hour lectures, two 1-hour discussion periods, and one hour of supervised research each week. Prerequisite: consent of staff. A course on the culture and institutions of the modern city as viewed by a variety of social scientists, architects, city planners, and social workers. Problems in housing, education, welfare, politics, planning, design and the cultures of class, ethnic, and deviant sub-groups will be discussed in lectures. Sections will be devoted to the formulation, design, execution, and supervision of research projects in particular problem areas. Mr. Simmons (F, W, Sp)

**Lithuanian 270. Structure of Modern Lithuanian. (4)** Mr. Whitfield (Sp)

### Comparative Study Courses

**Advanced study topics will vary placed at the beginning of each sequence—see the upper division course listings.**

**102A–102B. The City and Its Problems. (5–5)**
Two 1-hour lectures, two 1-hour discussion periods, and one hour of supervised research each week. Prerequisite: consent of staff. A course on the culture and institutions of the modern city as viewed by a variety of social scientists, architects, city planners, and social workers. Problems in housing, education, welfare, politics, planning, design and the cultures of class, ethnic, and deviant sub-groups will be discussed in lectures. Sections will be devoted to the formulation, design, execution, and supervision of research projects in particular problem areas. Mr. Simmons (F, W, Sp)

**201A–201B–201C. Interdisciplinary Seminar on South Asia. (4–4–4)**
One 2-hour meeting and one consultation hour per week. The seminar will examine the differing theoretical and methodological approaches taken by various disciplines to problems arising in the study of South Asia, a differing problem chosen every year. Problems for 1968–69: The City. Prerequisite: two quarters of upper division course work on South Asia.

**201A. Sources and types of empirical data.**

**201B. Theories and methods in the analysis of the problem in individual disciplines.**

**201C.** Not offered 1968–1969.

Sequence beginning (F)

Mr. Metcalf, Mr. Grimshaw, Mrs. Gumperz

**202A–202B. The Professional and Change in Low-Income Countries. (4–4)**
Four hours of class per week.

202A. An inquiry into the role of the professional as an agent of social, economic, and political change in low-income countries; the barriers and opportunities for effectiveness; the structural context for the international transfer of social and mechanical technologies.

202B. A research seminar in which a major paper arising from topics in 202A is written. Mr. Ichman (W, Sp)

*Not to be given, 1968–69.*
Milton Chennin, Ph.D., Professor of Social Welfare (Chairman of the Department).
Ernest Greenwood, Ph.D., Professor of Social Welfare.
Henry S. Maas, Ph.D., Professor of Social Welfare and Associate Director, Institute of Human Development.
Davis McEntire, Ph.D., Professor of Social Welfare.
Maurine McKeany, Ph.D., Professor of Social Welfare.
Kermit T. Wiltse, D.S.W., Professor of Social Welfare.
Martin Wolins, D.S.W., Professor of Social Welfare.
Ruth Cooper, D.S.W., Professor of Social Welfare, Emeritus.
Walter Friedlander, Ph.D., Professor of Social Welfare, Emeritus.
Margaret S. Schubert, Ph.D., Professor of Social Welfare, Emeritus.
Gertrude Wilson, M.A., Professor of Social Welfare, Emeritus.
Joseph S. Briar, D.S.W., Associate Professor of Social Welfare.
Ralph M. Kramer, D.S.W., Associate Professor of Social Welfare.
James R. W. Leiby, Ph.D., Associate Professor of Social Welfare.
Henry Miller, D.S.W., Associate Professor of Social Welfare.
Lydia Rapoport, M.S.S., Associate Professor of Social Welfare.
Andrew Billingsley, Ph.D., Assistant Professor of Social Welfare.
Ronald A. Feldman, Ph.D., Assistant Professor of Social Welfare.
Alfred A. Lucco, Ph.D., Assistant Professor of Social Welfare.

Robert Apte, Ph.D., Lecturer in Social Welfare.
Beryl Godfrey, M.S.W., Lecturer in Social Welfare and Field Work Consultant.
Margaret S. Gordon, Ph.D., Lecturer in Social Welfare.
Joanna F. Gorman, M.S.S.W., Lecturer in Social Welfare and in Public Health.
William H. Grier, M.D., Lecturer in Social Welfare.
Lawrence E. Grossman, M.S.W., Acting Assistant Professor of Social Welfare.
Norma S. Haan, Ph.D., Lecturer in Social Welfare.
Joseph A. Kuypers, M.A., Acting Assistant Professor of Social Welfare and Assistant Research Behavioral Scientist, Institute of Human Development.
Joseph Lifschutz, M.D., Lecturer in Social Welfare.
Herbert Maccoby, Ph.D., Lecturer in Social Welfare.
Anna Maenchen, Ph.D., Lecturer in Social Welfare.
Edward Nathan, M.S.W., Lecturer and Field Work Consultant in charge of Psychiatric Field Work.
Charles O'Shea, M.S.W., Lecturer in Social Welfare.
Ida Oswald, M.S.W., Lecturer in Social Welfare and Field Work Consultant.
Genevieve Oxley, M.S., Lecturer in Social Welfare.
Dorothy Pettes, M.A., Lecturer in Social Welfare and Coordinator of Field Work.
Marion Sloan, M.S.S.A., Lecturer in Social Welfare.
William T. Smelser, Ph.D., Lecturer in Social Welfare.
Harry Specht, Ph.D., Lecturer in Social Welfare.
Hasseltine Byrd Taylor, J.D., Ph.D., Lecturer in Social Welfare.
Robert A. Wasser, M.S.W., Lecturer in Social Welfare and Field Work Consultant.

† On leave, 1968-69.
‡ In residence, fall quarter only, 1968.
Robert E. Westfall, M.D., Lecturer in Social Welfare.
Kent Zimmerman, M.D., Lecturer in Social Welfare.

Kloh-Ann Amacher, M.S.W., Field Work Supervisor in Social Welfare.
Mary E. Anderson, M.S.W., Field Work Supervisor in Social Welfare.
Margaret Butcher, M.A., Field Work Supervisor in Social Welfare.
Elizabeth Cole, M.S.W., Field Work Supervisor in Social Welfare.
Wanda Collins, M.S.W., Field Work Supervisor in Social Welfare.
Dorothea J. Cudaback, M.S.W., Field Work Supervisor in Social Welfare.
Mark Ealey, M.S.W., Field Work Supervisor in Social Welfare.
Ronald H. Fremlin, M.S.W., Field Work Supervisor in Social Welfare.
Mary Jeffress, M.S.W., Field Work Supervisor in Social Welfare.
James Jennings, M.S.W., Field Work Supervisor in Social Welfare.
Irving Kermish, M.S.W., Field Work Supervisor in Social Welfare.
Barbara Kohlman, M.S.W., Field Work Supervisor in Social Welfare.
Frank N. Kushin, M.S., Field Work Supervisor in Social Welfare.
Elizabeth Lamborn, M.S.W., Field Work Supervisor in Social Welfare.
Irene C. Macdonald, M.S.W., Field Work Supervisor in Social Welfare.
Mary K. Miles, M.S.W., Field Work Supervisor in Social Welfare.
Johanna Renssen, M.S.W., Field Work Supervisor in Social Welfare.
Arthur Segal, M.S.S.W., Field Work Supervisor in Social Welfare.
Janet West, M.S.W., Field Work Supervisor in Social Welfare.
Marguerite Wilson, M.S.W., Field Work Supervisor in Social Welfare.

Undergraduate Group Majors

The group major in social welfare, leading to the degree of Bachelor of Arts, offers a social welfare sequence of general interest to liberal arts students. For students whose career interests are in this field, it provides preparation for graduate professional education in social work, and it also serves as preparation for entry into beginning social service positions directly upon graduation with the bachelor's degree.

Major Requirements

Lower Division
Psychology 1, Psychology 3, Sociology 1, and Psychology 5 or Statistics 2.

Upper Division

Eligible social welfare majors, upon recommendation of their advisers, may enroll in an honors program.

Graduate Programs

For information about graduate study in the School of Social Welfare, see pages
103–107 of this catalogue. For more detailed information see the separate Announcement of the School of Social Welfare, available from the School Office, 120 Haviland Hall.

Upper Division Courses

100. The Field of Social Welfare. (4)
Two 2-hour sessions per week. Survey of social welfare problems, programs, and issues. Designed to acquaint nonmajors with the field of social welfare. Not open to students who have completed or are taking course 110A–110B–110C.
Mr. Chernin (F, W, Sp)

102A–102B. Social Work as a Profession. (3–3)
Three 1-hour sessions per week. Prerequisite: senior standing; nonmajors must have course 100 or 110A (may be concurrent) and consent of instructor. Sequence beginning (F) and (W).
102A. Introduction to social work methods including social casework, social group work, and community organization.
102B. Analysis of case material illustrating the methods of social work; factors influencing practice in various special purpose agencies and in small and large communities.
Mr. O'Shea, (F, W, Sp)

Three 1-hour sessions per week.
110A. Social Welfare as an Institution. The background and development of the social services in relation to economic, political, and social change; social services in an industrial society.
Mr. Leiby (F)
110B. Economic Need and Income Maintenance. Public assistance and social insurance programs and other provisions for meeting economic need.
Mr. Leiby (W)
110C. Social Services for Special Needs. Socially provided services for children, the physically and mentally ill and handicapped, and delinquents.
Mr. Leiby (Sp)

H197A–197B–197C. Senior Honors Course. (3–3–3)
Weekly hours to be arranged. Problems in social welfare and social work. Preparation of a senior essay. Sequence beginning (F).
Mr. Chernin (F, W, Sp)

198. Group Study for Advanced Undergraduates. (2–5)
The Staff (Mr. Chernin in charge S; Mr. Wilte in charge Su, F, W)

199. Special Study for Advanced Undergraduates. (2–5)
The Staff (Mr. Chernin in charge S; Mr. Wilte in charge Su, F, W)

Graduate Courses

All graduate classroom courses in social welfare are open to qualified students from other departments, with the consent of the instructor.

200A–200B. Development of the Person. (3–3)
Two 1 1/2-hour sessions per week. Physical, psychological, and social development and adaptations of the person, as related to social welfare.
Sequence beginning (F). Mrs. Haan, Mr. Knypers, Mr. Luco, Mr. Mass, Mr. Smelser, Mr. Westfall, Mr. Zimmerman (F, W)

201A–201B. Social Organization and Social Welfare. (2–3, 2–3)
One 1 1/2-hour session per week for 2 units; an additional 1 1/2 hours every other week for students who elect an additional unit. Structure and dynamics of communities, organizations, groups and families, as related to social welfare. Credit and grade will be assigned upon completion of the sequence.
Mr. Wolins in charge (W, Sp)

202. Development of the Handicapped Child. (2)
One 1 1/2-hour session per week. Prerequisite: course 200A–200B or consent of instructor. Emotional, cognitive and social development of the handicapped child, with special emphasis on the mentally retarded and implications for welfare services.
Mr. Luco (Sp)

203. Development of the Social Deviant. (2)
One 1 1/2-hour session per week. Prerequisite: course 200A–200B or consent of instructor. Deviant behavior and welfare implications of minority status, educational and occupational incapacity, delinquency, sexual deviancy, and identity problems of the nonconforming members of society.

210A–210B. Psychodynamics and Psychopathology. (2–2)
One 1 1/2-hour session per week. Prerequisite: course 200A–200B or consent of instructor. Psychiatric symptomatology and psychopathology and their implications for social welfare.
Sequence beginning (F), Mr. Liehr, Mr. Litschutz, Mr. Luco, Mr. Smelser, Mr. Westfall (F, W)

211. Seminars in Human Development and Pathology. (2)
One 1 1/2-hour session per week. Prerequisite: course 200A–200B or consent of instructor. The social welfare implications of selected problems in human development and adaptation in situations involving physical illness, psychopathology, or stressful social conditions. Seminar topics will be announced annually.

212. Seminars in Social Organization and Social Welfare. (2)
One 1 1/2-hour session per week. Prerequisite: course 201A–201B or consent of instructor. Advanced study of selected problems in social organization and social welfare. Seminar topics will be announced annually.

One 1 1/2-hour session per week.
220A. Income Maintenance. Analysis of major issues in the social provision of income for individuals and families through public assistance, social insurance, family and children's allowance, work and training, income supplementation, and other income maintenance programs.
220B. Service Programs. Analysis of major issues with reference to socially provided services, child welfare, community mental health, etc.
220C. The Social Welfare Administration.
Prerequisite: consent of instructor. Identification of various social intervention and administrative agencies. Analysis of administrative policies.

221. Law and Social Welfare. (2)
One 1 1/2-hour session per week.

229A–229B–229C. Administration. (2–2–2)
Two seminars per week. Primarily aimed at analyzing welfare programs in communities or regions in advance of law enforcement.

233. Seminar in Social Policy. (2)

239A–239B–239C. Admin. (2–2–2)
One 1 1/2-hour session per week.

240A–240B–240C. Advanced Undergraduate Seminar in Social Welfare. (2–2–2)
One 1 1/2-hour session per week. Designed for students in social work of other departments in graduate school. Topic to be announced.

One 1 1/2-hour session per week. Designed for students in social work of other departments in graduate school. Topic to be announced.

242. Community Practice. (2–2–2)
One 1 1/2-hour session per week.
provided services in the fields of family and child welfare, corrections, public health including mental health, rehabilitation, and recreation. — (W)

Prerequisite: course 220A or 220B or consent of instructor. Examination of issues involved in the relation of the state to voluntary social services, intergovernmental relations, scope and control of administrative powers, and in the impact of alternative policy decisions. —— (W)

*221. Law and Social Welfare. (2)
One 1½-hour session per week. Legal information for social workers with emphasis on family law. —— (Sp)

230. Social Welfare Programs and Policies. (2)
One 1½-hour session per week. Comparative analysis of welfare policies and provisions in selected countries in cultural and ideological context. Countries or regions to be dealt with will be announced in advance each time the course is offered.

*233. Seminar in Social Security. (2)
One 1½-hour session per week.

239A—239B—239C. Seminars in Social Welfare Administration and Policy. (3—3—3)
Two seminar hours and one consultation hour per week. Primarily for doctoral students. Sequence beginning (F). 239A—239B. Theory of organization and administration with applications to social welfare. 239C. Selected problems of social welfare policy.

240A—240B—240C. Social Casework. (2—2—2)
One 1½-hour session per week. Basic principles of social work practice with individuals and families. Credit and grade for the B—C portion of the sequence, in even numbered sections, will be assigned upon completion of the C portion.

241A—241B—241C. Social Group Work. (2—2—2)
One 1½-hour session per week. Beginning analysis of theory and practice of social work with groups. Sequence beginning (F).

242A—242B. Community Organization. (2—2)
One 1½-hour session per week. Basic principles and methods of community organization practice in social welfare. Sequence beginning (F, Sp).

243. Community Development. (2)
One 1½-hour session per week. Principles and practice in urban and rural community development. —— (Sp)

244. Methods of Social Action. (2)
One 1½-hour session per week. Principles and methods in developing social action programs in social welfare. Mr. Grossman, Mr. Specht, (W, Sp)

250. Advanced Social Casework. (2)
One 1½-hour session per week. Prerequisite: course 240A—240B—240C or consent of instructor. Generic and specific components of social casework in different fields of practice, including corrections, family and child welfare, medical, psychiatric, public welfare, and social work. The Staff (Su, F)

251. Specialized Methods of Social Work Practice. (2)
One 1½-hour session per week. Prerequisite: consent of instructor. A study of various methods of social work practice with individuals, families, groups and communities in relation to social problems. Topics will be announced annually.

252A—252B. Advanced Social Group Work. (2—2)
One 1½-hour session per week. Prerequisite: course 241A—241B—241C or consent of instructor. Advanced analysis of social group work theory and practice; application in a variety of settings.

253A—253B. Advanced Community Organization. (2—2)
One 1½-hour session per week. Prerequisite: course 242A—242B or consent of instructor. Theory and practice of community organization in typical settings.

254A—254B. Social Welfare Administration. (2—2)
One 1½-hour session per week. Prerequisite: course 242A—242B or consent of instructor. Administrative process and problems in social welfare organizations. Sequence beginning (F).

Two 1½-hour sessions per week. Sequence beginning (F).

258. Methods of Supervision in Social Work. (2)
One 1½-hour session per week. Prerequisite: second-year standing in the M.S.W. program or consent of instructor.

Two seminar hours and one consultation hour per week. Primarily for doctoral students.

* Not to be given, 1968—69.
SOCIAL WELFARE; SOCIOLOGY

279A—279B—279C. Seminars in History and Philosophies of Social Welfare. (3—3—3)
Two seminar hours and one consultation hour per week. Primarily for doctoral students.

Sequence beginning (F)
279A, survey of historical thinking about the development of the social services; 279B, selected problems in historical research; *279C, study of political and ethical theories that bear on the development of the social services. Credit and grade for the A and B portion of the sequence will be assigned upon completion of the B portion.
Mr. Leiby (W, Sp)

280. Social Welfare Research Fields and Techniques. (2)
One 1½-hour session per week. The logic, methods and techniques of research in social welfare.
The Staff (Sp)

281A—281B. Research Techniques in Social Welfare. (2-2)
One 1½-hour session per week consisting of lecture and/or laboratory. Prerequisite: course 280. The theory and application of a variety of social research techniques usable in social welfare investigations. Sequence beginning (F). Credit and grade will be assigned upon completion of the sequence in even numbered sections and upon completion of each quarter's work in odd numbered sections.
The Staff (F, W)

287A—287B—287C. Directed Group Study. (2—2—2)
One 1½-hour session per week. Prerequisite: course 280. Group research on a selected problem in social welfare. Three quarters are devoted to the conduct of a single investigation from problem formulation to report writing. Sequence beginning (F). Credit and grade will be assigned upon completion of the sequence in even numbered sections and upon completion of each quarter's work in odd numbered sections.
The Staff (F, W, Sp)

*288. Advanced Graduate Study in Social Welfare. (2)
One 1½-hour session per week. Prerequisite: course 280. Methodological critique of investigations in selected substantive areas in social welfare.
The Staff (F, W, Sp)

289A—289B—289C. Seminars in Social Research. (3—3—3)
Two seminar hours and one consultation hour per week. Primarily for doctoral students.

Sequence beginning (F)
289A, advanced study of the logic and method of social research, with special reference to social welfare and social work; 289B, advanced study of the methods and techniques of social research, with special reference to social welfare and social work; *289C, seminar on research design.
Mr. Greenwood (F, Sp)

296. Individual Study for Graduate Students. (1—9)
Designed to permit any qualified graduate student to pursue special study in a subject of his own choosing under the direction of a faculty member.
The Staff (Mr. Wiltsie in charge) (Su, F, W); (Mr. Chernin in charge) (Sp)

298. Group Study for Graduate Students. (1—9)
The Staff (Mr. Wiltsie in charge) (Su, F, W); (Mr. Chernin in charge) (Sp)

299. Individual Research for Graduate Students. (1—9)
Designed to permit any qualified graduate student to pursue research in a subject of his own choosing under the direction of a faculty member.
The Staff (Mr. Wiltsie in charge) (Su, F, W); (Mr. Chernin in charge) (Sp)

Professional Courses

401. Field Work. (2—10)
Four units of credit per quarter for two days in the field. First-year requirement: 12 units spread over three quarters. Second year: 14 to 18 units spread over two or three quarters. Supervised practice in social agencies. Credit and grade for the first two quarters in each year of field work will be assigned upon completion of the second quarter.
The Staff (Su, F, W, Sp)

Four to five days per week during an eleven-month period. Supervised practice in public health departments.
Mrs. Gorman (F, W, Sp)

602. Individual Study for Doctoral Students. (1—8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidate for the D.S.W. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff (Mr. Wiltsie in charge) (Su, F, W); (Mr. Chernin in charge) (Sp)

IDS 175. A Nontechnical Introduction to Operations Research. (4)
See Interdepartmental Studies for the complete description of this course.

SOCIOMETRY

(Department Office, 410 Barrows Hall)

Robert N. Bellah, Ph.D., Professor of Sociology.
Reinhart Bendix,† Ph.D., Professor of Sociology.
Herbert Blumer, Ph.D., Professor of Sociology.
John A. Clausen,† Ph.D., Professor of Sociology.

* Not to be given, 1968—69.
† On leave, 1968—69.
Kingsley Davis, Ph.D., Professor of Sociology.
Wolfram Eberhard, Ph.D., Professor of Sociology.
Nathan Glazer, Ph.D., Professor of Sociology and of Social Science.
Charles Y. Glock, † Ph.D., Professor of Sociology.
Erving Goffman, Ph.D., Professor of Sociology.
William Kornhauser, Ph.D., Professor of Sociology.
Leo Lowenthal, Ph.D., Professor of Sociology.
H. Franz Schurmann, Ph.D., Professor of Sociology and of History.
Philip Selznick, Ph.D., Professor of Sociology.
Neil J. Smelser, Ph.D., Professor of Sociology.
Harold L. Wilensky, Ph.D., Professor of Sociology.
Margaret T. Hodgen, Ph.D., Professor of Sociology, Emeritus.
Robert Blauner, Ph.D., Associate Professor of Sociology.
Kenneth E. Bock, Ph.D., Associate Professor of Sociology.
David Matza, Ph.D., Associate Professor of Sociology.
Martin A. Trow, Ph.D., Associate Professor of Sociology.
Arthur L. Stinchcombe, Ph.D., Associate Professor of Sociology.
Jan E. Dizard, Ph.D., Assistant Professor of Sociology.
Calvin Goldscheider, Ph.D., Assistant Professor of Sociology.
Roy A. Hansen, Ph.D., Assistant Professor of Sociology.
Philippe Nonet, † Ph.D., Assistant Professor of Sociology.
Richard J. Ofshe, Ph.D., Assistant Professor of Sociology.
Robert H. Somers, Ph.D., Assistant Professor of Sociology.
Benjamin D. Zablocki, Ph.D., Assistant Professor of Sociology.

Alene R. Hochschild, M.A., Acting Instructor in Sociology.
Christopher J. Hurn, M.A., Acting Assistant Professor of Sociology.
Samuel W. Kaplan, M.A., Acting Instructor in Sociology.
Gertrude Jaeger Selznick, Ph.D., Lecturer in Sociology.
Dorothy E. Smith, Ph.D., Visiting Assistant Professor of Sociology.
Ivan A. Vallier, Ph.D., Lecturer in Sociology.
Carl Werthman, M.A., Acting Assistant Professor of Sociology.
Alan B. Wilson, Ph.D., Associate Professor of Education and Lecturer in Sociology.

Departmental Major Adviser: ———
Graduate Adviser: ———

The Major
Sociology 1 or 10 or 20 or 108; 105A–105B, 109, 141, 178, and 20 units from other upper division sociology courses within the department. A course in statistics is strongly recommended for students who plan to do graduate work in sociology.

