SECTION TWO

Courses and Curricula
Officers of Administration
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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 specially designed for freshmen and sophomores, and are open to upper division students, but without 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 of 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.

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 8 units in special study courses per quarter. Courses marked H are special honors courses subject to such general restrictions as may be imposed by the department.

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 \( \frac{1}{2} \), \( \frac{2}{3} \), or \( \frac{3}{4} \) of a sequence.

The number in parentheses following the course title indicates the credit value (see page 22); the letter in parentheses indicates the quarter in which the course is offered; (F) fall (W) winter (Sp) spring (Su) summer.

AEROSPACE STUDIES

(Department Office, 47 Harmon Gymnasium)

William A. Eveland, Major, USAF, Professor of Aerospace Studies (Chairman of the Department).

Kenneth W. Edwards, Major, USAF, Associate Professor of Aerospace Studies.

James S. Austin, Captain, USAF, Assistant Professor of Aerospace Studies.

The Department of Aerospace Studies offers the undergraduate or graduate student the opportunity to qualify for a commission in the United States Air Force while completing degree requirements of the University. Enrollment is open to most students, especially those in scientific, engineering, management and other professional fields.

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. 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 existent 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.
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; its 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 level, and the responsibility, authority and functions of the Air Force Officer.

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. For further details on scholarships, enrollment, service commitments, deferment, substitution of military experience for the General Military Course, etc., please contact the department staff.

Lower Division (General Military Course)

1A–1B–1C. World Military Systems. (2–2–2)
One 1-hour lecture and one 1-hour laboratory per week. Introductory course exploring the causes of present world conflict; role of military power; doctrine, missions, organization and employment concepts of the United States Air Force; mission, organization, and operational concepts of Air Force material, and communications support commands, personnel education and training support, future systems and doctrine.
Mr. Eueland, 1A (F); 1B (W); 1C (Sp)

21A–21B–21C. World Military Systems. (2–2–2)
One 1-hour lecture and one 1-hour laboratory per week. Prerequisite: course 1A–B–C or equivalent. Roles and missions, doctrine, organization and employment concepts of the U.S. Army and Navy; Western alliances including NATO, SEATO, and CENTO, and military forces of the nations of these alliances; military forces of Russia, its Satellites and Communist China; Analysis of the trends and implications of world military power.
Mr. Eueland, 21A (F); 21B (W); 21C (Sp)

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.
AFROTC Staff (Su)

Upper Division (Professional Officer Course)

Two 1½-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.
Mr. Austin, 131A (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)

AGRICULTURAL CHEMISTRY

Administered by an Interdepartmental Group
David L. Brink, Ph.D., Lecturer in Wood Chemistry.
Harold T. Gordon, Ph.D., Lecturer in Entomology.

Graduate Advisers: Mr. Brink, 145 Mulford Hall; Mr. Gordon, 10 Leuschner Observatory.

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 the departments of chemistry and biochemistry, and in various departments in the College of Agriculture. 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; 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, please consult the adviser.

Graduate Course

299. Research in Agricultural Chemistry. (1–12)
(Formerly numbered 201A–201B)
Agricultural Chemistry Group (Mr. Brink in charge) (F, W, Sp, Su)

AGRICULTURAL ECONOMICS

(Department Office, 207 Giannini Hall)
Raymond G. Bressler, Jr., Ph.D., Professor of Agricultural Economics.
David A. Clarke, Jr., Ph.D., Professor of Agricultural Economics.
Norman R. Collins, Ph.D., Professor of Agricultural Economics and Business Administration.
Varden Fuller, Ph.D., Professor of Agricultural Economics.
Sidney S. Hoos, Ph.D., Professor of Agricultural Economics, Economics, and Business Administration.
George M. Kuznets, Ph.D., Professor of Agricultural Economics, Economics, and Statistics.
Ivan M. Lee, Ph.D., Professor of Agricultural Economics.
George L. Mehren,† Ph.D., Professor of Agricultural Economics.
Loy L. Sammet, Ph.D., Professor of Agricultural Economics (Chairman of the Department).
Siegfried V. Wantrup, Dr.Agr., Professor of Agricultural Economics.
Harry R. Wellman, Ph.D., Professor of Agricultural Economics.
Murray R. Benedict, Ph.D., Professor of Agricultural Economics, Emeritus.
Henry E. Erdman, Ph.D., Professor of Agricultural Economics, Emeritus.
David Weeks, Ph.D., Professor of Agricultural Economics, Emeritus.
James N. Boles, Ph.D., Associate Professor of Agricultural Economics.
Irving J. Hoch, Ph.D., Associate Professor of Agricultural Economics.
Joseph D. Coffey, Ph.D., Assistant Professor of Agricultural Economics.
Joe B. Stevens, Ph.D., Assistant Professor of Agricultural Economics.