Recommended Lower Division Electives Anthropology 3; Economics 1; History 4; Psychology 1; Social Science 1A–1B; Statistics 2.

Honors Program H194A–H194B. Majors who enter their senior year with a B average are invited to join the department honors program.

The Graduate Major
Facilities for graduate study and research in sociology at Berkeley include courses, seminars, and research training under individual faculty supervision. Department members are engaged in studies of comparative institutions, demography, educational

† On leave, 1968–69.
sociology, industrial sociology, methodology, political sociology, race relations, social change in underdeveloped countries, social psychology, social stratification, sociology of culture, of health and medicine, of law, of religion, and urban sociology. Special research facilities are available through the Institutes of Industrial Relations, Human Development, and International Studies; the Survey Research Center; the Centers for the Study of Law and Society, for Research and Development in Higher Education, and for Chinese Studies; the International Population and Urban Research project, and other institutes and centers.

Admission to the Program In addition to the Graduate Division application form, the department requires special forms and requests evidence of the applicant’s creative capacity as exhibited in written work and as judged by instructors who are familiar with the student’s performance and promise. Applicants who are graduates of an American college or university must take either the Graduate Record Examination (apply to Educational Testing Service either at 1947 Center St., Berkeley, California 94704, or at Box 955, Princeton, New Jersey 08540) or the Miller Analogies Test. The portion of the GRE dealing with a substantive area may be in any field the applicant chooses; it need not be sociology.

Candidates for admission must apply by December 15. No action can be taken on an application until the department has received all the required materials.

The undergraduate major need not be in sociology. The character and quality of the individual’s prior education and experience is more important than the actual field of study.

M.A. Degree Requirements The M.A. program is designed to give a solid grounding in sociological theory and methods and to permit early assessment of the student’s promise as a potential candidate for the Ph.D. All M.A. candidates are required to take the two-quarter sequence in theory, courses 227 and 228, and to fulfill a requirement in sociological research methods. The methods requirement may be fulfilled by taking the two-quarter course 201A–201B or by passing an examination testing proficiency in methodology. A one-quarter course in statistics, or equivalent, is a prerequisite for the course 201A–201B as well as for the proficiency examination. Students who have not taken statistics are encouraged to defer taking 201A–201B until their second year.

Coursework (36 Required Units)
1. Sixteen units to fulfill the theory and methods requirements.
2. At least 12 additional units in the Department of Sociology, of which at least 8 units must be in graduate courses or seminars (4 may be in upper division courses).
3. Eight units may be upper division or graduate courses in other departments, on approval of the personal and graduate advisers.
4. Units in course 299 will not count toward the 24 required graduate sociology courses or seminars. No units in course 601 may be counted toward the required 36 units.

Deadlines for Completion
During his first five quarters of residence the student must complete (a) the requirements in methods and theory, including a paper in each of these areas; (b) at least two additional papers on sociological subjects written for instructors other than those for whom the theory and methods papers were written. The two additional papers may or may not be written as assignments in courses. A paper not written in connection with a course offered in the Department of Sociology must be submitted for appraisal to an instructor in the department. (c) 36 units as above. (Six quarters will be allowed if course scheduling does not permit the student to complete in five.)

There is no foreign language requirement for the M.A. degree.
Ph.D. Degree Requirements. A master's degree is required of all candidates for the Ph.D. degree. Students who take the M.A. at another university are expected to meet the basic course requirements for M.A. students at Berkeley, either by passing the courses or by examination. In addition, all doctoral candidates must take Sociology 202, Research Methods: Special Topics; 214, Advanced Quantitative Methods; and at least two seminars beyond the first 202 seminar and in addition to any taken to fulfill the requirements for the M.A.

Before he may take his Ph.D. oral examination, the student must have completed the required courses and must pass examinations in two approved languages (Ancient Greek, Arabic, Chinese, French, German, Hebrew, Hindi-Urdu, Italian, Japanese, Polish, Russian, Spanish) or he may elect on approval of the Graduate Division to take a single intensive examination.

The Ph.D. oral examination will cover four fields of specialization selected by the student in consultation with his adviser. One field must be either history of sociological theory or systematic sociological theory.

The two-semester requirement must be fulfilled before the student may be formally advanced to candidacy for the Ph.D. degree.

A detailed statement of requirements and procedures for the M.A. and Ph.D. degrees is available at the department office.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1. Introduction to Sociology: Selected Themes. (4)
Two lecture hours, two discussion section hours, and two consultation hours per week. Prerequisite: open only to students who have taken course 10. The instructor will choose a theme to be explored in depth and treated as a vehicle for introducing the student to the sociological perspective.
Mr. Ofshe (Su); Mr. Werthman (F); Mr. Kaplan (F, W); Mr. Hum (W); Mrs. Hochschuld (W, Sp); Mr. Zablocki (Sp)

10. Introduction to Sociology: Group Tutorial. (4)
Approximately three hours per week of tutorial sessions, lectures, and discussions to be arranged. Prerequisite: open only to students who have taken course 1 or 10. Emphasis is on guided reading and discussion.

20. Population and Society. (4)
Two lecture hours, two discussion section hours, and two consultation hours per week. Introduction to sociological analysis using demographic data and concepts.
Mr. Ofshe (W); Mr. Blauner (Sp)

49X. Sophomore Honors Seminar. (4)
Three hours per week of tutorial sessions, lectures, and discussions, and two consultation hours. Prerequisite: open only to sophomores who have received grade A or B in Sociology 1, 10, or 20. Intensive reading and discussion of important sociological works, both theoretical and empirical. Enrollment limited to 15 students.
Mr. Ofshe (W); Mr. Blauner (Sp)

Upper Division Courses

100. Social Evolution. (5)
Three lecture hours and two consultation hours per week. Major views of social development: cultural cycles, progress, social and cultural evolution.
Mr. Bock (W)

*101. Historical Sociology. (5)
Three lecture hours and two consultation hours per week. Social and cultural processes of change and persistence in Marx, Toynbee, Kroeber, Spengler, Teggart, Sorokin, Weber, and others.

105A–105B. Introduction to Sociological Methods. (5–5)
Two lecture hours, two laboratory hours, and one consultation hour per week. A two-quarter sequence course introducing the methods of sociological inquiry, with attention to both qualitative and quantitative studies. Problems of research design, measurement, and data collection, processing, and analysis, will be considered. Credit and grade will be given only upon completion of the full sequence.
Mr. Hansen (F, W); Mr. Somers (W, Sp)

107. Deviance and Social Control. (5)
Three lecture hours and two consultation hours per week. A consideration of forms, causes and controls of deviant behavior.
Mr. Matza (W)

108. Principles of Sociology. (5)
Three lecture hours and two consultation hours per week. A comprehensive survey of sociological fundamentals.

109. Sociology and Social Thought. (5)
Three lecture hours and two consultation hours per week. History of social thought as a source of present-day problems and hypotheses.
Mr. Roth (W); Mr. Selznick (Sp)

110. Race and Ethnic Relations. (5)
Three lecture hours and two consultation hours per week. Prerequisite: not open to students who have taken course 1 or course 10. An advanced, comprehensive survey of sociological fundamentals.

* Not to be given, 1968–69.
115. Major Social Problems. (5)
Three lecture hours and two consultation hours per week. The diagnosis and treatment of problems related to race relations, crime, old age, industrial conflict, political disorder.

Mr. Dizard (W); Mr. Kaplan (Sp)

117. American Society: A Comparative Analysis. (5)
Three lecture hours and two consultation hours per week. Various aspects of American values and behavior patterns over time; sources of differences from other developed nations.

Mr. Matza (F)

118. Introductory Political Sociology. (5)
Three lecture hours and two consultation hours per week. Political processes in organized groups, the social bases of power. The role of social classes, occupational groups, and religious groups, and the influence of cultural values.

Mr. Kaplan (W); Mr. Zablocki (Sp)

119. Law and Society. (5)
Three lecture hours and two consultation hours per week. Selected legal rules, principles, and institutions treated from a sociological perspective. Influence of culture and social organization on law; role of law in social change; social aspects of the administration of justice; social knowledge and the law.

Mr. Goldscheider (W)

120. Organizations and Institutions. (5)
Three lecture hours and two consultation hours per week. Administrative organizations and voluntary associations; major social institutions in industry, government, religion, and education.

Mr. Hansen (F)

123. Population Theories. (5)
Three lecture hours and two consultation hours per week. Prerequisite: course 20 or consent of instructor. A critical review of theories of population growth, structure, and distribution, from before Malthus to the present, analyzed in relation both to the history of social thought and to social, economic, and demographic trends.

Mr. Trow (W)

125. Sociology of Intellectual Life. (5)
Three lecture hours and two consultation hours per week. The status of the intellectual, knowledge and action in social thought, as analyzed by major social theorists.

Mr. Stinchcombe (W)

129. Industrial and Occupational Sociology. (5)
Three lecture hours and two consultation hours per week. The labor force; social control within and of occupations and professions (professionalization, professional associations vs. labor unions, codes of ethics, legal controls), social structure of the workplace, work experience of the participants, relation of both to community and society.

Mr. Wilensky (F)

130. Sociology of the Family. (5)
Three lecture hours and two consultation hours per week. Systematic and comparative analysis of family structure and change; marriage, reproduction, child-rearing, marital dissolution.

Mr. Goldscheider (W)

132. Social Stratification. (5)
Three lecture hours and two consultation hours per week. Recent trends in occupational stratification; social classes in local communities and the nation as related to interest organizations.

Mr. Hurn (Sp); Mr. Kaplan (Sp)

133. Methods and Documents in Population Analysis. (5)
Three lecture hours and two consultation hours per week. Prerequisite: course 20 or consent of instructor. Review of sources of demographic data, their uses and limitations, and how the data are statistically analyzed. Fertility, mortality, population composition and distribution, are included.

Mr. Kaplan (W)

134. Sociology of War and Conflict. (5)
Three lecture hours and two consultation hours per week. Violent and peaceful procedures in the pursuit of national objectives; analysis of attempts to specify the causes of war.

Mr. Somers (W)

135. Social Change in Underdeveloped Countries. (5)
Three lecture hours and two consultation hours per week. The problem of progress; factors influencing social change, especially in the modern West and Asia.

Mr. Hurn (W)

140. Social Change. (5)
Three lecture hours and two consultation hours per week. Major sources of change in societies; prediction of future changes.

Mr. Smelser (F)

141. Social Organization of Modern Western Societies. (5)
Three lecture hours and two consultation hours per week. Comparison of selected social institutions; their relation to ideas and social change.

Mr. Trow (F)

146. Sociology of Religion. (5)
Three lecture hours and two consultation hours per week. A systematic survey including sociological theory and organizational structure of religion, the character of religious authority and leadership, the individual's religion, and the interplay with other spheres of social life.

Mr. Vallier (Sp)

148. Elementary Collective Behavior. (5)
Three lecture hours and two consultation hours per week. Social contagion and crowd behavior, psychic epidemics, popular arts and interests, fashions, mass behavior, formation and manipulation of public opinion.

Mr. Zablocki (Sp)

150. Human Migration. (5)
Three lecture hours and two consultation hours per week. History of international migration and analysis of internal migration, study of international labor and in selected and demographic communities.

160. Urban Sociology. (5)
Three lecture hours and two consultation hours per week. The urban community; the functions it performs; the types of conflict and the urban world view.

161A-1B. Independent Study. (5)
Two lecture hours and two consultation hours per week.

165. Japanese Societies. (5)
Three lecture hours and two consultation hours per week. Selected aspects of Japan, India, China, and Other countries.

167. Modernization. (5)
Three lecture hours and two consultation hours per week. Selected modernizing societies.

174. Social Change. (5)
Three lecture hours and two consultation hours per week. The history and analysis of social change.

175. Communism. (5)
Three lecture hours and two consultation hours per week. The history and analysis of Soviet-type societies.

176. Small Societies. (5)
Three lecture hours and two consultation hours per week. The analysis of small societies, such as tribes, clans, and tribes, and the interplay of group life and local tradition.

177. Espionage. (5)
Three lecture hours and two consultation hours per week.

178. Social Movement. (5)
Three lecture hours and two consultation hours per week. The social movement and society.
160. Urban Sociology and Ecology. (5)
Three lecture hours and two consultation hours per week. The nature, causes, and consequences of world urbanization; metropolitan areas; location and types of cities, social and demographic characteristics of urban populations.
Mr. Ofshe (F, W)

161A—161B. Urban Problems. (5—5)
Two lecture hours, two seminar hours, and one consultation hour per week. A research practicum.
Mr. Werthman (F, W)

165. Japanese Society. (5)
Three lecture hours and two consultation hours per week. The nature of traditional Japanese society and its modern transformation. The place of values, world view and religion will be especially emphasized.
Mr. Bellah (W)

166. Agricultural Oriental Societies. (5)
Three lecture hours and two consultation hours per week. Main characteristics of medieval China, Japan, India as compared with the West. Research methods.
Mr. Eberhard (F)

167. Modern Social Structure in the Near East. (5)
Two lecture hours and two consultation hours per week. Social organization of contemporary Near East. Contacts of nomads with settled groups. Processes of modernization in both groups.
Mr. Eberhard (Sp)

174. Sociology of Literature. (5)
Three lecture hours and two consultation hours per week. The relation of literature to the social order and to systems of social control. Analysis of the social role of the writer.

175. Communication and Social Contact. (5)
Three lecture hours and two consultation hours per week. Prerequisite: recommended: course 1 or 10. The establishment of communication channels by differential contact and association; the emergence of consensus in primary and secondary groups; the organization and modification of perspectives in mass societies.
Mr. Lennard (F)

176. Small Groups. (5)
Three lecture hours and two consultation hours per week. An examination of sociological theories and research on behavior in small groups. Topics such as status relations, communication, coalitions and interpersonal conflict are examined in light of field and laboratory research.
Mr. Ofshe (F)

177. Experimental Research in Sociology. (5)
Three lecture hours and two consultation hours per week.
Mr. Ofshe (Sp)

178. Social Interaction and Personal Organization. (5)
Three lecture hours and two consultation hours per week. A critical analysis of dominant theories and schemes of research in social psychology.
Mr. Blumer (Sp)

184. Social Structure of Communist Societies. (5)
Three lecture hours and two consultation hours per week. Various aspects of the class system, economic life, nationality groups, the family, education, demographic factors; comparison of communist social structure with American.
Mr. Schurmann (W)

191. Experimental Courses. (5)
Three lecture hours and two consultation hours per week. Prerequisite: recommended: course 1 or 10. Prerequisite: open only to seniors in sociology who are seeking an A.B. degree with honors. Intensive study of individual topic to provide background for honors thesis. Group and individual conferences. Credit and grade will be assigned only upon completion of the full sequence.
Mr. Kornhauser (W, Sp)

199. Special Study for Advanced Undergraduates. (1—5)
Prerequisite: restricted to senior honor students.
The Staff (Su, F, W, Sp)

Graduate Courses

201A—201B. Methods of Sociological Research. (4—4)
Two lecture hours and two consultation hours per week. Prerequisite: course 105 or equivalent. A two-quarter sequence course treating sociological methods, emphasizing the logic of social inquiry, problems of research design and execution, and qualitative and quantitative analysis. Laboratory work will be offered in problems of design, data collection, and analysis. Credit and grade will be given only upon completion of the full sequence.
Mr. Stinchcombe (W, Sp)

202. Seminars in Residence Methods. (4)
Two seminar hours and two consultation hours per week. Prerequisite: courses 201A—201B or equivalent.
Mr. Goffman, Mr. Ofshe, Mr. Vallier, Mr. Zablocki (W); Mr. Matza, Mr. Somers, Mr. Stinchcombe (Sp)

*204A—204B. Social Contacts. (4—4)
Two-hour meeting and two consultation hours per week. A two-quarter sequence course. Social units and dynamics of face-to-face interaction in natural setting; communication aspects of public order.

206. Socialization and Personality. (4)
Two lecture hours and two consultation hours per week. Goals and process of socialization; the self, organized social roles as mediated through the norms and patterned interactions of family, peer group and school.
Mr. Komhauser (W, Sp)

* Not to be given, 1968–69.
207. Analysis of Social Action. (4)
Two lecture hours and two consultation hours per week. Advanced social psychology, particularly from the viewpoint of George H. Mead; the nature of the social situation, social roles, the self, socialization, the social act. Mr. Blumer (F)

210. Racial and Ethnic Minorities. (4)
Two lecture hours and two consultation hours per week. Describes and analyzes the nature of minorities and their relations with dominant members of society. Stresses processes of subjugation, accommodation and mobilization. Different kinds of minorities compared to convey the range of differences as well as similarities. Mr. Blauner (W)

212. Deviance and Social Control. (4)
Two lecture hours and two consultation hours per week. Deviance and social system analysis; ethnography of deviant communities. Mr. Matza (F)

214. Advanced Quantitative Methods. (4)
Two lecture hours and two consultation hours per week. Prerequisite: Statistics 130A or equivalent. Analysis of variance and its application to sociological problems; multiple and partial correlation and regression; sampling procedures; introduction to scaling theory and factor analysis. Mr. Hansen (Sp)

217. History of Social Thought. (4)
Two lecture hours and two consultation hours per week. Mr. Lowenthal (F)

219. Sociology of Law. (4)
Two lecture hours and two consultation hours per week. Functions of law in society; social sources of legal change; social conditions affecting the administration of justice; role of social science in jurisprudence. Mr. Selznick (F)

222. Sociology of Education. (4)
Two lecture hours and two consultation hours per week. The study of educational systems and processes, with special emphasis on the relations of education to other social institutions. Mr. Trow (Sp)

224. Social Change. (4)
Two lecture hours and two consultation hours per week. Stresses the rise and spread of industrialism to underdeveloped countries. Mr. Dizard (F)

227. Basic Issues in Sociological Theory. (4)
Two lecture hours and two consultation hours per week. Mr. Smelser (W)

228. Seminars in Sociological Theory. (4)
Two seminar hours and two consultation hours per week. Prerequisite: course 227 or equivalent. Mr. Blumer, Mr. Roth (F); Mr. Selznick (W); Mr. Bock (Sp)

229. Sociology of Work. (4)
Two seminar hours and two consultation hours per week. The organization of work and varieties of work experience. Topics: occupational roles and career patterns; the interplay of machine, man, colleague group, and complex organization; worker participation in management; social aspects of industrial conflict; labor, industry, and society. Mr. Willensky (W)

*230. Population. (4)
Two lecture hours and two consultation hours per week. Prerequisite: a course in population or consent of instructor. Problems in the theory of population; institutional and motivational aspects of demographic behavior. Mr. Selznick (F)

231. Sociology of Marriage, Family, and Kinship. (4)
Two lecture hours and two consultation hours per week. Family structure and behavior, including family life cycle, family and law, kinship. Mr. Blauner (W)

232. Social Stratification. (4)
Two lecture hours and two consultation hours per week. Theoretical and methodological problems in the field, with special emphasis on comparative materials. Mr. Roth (Sp)

241. Organizations and Institutions. (4)
Two lecture hours and two consultation hours per week. Mr. Schurmann (Sp)

242. Comparative Social Structure. (4)
Two lecture hours and two consultation hours per week. Mr. Eberhard (W)

246. Sociology of Religion. (4)
Two lecture hours and two consultation hours per week. Prerequisite: course 146, or consent of instructor. Mr. Bellah (W)

248. Collective Behavior. (4)
Two lecture hours and two consultation hours per week. Studies in mass behavior, social movements, and political action. Mr. Blumer (W)

253. Sociology of Culture. (4)
Two lecture hours and two consultation hours per week. Theories of elite and popular cultures, particularly in modern mass society; sociology of knowledge, the arts, popular culture, and education. Mr. Lowenthal (W)

254. Sociology of Health and Medicine. (4)
Two lecture hours and two consultation hours per week. A general orientation to sociological theory and research bearing upon the phenomena of health and disease and the organization and functioning of societal efforts to cope with disease. Mr. Lowenthal (W)

255. Sociology of Mental Health. (4)
Two lecture hours and two consultation hours per week. Social and cultural aspects of mental illness: etiology, symptomatology, and duration; social and organizational responses. Mr. Lowenthal (W)

260. Political Sociology. (4)
Two lecture hours and two consultation hours per week. Contributions of sociology to theory and research in politics. Analysis of structure and ideology of organized groups. Mr. Kornhauser (F)

262. Urbanization. (4)
Two lecture hours and two consultation hours per week. Urbanization in the world and in particular countries. Causes and consequences of organization, theory of city location, patterns of city growth, problems of measurement. Mr. Davis (Sp)
290. Seminar. (4)

Two seminar hours and two consultation hours per week. Advanced study in modern sociology. The specific topics will be announced at the beginning of each quarter.

Mr. Ofshe, (Su); Mr. Eberhard, Mr. Goffman, Mr. Lowenthal (F); Mr. Kornhauser, Mrs. G. Selznick (W); Mr. Davis, Mr. Dizard, Mr. Goldscheider, Mr. Wilensky (Sp)

299. Individual Study and Research. (1–9)

Primarily for students engaged in writing a Ph.D. dissertation. May not be substituted for available graduate lecture courses or course 290.

The Staff (Su, F, W, Sp)

601. Individual Study for Master’s Students. (1–8)

Individual study for the comprehensive requirements in consultation with the advisor. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis.

The Graduate Adviser (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.

The Graduate Adviser (Su, F, W, Sp)

SOILS AND PLANT NUTRITION

(Department Office, 108 Hilgard Hall)

Kenneth L. Babcock, Ph.D., Professor of Soil Chemistry.
Theodore C. Broyer, B.S., Professor of Plant Physiology.
Paul R. Day, Ph.D., Professor of Soil Physics (Chairman of the Department).
Louis Jacobson, Ph.D., Professor of Plant Physiology.
A. Douglas McLaren, Ph.D., Professor of Soil Biochemistry.
Roy Overstreet, Ph.D., Professor of Soil Chemistry.
James P. Bennett, Ph.D., Professor of Plant Physiology, Emeritus.
Geoffrey B. Bodman, Ph.D., Professor of Soil Physics, Emeritus.
R. Earl Storie, B.S., Professor of Soil Technology, Emeritus.
Lawrence J. Waldron, Ph.D., Assistant Professor of Soil Physics.

Rodney J. Arkley, Ph.D., Lecturer in Soils and Plant Nutrition.
Daniel I. Arnon, Ph.D., Professor of Cell Physiology.
Isaac Barshad, Ph.D., Lecturer in Soils and Plant Nutrition.
Eugene L. Begg, B.S., Lecturer in Soils and Plant Nutrition, Davis.
A. Herbert Gold, Ph.D., Professor of Plant Pathology.
Maynard A. Joslyn, Ph.D., Professor of Food Technology.
Gordon Mackinney, Ph.D., Professor of Food Technology.
Edward C. Stone, Ph.D., Professor of Forestry.
Perry R. Stout, Ph.D., Professor of Soil Science, Davis.
Albert Ulrich, Ph.D., Lecturer in Soils and Plant Nutrition.
D. Emerton Williams, Ph.D., Lecturer in Soils and Plant Nutrition.
Paul J. Emerton, Ph.D., Associate Professor of Forestry.

Undergraduate Major Adviser: Mr. Babcock.
Graduate Adviser for Soil Science: Mr. Waldron.
Graduate Adviser for Plant Physiology: Mr. Broyer.

The Department of Soils and Plant Nutrition in the College of Agricultural Sciences offers a major in soils and plant nutrition under the Agricultural Sciences Curriculum (see page 145). The requirements for the major involve both biological and physical sciences. Flexibility is provided by the inclusion of a substantial number of electives to be selected in consultation with the undergraduate adviser. The program may be broadly selected so as to include a wide variety of subjects relating to the improvement of production methods for food and fiber as well as the evaluation of the resources
of the agricultural industry. Alternatively, the student may undertake more specialized work, including preparation for graduate study in either soil science or plant physiology.

**Undergraduate Major Requirements**

**Humanities and Social Sciences**, 18 units as follows: English, speech, or comparative literature (8); restricted electives (anthropology, art, classics, decorative art, dramatic art, economics, foreign languages, geography, history, music, philosophy, political science, psychology, sociology, or additional English or Speech) (10).

**Physical Sciences and Mathematics**, 32 units as follows: chemistry (12); geology (4); physics (12); analytic geometry and calculus (4).

**Biological and Agricultural Sciences**, 22 units as follows: biology (15); plant ecology or world agriculture (3); plant pathology (4).

**Major Field**, 36 units as follows: plant nutrition (6); soil characteristics (4); development and morphology of soils (4); soil as a medium for plant growth (5); soil microbiology (4); additional courses in soil science (13).

**Additional courses**, 72 units.

Total units, 180.

Certain courses may be required in satisfaction of the above. The undergraduate adviser will provide this information and any other details about the major.

**Graduate Programs**

The Department of Soils and Plant Nutrition offers work leading to the M.S. and Ph.D. degrees in soil science or plant physiology. Typical areas of specialization include soil chemistry, soil physics, soil microbiology, soil genesis and morphology, soil fertility, plant or soil biochemistry, plant nutrition, plant physiology, plant-soil relationships, and water relations of plants and/or soils. In addition, degrees are available in agricultural chemistry, biophysics, comparative biochemistry, microbiology, and other group programs in which individual faculty members participate.

Candidates for advanced degrees in **Soil Science** are required to show competence in mathematics (calculus), in the physical, biological, and earth sciences, and in soil science and plant nutrition. The M.S. degree may be obtained either by the thesis plan or by comprehensive examination. Applicants for the Ph.D. degree must satisfy the foreign language requirement before taking the oral qualifying examination. At least two units of graduate seminar credit are required.

Candidates for advanced degrees in **Plant Physiology** are required to secure a strong background in mathematics (including calculus and biometry), botany, chemistry, physics, and biochemistry in addition to prescribed courses in genetics, plant nutrition, and soil science. After admission to candidacy, a student may obtain the M.S. degree by means of a thesis based on individual research, or by means of a comprehensive examination. Ph.D. candidates must satisfy a foreign language requirement before taking the oral qualifying examination. Appropriate graduate seminars are prescribed during doctorate study.

For further details, consult the appropriate graduate adviser.

**Soil Science**

**Lower Division Courses**

10. The Soil and Its Significance to Man. (3)

Three 1-hour lectures per week. **Prerequisite:** Chemistry 1A or high school chemistry. Cannot be used for credit in the soil science major. For students who desire a general knowledge of soils.

10L. The Soil and Its Significance to Man—Laboratory. (1)

One 3-hour meeting per week: laboratory, demonstrations, and field trips. **Prerequisite:** course 10 (may be taken concurrently). Mr. Williams (Sp)

**Upper Division Courses**

100. Soil Characteristics. (4)

Three 1-hour lectures per week; one 3-hour laboratory per week; one field trip. **Prerequisite:** Chem-
114. Properties of Colloidal Particles and Systems. (2)
Two 1-hour lectures and discussions per week. Prerequisite: a course in physical chemistry. Offered in odd-numbered years. Properties of colloidal systems of importance in agriculture and biology.
Mr. McLaren (F)

116. Soil Management. (3)
Two 1½-hour lectures and demonstrations per week. Prerequisite: senior standing in soil science. Estimation of soil fertility by soil and tissue analyses and plant growth methods; use of fertilizers; soil physical properties related to management problems.
Mr. Ulrich, Mr. Arkley (Sp)

199. Special Study for Advanced Undergraduates. (1–5)
Open only to students with an average grade of at least B, and subject to the approval of the undergraduate advisor in soil science.
The Staff (Su, F, W, Sp)

203. Soil Resource Evaluation. (3)
One 2-hour lecture per week; field work. Prerequisite: training in any of the following fields: soil science, forestry, range management, irrigation, land economics, geography. Survey data interpretations for appropriate land uses; cultivation, grazing, timber, watershed, and multiple use; tax and economic appraisals.
Mr. Arkley (W)

205. Soil Stratigraphy. (4)
One 1-hour lecture per week; one 3-hour laboratory per week; field work. Prerequisite: course 101 or 105; Geology 5A; or consent of instructor. Pedologic and geologic techniques are used to solve problems of soil genesis, the dating and correlation of alluvial deposits, and the interpretation of Quaternary history.
Mr. Arkley (W)

211. Advanced Soil Biochemistry and Soil Biology. (2)
Two 1-hour lectures and discussions per week. Prerequisite: course 111 or equivalent. Offered in even-numbered years. Microbial activity at surfaces of alluvial deposits, and the interpretation of Quaternary history.
Mr. Arkley (W)

212. Advanced Soil Chemistry. (4)
Two 1-hour and one 2-hour lectures per week. Prerequisite: course 110; Chemistry 109. Applications of thermodynamics to soil systems.
Mr. Babcock (W)

213. Pedochemistry and Mineralogy of Soils. (3)
Three 1-hour lectures per week. Prerequisite: graduate standing in soil science or consent of instructor. Crystal structure and colloid chemistry of soil clay minerals; application of principles of mineralogy and chemistry to a quantitative evaluation of soil formation.
Mr. Barshad (W)

213L. Pedochemistry and Mineralogy of Soils. (2–5)
Laboratory, six to fifteen hours per week. Prerequisite: course 211 or 213, may be taken concurrently. Chemical and mineralogical analyses for evaluating soil profile formation and chemistry of soil organic matter. Laboratory exercises adapted to individual interest of the student. Mr. Barshad (W)

110. The Soil as a Medium for Plant Growth. (5)
Five 1-hour lectures per week. Prerequisite: Chemistry 1A–1B–1C. Chemistry of plant, soil, and microbial interrelationships under acid, alkaline, and saline regimes; nutritional factors in productivity, reclamation, and conservation.
Mr. Babcock (F)

111. Soil Microbiology and Soil Biochemistry. (4)
Two 1-hour lectures per week; laboratory, six hours per week. Prerequisite: Biology 1A–1B–1C; Chemistry 3 and 8A–8B. Activities of microorganisms related to soil organic matter, soil properties, and the rhizosphere.
Mr. McLaren (Sp)

112. Soil Chemistry in Relation to Plant Growth. (3)
Two 1½-hour lectures per week. Prerequisite: course 110 and Chemistry 5. Properties of the physicochemical environment influencing plant growth.
Mr. Overstreet (W)

113. Soil Chemistry in Relation to Plant Growth. (3)
Three 3-hour laboratories per week. Prerequisite: course 112 (usually taken concurrently); Chemistry 5. Liquid, solid, and gaseous phases of soils; cation exchange; solubility, buffering, salinity, reactions; chemistry of macronutrients and micronutrients.
Mr. Overstreet (W)

102. Soil Physics. (5)
Three 1-hour lectures per week; two 3-hour laboratories per week. Prerequisite: course 100, Mathematics 16A–16B. Analysis of important physical processes occurring in soil and of the soil physical properties affecting them.
Mr. Waldron (W)

103. Soils of California and the Western United States. (4)
Three 1-hour lectures per week; one hour discussion per week; two field trips to be arranged. Prerequisite: Geology 5A, 10, or 15; Chemistry 1A. Characterization and geography of agricultural, grazing, and forest soils of the western United States, with emphasis on soils of arid regions; their identification, classification, and use rating.
Mr. Arkley (W)

105. Summer Field Course. (8)
Six weeks, daily. Prerequisite: course 100, 101, or 103, and consent of instructor. Field study of soils, with emphasis on their characteristics, morphology, and genesis. Field exercises in classifying and mapping soils, and preparation of soil survey reports. Practice in identifying and evaluating soils for agricultural, range, forest, and other use.
Mr. Arkley, Mr. Begg (Extrasession)

106. Development and Morphology of Soils. (4)
Three 1-hour lectures and 1-hour discussion per week. Prerequisite: Geology 10; Chemistry 1A; Geology 5A or 10. Properties of the physicochemical environment influencing plant chemistry of macronutrients and micronutrients.
Mr. Day (F)
220. Soil Physics. (5)
Five 1-hour lectures per week. Prerequisite: course 102; Mathematics 1A–1B–1C, and consent of instructor. Advanced course dealing with the dynamics of soil water and soil deformation theory, with applications to irrigation, drainage, and tillage.
Mr. Day (Sp)

235. Seminar. (2)
One 1½-hour meeting per week. Prerequisite: graduate standing in soil science, plant physiology, or related subjects.
The Staff (W)

299. Research in Soil Science. (1–12)
Prerequisite: graduate standing and consent of instructor.
The Staff (W)

601. Individual Study for Master’s Students. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff, Mr. Waldron in charge (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff, Mr. Waldron in charge (Su, F, W, Sp)

Staff Seminar in Soil Science. (No credit)
The Staff (F, W, Sp)

Plant Nutrition

Upper Division Courses

115. The Nutrition of Green Plants. (3)
Three 1-hour lectures per week. Prerequisite: Botany 140. Evolution of modern concepts of plant nutrition, including functional aspects of inorganic nutrients, photosynthesis, nitrogen metabolism.
Mr. Broyer (F)

117. The Nutrition of Green Plants—Laboratory. (3)
Three 3-hour laboratories per week. Prerequisite: course 115 (taken concurrently if possible); Chemistry 5. Laboratory and greenhouse experiments in plant nutrition to accompany course 115.
Mr. Jacobson (F)

199. Special Study for Advanced Undergraduates. (1–5)
Prerequisite: senior standing and consent of student’s major adviser.
The Staff
Graduate Courses

206. Seminar in Plant Physiology. (2)
One 1½-hour meeting per week. Prerequisite: qualified graduate students with consent of staff member in charge. Problems of plant physiology in the field of botany, food science, forestry, plant nutrition, and soil science.
Mr. Babcock, Mr. Broyer, Mr. Gold, Mr. Jacobson, Mr. Joslyn, Mr. Mackinney, Mr. Overstreet, Mr. Stone, Mr. Stout, Mr. Ulrich, Mr. Williams (F, W)

*222. Unifying Concepts of Photosynthesis. (3)
Two 1½-hour lectures per week. Prerequisite: consent of instructor. Carbon assimilation, structure of photosynthetic apparatus, light and dark reactions, with special emphasis on energy conversion, photosynthetic phosphorylation, and photosynthesis in subcellular systems.
Mr. Arnon (F)

299. Research in Plant Nutrition. (1–12)
Prerequisite: graduate standing and consent of the instructor.
The Staff (Su, F, W, Sp)

601. Individual Study for Master’s Students. (1–8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master’s degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff, Mr. Broyer in charge (Su, F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis.
The Staff, Mr. Broyer in charge (Su, F, W, Sp)

Staff Seminar in Plant Nutrition. (No credit)
The Staff (F, W, Sp)

SPANISH AND PORTUGUESE

(Department Office, 4321 Dwinelle Hall)

G. Arnold Chapman, Ph.D., Professor of Spanish (Vice-Chairman of the Department).
Luis Monguío, Licenciado en Derecho, LL.D., Professor of Spanish (Chairman of the Department).
Edwin S. Morby, Ph.D., Professor of Spanish.
Antonio Rodríguez-Moñino,** Doctor en Filosofía y Letras, Docteur ès Lettres (h.c.), Professor of Spanish.
Dorothy C. Shadi, Ph.D., Professor of Spanish.

* Not to be given, 1968–69.
** Appointment as Humanities Research Professor, fall and winter quarters.
Charles E. Kany, Ph.D., Professor of Spanish, Emeritus.
José F. Montesinos, Licenciado en Filosofía y Letras, Docteur ès Lettres (h.c.), LL.D.,
Professor of Spanish, Emeritus.
S. Griswold Morley, Ph.D., Litt.D., Professor of Spanish, Emeritus.
Lesley B. Simpson, Ph.D., Professor of Spanish, Emeritus.
Robert K. Spaulding, Ph.D., Professor of Spanish, Emeritus.
Arturo Torres-Rioseco, Ph.D., Professor of Latin-American Literature, Emeritus.
Louis A. Murillo, Ph.D., Associate Professor of Spanish.
John H. R. Polt, Ph.D., Associate Professor of Spanish.
Benjamin M. Woodbridge, Jr., Ph.D., Associate Professor of Portuguese.
Arthur L. Askins, Ph.D., Assistant Professor of Spanish.
Demetrios Basdekis, Ph.D., Assistant Professor of Spanish.
Jerry R. Craddock, Ph.D., Assistant Professor of Spanish.
Donald R. Larson, Ph.D., Assistant Professor of Spanish.
Rafael Pérez de la Dehesa, Ph.D., Assistant Professor of Spanish.
Michael J. Ruggerio, Ph.D., Assistant Professor of Spanish.
Martin C. Taylor, Ph.D., Assistant Professor of Spanish.

Departmental Major Advisers: Mr. Askins, Mr. Larson, Mr. Pérez de la Dehesa, Mr. Ruggerio, Mr. Taylor.

The sequence of undergraduate and graduate programs of the Department of Spanish and Portuguese is designed to lead from the acquisition of competence in written and spoken Spanish or Portuguese, through an acquaintance with the structure and history of one or both of these languages and a critical understanding of the development and achievements of their literatures in the Old World and in the New, to training in advanced study and independent research. The department has always maintained a balanced strength between language and literature and between Peninsular and Hispanic-American facets of a unified field.

The Major

**Lower Division** 1, 2, 3, and 4 (or their equivalents); 9A–9B or 9LA–9LB (9LA–9LB to be passed with a grade of A or B); 25A–25B–25C. Passing course 4 with a grade of A entitles a student to proceed directly to 25A. One year of high school Latin, or Latin 1 (to be completed before entering upon the senior year). Students transferring from other institutions with advanced standing and intending to major in the department must present evidence (by examination or otherwise) that their preparation includes the equivalent of Spanish 25A–25B–25C.

**Upper Division** 40 units of upper-division work in the department, including: 103A–103B; 104A–104B–104C; 107A–107B–107C (see below the prerequisite to the 107 sequence). The remaining 16 units must be completed from among the upper division courses in Spanish and, with the consent of the adviser, may include up to four units of upper division courses in Portuguese. Recommended: further study in French, German, Italian, Latin, and Portuguese; and History 147A–147B, 156A–156B.

**Honors Program** To be admitted to the honors program in Spanish, students shall have completed at least three quarters of work on this campus with a general average of at least 3.0 and a departmental average of at least 3.0, and have the approval of the major adviser in consultation with other members of the department.

Students admitted to the honors program shall complete, prior to the beginning of the senior year, courses 103A–103B, 104A–104B–104C and 107A–107B–107C, or give evidence, by special examination, of equivalent preparation. The prerequisite
Preparation for Graduate Study  Students who may wish to pursue work toward advanced degrees in Spanish should note that a broader foundation in Latin than that required in the baccalaureate major is a prerequisite for such work. A minimum of one year of college Latin (or equivalent) is therefore strongly recommended. They should note that the M.A. degree program in Spanish also requires a reading knowledge of another language; and that the Ph.D. degree program in Romance languages and literature requires a reading knowledge of Latin, French, and Italian, besides Spanish.

Students (other than Berkeley A.B. Spanish majors) applying for admission to graduate study in the Department of Spanish and Portuguese should have an undergraduate preparation reasonably approximating that of the undergraduate major in Spanish at Berkeley.

The Graduate Programs  The requirements for an M.A. degree in Spanish are: an A.B. degree with a major in Spanish equivalent to the undergraduate major in Spanish at the University of California, Berkeley (see above); an elementary knowledge of Latin; a reading knowledge of another language; 36 units of post-baccalaureate work in the Department of Spanish and Portuguese at Berkeley, of which at least 18 units must be in strictly graduate courses (200 series) including Spanish 212A–212B–212C, Old Spanish; and a comprehensive written and oral examination. The examination covers Spanish philology and all periods and genres of Spanish and Spanish-American literature.

The doctoral program in Romance languages and literature with emphasis on Hispanic literature requires an A.B. degree with a major in Spanish approximately equivalent to the undergraduate major at Berkeley. No specific courses are required, but the student in consultation with a graduate adviser will lay out a program designed to prepare him for qualifying examinations preceding advancement to candidacy. As early as possible, he must demonstrate a reading knowledge of Latin, Italian, and French, by a reading examination in one of these languages, and by written examination or appropriate course work in the others. A reading knowledge of German is also recommended. The precise nature of the qualifying examinations will depend on the student's choice of two alternative plans of preparation, both of which require a detailed knowledge of Spanish and Spanish-American literature and familiarity with Romance philology, with emphasis on Spanish. Plan I further requires a knowledge of a second Romance literature as a collateral, and of prescribed masterpieces in the third. Plan II requires a command of one broad, integrated field (period, movement,
Letters and Science List: for regulations governing this list, see page 80.

Spanish

Lower Division Courses

Duplication of Credit. A student will not be allowed unit credit for that part of Spanish 1, 2, 3, or 4 which duplicates courses previously completed in secondary school or in another institution of collegiate grade. The first unit of secondary school credit in Spanish is considered to be equivalent to the first quarter course; each successive unit of credit is equal to one additional course (4–5 units) in a sequence of four quarter courses in college.

1. Elementary Spanish (Beginner's Course). (4)
   Five 1-hour class meetings per week; laboratory periods to be arranged.
   Mr. Larson in charge (Su, F, W, Sp)

2. Elementary Spanish (Continuation of 1). (4)
   Five 1-hour class meetings per week; laboratory periods to be arranged. Prerequisite: course 1 or equivalent or a satisfactory score on the placement test.
   Mr. Askins in charge (Su, F, W, Sp)

3. Intermediate Spanish (Continuation of 2). (5)
   Five 1-hour class meetings per week; laboratory periods to be arranged. Prerequisite: course 3 or equivalent or a satisfactory score on the placement test.
   Mr. Taylor in charge (Su, F, W, Sp)

4. Intermediate Spanish (Continuation of 3). (5)
   Five 1-hour class meetings per week; laboratory periods to be arranged. Prerequisite: course 3 or equivalent or a satisfactory score on the placement test. Mr. Perez de la Dehesa in charge (Su, F, W, Sp)

9A–9B. Intermediate Spanish. (4–4)
   Four 1-hour class meetings per week. Prerequisite: course 3 or equivalent or a satisfactory score on the placement test. May be taken concurrently; a student may receive credit for both courses 9A–9B and 9LA–9LB. Mr. Ruggerio in charge (Su, F, W, Sp)

9LA–9LB. Introduction to Spanish Literature. (4–4)
   Four 1-hour class meetings per week. Prerequisite: course 4 or equivalent or a satisfactory score on the placement test. Courses 9A–9B and 9LA–9LB may be taken concurrently; a student may receive credit for both. Mr. Ruggerio in charge (Su, F, W, Sp)

   Three class hours per week. Prerequisite: course 4 (with a grade of A) or course 9A–9B or course 9LA–9LB (the latter with a grade of A or B), or equivalent. Recommended: sophomore standing. Required of majors. 25A and 25B, or 25B and 25C may be taken concurrently. Mr. Askins in charge (Su, F, W, Sp)

39. Spanish and Spanish-American Literature in English Translation. (4)
   Three class hours per week. Open to students in all departments of the University. No knowledge of Spanish necessary.
   39A. Spain: Medieval Period, Renaissance, and Golden Age. Mr. Basdekis (F)
   39B. Spain: Neo-Classical Period to Present Day. Mr. Basdekis (Su, W)
   39C. Spanish America: To the End of the Nineteenth Century. Mr. Askins, Mr. Chapman (F, Sp)
   39D. Spanish America: Modernism and the Contemporary Period. Mr. Chapman (Su, W)

Upper Division Courses

Prerequisite to all upper division courses: 26 units of lower division Spanish or the equivalent.

100. Introduction to Spanish Linguistics. (3)
   Three class hours per week.

102. American-Spanish Divergencies from Standard Castilian. (3)
   Three class hours per week.

103A–103B. History of Spanish Literature: 1700 to the Present. (3–3)
   Three class hours per week. Required of majors. Sequence beginning (F, Sp), Mr. Basdekis, Mr. Perez de la Dehesa

103C. Study of a Prose Genre of the Nineteenth Century. (4)
   Three class hours per week.

   Three class hours per week. Required of majors.

105. Modern Peninsular Drama: From the Romantic Movement to the Present. (4)
   Three class hours per week. Mrs. Shadi (F)

107A–107B–107C. History of Spanish Literature to 1700. (3–3–3)
   Three class hours per week. Required of majors. Sequence beginning (F), Mr. Morby, Mr. Larson, Mr. Murillo

108. Introduction to the Ballad. (4)
   Three class hours per week.

* Not to be given, 1968–69.
109A–109B. Spanish Drama of the Sixteenth and Seventeenth Centuries. (3–3)
Three class hours per week.
Sequence beginning (F), Mr. Ruggerio

110A–110B. Twentieth-Century Peninsular Prose. (3–3)
Three class hours per week.
Sequence beginning (W), Mr. Pérez de la Dehesa

111A–111B–111C. Cervantes. (3–3–3)
Three class hours per week.
Sequence beginning (F), Mr. Montesinos

112. Studies in Spanish Culture. (4)
Three class hours per week.
Mr. Rodríguez-Monino (Sp)

*113. Studies in Latin-American Culture. (4)
Three class hours per week.

Three class hours per week.