Kenneth R. Farrell, Ph.D., Lecturer in Agricultural Economics.
Davis McEntire, Ph.D., Lecturer in Agricultural Economics and Professor of Social Welfare.
Eric Thor, Ph.D., Lecturer in Agricultural Economics.
L. T. Wallace, Ph.D., Lecturer in Agricultural Economics.
Pinhas Zusman, Ph.D., Visiting Associate Professor of Agricultural Economics.

Undergraduate Major Advisers: Mr. Boles, Mr. Coffey, Mr. Stevens.
Graduate Advisers: Mr. Clarke, Mr. Sammet.

Agricultural Economics is one of the majors under the Agricultural Sciences Curriculum in the College of Agriculture (see page 62), 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 (3 units of calculus; 3 additional units of calculus or linear algebra) (6); 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*, 52 units as follows: A. Core requirements, 25 units, consisting of: accounting (5); 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*, 61 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, 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.
AGRICULTURAL ECONOMICS / 129

Lower Division Course

23. World Agriculture. (4)
(Formerly numbered 25)
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 (F)

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. Mr. Bressler (F)

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. Mr. Hoch (Sp)

106. Analysis of Agricultural Economic Data. (5)
Three 1½-hour lectures per week. Prerequisite: Statistics 2, Mathematics 16A, or equivalents. Evaluation and treatment of economic data in agriculture, with emphasis on methods of analyzing relationships among economic variables. Mr. Zusman (Sp)

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 1½-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. Sequence, beginning (W). Mr. McEntire (W, Sp)

120. Agricultural Policy. (5)
Three 1½-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)
(Formerly numbered 163)
Three 1½-hour lectures per week. Prerequisite: course 100A and consent of instructor. Development of the agricultural sector; production, marketing, and institutional problems affecting agriculture in development and the impact of development on agriculture; the transformation of traditional agriculture. Mr. Coffey (W)

130. Agricultural Marketing. (4)
Two 1½-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. Hoch (Sp)

141. Management Operations. (5)
(Formerly numbered 140)
Three 1½-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)
(Formerly numbered 145)
Two 1½-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. Hoch (Sp)

156. Agricultural Economic Measurements. (4)
Two 1½-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. Hoch (Sp)

160. Economic Analysis in Agricultural Marketing. (5)
Three 1½-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 1½-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. Mr. Stevens (F)

Selected topics in agricultural economics for advanced undergraduates. The Staff (Mr. Boles in charge) (F, W, Sp)

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

Graduate Courses

200A–200B. Economics of Agricultural Production and Consumption. (5–5)
Three 1½-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. Zusman (Sp)
210A–210B–210C. Quantitative Methods in Agricultural Economics. (S–2–2)

210A. Three 1½-hour lectures per week.
210B. Two 1½-hour lectures per week.
210C. Two 1½-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, ——— (W)


Two 1½-hour lectures per week. Growth trends and cyclical variation in agriculture and in 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, ——— (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)


Two 1½-hour lectures per week. A seminar on the literature, current research problems, and methods of analysis in agricultural marketing. Sequence, beginning (F).

230A, Mr. Bressler (F); 230B, Mr. Sammet (W); 230C, Mr. Clarke (Sp)


Two 1½-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, ——— (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, Mr. Stevens (F); 270B, ——— (W); 270C, Mr. Wanner (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)

297. Individual Study. (1–9)

Prerequisite: advanced graduate standing. Open to advanced graduate students for individual study in preparation for the Ph.D. qualifying examination. The Staff (Mr. Clarke in charge) (F, W, Sp, Su)

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. Clarke in charge) (F, W, Sp, Su)

299. Individual Research. (1–9)

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

Agricultural Science

The undergraduate major in agricultural science is a combined offering of the teaching departments in the College of Agriculture. 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 and poultry husbandry, 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 (8); English, speech, or comparative literature (8); restricted electives (anthropology, classics, foreign languages, geography, history, philosophy, psychology, sociology, or additional English or speech) (16).