115. A Survey of Spanish Lyric Poetry. (4)
Three class hours per week.
Mrs. Shadi (W)

Three class hours per week. Required of candidates for the Certificate of Completion, teacher training curriculum, whose major or minor is Spanish. 116A and 116B or 116B and 116C may be taken concurrently.
Mr. Basdekis, Mr. Larson, Mr. Ruggerio (Su, F, W, Sp)

125. Spanish Pronunciation. (3)
Three class hours per week. Required of candidates for the Certificate of Completion, teacher training curriculum, whose major is Spanish, and recommended for those whose minor is Spanish. — (F, Sp)

*131. A History of the Spanish Lexicon. (3)
Three class hours per week. A brief introductory survey of the lexical strata against the background of Hispanic cultural history. — (Sp)

H198A–H198B–H198C. Spanish Honors Course. (3–3–3)
The Staff (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (2–4)
Restricted to senior honor students with an adequate preparation for the subject proposed for special study, and by previous arrangement with members of the departmental staff. The Staff (Su, F, W, Sp)

Graduate Courses
(Concerning conditions for admission to graduate courses, see page 139.)
In the requirements for the master's degree this department follows Plan II.

*200A–200B–200C. Early Spanish Literature. (2–2–2)
One 2-hour meeting per week. Analytical history of Spanish literature to the Renaissance: the development of the various genres; the provincial literatures; a thorough grounding in bibliography; the development of a critical attitude.
Sequence beginning (F),

201A–201B–201C. History of Hispanic Poetry. (2–2–2)
One 2-hour meeting per week. Studies of a period, movement, or type of Spanish language poetry. When appropriate the study will include both Spanish and Spanish-American poetry. Course may be repeated for credit when topic changes. Topic for 1968–69: Spanish Baroque Poetry.
Sequence beginning (F), Mr. Montesinos

*203A–203B–203C. Techniques of Literary Scholarship. (2–2–2)
One 2-hour meeting per week.
Sequence beginning (F), Mr. Rodríguez-Monino

204A–204B–204C. The Spanish-American Novel. (2–2–2)
One 2-hour meeting per week.

205A–205B–205C. Contemporary Spanish-American Poetry. (2–2–2)
One 2-hour meeting per week. A study of aesthetic principles and poetic movements.
Sequence beginning (F), Mr. Monguíó

One 2-hour meeting per week. Literary movements and types in eighteenth-century Spain, and their aesthetic principles and philosophical framework.
Sequence beginning (F), Mr. Polt

*208A–208B–208C. The Ballad. (2–2–2)
One 2-hour meeting per week.
Sequence beginning (F), Mr. Rodríguez-Monino

212A–212B–212C. Old Spanish. (2–2–2)
One 2-hour meeting per week. Required for candidates for the Master's degree.
Sequence beginning (F), Mr. Craddock

One 2-hour meeting per week.
Sequence beginning (F), Mr. Montesinos

*214A–214B–214C. Modernism in Hispano-America. (2–2–2)
One 2-hour meeting per week.

*215A–215B–215C. Moralists and Satirists of the Sixteenth and Seventeenth Centuries. (2–2–2)
One 2-hour meeting per week.
Sequence beginning (F), Mr. Montesinos

216. Spanish Versification. (2)
One 2-hour meeting per week.
Mrs. Shadi (Sp)

* Not to be given, 1968–69.
226A–226B–226C. Critical and Stylistic Studies of a Single Author or Genre. (2–2–2)

One 2-hour meeting per week. Course may be repeated for credit when topic changes.
Sec. 1, topic for 1968–69: Lope de Vega.
Sec. 2, topic for 1968–69: Cervantes, Don Quijote.
Mr. Ruggerio (Sp) *228A–228B–228C. The Literature of a Single Spanish-American Country. (2–2–2)

One 2-hour meeting per week. Course may be repeated for credit when topic changes.
Sequence beginning (F) 299. Special Advanced Study. (2–6)

Restricted to candidates for higher degrees with an adequate preparation for the subject proposed for special study, and by previous arrangement with members of the departmental staff.
Mr. Woodbridge, Mr. Morby (Su, F, W, Sp) 601. Individual Study for Master’s Students. (1–8)

Individual study in consultation with the graduate adviser, to provide an opportunity for student to prepare for the comprehensive examination. May be taken only after completion of all unit and language requirements, and only in the quarter in which the examination will be attempted. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Graduate Advisers in charge) (Su, F, W, Sp) 602. Individual Study for Doctoral Students. (1–8)

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the qualifying examination required of candidates for the Ph.D. and to be taken in the quarter immediately preceding that examination. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (Graduate Advisers in charge) (Su, F, W, Sp) 16–26. Beginning Spanish for Graduate Students. (No credit)

Three 1-hour meetings per week. Preparation for the graduate reading examinations. (Su, F, W, Sp) 2. Elementary Portuguese (Continuation of 1). (4)

Five 1-hour class meetings per week. Prerequisite: course 1 or equivalent or a satisfactory score on the placement test. Mr. Askins (W) 3. Intermediate Portuguese (Continuation of 2). (5)

Five 1-hour class meetings per week. Prerequisite: course 2 or equivalent or a satisfactory score on the placement test. Mr. Askins (Sp) 4. Intermediate Portuguese (Continuation of 3). (5)

Five 1-hour class meetings per week. Prerequisite: course 2 with grade of A, or course 3 or equivalent, or a satisfactory score on the placement test, or 18 units in another Romance language. Reading, translation, and oral interpretation of modern texts. Mr. Woodbridge (F, Sp) 39C–39D. Brazilian Literature in English Translation. (4–4)

Three class hours per week. Open to students in all departments of the University. No knowledge of Portuguese necessary.
Sequence, beginning (W), Mr. Woodbridge Upper Division Courses

Prerequisite to all upper division courses: 18 units or equivalent of Portuguese or another Romance language. With the approval of the graduate adviser, upper division and graduate credits in Portuguese may be applied toward the M.A. degree in Spanish.
*120. Gil Vicente and Camões. (4)

Three class hours per week. Major works in Spanish as well as in Portuguese. Mr. Woodbridge (F) 122. Portuguese Literature. (4)

Three class hours per week. Survey of the literature of Portugal. Mr. Woodbridge (F) 123. Brazilian Literature. (4)

Three class hours per week. Survey of the literature of Brazil. Mr. Woodbridge (W) *150. Problems of Portuguese Linguistics. (3)

Three class hours per week. Prerequisite: consent of instructor. Analysis of selected problems of the Portuguese language, in an effort to contrast it more sharply with Spanish and with other varieties of Romance speech. (W) 199. Special Study for Advanced Undergraduates. (2–4)

Restricted to senior honor students with an adequate preparation for the subject proposed for special study, and by previous arrangement with members of the departmental staff.
Mr. Askins, Mr. Woodbridge (F, W, Sp) Graduate Courses

(Concerning conditions for admission to graduate courses, see page 139.) *200A. Early Portuguese Literature. (2)

One 2-hour meeting per week. Analytical history of Portuguese literature to the Renaissance: lyrical poetry; translations from the Latin; creative and historical prose; a thorough grounding in bibliography. Mr. Askins (W) * Not to be given, 1968–69.
201. The Brazilian Novel. (2)
One 2-hour meeting per week.
Mr. Woodbridge (Sp)

226. Critical and Stylistic Studies of a Single Author or Genre. (2)
One 2-hour meeting per week. Course may be repeated for credit when topic changes.
Mr. Woodbridge (Sp)

**SPEECH**

(Deputy Office, 2125 Dwinelle Hall)

Edward N. Barnhart, Ph.D., Professor of Speech and Lecturer in Psychology.
Robert L. Beloff, Ph.D., Professor of Speech (Chairman of the Department).
Don Geiger, Ph.D., Professor of Speech.
Richard Hagopian, M.F.A., Professor of Speech.
Anthony Ostrow, M.S., Professor of Speech.
Garff B. Wilson, Ph.D., Professor of Speech and Professor of Dramatic Art.
Gerald E. Marsh, M.A., Professor of Speech, Emeritus.
Arnold Perstein, Ph.D., Professor of Speech, Emeritus.
Edward Z. Rowell, Ph.D., Associate Professor of Speech, Emeritus.
Albert Bendich, LL.B., Associate Professor of Speech.
William J. Brandt, Ph.D., Associate Professor of Speech.
Seymour B. Chatman, Ph.D., Associate Professor of Speech.
Susan Ervin-Tripp, Ph.D., Associate Professor of Speech and Lecturer in Psychology.
Leonard E. Nathan, Ph.D., Associate Professor of Speech.
Janette L. Richardson, Ph.D., Associate Professor of Speech.
William F. Shepard, Ph.D., Associate Professor of Speech.
Todd G. Willy, Ph.D., Associate Professor of Speech.
Richard L. Chesney, J.D., Assistant Professor of Speech.
Kenneth Salter, J.D., Assistant Professor of Speech.
Dennis Tedlock, Ph.D., Assistant Professor of Speech.
Ronald Yank, J.D., Assistant Professor of Speech.

Thomas Conley, B.A., Acting Assistant Professor of Speech.
Edward Purcell, M.A., Acting Assistant Professor of Speech.
Peter F. MacNeilage, Ph.D., Visiting Associate Professor of Speech.
Elizabeth F. Russell, Ph.D., Lecturer in Speech.
Fred S. Stripp, Th.D., Lecturer in Speech.
Richard Titlebaum, M.A., Acting Assistant Professor of Speech.

**Administrative Major Advisers:** Mr. Beloff, Mr. Nathan, Mr. Purcell, Mr. Titlebaum.

**Graduate Advisers:** Mr. Willy, Mr. Nathan, Mr. Chatman.

**The Major**

**Lower Division** Speech 1A–1B, Introduction to Speech. (Those students who did not take Speech 1A–1B will be required to take Speech 10, The Logic of Argument.)

**Upper Division** Departmental upper division courses which satisfy the major requirements are classified into three categories as follows: (1) Oral Interpretation: 111A, 111B, 111C, 115, 118. (2) Rhetoric, Argumentation, Public Address: 131A–131B, 134A–134B, 135, 137, 139, 140, 141, 142, 144, 145, 146, 147. (3) Speech Science 150, 151, 152, 155, 156, 160A–160B, 161, 164A–164B, 165.

* Not to be given, 1968–69.

299. Special Advanced Study. (2-6)
Restricted to candidates for higher degrees with an adequate preparation for the subject proposed for special study, and by previous arrangement with members of the departmental staff.
Mr. Askins, Mr. Woodbridge (F, W, Sp)

**Letters of instruction and governing the content of courses**

Prerequisites: Permission of instructor or co-optation through the above program. No course as a part of the major in Speech. Students will be used for any course in the beginning sections of the major.

Introduction to the relation of the text to the teaching of Speech. Development of the major in Speech. Students will be determined from the beginning sections.

10. The Logical Reasoning.

*Not to be given, 1968–69.*
Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

1A-1B. Introduction to Speech. (5-5)
Prerequisite: a passing grade in Subject A examination or course. Rhetorical and argumentative analysis through written themes and class discussion. This course satisfies the breadth requirement in reading and composition for the College of Letters and Science. Sections intended primarily for prelegal students will usually be offered each quarter. Sequence beginning each quarter. 

Mr. Stripp, Mr. Tabler (Su, F, W, Sp)

2A-2B. Fundamentals of Oral Interpretation of Literature. (5-5)
Introduction to literature through a study of the relation of textual analysis and oral reading. Practical training in critical reading and oral performance. Sequence beginning each quarter.

Oral Interpretation Staff (Su, F, W, Sp)

10. The Logic of Argument. (5)
Principles of argument, with emphasis on problems of meaning, inference, and evidence, as developed in terms of current social issues. Required of those students who wish to complete a major in Speech and who did not take Speech 1A-1B.

Legal Rhetoric Staff (F, W, Sp)

12. Psychology of Argument. (5)
The function of communication in inducing belief and directing behavior; techniques of political propaganda and other forms of persuasion. Mr. Barnhart

15. Fundamentals of Speech Behavior. (5)
An introduction to the scientific study of speech.

Speech Science Staff (F, Sp)

45. Public Speaking. (5)
Designed for sophomores, but open to students in the upper division. Intensive work, in conjunction with study of significant contemporary political and social issues, in the essentials of public speaking and the forms of public address. Platform theory and practice; principles of public style.

Mr. Stripp, Mr. Tabler (Su, F, W, Sp)

Upper Division Courses

105. Debate. (3)
Designed for those who wish to participate in intercollegiate debate. May be repeated for a maximum of 9 units. Students wishing to take this course and 131A-131B may enroll in the latter only with the consent of the instructor and may not receive more than 14 units of credit in any combination of the two courses.

Mr. Stripp, Mr. Tabler (F, W, Sp)

106. Oral Interpretation of Poetry and Prose. (5)
Prerequisite: primarily for candidates for teaching credentials whose major is English; others admitted with consent of instructor. Not open to students who have taken course 2A or 2B. Study in rhetorical theory of poetry and prose, with particular reference to the problem of persona in relation to the proper understanding and oral communication of the main literary forms. Principles of effective oral reading; practice in platform performance.

Oral Interpretation Staff (Su, F, W, Sp)

109. Analysis of Communication Content. (5)
Research techniques in communication, with special emphasis on content analysis and audience response; supervised individual and group research.

Mr. Barnhart (F)

Oral Interpretation of Literature

111A-111B-111C. Oral Interpretation. (5-5-5)
Prerequisite: course 2A-2B or consent of instructor.

111A: Oral Interpretation and the Lyric Mode. Qualities of the various lyric modes developed through oral reading; advanced study of the traditional lyrical voices in the major American and English literary periods.

Oral Interpretation Staff (F, W)

111B: Oral Interpretation and the Narrative and Dialogic Modes. Same as 111A but with reference to the narrative and dialogic voices as developed in both poetry and prose.

Oral Interpretation Staff (F, Sp)

111C: The Oral Interpretation of Drama. A critical study of the dramatic mode of literary discourse and of the problems involved in the oral presentation of such discourse by a single performer. The specific material is an intensive study of the theory and form of tragic drama as illustrated by selected plays from the Greek, Shakespearean, and modern periods and by selected critical writings from Aristotle to Arthur Miller.

Oral Interpretation Staff (W, Sp)

115. Theory of Interpretation: Aesthetic Values. (5)
Analysis of mimetic, pragmatic, expressive and objective theories of the nature and function of literary discourse.

Mr. Geiger (W)

118. Symbolism: Expressive Functioning of Signs. (5)
The functions of language in literature, especially poetry; the literary symbol, the nature and function of figures of speech. Limited to 30 students; speech majors to have preference.

Mr. Beloof (W)

Rhetoric, Argumentation, Public Address

131A-131B. Argumentative Discourse: Oral and Written. (5-5)
Prerequisite: course 1A-1B. Students completing this course may not receive more than 3 units of credit for course 105. Principles of effective reason-
Speech Sciences

150. General Phonetics. (5)
Prerequisite: speech 15 or consent of instructor.
Physical, anatomical, and physiological factors in speech; classical articulatory phonetic theory, modern acoustic phonetics. Speech Science Staff (F)

151. Vocal Features in Oral Interpretation. (5)
Four and 1/2 hours of lecture per week. Prerequisite: speech 15 or consent of instructor. The analysis of aspects of the English voice available for the expression of cognitive, emotive, and identificational meanings, and their relation to the phonetic conventions of literature.
Mr. Chatman (W)

152. Stylistics. (5)
Prerequisite: speech 15 or consent of instructor. The concept of style as pattern of individual choices among the array of linguistic features permitting choice; exercises in delineating the styles of famousauthors.
Mr. Chatman (Sp)

155. Contrastive Language Analysis: English as a Second Language. (5)
Four and 1/2 hours of lecture per week. Prerequisite: speech 15 or consent of instructor. Theory and research on children's acquisition of their native language including the sound system, grammatical structure, basic semantic categories, and social aspects of usage.
Mrs. Ervin-Tripp (Sp)

160A-160B. Meaning and Communication. (5-5)
Four and 1/2 hours of lecture per week. Prerequisite: speech 15 or consent of instructor. Theories of meaning, with special attention to spoken communication; communication and information theory; verbal and nonverbal components of the communication situation; misunderstanding as a special problem in communication.

161. The Semantics of Literary Interpretation. (5)
Prerequisite: speech 15 or consent of instructor. The nature of literary meanings and how they emerge from text by techniques of paraphrase, explanation, elucidation, and interpretation.
Mr. Chatman (F)

164A-164B. Speech and Society. (5-5)
Four and 1/2 hours of lecture per week. Prerequisite: speech 15 or consent of instructor. The structure of speech in face-to-face interaction, in relation to participants, situation, functions of communication. Speech diversity and types of discourse in large societies.
Mrs. Ervin-Tripp (W, Sp)

165. Cultural Patterns of Discourse. (5)
Four and 1/2 hours of lecture per week. Prerequisite: speech 15 or consent of instructor. Cultural factors of communication. Case studies from contemporary societies, literate and nonliterate.
190. Senior Proseminar. (1-5)
Prerequisite: required for and limited to seniors in the communication and public policy major. Intensive reading, discussion and individual research on topics relating to the field of the major.
Mr. Barnhart (W)

H195A-H195B. Honors Course. (5-5)
Prerequisite: Speech majors, senior standing, and on the honors list. A special program which may be substituted for 10 units of the major requirement with the approval of the major adviser. Sequence course.
The Staff (Mr. Brandt in charge) (W, Sp)

H197A-197B. Honors Course, Communications and Public Policy Major. (5-5)
Prerequisite: communication and public policy majors, senior standing, and on the honor list. Special studies in the field of the major with emphasis on sociological aspects. Sequence course.
Mr. Barnhart (F, W)

198. Directed Group Studies for Upper Division Students. (1-5)
The Staff, Mr. Beloof in charge (Su, F, W, Sp)

199. Special Study for Advanced Undergraduates. (1-5)
Restricted to senior honor students.
The Staff (Su, F, W, Sp)

Graduate Courses
A prerequisite for all graduate courses is graduate status and approval of the graduate adviser.

201. Research Problems in Speech. (5)
Offerings vary from year to year. May be repeated for credit. Several sections on different topics may be offered in any one quarter and may be taken simultaneously.
A: Topics in Rhetoric Mr. Willy, Mr. Brandt
B: Topics in Speech Science Mr. Chatman, Mr. Ervin-Tripp
C: Topics in Oral Interpretation Beloof, Ostroff
D: Topics involving a combination of rhetoric and/or speech science and/or oral interpretation
The Staff

Problems in the scope, applications, and divergencies of western theory and practice of rhetorical invention, ethical and aesthetic criteria of invention theory. This course is normally required of all graduate students.
A: to 400 A.D. Mr. Conley (F)
B: 400–1700 Miss Richardson, Mr. Brandt (W)
C: 1700 to the present Mr. Willy (Sp)

203. Principles of Speech Science. (5)
An introduction to research in articulatory and acoustic phonetics, phonology, morphology, syntax, semantics and related fields. Should be taken by all graduate students before other speech science graduate courses.
Mr. Chatman (F)

210. History of Oral Literature and Oral Interpretation to 1900 A.D. (5)
Research problems in the distinctive nature of oral literature with emphasis on the oral compositional aspects of the epic tradition; the shifting role of oral communication as literature changes from oral composition, to written composition, to printed transmission.
Mr. Beloof (F)

211. Contemporary Theory of Oral Interpretation. (5)
Consideration of leading developments, doctrines, and problems in oral interpretation studies in the modern period.
Mr. Geiger (F)

213. Methodology of Oral Interpretation: Individual Authors. (5)
Intensive study of the oral implications in the works of specific authors by means of an extensive examination of their canon.
Mr. Geiger, Interpretation Staff (F)

215. Explication and Oral Interpretation. (5)
Studies in the value and limitation of close textual analysis for the interpreter, with emphasis on twentith century critical apparatus and texts.
Mr. Ostroff, Interpretation Staff (W)

217. Poetics and the Lyric Voice. (5)
Investigations into the changing notions of “natural” voice—“tone of voice”—in individual works; its general relation to contemporaneous poetic theory.
Mr. Nathan (W)

221. Prosody and Oral Communication. (5)
Problems in the aesthetic usage of metrics and rhythm, the history of metrics, and the relationship of metrics to oral transmission of poetry.
Mr. Beloof (Sp)

231. Rhetoric and Rhetorical Criticism: Ancient Rome. (5)
Prerequisite: competence in Latin. Rhetoric in ancient Rome, both as expounded by theorists and as it permeated various forms of Latin discourse.
Miss Richardson (F)

232. Rhetoric and Rhetorical Criticism: The Middle Ages. (5)
Prerequisite: an elementary knowledge of Latin. Rhetoric in the Middle Ages, both as expounded by medieval rhetoricians and as practiced by medieval writers.
Miss Richardson (F)

234. Rhetoric and Poetics in The Middle Ages and Renaissance. (5)
Examination of the developing connections between rhetorical theory and aesthetics, particularly in the Middle Ages and Renaissance, with attention to the consequences for poetic practice.
Mr. Nathan (W)

238. Rhetoric and Civilization. (5)
Conflicting theories and modes of rhetoric in periods of cultural transition.

241. Analytic Techniques for Rhetorical Documents. (5)
Problems and techniques in the analysis of individual modes and general modal patterns of rhetori-
242. Rhetoric and Perception in the Seventeenth Century. (5)
An investigation of modes of thought in the seventeenth century through a close analysis of its rhetoric. The major forms of discourse characteristic of the period will be considered. Mr. Brandt (W)

246. Studies in Legal Rhetoric. (5)
The nature and function of rhetorical analysis as a technique for the examination of legal materials. Mr. Bendich (F)

250. Metrics. (5)
Rhythm as physical fact and psychological percept; the linguistic features available for rhythm; phonological backgrounds—"stress," accent, length, juncture in phonetic and phonemic terms; the distinction between meter and recitation; scansion and recitational analysis, semantic aspects of meter. Mr. Chatman (Sp)

251. Advanced Phonetics. (5)
Prerequisite: speech 150 or equivalent or consent of instructor. Acoustic theory; individual research employing phonetic instruments. (Sp)

252. Advanced Stylistics. (5)
The linguistic specification of literary style: phonostylistics of "schemes" and meter, stylistic choice in grammar (particularly syntax), in vocabulary (diction, "tropes" and related phenomena), and in discursive structure. Mr. Chatman (Sp)

255. Advanced Contrastive Language Analysis: English as a Second Language. (5)
Phonological, grammatical and semantic contrastive analysis; the diagnosis of bilingual interference; preparation of instructional devices based on contrastive analyses. Mrs. Ervin-Tripp (W)

257. Discourse Analysis. (5)
Methods, techniques and theories for the analysis of meaning in natural language use, with emphasis on extended speech and communication. (W)

Advanced study of selected problems of speech comprehension, production, and usage. Topics vary from year to year. Speech Science Staff (W)

266. Values and World View: Cultural Bases of Communication. (5)
Structural analysis of cultural patterns of communication; cultural dynamics of speech behavior; criteria of credibility in different cultures; relations of verbal to nonverbal behavior. (Sp)

295. Special Study. (1-5)
Open to qualified graduate students who wish to pursue special studies and research under the direction of a member of the staff. The Staff (F, W, Sp)

299. Directed Research. (1-5)
Open to qualified graduate students who wish to pursue special studies and research under the direction of a member of the staff. Primarily for students engaged in preparation of the doctoral thesis. The Staff (F, W, Sp)

300. Problems in Teaching Speech. (1-5)
Prerequisite: graduate students and others by consent.
A: Oral Interpretation
B: Argumentative Composition
C: Speech Sciences
D: Rhetoric
The course may be repeated in different sections. The Staff (F, W, Sp)

601. Individual Study for Master's Students. (1-8)
Individual study for the comprehensive or language requirements in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (F, W, Sp)

602. Individual Study for Doctoral Students. (1-8)
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (F, W, Sp)

STATISTICS

(Department Office, 501 Campbell Hall)

Edward W. Barankin, Ph.D., Professor of Statistics.
David Blackwell, Ph.D., D.Sc.(hon.), Professor of Statistics.
Lester E. Dubins, Ph.D., Professor of Statistics and of Mathematics.
David A. Freedman, Ph.D., Professor of Statistics.
Joseph L. Hodges, Jr., Ph.D., Professor of Statistics.
George M. Kuznets, Ph.D., Professor of Agricultural Economics, of Statistics, and of Economics.
Lucien LeCam, Ph.D., Professor of Statistics.
Erich L. Lehmann, Ph.D., Professor of Statistics.
Michel Loève, Docteur ès Sciences, Professor of Statistics and of Mathematics.

† On leave, fall, 1968, winter, 1969.
The Department of Statistics offers the undergraduate a thorough introduction to the theory of probability and of statistics, their extensions in several directions such as stochastic processes and sampling surveys, and some of their applications in general and in special fields such as social science and engineering.

The undergraduate courses are divided into several basic cycles according to their emphasis and mathematical background. One cycle, emphasizing theory but including some application in the laboratories, includes courses 20 and 100A-B-C (or 200A-B-C-L-M-N). Statistics 100 requires two years of calculus (Statistics 200 requires more); the first half is devoted to probability and the second half to statistics. A second cycle, requiring four quarters of calculus and emphasizing interpretation and concepts, is based on 134 (or 133), 135A-B; the first quarter is devoted to probability, the remainder to statistics. A third cycle, emphasizing concepts and applications and requiring one quarter of calculus in its third quarter, is the sequence 130A-B-C; the probability material is developed as needed for the statistics. A cycle intended for social scientists, requiring less mathematics, involves 16 (or 2), 131 with 131L, 132 with 132L.

A student may not receive full credit for partially parallel sequences of courses. The interests of the members of the staff are too varied to be completely reflected in the courses given each year. The courses numbered from 152 to 169 cover a wide range; attention is also drawn to 191 given to recent developments.

The Major

Lower Division Courses   Mathematics 1A–1B–1C or 11A–11B; 11C–12A–12B (or preferably the corresponding honors courses) with emphasis on the conceptual side of the material offered. Recommended: The student may consider taking Statistics 1A–1B or 2. Statistics 20 is an excellent preparation for the upper division program in statistics.

†† On leave, spring, 1969.
†† On leave, summer, fall, winter quarters, 1968–69.
$†† Recalled to active service, 1968–69.
Upper Division Courses  Statistics 100A–B–C; Mathematics 111 or 113B. At least four courses from Statistics 152, 160, 161, 162, 165, 166 (with 166L), and 168 and 169. In addition, either two courses from Mathematics 104A, 104B, 105, 113A, 125A, 128A, 135 and 185; or at least three advanced nonoverlapping courses from a substantive field. The courses selected for the 40 or more upper division units required for the major must be approved in advance by the major adviser.

Individual Major  Attention of the student is drawn to the possibility of an individual major in statistics combined with a science, or a social science or philosophy, etc., according to his interests.

Engineering Mathematical Statistics  The College of Engineering with the cooperation of the Department of Statistics offers a curriculum in engineering mathematical statistics leading to the degree of Bachelor of Science. Major Adviser: Mr. LeCam (see section on Program of Study in Engineering Science, page 244).

Honors Program  Honor students may apply for enrollment in the honors program. The program will include course H197, reading in a special topic and writing a thesis.

Preparation for Graduate Study  Those interested in the graduate statistics major should include in the undergraduate courses a strong foundation in mathematics as well as probability and statistics. For advanced degrees of the theoretical type, Mathematics 104B, 105, 113B and 185 are needed. For advanced degrees of the applied type, at least a year of upper division probability and statistics (or course 200A–200B–200C with 200L–200M–200N). It is also recommended that all students acquire some familiarity with French, German, or Russian.

The Graduate Major  Higher degrees may be of the theoretical or of the applied type. The program for the theoretical type of M.A. will usually include either 205A–B or 203A–B and 210A–B–C; the program for the applied type of M.A. will usually include 230A–B, 236A–B, 240 and at least one of 232, 238, 242, 248. All students will prepare either a master's oral or a master's thesis.

There are no fixed course requirements for the Ph.D. degrees at Berkeley. However, the student is asked to prepare an extensive list of detailed questions for his qualifying examination. He also prepares a special one-hour lecture on a topic selected by his graduate adviser and not included in course work. In addition, there is a test of his reading knowledge in two languages out of French, German, Russian.

For further details on the requirements for the M.A., consult the graduate adviser, Mr. Scheffé, and for the Ph.D. with emphasis on probability, Mr. LeCam, with emphasis on statistics, Mr. Lehmann.

Biostatistics  A program in biostatistics, leading to the M.A. or Ph.D. degree, is offered jointly with the School of Public Health. The emphasis may be toward theory or toward the substantive field. For information, consult Miss Scott.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses 1A. Introduction to Probability. (3)  Three 1-hour lectures per week. Prerequisite: high school algebra. Elementary concepts of probability; random variables; expectation and variance; binomial and hypergeometric distribution; normal and Poisson approximations. — (F); Mr. Lehmann (W); —— (Sp)

1B. Introduction to Statistical Inference. (3)  Three 1-hour lectures per week. Prerequisite: course 1A. Elementary concepts of statistical inference. Estimation with applications to the estimation of means, differences, variance. Determination of sample size, choice of estimate and problems of design. Testing hypotheses; simple examples of tests; the concept of power. Mr. Lehmann (Sp)

2. Introduction to Statistics. (5)  Three 1-hour lectures and three 1-hour laboratories per week. Prerequisite: high school algebra.
Elementary treatment of basic ideas in probability and statistical inference. Models; conditional probability; measures of location, spread, and association; binomial distribution; normal approximation. Sampling; point estimation; some standard significance tests; power.

Mr. Darling, Mr. Freedman (F); Mr. Darling, — (W); Mr. Purves, Mr. Blackwell, Mr. Darling (Sp);

16. Elements of Decision Theory. (5)
Three 1-hour lectures and three 1-hour laboratories per week. Prerequisite: Mathematics 16A-B; Structures of statistical decision problems. Bayes solutions; complete class theorems. Illustrative examples in estimation, testing, prediction, and experimental design.

20. Introduction to Probability and Statistics. (4)
Four 1-hour lectures per week. Prerequisite: one quarter of calculus. For students with mathematical background who wish to acquire basic concepts. Relative frequencies, discrete probability, random variables, expectation. Testing hypotheses. Estimation. Illustrations from various fields.

Mr. Millar (F); — — (W); — — (Sp)

Upper Division Courses

100A. Introduction to the Theory of Probability and Statistics. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: second year calculus. Discrete probability models. Random variables. Binomial and Poisson distributions. Expectation and variance. Law of large numbers. De Moivre-Laplace theorem. Mr. Hodges (F); Mr. Millar (W); — — (Sp)

100B–100C. Introduction to the Theory of Probability and Statistics. (4–4)
Three 1-hour lectures and one 2-hour laboratory per week. (Continuation of 100A.) Statistical inference, including point and interval estimation and tests of hypotheses. Probability densities including the normal, t, x², and F.

100B, Mr. Hodges (W); Mr. Millar (Sp); 100C, Mr. Hodges (Sp)

130A–130B–130C. Statistical Inference. (4–4–4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite for 130C: one quarter of calculus. Students who have taken any part of Statistics 100, 131, 132, 133, 134, 135 may receive only two units for 130A. Meant for users of statistics. Basic concepts and principal tools of probability theory, hypotheses testing and estimation. The conceptual and operational aspects are treated carefully, the more difficult theorems are stated without proof. Useful also for students taking only one quarter.

130A, Mr. Doksum (F); Mr. Spjotvoll (Sp); 130B, Mr. Doksum (W); 130C, Mr. Doksum (Sp)

131. Statistical Inference for Social Scientists. (4)
Four 1-hour lectures per week. Prerequisite: a mathematics course such as Mathematics 190. May not be taken for credit by students having completed Statistics 130A. Ideas of estimation and hypothesis testing basic to social science applications. Linear estimation and normal regression theory.

Mr. Bhattacharya (Su); Mr. Beran, — — (F); Mr. Bickel (W); Mr. Bickel (Sp)

131L. Laboratory Course in Statistical Inference for Social Scientists. (1)
One 2-hour laboratory per week. May be taken only in conjunction with Statistics 131L.

Mr. Bhattacharya (Su); Mr. Beran, — — (F); Mr. Bickel (W)

132. Second Course in Statistical Inference for Social Scientists. (4)
Three 1-hour lectures per week. Prerequisite: course 131. May not be taken for credit by students having completed 130B. Further study of topics in probability and statistics relevant to social science applications.

Mr. Bhattacharya (Su); Mr. Kuznets (W)

132L. Second Laboratory Course in Statistical Inference for Social Scientists. (1)
One 2-hour laboratory per week. May be taken only in conjunction with Statistics 132. Course 131L is not prerequisite to 132L.

Mr. Kuznets in charge (W)

133. Elementary Probability Theory. (3)
Three 1-hour lectures per week. Prerequisite: one year of calculus. May not be taken for more than one unit by students having completed Statistics 100A. A briefer treatment of the topics in Statistics 134, sufficient for Statistics 135A.

Mr. Bhattacharya (Su); — — (F); — — (Sp)

134. Methods of Probability Theory. (5)
Three 1-hour lectures and one 1-hour discussion groups meeting plus individual work per week. Prerequisite: Mathematics 12A. May be taken concurrently. May not be taken for more than one unit by students having completed Statistics 100A. An introduction to the concepts and facts of probability theory in both the discrete and continuous cases. Emphasis on interpretation rather than proofs. Probability distributions, conditional probability, random variables, expectation, law of large numbers.

Mr. Barankin, Mr. Bühler, Mr. Scheffé, Mr. Thomasian (Sp); Mr. Barankin, Mr. Scheffé (W); Mr. Barankin, Mr. Bühler, Sec. 3: Mr. Thomasian (Sp)

135A–135B. Methods of Statistics. (3–3)
Two 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 133 or 134 or 100B. 135A may not be taken for more than one unit by students having completed 130B or 131. Presents the principal inference methods used in engineering and operations research. Sampling distributions. Estimation and hypothesis testing. Regression and linear hypotheses. Experimental designs and analysis of variance. Sequential and nonparametric methods briefly treated.

135A, Mr. Scheffé (F); Mr. Haggstrom (W); 135B, Mr. Scheffé (W); Mr. Haggstrom (Sp)

152. Elementary Stochastic Processes. (4)
Three 1-hour lectures. Prerequisite: course 100A or 134. Topics such as random walks, branching processes, Markov chains, Poisson processes, birth and death processes, martingales, Brownian motion, gambling.

Mr. Radner (W)

160. Elements of Nonparametric Inference. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: Statistics 100C or 130B or
161. Statistical Inference in Linear Models. (4)

Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: one of the courses Statistics 100C, 130B, or 132, and one of the courses Mathematics 111, 113B, or 190B. May not be taken for credit by students having completed 135B. Optimum point estimation in univariate linear models. Hypothesis testing and related confidence sets in the normal case.

Mr. Haggstrom (W)

162. Introduction to Multivariate Analysis. (4)

Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: one of the courses Statistics 100C, 132, or 161, and one of the courses Mathematics 111, 113B, or 190B. Multivariate normal distribution, partial and multiple correlation, Hotelling's T^2-test, multivariate analysis of variance.

Mr. Barlow (Sp)

165. Introduction to Continuous Probability. (4)


Mr. Millar (W)

166. Sampling Surveys. (4)

Four 1-hour lectures per week. Prerequisite: course 100A or 130A or 131 or 135A or consent of the instructor. Theory of sampling and analysis of sampling methods. Unrestrictedly random, stratified, cluster and double sampling procedures.

Mr. Kuznets (Sp)

166L. Laboratory Course in Sampling Surveys. (1)

One 2-hour laboratory per week. May be taken only concurrently with course 166. Study of sampling materials and of representative designs.

Mr. Kuznets in charge (Sp)

168. Game Theory. (4)

Two 1\frac{1}{2}-hour lectures per week. Prerequisite: Two years of Calculus. General theory of zero-sum, two-person games, illustrated by detailed study of examples.

Mr. Buhler (W)

169. Dynamic Programming. (4)

Two 1\frac{1}{2}-hour lectures per week. Prerequisite: course 100A or 133 or 134. General theory of dynamic programming, illustrated by detailed study of examples.

Mr. Buhler (W)

191. Experimental Courses in Probability and Statistics. (3)

Three 1-hour lectures per week. Prerequisite: consent of instructor. Recent developments of special interest to the instructor expositated as a senior level course.

The Staff (F)

H197. Special Study for Honors Candidates. (1-7)

The Staff (Su, F, W, Sp)

* Not to be given, 1908-69.

199. Special Study for Advanced Undergraduates. (1-5)

Investigation of special problems under the direction of members of the department. Restricted to senior honor students.

The Staff (Su, F, W, Sp)

Graduate Courses

Courses 210A–B–C constitute the bases of the graduate instruction for students whose primary interest is in mathematical statistics; course 205 or 203, for those with primary interest in probability. Courses 230, 236, 240, and one of 232, 242 represent the core of the graduate program for students interested in statistics as a tool in empirical research, either experimental or observational.

200A. Introduction to Probability and Statistics at an Advanced Level. (4)

Three 1-hour lectures per week. Prerequisite: Sec. 1: a year of upper division mathematics including measure; Sec. 2: a year of upper division mathematics. Intended for students who have not taken probability. Advanced treatment of topics in probability including: definite probability models, axiomatic development, laws, random variables, distribution functions, binomial, hypergeometric, Poisson, normal, central limit theorem. Probe ability density functions, conditional probability, expectation, variance, Chebyshev inequality, law of large numbers. Additional topics. Sec. 1: Mr. Beran, Mr. Bhattacharya (F); Mr. Thomasian (Sp)

200B. Introduction to Probability and Statistics at an Advanced Level. (4-4)

Three 1-hour lectures per week. Prerequisite: course 200A or consent of instructor.

200B, change of variables, generating functions, characteristic functions. Standard distributions, including t, F, χ². Point estimation, properties and methods, Testing hypotheses, simpler applications.


200B, Mr. Beran, Mr. Bhattacharya (W); Mr. Scheffe (Su)

200C, Mr. Haggstrom (F); Mr. Beran, Mr. Bhattacharya (Sp)

200L. Laboratory Course in Probability. (1)

One 2-hour laboratory per week. Strongly recommended for and open only to students in 200A. Applications of probability to "real" problems in various fields.

200M–200N. Laboratory Course in Probability and Statistics. (1–1)

One 2-hour laboratory per week. Strongly recommended for and open only to students in 200B–200C, respectively. Any of 200L, 200M, 200N may be taken without the others. Applications of probability and statistics to "real" problems in various fields.

200M, Mr. Haggstrom (Su); (W)

200N, (F), (Sp)
201. Mathematical Bases of Probability Theory. (4)

Three 1-hour lectures per week. Prerequisite: Mathematics 105 and one of course 100A, 134, 200A or consent of instructor. Topics such as random walks, Brownian motion, Markov chains, gambling, and renewal theory will be developed as needed.
Sequence beginning (F)
Mr. Dubins (F); Mr. Dubins (W); Mr. Buhler (Sp)

205A–205B–205C. Probability Theory. (4–4–4)
Three 1-hour lectures per week. Prerequisite: course 201 (may be corequisite) or consent of the instructor. Expectations, conditioning, distributions and characteristic functions. Independence and marginals; convergence theorems, central limit problem. Stationary, ergodic theorems. Elementary Markov chains.
Sequence beginning (F)
Mr. Loève (F); Mr. Loève (W); Mr. Loève (Sp)

Three 1-hour lectures per week. Prerequisite: a year of upper division probability and statistics. Mathematics 111 (or 113B). Course 203A or 205A is prerequisite to 210B. A survey of mathematical statistics including the theories of hypothesis testing, point estimation, confidence sets and multiple decision procedures with applications in areas such as normal theory, analysis of variance, multivariate analysis, nonparametric inference and sequential analysis.
Sequence beginning (F)
Mr. Lehmann (F); Mr. Lehmann (W); Mr. Bickel (Sp)

210M. Laboratory for Statistics 210B. (2)
Two 1-hour laboratories per week. (W)

210N. Laboratory for Statistics 210C. (2)
Two 1-hour laboratories per week. (Sp)

216A–216B. Theory of Nonparametric Inference. (3–3)
Three 1-hour lectures per week. Prerequisite: course 210A or equivalent. The theory of nonparametric and robust methods for problems such as the one- and two-sample problems, the hypotheses of randomness and independence, testing and estimation occurring in linear models. Asymptotic null distributions, power and efficiency.
216A, Mr. Hodges (W); 216B, Mr. Hodges (Sp)

Three 1-hour lectures per week. Prerequisite: 205, and 210B, or 200C. Convergence of probability measures. Large sample properties of maximum likelihood estimates and Bayes estimates. Asymptotically normal families of probability measures. Asymptotic sufficiency. Von Mises differentiable statistical functions. Best asymptotically normal estimates and related tests including the $\chi^2$ test, likelihood ratio tests and asymptotically similar tests.
Sequence beginning (F), 217A, Mr. LeCam (F); 217B, Mr. LeCam (W); 217C, Mr. LeCam (Sp)

218. Theory of Statistical Decision Functions. (4)
Mr. Bickel (F)

230A–230B. Analysis of Variance. (4–4)
Sequence beginning (F)
230A, Mr. Spjotvoll, Mr. Haggstrom (F); 230B, Mr. Spjotvoll (W)

232. Experimental Design. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 210B. Randomization models. Blocking, confounding, and fractional replication in a $^n$ experiments. Response surface exploration.
Mr. Spjotvoll (Sp)

236A–236B. Analysis of Discrete Observations. (3–3)
236A, Miss Scott (F); 236B, Miss Scott (W)

238. Sequential Experimentation. (3)
Two 1-hour lectures and one 2-hour laboratory per week. Prerequisite: one of course 100G, 130G, 132, 135A, 200C. Wald probability-ratio tests. Truncated sequential tests. Sequential design. Industrial inspection. Sequential estimation. Two-stage procedures.
(F)

240. Nonparametric Analysis. (4)
Mr. Doksum (W)

242. Multivariate Analysis. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 230A. Topics selected from the following, with testing and estimation in each case: Sampling theory for multivariate normal populations. Multivariate analysis of variance and covariance, Classification and discriminant analysis, Component and factor analysis. Canonical correlations. Stochastic difference equations.

248. Inference in Time Series. (4)
Mr. Beran (Sp)

* Not to be given, 1968-69.
252. Special Stochastic Processes. (4)
Three 1½-hour lectures per week. Prerequisite: consent of instructor. Material covered will include branching processes, point processes and birth and death processes. Equations satisfied by these processes, orthogonal polynomial solutions. First passage time. Absorption probabilities. Mr. Miller (Sp)

257. Probability Models in Biology and Problems of Health. (3)

258. Statistical Problems in Modern Research in Astronomy. (3)
Three 1-hour lectures per week. Prerequisite: familiarity with concepts of probability and consent of the instructor. Preliminaries on theory. Clustering model of spatial distribution of galaxies. Selection bias. Catalogue and space distributions of characteristics of galaxies. Space abundances of morphological types. Luminosity functions. Magnitude-redshift and magnitude-diameter relations. Frequencies of supernovae. Stability of clusters. Mr. Neyman (W)

259. Statistics in Scientific Research. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: familiarity with concepts of probability and consent of instructor. Separability, sample continuity, martingale processes, and Further topics. Mr. Neyman (Sp)

260. Foundations of Random Analysis. (3)
Three 1-hour lectures per week. Prerequisite: course 205B or consent of instructor. Separability, sample continuity, martingale processes, and Further topics. Mr. Neyman (Sp)

261. Information Theory. (4)
Three 1-hour lectures per week. Prerequisite: course 205A or 205A. Topics in the Shannon theory of information such as entropy rate, channel capacity, coding theorems, error bounds, algebraic coding, sequential decoding. Mr. Miller (Sp)

263. Decomposable Processes. (3)
Three 1-hour lectures per week. Prerequisite: course 261 or consent of instructor. Three part decomposition, Continuity, Levy-Ito theorem, Poisson processes and Brownian processes. Mr. Miller (Sp)

265. Markov Processes. (3)
Three 1-hour lectures per week. Prerequisite: course 261 or consent of instructor. Markov independence. Time continuous transition probabilities. Strong Markov property. Semigroup methods, relation to potential theory. Mr. Miller (Sp)

273. Topics in the Theory of Second Order Processes. (4)
Three 1-hour lectures per week. Prerequisite: consent of instructor. Second order processes. Calculus in quadratic mean. Filtering. Spectral analysis. Estimation of the spectrum. Reproducing kernels and tests of hypotheses for Gaussian processes. Mr. Barankin (W)

291. Experimental Courses in Probability and Statistics. (3)
Three 1-hour lectures per week. Prerequisite: consent of instructor. Recent developments and topics of current interest in probability theory and mathematical statistics. 291G, Mr. Hammersley (Su); Mr. Freedman (F, W, Sp); 291D, Mr. Bickel (W) 291A. Dynamic Programming; 291B. Topics in Nonparametric Inference; 291C. Recent Developments in Estimation and Testing; 291D. Sequential Analysis; 291E. Topics in Multivariate Analysis; 291F. Gambling; 291G. Monte Carlo Methods.