Physical Sciences and Mathematics, 38 units as follows: chemistry, including organic (20); mathematics (3); statistics (3); physics (12).
Biological and Agricultural Sciences, 41 units as follows: agricultural science (4); bacteriology (5); biology (15); physiology (5); ecology (4); botany and/or zoology (8).

Major Field, 33 units as follows: agricultural economics (4); entomology (4); genetics (4); 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 Agriculture, 101 Giannini Hall, for information concerning advisers.

ANATOMY

For courses in Anatomy, see Physiology-Anatomy.

ANTHROPOLOGY

(Department Office, 232 Kroeber Hall)

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

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 Anthropology.

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

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


Theodore D. McCown, Ph.D., Professor of Anthropology and Curator of Physical Anthropology.

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 (Chairman of the Department).

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

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

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

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

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

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

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

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

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

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

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

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

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

Jack M. Potter,‡ Ph.D., Assistant Professor of Anthropology.

‡ On leave, winter and spring quarters, 1966–67.
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, Linguistics 105; (IV) Any area course.

Also required are additional elective courses to complete, with the above, a total of 36 units of upper division courses in anthropology. Substitutions may be permitted among these additional elective courses of not more than 8 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).

Preparation for Graduate Study Admission to the graduate study 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, 1967) 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. One must be chosen from French, German, or Russian. The second may be selected from this list, or from a supplementary list which permits students to acquire the language they will use in field work. At least one language examination must be passed by the end of the first year of graduate study; otherwise the student will be dropped from the graduate program.
The Graduate Major

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

*Step I.* This segment normally takes one year, during which the student begins 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 requires a minimum of one year. The writing of the dissertation normally 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 72.

**Lower Division Courses**

1. **Introduction to Physical Anthropology. (4)**
   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. Washburn (F); Mr. McCown (W); ——— (Sp)

2. **Introduction to Archaeology. (4)**
   (Formerly course 2A)
   Three 1-hour lectures and one 1-hour section meeting per week. Prehistory and cultural growth. Mr. Isaac and Mr. Rodden (W)

3. **Introduction to Social and Cultural Anthropology. (4)**
   (Formerly course 2B)
   Three 1-hour lectures and 1-hour section meeting per week. Structure and dynamics of culture. Mr. Hammel (F); Mr. Berreman (Sp)

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

**Upper Division Courses**

**Class Meetings:** Unless otherwise noted, lecture courses meet three hours per week.

**Group I. Physical Anthropology and Primatology**

100. **Fossil Man. (4)**
   (Formerly course 152)
   **Prerequisite:** course 1 or equivalent. Origin and relationships of the extinct forms of mankind. Mr. McCown (Sp)

102. **Adaptations in Human Populations. (4)**
   (Formerly course 153)
   Genetic, morphological, physiological, ecological and cultural factors are considered in detailed examinations of selected human populations so as to illustrate adaptive proactive processes and problems in prehistoric and on-going human microevolution. ——— (W)

104. **Physical Anthropology Laboratory. (4)**
   (Formerly 150)
   Two 2-hour meetings per week. **Prerequisite:** course 100, or 102, or 108 (may be taken concurrently). Enrollment limited to twelve students: primarily for majors in anthropology and the life sciences. Descriptive and analytical techniques and methods applicable to the study of intra- and intergroup resemblances and differences. ——— (W)
108. Primate Evolution. (4) 
(Formerly course 151).
Prerequisite: course 1 or equivalent. A consideration of the major groups of primates with emphasis on the evolution of behavior. Mr. Washburn (W)

108L. Primate Evolution Laboratory. (4) 
(Formerly course 151L)
Four hours of lecture and laboratory sessions per week. Prerequisite: course 108 (preferably taken concurrently). Enrollment limited to twelve students; primarily for majors in anthropology and the life sciences.
Mr. Washburn (W)

110. Primate Social Behavior. (4) 
(Formerly course 154)
Survey of the social behavior and organization of monkeys and apes; their relevance to the evolution of human behavior and social groups.
Mrs. Lancaster (F)

110L. Primate Social Behavior Laboratory. (4)
Four hours of lecture and laboratory sessions per week. Prerequisite: course 110 (preferably taken concurrently). Enrollment limited to twelve students; primarily for majors in anthropology and the life sciences.
Mrs. Lancaster (F)