298. Seminars.
298A. Current Literature. (3) Supervised presentation, by students, of current literature. Mr. LeCam (F, W, Sp) 298B. Special Seminars. (2–6) Special topics, by means of lectures and informal conferences. Mr. Neyman (Su, F, W, Sp) 298C. Seminar in Applied Probability and Statistics. (2–4) Special topics with informal lectures by researchers in substantive fields and by members of staff. Mr. Neyman (Sp) 298D. Seminar in Mathematical Statistics. (2–4) Special topics with informal lectures by researchers in substantive fields and by members of staff. Mr. Neyman (Sp)

299. Individual Research Leading to Higher Degrees. (2–6) The Staff (Su, F, W, Sp) 602. Individual Study. (1–5) By appointment. Prerequisite: one year of full-time graduate study and permission of the graduate adviser. Individual study in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for certain examinations required of candidates for the Ph.D. degree. May not be used for unit or residence requirements for the doctoral degree. Course to be taken on the satisfactory or unsatisfactory basis. The Staff (Su, F, W, Sp) Colloquium in Probability and Statistics. (No credit) Meeting for the presentation of original work by members of the staff, visitors, and graduate students. (Su, F, W, Sp) The Statistical Laboratory When founded in 1939, the Statistical Laboratory was a unit of the Department of Mathematics and combined research with an extensive instruction program in mathematical statistics. This instruction program led to A.B., M.A., and Ph.D. degrees in statistics. In 1955, the instruction activities in statistics were taken over by the newly established Department of Statistics. Since that time the Laboratory has been functioning as a research unit.
Research activity of the Statistical Laboratory includes work on the theory of statistics and its various applications: to astronomy (cosmology), to biology (population dynamics, competition of species), to communication theory, to problems of health (theory of diagnostic tests, bio-assay, apparent associations between diseases, carcinogenesis), to experimentation, to meteorology (experiments on weather control), etc.

Some of the above research is conducted in cooperation with other units of the University and with individuals and institutions outside the University.

Every faculty member of the Department of Statistics may use the facilities of the Statistical Laboratory. A substantial number of research assistants and secretarial help, are available.

**SUBJECT A: ENGLISH COMPOSITION**

(Department Office, 216 Dwinelle Hall Annex)

**Committee in Charge of Subject A:**

Maurice Holt, Ph.D., Professor of Aeronautical Science.
Richard Bridgman, Ph.D., Associate Professor of English (Chairman).
Martin Trow, Ph.D., Associate Professor of Sociology.
C. Douglas Chrétien, Ph.D., Director of Subject A and English as a Foreign Language, and Professor of Linguistics.

**Subject A. (No credit)**

Three 1½-hour meetings per week. Required of all students who have not met the requirement in Subject A. Fee $45. For regulations governing this requirement, see page 29. Training in the principles of composition, sentence structure, grammar, punctuation, and spelling. Weekly compositions and frequent exercises. Sections limited to thirty students. The Staff (Su, F, W, Sp)

**ZOOLOGY**

(Departmental Office, 4079 Life Sciences Building)

Max Alfert, Ph.D., Professor of Zoology.
William Balamuth, Ph.D., Professor of Zoology.
William E. Berg, Ph.D., Professor of Zoology.
Howard A. Bern, Ph.D., Professor of Zoology.
Kenneth B. DeOme, Ph.D., Professor of Zoology and Director of the Cancer Research Genetics Laboratory.
Richard M. Eakin,† Ph.D., Professor of Zoology.
Cadet H. Hand, Jr., Ph.D., Professor of Zoology and Director of the Bodega Marine Laboratory.
Morgan Harris,† Ph.D., Professor of Zoology.
A. Starker Leopold, Ph.D., Professor of Zoology and Forestry and Conservationist, Museum of Vertebrate Zoology.
Daniel Mazia, Ph.D., Professor of Zoology.
Satyabrata Nandi, Ph.D., Professor of Zoology.
Oliver P. Pearson, Ph.D., Professor of Zoology and Director, Museum of Vertebrate Zoology.
Frank A. Pitelka,† Ph.D., Professor of Zoology and Ecologist, Museum of Vertebrate Zoology.
Wilbur B. Quay, Ph.D., Professor of Zoology.
Ralph I. Smith,† Ph.D., Professor of Zoology.
Robert C. Stebbins, Ph.D., Professor of Zoology and Curator in Herpetology, Museum of Vertebrate Zoology.

† On leave, 1968–69.
† On leave, fall quarter, 1968.
‡ On leave, winter and spring quarters, 1969.
Curt Stern, Ph.D., D.Sc. (h.c.), Professor of Zoology and Genetics.

Jonas E. Gullberg, A.B., Professor of Metrology, Emeritus.

George W. Barlow, Ph.D., Associate Professor of Zoology and Ethologist, Museum of Vertebrate Zoology.

Seth B. Benson, Ph.D., Associate Professor of Zoology and Curator of Mammals, Museum of Vertebrate Zoology.

Ned K. Johnson, Ph.D., Associate Professor of Zoology and Curator of Birds, Museum of Vertebrate Zoology.

Paul Licht, Ph.D., Associate Professor of Zoology.

William Z. Lidicker, Jr., Ph.D., Associate Professor of Zoology and Associate Curator of Mammals, Museum of Vertebrate Zoology.

Oscar H. Paris, Ph.D., Associate Professor of Zoology.

C. H. Fraser Rowell, Ph.D., Associate Professor of Zoology.

Richard C. Strohman, Ph.D., Associate Professor of Zoology.

Fred H. Wilt, Ph.D., Associate Professor of Zoology.

David R. Bentley, Ph.D., Assistant Professor of Zoology.

C. William Birky, Jr., Ph.D., Assistant Professor of Zoology.

C. Richard Dawkins, D.Phil., Assistant Professor of Zoology.

Michael T. Ghiselin, Ph.D., Assistant Professor of Zoology.

John E. Simmons, Ph.D., Assistant Professor of Zoology.

Richard A. Steinhardt, Ph.D., Assistant Professor of Zoology.

Marshall White, Ph.D., Assistant Professor of Zoology and Forestry and Assistant Conservationist, Museum of Vertebrate Zoology.

Phyllis B. Blair, Associate Professor of Immunology in Residence.

Justin N. Frost, Ph.D., Visiting Assistant Professor of Zoology in the summer quarter.

Mohammad A. Hafeez, M.Sc., Acting Instructor in Zoology in the summer quarter.

Gregory R. Patent, Ph.D., Acting Assistant Professor of Zoology in the summer quarter.

Charles R. Stasek, Ph.D., Visiting Associate Professor of Zoology in the summer quarter.

Jack T. Tomlinson, Ph.D., Visiting Associate Professor of Zoology in the summer quarter.

The Department of Zoology presents a broad coverage of animal biology, ranging from vertebrate and invertebrate zoology to physiology, ultrastructure, and cell and molecular biology. The zoology major may be entered after a basic year-course in biology (see General Biology) or zoology, supported by courses in chemistry and physics. The "core" of the upper division major program consists of four courses representing the areas of (1) genetics, (2) cell biology, (3) organismal animal biology, (4) natural history, systematics, ecology. These courses represent the common ground upon which more specialized senior programs and graduate study may be developed.

The Major

(1) Biology 1A, 1B, and 1C; Chemistry 1A, 1B, 8A, and 8B; Mathematics 16A and 16B or equivalent; Physics 6A, 6B, and 6C. Recommended: German, French, additional mathematics, statistics, additional chemistry, biochemistry, and basic courses in other biological sciences. (2) Thirty-six units of upper division Zoology, up to 16 of which may be substituted for by courses in related fields by permission of the major adviser. The program must include at least one course or sequence in each of the 4 following areas: (a) Genetics: Zoology 150 or 151 or Genetics 100; (b) Cell Biology: Zoology 104 or 110A–110B or Physiology 101; (c) Organismal Animal Biology: Zoology
105 or 106 or 120 or 131-131L or 128-128L or Physiology 113-113L or Physiology 123-123L; (d) Natural History, Systematics, Ecology: Zoology 107A-107B or 108A-108B or 155 or 157 or 173 or Biology 150 plus Zoology 140. The total program must include at least one course with laboratory, one course with field work, and a third course with laboratory or field work (exclusive of units in Zoology 199, 197, or H-196). (3) Seniors with a B average or better in courses of the major are encouraged to seek faculty sponsorship for independent study and research under course 199, and to participate in the proseminar (Zoology 198).

Honors Program Honor students may apply at the beginning of the senior year to the professor in charge of the Thesis Course (Zoology H196) for admission to the honors program. Students accepted in the honors program will complete the proseminar (Zoology 198) and prepare a thesis (Zoology H196).

Preparation for Graduate Study Those planning to enter graduate study in Zoology should have the equivalent of a major in zoology or biology and a reading knowledge of one foreign language, required for the M.A. A reading knowledge of two foreign languages is required for the Ph.D. and should be gained not later than the second year of graduate work.

Graduate Degrees in Zoology The Department of Zoology offers the M.A. by either thesis or examination plan, details of which may be obtained from the departmental office. The program for the Ph.D. varies considerably, according to the background and interests of the individual student, but all candidates are expected to have a reading knowledge of two foreign languages or of one in depth. All candidates for the Ph.D. must pass an oral examination. The crucial part of the Ph.D. program is the thesis, based upon original research in which the candidate demonstrates the ability to conduct independent study and to incorporate the results in a thesis. Service as a teaching assistant is normally required as part of the Ph.D. program in zoology. Details of the Ph.D. program may be obtained from the departmental office.

Letters and Science List: for regulations governing this list, see page 80.

Lower Division Courses

10. Animal Biology. (4)
Three 1-hour lectures per week, plus demonstrations to be arranged. Open without prerequisite to all students, but designed for those not specializing in zoology. An outline of the main facts and principles of biology, with special reference to the bearing of biology upon human life.
Mr. Tomlinson (Su); --- (F, W); Mr. Strohman (Sp)

20. Basic Problems in Experimental Zoology. (4)
Three 1-hour lectures and one 3-hour laboratory period per week. Prerequisite: sophomore status and permission of the instructor. Limited to majors or prospective majors in the physical sciences. An introductory course dealing with selected topics of current research interest in studies of evolution, cell biology and animal physiology. Emphasis is placed on the relation of biological theory to the design of biochemical and biophysical experiments.
Mr. Ghiselin, Mr. Steinhardt (W)

Upper Division Courses

104. Introduction to Physicochemical Biology. (4)
Three 1-hour lectures per week. Prerequisite: Biology 1 or equivalent, organic chemistry; general physics. Graduate students without the prerequisites may be admitted by consent of instructor. The living cell as an integrated molecular system; its structural organization, growth, reproduction, and work output.
Mr. Mazia (W)

105. Vertebrate Embryology. (6)
Two 1%-hour lectures, two 3-hour laboratories per week. Prerequisite: Biology 1. Development of the vertebrate body from fertilization through organogenesis, including experimental analyses of selected problems in morphogenesis and fetal physiology.
Mr. Patent (Su); Mr. Eakin (F)

106. Evolutionary and Functional Vertebrate Anatomy. (6)
Two 1%-hour lectures, two 3-hour laboratories per week. Prerequisite: Biology 1 or equivalent. Functional and evolutionary significance of the structures of the vertebrate body, and introduction to analytical and experimental methods in morphology.
Mr. Hafeez (Su); Mr. Quaye (W)

107A–107B. Natural History of the Vertebrates. (4–4)
Two 1-hour lectures, one 2-hour laboratory and one 4-hour field period per week. Sequence beginning (W). Both quarters must be completed for credit. Prerequisite: Biology 1. Biology of vertebrates, exclusive of fish. Field work is emphasized.
Mr. Stebbins, Mr. Benson, Mr. Johnson (W, Sp)
108. Invertebrate Zoology (Summer Quarter at Berkeley). (8)
Four 1-hour lectures, three 3-hour laboratory periods and a 1-day field trip per week. Prerequisite: Biology 1A—1B—1C. An alternative to Zoology 108A—108B, given intensively in the summer quarter at Berkeley. (Su)

108A—108B. Invertebrate Zoology. (4—4)
Two 1-hour lectures, two 3-hour laboratories or field trips per week. Sequence beginning (W). Both quarters must be completed for credit. Prerequisite: Biology 1 or Biology 11. Biology of the invertebrates. Mr. Hand, Mr. Simmons (W); Mr. Ghiselin (Sp)

Two 1½-hour lectures per week, plus written reports and special readings to be arranged. Prerequisite: Biology 1. Recommended: course work in taxonomy or elementary genetics. Evolutionary processes in the origin of species and higher groups; rates and progress; interrelations and phylogenies of animals. Mr. Johnson (F)

110A—110B. Cytology (3—3)
Two 1-hour lectures per week. Sequence beginning (F). Both quarters must be completed for credit. Prerequisite: Biology 1A—1B—1C. The structure and activities of the cell, especially in development, sex determination, and heredity. Mr. Alfert (F, W)

110L. Cytology Laboratory. (3)
Two 3-hour laboratories per week. Prerequisite: course 110A—110B, or concurrent enrollment therein. Recommended: course 110, working knowledge of microtechnique. Mr. Alfert (F, W)

111. Experimental Embryology. (4)
Three 1-hour lectures per week. Prerequisite: course 105. A review of experimental and chemical embryology of vertebrate and invertebrate animals. Mr. Berg (F)

111L. Experimental Embryology Laboratory. (4)
Two 3-hour laboratories per week. Prerequisite: course 111 or concurrent enrollment therein. Enrollment limited to 10 students. Experimental embryology of sea urchin and amphibian embryos. Mr. Berg (W)

113. Normal and Abnormal Growth. (4)
Three 1-hour lectures per week, plus written reports. Prerequisite: Biology 1. Biosynthesis at molecular, cellular, and organismal levels; dynamic aspects of body form as seen in tissue culture, transplantation, and the development of tumors. Mr. Harris (F)

120. Biology of Chemical Mediation. (5)
Four 1-hour lectures, one 1-hour discussion period per week. Prerequisite: Biology 1. Recommended: organic chemistry, and course 105 or 106. Hormonal and parahormonal mechanisms, with emphasis on the comparative endocrinology of vertebrates and invertebrates. Mr. Bern (F)

121. Advanced Comparative Endocrinology. (5)
Two 3-hour laboratories, two 1-hour lecture-discussion periods per week. Prerequisite: course 120, or Physiology 141. Recommended: course 180, or Anatomy 201—B—C. Mr. Nandi, Mr. Bern (W)

*128. Vertebrate Reproduction. (4)
Three 1-hour lectures per week. Prerequisite: course 105. Recommended: 106, 107A—107B. Reproductive biology of vertebrate animals, with a consideration of the factors influencing reproduction in natural populations. Mr. Lidicker (W)

*128L. Laboratory in Vertebrate Reproduction. (2)
One 3-hour laboratory per week. Prerequisite: course 128. Mr. Lidicker (Sp)

131. Physiological Ecology. (4)
Three 1-hour lectures per week. Prerequisite: Biology 1ABC, or equivalent. Comparative physiology of the vertebrates with emphasis on adaptation to the various aspects of the physical environment, such as temperature, water, ions, and gases. Mr. Licht (Sp)

131L. Laboratory in Physiological Ecology. (3)
Two 3-hour laboratories per week with the possibility of field work. Prerequisite: course 131. Mr. Licht (Sp)

135. Animal Behavior. (4)
Three 1-hour lectures per week plus 1 hour of discussion/demonstration (films, sound recordings, etc.). Prerequisite: Biology 1 or consent of instructor. An introduction to comparative animal behavior and behavioral physiology. Mr. Barlow, Mr. Dawkins (W)

136. Laboratory Studies of Animal Behavior. (3)
Two 3-hour laboratories per week with the possibility of field work. Prerequisite: course 135 and consent of instructor. Limited to ten students. Mr. Dawkins (Sp)

140. Animal Ecology. (4)
Two 1½-hour lectures per week. Prerequisite: three quarters of upper division work in Ecology, or graduate status in a related field. Recommended: Biology 150 and a course in statistics. Quantitative ecology of animal populations and natural communities; emphasis on terrestrial environment. Mr. Paris (F)

150. Genetics (summer quarter). (5)
Four 1-hour lectures and one conference per week. Prerequisite: course 110, one quarter of biology. Introduction to general genetics; given in summer quarter only. Mr. Frost (Su)

150A—150B. Genetics. (3—3)
Two 1-hour lectures and one 1-hour conference per week. Sequence beginning (W). Both quarters must be completed for credit. Prerequisite: one quarter of biology. Introduction to general genetics. Mr. Stern (W, Sp)

*150L. Genetics Laboratory. (3)
Two 3-hour laboratories per week. Prerequisite: course 150 (may be taken concurrently). Limited to 24 students.

*151. Human Genetics (summer quarter). (5)
Four 1-hour lectures and one conference per week. Prerequisite: one quarter of biology. Principles of inheritance as applied to the physical and mental characteristics of man, of the heredity-environment problem, and of the genetic constitutions of populations; given in summer quarter only. (Su)

* Not to be given, 1968—69.

154A—154B. General Zoology (Summer Quarter at Berkeley). Two 1-hour lectures per week. Mr. Bern (F)

155. Comparative Endocrinology. (5)
Two 1-hour lectures and one conference per week. Prerequisite: Biology 1ABC, or equivalent. Endocrine mechanisms, including the control of growth, reproduction, and behavior. Mr. Johnson (F)

156. General Zoology. (5)
Two 1-hour lectures and two discussion periods per week. Recommended in alternate years. Mr. Simmons (F)


151A—151B. Human Genetics. (3—3)
Two 1-hour lectures and one 1-hour conference per week. Sequence beginning (W). Both quarters must be completed for credit. Prerequisite: one quarter of biology. Principles of inheritance as applied to the physical and mental characteristics of man, of the heredity-environment problem, and of the genetic constitutions of populations.
Mr. Stern (W, Sp)

153. Developmental Genetics. (4)
Three 1-hour lectures per week. Prerequisite: course 111 and course 150 or Genetics 100 or consent of instructor. The role of inheritable factors in the control of embryonic development; genic mechanisms of cell differentiation.
Mr. Birky (Sp)

155. General Protozoology. (5)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: Biology 1, or Biology 11A—11B, or equivalent. Survey of the major groups of protozoa. Emphasis in the laboratory on living material, including methods of isolation from natural habitats and techniques of staining.
Mr. Balamuth (W)

156. General Animal Parasitology. (5)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: Biology 1, or equivalent. General principles of parasitology based upon protozoa, helminths and other invertebrates. Emphasis upon properties common to diverse taxonomic groups, with a comparative approach.
Mr. Simmons (Sp)

157. Biology of Marine Invertebrates. (8)
Full-time study at Bodega Marine Laboratory in first 5 weeks of summer quarter, including lectures, laboratory, field work, and individual study of marine invertebrates. Class limited to 24 students. Prerequisite: course 108 or equivalent, or consent of instructor.
Mr. Gliedstein, Mr. Holland, Mr. Stasek (Su)

163. Mammalogy. (4)
Two 1-hour lectures and discussion periods and one 3-hour laboratory per week. Two weekend field trips. Prerequisite: course 107A—107B. Recommended: course 106, Classification, survey of mammalian orders, field methods of collection. Enrollment limited to 16.
Mr. Benson (F)

164. Ornithology. (4)
Two 1-hour lectures and two 2-hour laboratories per week; plus papers to be arranged. Prerequisite: course 107A—107B. Anatomy and function in birds from the standpoint of adaptations and systemsatics. Ordinal and familial groups of the world.
Mr. Bremson (F)

165. Herpetology. (4)
Two 1-hour lectures and one 3-hour laboratory per week, plus two weekend field trips. Prerequisite: course 107A—107B or equivalent. Advanced study of amphibians and reptiles.
Mr. Stebbins (Sp)

166. Ichthyology. (5)
Two 1-hour lectures and two 3-hour laboratories per week; some weekend field trips. Prerequisite: three quarters of upper division work in zoology. Recommended: course 106 or 107A—107B. A basic course in the biology of fishes.
Mr. Barlow (F)

167. Zoogeography. (3)
Two 1-hour lectures per week. Prerequisite: Zoology 107A—107B or 108A—108B, or Entomology 100. Recommended: course work in palaeontology and physical geography. Principles underlying patterns of geographic distribution of animals based on critical analysis of evidence from selected groups.
Mr. Johnson (F)

170. Wildlife Biology and Management. (4)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: upper division standing. Ecological mechanisms that determine wildlife populations. Distribution, life histories, and management of important species.
Mr. Leopold, Mr. White (F)

173. Field Course in Wildlife and Fisheries. (8)
Full-time study in first five weeks of summer quarter, including lectures, laboratory and field work. Prerequisite: consent of instructor. Given at Sagehen Creek Field Station near Truckee, California.
Mr. Leopold, Mr. White (Su)

175. Wildlife Populations. (4)
One 2-hour lecture and discussion period per week. Prerequisite: course 170 or equivalent. Recommended: course 140 or Biology 150. Dynamics of game bird and mammal populations; mechanisms regulating natality, mortality, population density, and potential productivity.
Mr. White (Sp)

180. Comparative Histology. (4)
Two 1-hour lectures per week, plus conferences and term paper. Prerequisite: Biology 1 or equivalent. A course in comparative or mammalian anatomy. Tissues of chordates; organizations of cells and their products to form tissues and organs; functional and comparative attributes of tissue structure, composition and activities.
Mr. Quay (Sp)

180L. Laboratory in Comparative Histology. (4)
Or one or two 1-hour lectures, three 3-hour laboratories per week. Prerequisite: course 150 or concurrent enrollment therein. Enrollment limited to 16. Lectures, laboratories, demonstrations and special projects on functional and comparative aspects of tissue structure and composition in chordates.
Mr. Quay (Sp)

181. Biology of Neoplasia. (4)
Two 1-hour lectures per week, plus individual conferences. Prerequisite: open to senior and graduate students and by consent of instructor. Lectures, assigned reading, and individual reports on biological aspects of experimental cancer research.
Mr. DeOme, Mr. Nandi (F)

181L. Laboratory in Biology of Neoplasia. (5)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 181 and consent of instructor. Lectures and laboratory exercise emphasizing recognition of neoplasms and the laboratory methods appropriate to research in cancer biology.
Mr. Nandi, Mr. DeOme (W)

*185A—185B—185C. Optics and Metrology in Biology. (3—3—3)
One 2-hour lecture and one 3-hour demonstration period per week. Sequence beginning (F)
185A. Theoretical principles and critical use of the microscope.
185B. Theoretical principles and critical use of other primary optical instruments. 185C. Theory and advanced techniques of scientific photography and special photometric methods.
Mr. Quay (F, W, Sp)

* Not to be given, 1968—69.
|| Zoology 150A—150B and 151A—151B to be offered in alternate years.
197. Extra Session Work. (1—4)
Work on assigned topics carried on in the field, or in Berkeley when the University is not in session, under the direction of a staff member. The Staff

198. Proseminar in Zoology. (1)
One 1-hour meeting per week, plus individual conferences. Prerequisite: upper division standing with an over-all B average, and at least a B average in the major. Reporting and group discussion on selected topics. Although organized by designated faculty member, others will participate.
Mr. Balamuth, Mr. Berg (F); Mr. Strohman (W); Mr. Steinhardt (Sp)

199. Special Study for Advanced Undergraduates. (1—4)
Prerequisite: background courses in chosen subjects. Restricted to senior honor students.
The Staff (Su, F, W, Sp)

Graduate Courses

For admission to a graduate course, a student should have permission of the instructor (which may be given to graduate students and to seniors with not less than a B average), and should have had 18 units of basic upper division preparatory work.

201. Molecular and Cellular Aspects of Development. (3)
Two 1%-hour lectures per week. Prerequisite: courses 104, 105, and 150 or equivalent. Advanced treatment of cellular developmental biology. Regulation of cell biosynthesis and differentiation.
Mr. Pearson (F)

207. Special Problems in Vertebrate Zoology. (3)
One 2-hour laboratory period per week and three or four week-end field trips. Prerequisite: course 107A—107B or equivalent and consent of instructor. Group participation in selected original research problems involving field work and a variety of techniques. Enrollment limited to eight.
Mr. Pearson, Mr. Alpert, Mr. Raper (Sp)

210. Seminar in Cytology. (2)
One 2-hour meeting per week. Prerequisite: course 110A—110B. Critical discussion of basic problems and recent literature in descriptive cytology and cytochemistry.
Mr. Alpert (Sp)

212. Laboratory in Cell Biology. (4)
One 1-hour lecture, two 4-hour laboratories per week. Prerequisite: course 104. Recommended: a course in biochemistry, Isolation and characterization of cells and subcellular particles. Students assigned individual experimental procedures involving (a) enzyme structure relationships, (b) energy generation and utilization, and (c) biosynthesis of macromolecules.
Mr. Strohman (F)

*214. Advanced Laboratory in Cell Biology. (5)
One 6-hour laboratory and one discussion hour per week. Prerequisite: course 212 or equivalent. Application of physicochemical techniques to analysis of developmental and in vitro culture systems.
Mr. Wilt (Sp)

215. Seminar in Physicochemical Biology. (2)
One 2-hour meeting per week. Prerequisites: courses 104 and 212, or consent of the instructor. Seminar discussion of recent literature.
Mr. Maza (F)

*216. Somatic Cell Heredity. (2)
One 2-hour meeting per week. Prerequisite: consent of the instructor. Developmental, genetic, and neoplastic changes in isolated cell systems.
Mr. Harris (Sp)

*218. Seminar on Fine Structure. (2)
One 2-hour meeting per week. Prerequisite: courses 105 or equivalent and course 111, or 112, or 113. Mr. Berg, Mr. Birky, Mr. Eakin, Mr. Wilt (W, Sp)

*220. Special Topics in Biology of Chemical Mediation. (2)
One 2-hour lecture and discussion period per week. Prerequisite: course 120, or Physiology 141 or equivalent. Selected topics in comparative endocrinology, neuroendocrinology and pheromone research. In summer quarter offered in second five weeks at the Bodega Marine Laboratory.
Mr. Bern (Sp)

221. Seminar in Comparative Endocrinology. (2)
One 2-hour meeting per week. Prerequisite: course 120, or Physiology 141, or equivalent. Recommended: course 220.
Mr. Bern, Mr. Nandi, Mr. Licht (Sp)

224A—224B. Invertebrate Physiology. (5—5)
Two 1-hour lectures, two 3-hour laboratories per week. Sequence beginning (W). Prerequisite: course 108A—108B, or an upper division course in physiology or entomology.

224A. Comparative physiology of nutrition, respiration, excretion, excretion, and related processes in invertebrates.
Mr. Rowell (W, Sp)

224B. Comparative physiology of nervous and hormonal coordination, activity, sensory physiology, and behavior of invertebrates.
Mr. Smith, Mr. Alpert (Su, F, W, Sp)

224C. Invertebrate Physiology (summer). (6)
Full-time study at Bodega Marine Laboratory in second half of summer quarter. Prerequisite: Zoology 157 or equivalent. Subject matter equivalent to that of either Zoology 224A or 224B in alternate summers with addition of field-based special problem. Course may be repeated once for credit.
Mr. Alpert (Su)

225. Comparative Neurophysiology. (3)
Three 1-hour lectures per week. Prerequisite: an upper division course in physiology or consent of the instructor. Comparative structure and function of nervous systems, with stress on invertebrates.
Mr. Steinhardt (F)

226, Comparative Neurophysiology. (5—5)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: courses 105 or equivalent and consent of instructor. Methods for morphological and physiologi-.cal study of nervous systems. In alternate summers.
Mr. Smith, Mr. Alpert (Su, F, W, Sp)

227. Seminar of Invertebrate Zoology. (1)
One 2-hour meeting per week. Prerequisite: course 224, or consent of instructor.
Mr. Bern (Sp)

*231. Seminar in Vertebrate Zoology. (1)
One 2-hour meeting per week. Prerequisite: courses 104, 105, and 150 or equivalent.
Mr. Steinhardt (Sp)

237. Seminar in Zoology. (1)
One 2-hour meeting per week. Prerequisite: courses 104, 105, or equivalent.
Mr. Steinhardt (Sp)

240A—240B. Advanced Zoology. (4)
One 2-hour meeting per week. Prerequisite: courses 105, 140, or equivalent and consent of instructor.
Mr. Berg, Mr. Nandi, Mr. Steinhardt (Sp)

241. Comparative Zoology. (2)
One 2-hour meeting per week. Prerequisite: an upper division course in zoology. Invertebrate and vertebrate evolutionary relationships.
Mr. Eakin (Sp)

242. Comparative Zoology. (2)
Two 1-hour meetings per week. Prerequisite: courses 105, 140, or equivalent and consent of instructor. Evolutionary biology of invertebrate and vertebrate animals.
Mr. Wilt, Mr. Alpert, Mr. Eakin, Mr. Steinhardt (Sp)

243 Seminar in Zoology. (1)
One 2-hour meeting per week. Prerequisite: courses 104, 105, or equivalent.
Mr. Steinhardt (Sp)

244. Genetics. (2)
Two 1-hour meetings per week. Prerequisite: an upper division course in biology (2) and recent literature in descriptive cytology and cell biology. Additional topics in genetic research.
Mr. Alpert (Sp)

253. Seminar in Invertebrate Zoology. (2)
One 2-hour meeting per week. Prerequisite: course 224 or consent of instructor.
Mr. Winslow (Sp)

254. Biology of Cells. (4)
Two 1-hour meetings per week. Prerequisite: an upper division course in biology (2) and recent literature in descriptive cytology and cell biology. Additional topics in comparative neurophysiology.
Mr. Steinhardt, Mr. Wilt, Mr. Alpert (Sp)

* Not to be given, 1968—69.
225L. Comparative Neurophysiology Laboratory. (3)
Two 3-hour laboratory periods per week. Prerequisite: course 225 (may be taken concurrently) or consent of the instructor. Laboratory in neurophysiological methods. Demonstrations, special problems, and reports. Enrollment limited.
Mr. Steinhardt (F)

227. Seminar in Comparative Functional Biology of Invertebrates. (2)
One 2-hour meeting per week. Prerequisite: course 224 or consent of instructor.
Mr. Tominson (Su); Mr. Davis (Sp)

*231. Seminar in Physiological Ecology. (2)
One 2-hour meeting per week. Prerequisite: consent of instructor.
Mr. Licht (W)

237. Seminar in Animal Behavior. (2)
One 2-hour meeting per week. Prerequisite: course 135 or equivalent and consent of the instructor.
Mr. Dawkins (F); Mr. Barlow (Sp)

240A-240B. Analytical Field Ecology. (4-4)
One 1-hour lecture, two 4-hour field periods per week. Prerequisite: courses 107A-107B or 108A-108B, 140, and a course in statistics. Analytical methods for the investigation of animal populations and trophic relationships; survey of major communities in California. An in-progress grade will be reported at the end of the winter quarter.
Mr. Paris, Mr. Pitelka, (W, Sp)

Two 2-hour lecture and discussion periods per week, plus written reports. Prerequisite: course 140 or equivalent. A comparative review of population and life cycle characteristics; types of population organization evolved among higher animals, especially vertebrates.
Mr. Pitelka (F)

244. Seminar in Animal Ecology. (2)
One 2-hour meeting per week. Prerequisite: course 140 or equivalent, and consent of instructor.
Mr. Pitelka, Mr. Paris (W)

248. Genetic Ecology. (2)
Two 1-hour meetings per week. Prerequisite: an upper division course in genetics and one in animal ecology (Zoology 140 or equivalent). Lectures and discussion concerning the relationships between the genetic composition of populations and ecological processes. Specific topics will vary from year to year.
Mr. Lidicker (W)

253. Seminar in Genetics. (2)
One 2-hour meeting per week. Prerequisite: a course in genetics. Special topics will vary from quarter to quarter.
Mr. Frost (Su); Mr. Stern (F)

254. Biology of Parasitic Protozoa. (5)
Two 1-hour lectures and two 3-hour laboratory periods per week. Prerequisite: Zoology 156 or equivalent background in general parasitology. Detailed treatment of parasitic protozoa, with reference to morphology, life cycles, and host-parasite interactions. Examples of medical and veterinary importance are included with other forms in the interest of presenting a comprehensive survey. Offered occasionally in place of Zoology 255.
Mr. Balamuth (W)

*255. Experimental Protozoology. (5)
Two 1-hour lectures, two 3-hour laboratories per week, plus individual conferences to be arranged. Prerequisite: course 155, or a course in microbiology or cellular physiology. Aspects of physiology and morphogenesis applied to study of protozoa. Laboratory concerned with problems of growth, cyclical differentiation, regeneration, and sexuality. Enrollment limited.
Mr. Balamuth (W)

256. Seminar in Protozoology. (2)
One 2-hour meeting per week, plus outside preparation of papers. Prerequisite: course 155 or 255, or consent of instructor.
Mr. Balamuth (W)

257. Advanced Biology of Marine Invertebrates. (5)
(Formerly numbered 255B)
Full-time study at Bodega Marine Laboratory in second half of summer quarter. Lectures, seminar discussions, and individual study of selected problems. Prerequisite: Zoology 157 and consent of instructor. A supplement to course 157, stressing individual guided research on special problems in field or laboratory.
Mr. Ghiselin, Mr. Holland, Mr. Stasek (Su)

*258. Advanced Invertebrate Zoology. (5)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: course 108A-108B, or consent of instructor. Biology of major invertebrate groups, topics to vary from year to year. May be repeated.
Mr. Ghiselin, Mr. Hand, Mr. Smith (F)

259. Seminar in Invertebrate Zoology. (2)
One 2-hour meeting per week, plus individual conferences. Prerequisite: consent of instructor.
Mr. Hand (F)

*267. Seminar on Speciation in Vertebrates. (2)
One 1½-hour meeting per week. Prerequisite: course 107A-107B. Review of problems of speciation and isolating mechanisms in vertebrates, with emphasis on current literature.
Mr. Benson, Mr. Johnson (F)

268. Vertebrate Review. (2)
One 1½-hour meeting per week. Review of current literature on ecology and evolution of higher vertebrates. May be repeated for credit.
Mr. Benson, Mr. Pearson (W)

275. Seminar in Wildlife Ecology and Population Dynamics. (2)
One 2-hour meeting per week. Prerequisite: course 175 or equivalent.
Mr. White, Mr. Leopold (Sp)

280. Chordate Neurology. (4)
Two 1½-hour lectures, one 2-hour demonstration per week. Prerequisite: courses in chordate anatomy and physiology, and consent of instructor. Organization, composition, and regulatory mechanisms of chordate nervous systems. Subject matter will vary from year to year.
Mr. Quay (F)

284. Seminar on Biology of Neoplasia. (2)
One 2-hour meeting per week. Prerequisite: course 181 and consent of instructor. Preparation and discussion of current research in biology of neoplasia.
Mr. DeOme, Mr. Nandi, Mr. Bern, Mr. Blair, Mr. Harris (Sp)

* Not to be given, 1968-69.
285. Seminar in Comparative Neurochemistry. (2)
Prerequisite: consent of instructor. Correlative review of recent advances in comparative and experimental neurochemistry of invertebrates and vertebrates. Mr. Quay (W)

286. Electrical Measurements in Biology. (5)
One or more 2-hour lectures and two 3-hour laboratory periods per week. Prerequisite: consent of instructor. Theory and critical use of electrical instrumentation. (variable)

294A–294B. Principles and Concepts of Modern Zoology. (2–2)
One 2-hour lecture and discussion period per week and recommended reading. Prerequisite: graduate standing and consent of instructor. Intended for graduate students who are preparing for written departmental examinations. Must be taken on a pass/ not pass basis. Sequence beginning (F).
Mr. Harris (in charge) (F); Mr. Pitelka (in charge) (W)

295. Group Research in Summer Quarter.
295A. Special Problems in Biology of Neoplasia. (4)
Nine hours of laboratory work per week, plus individual conferences. Prerequisite: consent of instructor. Special problems in biology of neoplasia. Open to graduate students not preparing M.A. or Ph.D. theses in this area, Mr. DeOme, Mr. Nandi, Mr. Bern (Su)

296. Research. (1–12)
Credit awarded according to work planned and accomplished. The Staff (Su, F, W, Sp)

299. Special Study for Graduate Students. (1–4)
Reading or other advanced study by arrangement with a staff member. The Staff (Su, F, W, Sp)

601. Individual Study for Master's Students. (1–8)
Individual study for the comprehensive examinations or language requirements in consultation with the graduate adviser. Units may not be used to meet either unit or residence requirements for a master's degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (F, W, Sp)

602. Individual Study for Doctoral Students. (1–8)
Individual study in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. May not be used for unit or residence requirements for the doctoral degree. Must be taken on a satisfactory/unsatisfactory basis. The Staff (F, W, Sp)

Zoology Seminar. (No credit)
Meetings for the presentation of original work by the faculty, visiting lecturers, and graduate students. (Su); Mr. Birky (F); Mr. Stebbins, Mr. Lidicker (in charge) (Sp)

IDS 250. Experimental Helminthology. (4)
See Interdepartmental Studies for the complete description of this course.

* Not to be given, 1968–69.

Cancer Research Genetics Laboratory

The Cancer Research Genetics Laboratory was established in 1950 within the Department of Zoology. The laboratory carries on a research, teaching, and service program designed to foster faculty, predoctoral, and postdoctoral students' participation in cancer research. The central research program represents a multidisciplinary approach to an understanding of the neoplastic transformation and involves investigators in other parts of the University, as well as the laboratory staff. The academic members of the laboratory staff participate directly in the regular teaching program of the departments of Zoology and Bacteriology. Graduate student postdoctoral research programs are supported in various areas of tumor biology: cytology, endocrinology, immunology, genetics, histopathology. The laboratory also houses a major source of inbred mouse strains and the Secretariat of the University's Cancer Research Coordinating Committee. Graduate students and postdoctoral fellows interested in the laboratory's program may communicate with the Director, 230 Earl Warren Hall.

Museum of Vertebrate Zoology

This museum was founded by the late Annie M. Alexander as a research institute and repository for specimens and information relative to the higher vertebrate animals. It serves several departments on the campus in respect to research programs and contracts. All the academic staff members of the Museum hold titles in the Department of Zoology and teach upper division and graduate courses pertinent to their special areas of scholarship in systematics, ecology, evolution, and wildlife conservation and management.

Collections

The museum is situated in the Life Sciences Building on the Berkeley campus and has a large and continually growing collection of mammals, birds, reptiles, and amphibians. The specimens with the accompanying field notes, photographs, and maps provide the basis for research.

The Frances Simes Hastings Natural History Reservation

The reservation is in the upper Carmel Valley of Monterey County and is operated by the museum as a research center for investigation in general ecology and natural history, with emphasis on vertebrate animals. The flora and fauna of the 1700-acre tract are completely protected in order
to study ecologic relations in undisturbed communities. Qualified graduate students and guest workers may pursue advanced studies and use the facilities of the museum and the Natural History Reservation under the sponsorship of a member of the museum staff. Persons interested may address the Director of the Museum, 2593 Life Sciences Building; or Dr. John Davis, in charge of Hastings Reservation, Carmel Valley, California.

Sagehen Creek Wildlife and Fisheries Station

This station, located at an elevation of 6,500 feet, 12 miles north of Truckee, California, was developed primarily for year-round, basic field research on ecologic problems by both faculty members and graduate students. The main problems under attack are concerned with cycles in game animals, birds, and fishes, with special effort being directed toward the study of the causes of winter mortality in fishes. The site and facilities are available for other types of ecologic studies as well. Persons interested may address Dr. A. Starker Leopold, Museum of Vertebrate Zoology.
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College of Letters and Science
Walter D. Knight, Ph.D.

School of Business Administration and Graduate School of Business Administration
Richard H. Holton, Ph.D.

School of Criminology
Leslie T. Wilkins (Acting)

School of Education
Theodore L. Reller, Ph.D.

School of Forestry and Conservation
John A. Zivmuska, Ph.D.

School of Librarianship
Raynard C. Swank, Ph.D.

School of Law
Edward C. Halbach, Jr., J.D., LL.M.

School of Optometry
Meredith Morgan, Ph.D.

School of Public Health
William C. Reeves, (Acting)

School of Social Welfare
Milton Chernin, Ph.D.

Graduate Division, Berkeley
Sanford S. Elberg, Ph.D.
Absence, leave of, 28
   for graduate student, 36
Academic residence, 37
Academic senate, 11
   degrees for members of, 39
Activities fair, 56
Accommodations, living, 63
Administration, 11, 530
Admission
   to advanced standing, 18
   application and fee, 15
   to graduate study, 33
   with bachelor's degree, 20
   to graduate study, 33
   with deficiencies, 18
   by examination, 18
   to graduate study, 33
   foreign applicants, 21
   to graduate study, 34
   freshman requirements, 16
   nonresident freshman, 19
   grade-point average, 17
   intercampus transfer, 20
   from other schools, 19
   reapplication, 16
   to graduate study, 34
   special circumstances, 20
   limited and special status, 20
   subject A, 16
   transcript of record, 15
   undergraduate procedures, 15
   visiting scholars, 34
Admission requirements
   in the colleges of
   agriculture, 67
   chemistry, 69
   engineering, 70
   environmental design, 74
   letters and science, 77
   in the schools of
   business administration, 81
   criminology, 84
   education, 86
   forestry and conservation, 87
   journalism, 91
   law, 93
   librarianship, 98
   optometry, 100
   public health, 101
   social welfare, 103
   Admissions, office of, 15
Advanced standing, admission to, 19
Advisers, faculty
   for foreign students, 21
   graduate, 35
   language training, 131
   for graduate students, 34
   for undergraduates, 22
Aeronautical sciences, 241
   courses in, 278
Aeronautics and space administration, national, 131
Aerospace studies, department of, 139
African studies, committee for, 118
Agricultural chemistry, 141
Agricultural economics, department of, 142
Agricultural experiment station, 68
Agricultural sciences, 66, 145
Agricultural sciences, college of, 66
   facilities, 69
Air force ROTC program, 58
Altaic languages, 432
Alumni association, 65
   placement center, student and, 53
American history and institutions
   requirement, 30
American marketing association, 83
Anatomy, see physiology-anatomy
Anthony loan fund, 54
Anthropology, department of, 146
   prehistory, and culture
   history courses, 149
   physical anthropology and primatology
   courses, 148
   research facilities, 152
   social and cultural courses, 149
Anthropology museum, 152
Application for admission and fee, 15
   to graduate study, 33
   Applied mechanics, 242
   courses, 279
Arabic, 408
Archaeology, see anthropology, classics, paleontology
Archaeological research facility, 152
Architecture, department of, 306
   area courses, 307
   administration and related
   professional studies, 309
   design problems, 307
environmental control systems, 308
history of the environment, 309
social and economic factors in architectural and urban design, 309
structure and production, 308
courses in college of environmental design, 304
special studies, 310
Architecture, landscape, 319
Architecture, naval, 285
Area programs of institute of international studies, 112
centers
Chinese studies, 118
Japanese and Korean studies, 118
Latin-American studies, 119
Slavic and East European studies, 119
South Asia studies, 119
Southeast Asia studies, 120
committees for African studies, 118
Middle Eastern studies, 119
Area studies in political science, 458
Armenian, 409
Army ROTC programs, 58
Art, department of, 152
major programs, 153
history of art, 154
medieval studies, 157
painting, 156
sculpture, 156
Art gallery, university, 157
Arts and lectures, committee for, 56
ASUC, 55
Assistantships, research or teaching, 49
Associateships, 49
Astronomy, department of, 158
courses from other departments, 159
facilities and equipment, 158
Athletic privilege card, 60
Atmospheric and space sciences, 161
Bachelor of arts degree, university requirements, 27, 79
college of agriculture, 66
college of environmental design, 76
college of letters and science, 77
school of criminology, 84
second degree, work toward, 20
Bachelor of science degree
college of agriculture, 67
college of chemistry, 69
college of engineering, 70
school of business administration, 81
school of criminology, 84
Bacteriology and immunology, department of, 162
Bancroft library, 52
Bancroft laboratory, 129
Basic research in science, Miller institute of, 109
Bear's Lair, 55
Berkeley campus, 12
Biochemistry, department of, 165
Biography, 167
Biology, department of molecular, 395
Biomechanics laboratory, 73
Biophysics courses, 392
Biostatistics, program in, 516
Bituminous materials laboratory, soil mechanics and, 291
Blake estate, 77
Blodgett forest, 90
Board of educational development, 106, 170
Botanical garden, 172
Botany, department of, 168
herbaria, 173
recommended courses in related departments, 169
Business administration, department of, 173
Business administration, school of, 81
facilities and opportunities, 83
financial aid, 84
optional courses in mathematics and statistics, 82
Business and economic research, institute of, 110
Calendar ii
California Public Survey, 111
Camp Califormis, 90
Cancer research genetics laboratory, 528
Candidacy for bachelor's degree, 29
master's degree, 41
doctor's degree, 42
Cell physiology, department of, 185
Center, counseling, 53
student and alumni placement, 53
Centers for research and study, 112, 113, 128; see also area programs,
institutes, organization and research interests
child study, 111
computer, 73, 128, 159
Earl Warren legal, 97
education field service, 87
international population and urban research (IPUR), 115
law and society, 128
operations research, 73, 291
planning and development, 121
real estate and urban economics, 77, 122
research and development in higher education, 128
research in management science, 129
survey research, 129
White Mountain research station, 131
wildland research, 91
Ceramic engineering, 249
Ceramics, emphasis on, in department of environmental design; design, 316
Chancellors, 11, 531
Charter day, 9
Chemical biodynamics laboratory, 69, 123
Chemical engineering, department of, 185
Chemistry, agricultural, 141
Chemistry, college of, 69
Chemistry, department of, 189
choice of undergraduate college, 69
major in college of chemistry, 69, 191
major in college of letters and science, 69, 191
teaching credential, 192
Child study center, Harold E. Jones, 111
Chinese, 422
courses, 424
in translation, 425
Chinese studies, center for, 118
City and regional planning, department of, 310
emphasis in master's program, 312
undergraduate courses in college of letters and science, 312
Civil engineering, department of, 236
Classics, department of, 193
major in
classical languages, 196
Greek, 196
Latin, 196
Clubs, special interest, 56
College of California, 9
College entrance examination board, 17
admission by, 18
for nonresident applicants, 19
scholastic aptitude test, 18
three achievement tests, 18
Colleges at Berkeley, 66
requirements for, 31
Colleges in San Francisco, 107
Committees for research, 109; see also area programs
African studies, 118
medieval studies, 51
Middle Eastern studies, 118
Communist societies, comparative study of, 113
Comparative analysis courses in political science, 457
Comparative literature, department of, 201
Comparative research programs of institute of international relations, 112
communist societies, study of, 113
developmental studies, 113
international integration, 113
international population and urban research, 115
national development, 113
political elites, 113
religion and society, 114
western industrial society, studies of, 115
world population growth and demographic behavior, 114
Comparative Studies, 113
Composition, English: subject A, 16, 29, 295, 521
Computer center, 128
Computer science, department of, 208
Computer sciences, electrical engineering and, 238, 245, 263
Conduct, student and discipline, 28,
Contra Costa Academy, 9
Counseling center, 53
Courses of general interest for upper division, 133
symbols used in listing, 139
Cowell memorial hospital, 22, 52
Credit, course, 27
by examination, 27
graduate, 40
passed-or-not-passed, 27
transfer from other institutions, 40
Criminology, department of, 210
Criminology, school of, 84
admission, 84
criminalistics program, 85
social science emphasis, 84
criminology program, 85
natural science emphasis, 84
financial aid, 84
student activities and opportunities, 85
Crooked Creek laboratory, 131
Cultural anthropology, social and, 149
Culture history, archaeology, prehistory and, 149
Cuneiform, 409

Deans, 532
Debate, varsity, 56
argumentation courses in department of speech, 511
university roundtable, 56
Defense language institute at Monterey, 46

Deficiencies, subject or grade, 18
Degrees, 29; see also bachelor's degree, master's, doctor's
academic, 33, 40
for academic senate members, 39
on Berkeley campus, 50
 candidacy for, 29, 43
duplication of, 39
university requirements, 31
work toward, 28, 39

Dentistry, school of, in San Francisco, 107
Demography, department of, 214
Design, college of environmental, 74
Design, department of, 315
emphasis on
ceramics, 316
interior design, 316
textiles, 316
graduate seminars, 319
Design research, laboratory for, 77
Developmental studies, research program of, 113
Dietetics, see nutritional sciences
Dining commons, 55
Dining facilities, 55
Dismissal, 26
honorable, 36
Doctor's degree, 42; see also requirements in various departments
at Berkeley, 43, 47, 50
candidate's degree, 45

Dissertation Abstracts, 45
university requirements, 43
Donner laboratory, 123
Dramatic art, department of, 217
course credit for acting, 56
university theater, 217
Dravidian, 410
Dutch, 350

East European studies
center for slavic and, 119
certificate in, 51

Economic history courses, 357
Economic research, institute of business and, 110
Economic and social factors in architectural and urban design, 309
Economics, agricultural, 142
Economics, department of, 221
requirements in statistics, 222
Education, center for research and development in higher, 128
Education, department of, 227
Education, physical orientation meeting, 23
Education, school of, 86
degrees and credentials, 86
extension courses, 87
facilities and opportunities, 87
Education act of 1965, new higher, 54
study abroad program, 64
centers, 47, 65
committee for, 47, 65
Education field service, 87
Educational media laboratory, 87
Educational opportunity grants, 62
Educational placement office, 54
Educational testing service, 18, 94
graduate examination, 33
TOEFL, 34

Egyptian, 410

Electrical engineering, department of, 238, 245, 263
Electronics research laboratory, 289
Engineering, college of, 70
electives, 71
extension courses, 73
foreign applicants, 21
research facilities, 74
special facilities, 72
special regulations, 72
student activities and services, 72
cooperative program, 72
Engineering, departments and divisions, 236
courses, 251
aeronautical sciences, 241
courses, 278
applied mechanics, 241
courses, 279
ceramic, 249
civil, 236, 244
courses, 253
electrical and computer sciences, 238, 245
courses, 263
engineering geoscience, 250
courses, 284
hydraulic and sanitary, 237
laboratory, 289, 291
industrial and operations research, 241, 247
courses, 270
laboratories, 289
materials science, 250
courses, 282
mathematical statistics, 516
mechanical, 241
courses, 273
laboratories, 290
mechanical design, 242
metallurgy, 249
extractive, 249
physical, 249
mineral technology, 243
curriculum in materials science, 250
naval architecture, 243, 251
courses, 285
laboratory, 290
nuclear, 244, 251
courses, 286
laboratory, 290
structural engineering and structural mechanics, 237
laboratory, 292
thermal systems, 242
transportation, 238
Engineering extension, 73
Engineering physics, 441
Engineering research, 73
Engineering science, 246
English, department of, 292
courses, undergraduate, 295
honors, 294
in advanced composition, 298
in language and literature, 296
preceptorial, 295
special studies, 298
graduate seminars, 299
teacher training, 295
English composition: subject A, 16, 29, 295
English as a foreign language, 300
Enrollment, 10, 12
advance, dates for, ii
in classes, 24
in restricted courses, 24
Entomology and parasitology, department of, 300
Environmental control systems, 306
Environmental design, college of, 304
departments in, 304
Examinations, 27
admission by, 18
to graduate study, 33
achievement tests, 18
American history and institutions, 30
course credit by, 27, 40
medical-physical requirements, 22
midterm and final, 27
scholastic aptitude, 18
subject A, 29
state board for optometry, 100
Expenses of students, 59
table of, 60
Extension, university, 12, 39, 87
engineering, 73
social welfare, 105
Facilities and services
at Berkeley, 52
graduate, 46
Faculty, 10
Faculty advisers
for foreign students, 21, 35
for graduate students, 35
for undergraduates, 24
Family sociology, 417
Fees and expenses, 59
application for admission and, 15
ASUC, 60
athletic privilege card, 60
registration, 60
late registration, 22
nonresident tuition, 23, 60
student union, 60
subject A, 60
table of, 60
Fellowships
honorary traveling, 49
national defense education act, 49
national science foundation, 49
teaching, 49
Filing study list, 24
dates for, ii
Financial aids, 47, 61
assistantships, 49, 50
associateships, 49
in business administration, 84
fellowships, 49
in criminology, 85
to graduate students, 47
loan funds, 54, 62, 63
and military information, 57
NIMH intern, 86
prizes, 61
scholarships, 61
in public health, 103
in social welfare, 98
for veterans, 105
Vollmer memorial scholarship fund, 86
work-study program, 62
Fisheries station, Sagehen wildlife and,
529
Folklore, 325
Food sciences, see nutritional sciences
Foreign language
defense language institute at Monterey,
46
training, 46, 131
adviser, 46
placement-achievement tests, ii
requirement for college of letters and
science, 76
requirement for doctor’s degree, 42
requirement for graduate degrees, see
various departments
Foreign literature in translation, 323
Foreign students
admission, 21
to graduate study, 34
advisers, 21, 35
ASUC international relations board, 57
engineering students, 21
English for, 300
groups, 56
health insurance, 21
I house, 57
proficiency in English, 21
registration, 36
study list and study list limits, 38
TOEFL, 34
Forest products laboratory, 91
Forestry and conservation, department of,
326
Forestry and conservation, school of, 87
summer field program, 88
facilities and activities, 90
financial aid, 91
Fraternities and sororities, 57
French, department of, 329
Freshman admission requirements
for California residents, 16
for nonresidents, 19
General interest courses for upper division
students, 133
Genetics, department of, 333
cancer research laboratory, 528
major requirements under agricultural
sciences, 142, 333
related courses in other departments,
335
Geography, department of, 335
Geology and geophysics, department of,
340
major in geology, 341
major in geophysics, 342
Geoscience, engineering, 246, 342
German, department of, 346
duplication of credit, 348
linguistics, 347
literature, 347
in English translation, 323
Giauque low-temperature laboratory, 69
Giannini foundation, 68
Gill tract, 68
Governmental studies, institute of, 110
Grade points, grades and, 25
admission requirements, 19
course credit by, 25
letter grades, 25
Graduate council of the Berkeley division,
33, 46
Graduate curricula, study programs in
college of agricultural sciences, 67
college of engineering, 72
college of environmental design, 75
school of business administration, 82
school of criminology, 85
school of education, 86
school of forestry and conservation, 88
school of journalism, 92
Graduate division, 326
Graduate residence, 75
Graduate school, 33, 46

Foreign language

Foreign literature in translation, 323

Foreign students
admission, 21
to graduate study, 34
advisers, 21, 35
ASUC international relations board, 57
ing engineering students, 21
English for, 300
groups, 56
health insurance, 21
I house, 57
proficiency in English, 21
registration, 36
school of law, 94
school of librarianship, 98
school of optometry, 100
school of public health, 101
school of social welfare, 104
Graduate division, 33
Graduate record examination, 33, 91
Graduate school science library, Hans Kelsen, 83
Graduate students, 36
degrees, 40, 42, 50
facilities and services for, 46
financial aid to, 58, 61
instruction, 38
regulations and procedures, 35
study abroad for, 47
Graduate theological union, 46
Greek, 196, 198
Hastings college of the law in San Francisco, 107
Hastings reservation, 528
Health service, student, 22, 36, 52
Hebrew, 323, 410
Herbaria, botany, 173
High school requirements for admission, 16
Higher education act of 1965, 62
work-study program, 62
Hindi-Urdu, 411
History, department of, 350
History, economic, courses, 357
History of art, 154
History of the environment, 309
History of science courses, 357
History of the university, 9
Honors, 27; see also honors courses in various departments
Hormone research laboratory, 124
Hospital, Cowell memorial, 21, 52
Housing information services, 63
Human development, institute of, 111
Human learning, institute of, 111
Humanities, 358
field major in, 358
Hungarian, 488
language and culture courses, 488
literature in translation, 323
Hydraulic engineering laboratory, 289
Hydraulic and sanitary engineering, 237
I house, 57
Immuno logic, department of bacteriology and, 162
Industrial engineering laboratory, 289
Industrial relations, institute of, 112
Inorganic materials research laboratory, 124
Institutes of
basic research in science, 109
business and economic research, 110
defense language, at Monterey, 46
governmental studies, 110
human development, 111
human learning, 111
industrial relations, 112
international studies, 112
library research, 121
marine resources, 121
personality assessment and research, 121
planners, American, 311
transportation and traffic engineering, 73, 130
urban and regional development, 76, 122
Intercampus exchange program, 34
Intercampus transfer, 20
Interdepartmental studies, 358
Interior design, emphasis on, in department of design, 316
International house, 57
International integration, program on, 112
International population and urban research (IPUR), 117
International studies, institute of, 112;
see also area programs, centers, committees for research, comparative research programs
Iranian, 412
Italian, department of, 359
chair of Italian culture, 359
doctor’s degree in Romance languages and literatures, 360
literature in translation, 323
Japanese courses, 424
literature in translation, 323
seminars, 427
Japanese studies, center for, 118
Journalism, department of, 91, 362
Korean studies, center for, 118
Kraft prize, 61
Laboratories
Barcroft, 131
chemical research, 528
cancer research, 69, 123
crooked Creek, 131
design research, 77
donner, 123
educational media, 87
electronics research, 73, 289
forest products, 90
hormone research, 124
hydraulic engineering, 73, 289
industrial engineering, 289
inorganic materials research, 124
Lawrence radiation, 69, 125
low-temperature, 69
mechanical engineering, 290
naval architecture, 290
naval biological, 125
nuclear engineering, 290
Owens Valley, 131
of the Rockefeller university, 125
sanitary engineering research, 73, 291
sea water conversion, 73, 291
soil mechanics and bituminous materials, 291
space sciences, 73, 126
statistical, 520
structural engineering materials, 73, 292
Summit, 131
virus, 126
Landscape architecture, department of, 319
Language training adviser, 131
foreign language training, 46, 131
Latin, 196, 199
Latin-American studies, center for, 115
Law, department of, 364
semester units, 366
Law, school of, 93
admission test, 94
dates for, ii
Law and society, center for study of, 128
Lawrence radiation laboratory, 69, 125
Livermore programs, 125
Lectures, 56
Legal residence, 37
Legal studies program, international, 116
Letters and science, college of, 77
Letters and science list of courses, 80
Leuschner observatory, 158
Librarianship, school of, 91, 370
Libraries
branch, departmental, 52
interlibrary loans, 11
law, 96
main, 52
Bancroft, 52
Morrison, 52
Library research, institute of, 121
Lick observatory, 159
Limited status, admission to, 20
Linguistics, department of, 374
degrees, master's and doctor's, 375
doctor's, in Sanskrit, 376
program of study in Germanic languages, 347
related courses in other departments, 378
Literature, foreign, in translation, 323
Living accommodations, 63
Loan funds
Anthony graduate, 54
California state guaranteed program, 63
education act of 1965, 54, 63
health professions, 52
Mulford in forestry, 90
NDEA, 62
university, 62
Logic and the methodology of science, 380
interdisciplinary program, 380
logic colloquium, 381
Lost-and-found service, 55
Low-temperature laboratory, 69
Major, see various departments declaration and change of, 28
and department, 31
requirement for degree, 79
Management, society for advancement of, 83
Management science, center for research in, 129
Management sciences laboratory, 129
Marine corps, programs for navy and, 59
Marine resources, institute of, 121
Master's degree, 39; see also various departments list of, at Berkeley, 40, 50
Materials science, 250, 282
Mathematics, department of, 381
computer science, 383
related courses in other departments, 390
for teachers, 383
Mechanical design, 242
Mechanical engineering, department of, 241
Mechanical engineering laboratory, 290
Medical-physical examination requirement, 22
for graduate students, 36
Medical physics, 391
graduate courses in
  cellular biophysics, 392
  medical physics, 392
  radiation biophysics, 392
  theoretical biophysics, 392
Medicine, school of, in San Francisco, 107
Medieval studies, 51
  committee for, 51
  graduate courses in art department, 157
  interest in history department, 357
  in music, 399
Metallurgy, 249
Methodology of science, logic and, 380
Middle Eastern studies, committee for, 119
Midterm and final examinations, 27
Military information, 57
Military science, department of, 393
Miller institute for basic research in science, 109
Mineral technology, department of, 243
Morrison library, 52
Molecular biology, department of, 395
Morrill act of 1862, 58
Museums of
  anthropology, 152
  paleontology, 428
  vertebrate zoology, 526
Music, department of, 397
courses in
  history and literature, 399, 401
  medieval studies, 399, 402
  performance, 400, 402
  theory, 401, 402
  cultivation of, 56, 398
National aeronautics traineeships, 49
National defense education act fellowships, 49
National development, research program in comparative, 113
National science foundation fellowships, 49
  traineeships, 49
Natural science, 403
Naval architecture, 285
Naval architecture laboratory, 290
Naval biological laboratory, 125
Naval research, office of, 131
Naval science, department of, 403
draft exemption for NROTC students, 404
Navy and marine corps programs, 59
NDEA loan funds, 62
Near Eastern studies, department of, 405
courses in
  Arabic, 408
  Armenian, 409
  Cuneiform, 409
  Dravidian, 410
  Egyptian, 410
  Hebrew, 323, 410
  Hindi-Urdu, 411
  Iranian and Persian, 412
  Near Eastern, 407
  Semitics, 412
  South Asian, 408
  Turkish, 323, 413
  literature in translation, 323
New higher education act of 1965, 54
NIMH intern fellowships, 85
Nonresidents
  freshman admission, 18
  tuition fee, 23
NROTC students, draft exemption for, 404
Nuclear engineering, department of, 244, 286
Nuclear engineering laboratory, 251
Nursing, school of, in San Francisco, 99
Nutritional sciences, department of, 413
  family sociology, 417
  major in
    dietetics, 414
    food science, 415
    nutrition, 415
Operations research center, 291
Operations research, industrial
engineering and, 241, 247, 270
Optometry, department of, 418
  physiological optics program, 94, 100, 419, 420
Optometry, school of, 100
Optometry clinic, 53
Oriental languages, department of, 422
emphasis on
Altaic languages, 423
Chinese, 422, 424
Japanese, 423, 424
literature in translation, 323
Owens Valley laboratory, 131
Oxford tract, 68

Painting, see art department
Paleontology, department of, 428
Paleontology museum, 431
Parasitology, department of entomology and, 300
Passed-or-not-passed courses, 27
Pathology, plant, 449
Personality assessment and research, institute of, 121
Pharmacy, school of, in San Francisco, 107
Philology, Romance, 479
Philosophy, department of, 431
Physical anthropology courses, 148
Physical education, department of, 434
fees, 436
orientation meeting, 23
teaching credential, 436
Physical-medical examination, 22
Physics, department of, 438
and biology, 441
engineering physics, 441
Physiological optics, see Optometry
Physiology, cell, 185
Physiology-anatomy, department of, 445
graduate major in anatomy, 446
major in physiology, 446
Placement center, student and alumni, 53
Placement, office of educational, 54
Planners, institute of American, 311
Planning and development research, center for, 77
Plant nutrition, soils and, 501
Plant pathology, department of, 449
graduate work in, 64
Police, university, 55
Political elites program, comparative, 113
Political science, department of, 451
area studies seminar, 458
behavior courses, 459
political theory courses, 458
Portuguese, department of Spanish and, 504
courses, 509
literature in translation, 323
Poultry husbandry, department of, 461
Primalogy, physical anthropology and, 148
Probability, courses in, 516, 517
Probation, 26
Professional schools program, 116
Psychology, department of, 462
Public administration and public policy courses, 460
Public Affairs Report, 110
Public health, department of, 468
Public health, school of, 101
financial aids, 103
Public law and jurisprudence seminars, 459
Publications, student, 56
Quarter system, 11
dates, ii
procedures, 25
Radio astronomy observatory, 158
Range management, 477
curriculum requirements in other departments, 478
Readmission, application for, 36
Real estate and urban economics, center for, 77, 122
Reapplication for admission, and fee, 16
graduate, 34
Recreational facilities, athletic and, 54
Regents, 11, 530
Regional planning, city and, 310
Registration fee, 60
Registration and enrollment, 22
graduate, 36
Religion and society, comparative program on, 114
Research at Berkeley, 10, 109
Research and development in higher education, center for, 128
Research services, office of, 73
Residence
academic, 37, 43
legal, 37
Residences, university operated or registered, 63
Richmond field station, 73
Rockefeller university laboratory, 125
Romance philology, 479
ROTC programs, 57
Russian, 486
Russian and East European studies, certificate in, 51

Sagehen Creek wildlife and fisheries station, 529
San Francisco, schools in, 107
Sanitary engineering research laboratory, 73, 291
Sanskrit, degree in, 376
Scandinavian, department of, 480
Literature in translation, 323
Scholarship requirements, 26
Scholarships, 61; see also financial aids
Scholarships, committees on, 47, 91
Scholastic aptitude test, 18
Schools at Berkeley, requirements, 31
Schools in San Francisco, 107
Sculpture, 156
Sea water conversion laboratory, 73, 291
Seismographic station, 346
Selective service regulations, 57
Semitics, 412
Services and facilities of the Berkeley campus, 52
Slavic and East European studies, center for, 119
Slavic languages and literatures, department of, 483
duplication of credit, 486
Lecture courses on Slavic literatures, 487
Russian courses, 486
in translation, 323
Social anthropology, 149
Social and economic factors in architectural design, 309
Social science, department of, 489
Social welfare, department of, 490
Social welfare, school of, facilities, 105
extension, 105
Social welfare research projects office, 105
Society, center for study of law and, 128
Sociology, department of, 494
Sociology, family, 417
Soil mechanics and bituminous materials laboratory, 291
Soils and plant nutrition, department of, plant nutrition courses, 504
soil science courses, 502
Sororities, 57
South Asia studies, center for, 119
South Asian languages, 408
Southeast Asia studies, center for, 119
Space sciences, atmospheric and, 161
Space sciences laboratory, 73, 126
Spanish and Portuguese, department of, duplication of credit, 507
Portuguese courses, 509
in translation, 323
Spanish courses, 507
in translation, 323
Special admission, 20
Special interest clubs, 56
Special services, office of, 54
Special status, 20
Speech, department of, 510
Sports and recreational facilities, 54
Stanford-California exchange program, 46
Statistical laboratory, 520
Statistics, department of, 514
Strawberry Canyon recreation area, 55
Structural engineering materials laboratory, 73, 292
Study abroad for graduate students, 47
Study list
changes in graduate, 38
filing, 24
limits, 38

Students, 10
center, 55
conduct, 28
financial aids, 61
health service, 52
living accommodations, 63
organizations and activities, 55
agriculture, 69
business administration, 83
criminal justice, 85
engineering, 74
forestry, 91
social welfare, 105
publications, 56
services and facilities, 11, 52
union and student center, 55

Student and alumni placement center, 53
Student health service, 52

INDEX / 543
Study of law and society, center for, 128
Subject A, department of, 521
  entrance requirement, 16, 29
  English for foreign students, 300
Summit laboratory, 131
Survey research center, 129
Teaching assistantships and fellowships, 49
Teaching credentials, 51, 86
Tests, see examinations
Textiles, emphasis on, in department of design, 315
Theater, TV, and radio, 56
Theological union, graduate, 46
Traineeships, 49
Transcript of record, 15
Transfer after dismissal, 26
Transportation and traffic engineering, institute of, 130
Turkish, 413
Units, courses and, 25
University art gallery, 158
University extension, 12, 39, 78, 87
University operated or registered residences, 63
University press, 64
University roundtable, 56
University village for married students, 63
Urban and regional development, institute of, 77, 122
Urdu, Hindi, 411
Vaccination certificate requirement, 22
Varsity debate, 56
Vertebrate zoology museum, 528
Veterans, aid to, 58
  aid to dependents of, 58
Veterinary medicine, school of, at Davis, 68
Vice-presidents, 530
Virus laboratory, 126
Visiting scholars, 34
Vollmer memorial scholarship fund, August, 86
Warren legal center, Earl, 97
Western industrial societies, comparative studies of, 114
White Mountain research station, 131
Wildland research center, 91
Withdrawals, absences and, 28
  graduate, 36
Work-study program, 62
World population growth and demographic behavior, comparative study of, 114
Yiddish, 350
Zoology, department of, 521
  facilities and stations, 528
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