Group II. Archaeology, Prehistory, and Culture History

120. Culture Growth. (4) 
(Formerly course 103)
Archaeological theory and cultural process, illustrated by the origin and development of civilization in the Old World and the New. Mr. Rowe (W)

122. Archaeology of North America. (4) 
(Formerly course 106)
Prehistory of North American Indians; prehistoric culture areas; relations with historic Indians.
Mr. Graham (Sp)

124. Ancient Civilization of Mexico and Central America. (4) 
(Formerly course 141)
A study of the development, form, and history of pre-Columbian Indian civilization, surveying the achievements of the Maya, the Aztec, and their neighbors.
Mr. Graham (F)

126. Peoples of the Andes. (4) 
(Formerly course 142)
Inca culture and its antecedents; a survey from the earliest times to the present. Miss Menzel (Sp)

(128B formerly course 111)
Prerequisite: course 2. Any quarter of this course may be taken independently, and no quarter is prerequisite to any other. 128A: Europe. Mr. Isaac (F)
128B: Europe and Asia in the Pleistocene. Mr. McCown (W)
128C: Post-Pleistocene cultural phenomena of Europe and Asia. Mr. Rodden (Sp)

128L. Old World Prehistory Laboratory. (4)
Two 2-hour meetings per week. Prerequisite: 128A, 128B, or 128C (may be taken concurrently) and consent of the instructor. May be repeated without duplication of credit with consent of the instructor. Descriptive and analytical methods used in classification and discussion of prehistoric cultures of the Old World.
Mr. Isaac (F); Mr. Rodden (Sp)

§129A–129B. The Archaeology of Egypt. (4–4)
A survey emphasizing recent discoveries.
Mr. Fakhry (F, W)

130. Invention and Technology. (4) 
(Formerly course 126)
Origin, history, and spread of fundamental inventions; illustrative material from the Lowie Museum of Anthropology. Mr. Clark (Sp)

131. Science in Archaeology. (4)
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 (F)

132. Archaeology and Society. (4) 
(Formerly course 107)
Archaeological research methods and their uses in the study of man’s past.
Mr. Heizer (F)

*133. Field Course in Archaeological Method. (4) 
(Formerly course 195)
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. (4) 
(Formerly course 196)
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.

Group III. Social and Cultural 
Anthropology: Theory and Method

140. The Nature of Culture: An Introduction to 
Cultural Anthropology. (4) 
(Formerly course 118)
Not open for credit to students who have taken Course 3. Advanced level introduction to cultural anthropology for nonmajors.
Mr. Dundes (F); Mr. Kay (W); Mr. Berlin (Sp)

141. Comparative Society. (4) 
(Formerly course 125A)
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.
Miss Nader (F); Mr. Anderson (W); Mrs. Diaz (Sp)

142. Kinship and Social Structure. (4) 
(Formerly course 125B)
Prerequisite: course 141. Comparison of kinship and family types throughout the world; techniques of kinship and structural analysis. Mr. Graburn (W)

§ Approved for one offering only, 1966–67.
* Not to be given, 1966–67.
144. Social and Cultural Change. (4)
   (Formerly course 163)
   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 (W)

146. Comparative Peasant Society. (4)
   A comparative study of peasant society as a social type contrasted with primitive and industrial society.
   Mr. Potter (Sp)

148. Man's Ecological Relationships. (4)
   Survey of theories, methods, and applications of the ecological perspective to cultural and physical attributes of human populations.
   Mr. Anderson (Sp)

149. Culture and Personality. (4)
   (Formerly course 119)
   Relationships of cultural, social, and personality factors in human behavior; personality in representative societies; techniques for studying culture-personality relations.
   Mr. Phillips (W)

152. Anthropology in Modern Life. (4)
   (Formerly course 162)
   Anthropological theory and data applied to problems in such fields as medicine, agriculture, education, and international technical-aid programs.
   Mr. Foster (F)

*153. The Transmission of Culture and the Socialization of the Individual. (4)
   (Formerly course 170)
   Methods and problems in the transmission of culture from generation to generation and of the socialization processes of the individual.

154. Marriage and the Family in Non-western Societies. (4)
   (Formerly course 129)
   Comparative analysis of types of conjugal unions and households in non-western societies and how these change.

155. Economic Anthropology. (4)
   (Formerly course 122)
   Economic behavior in non-industrial societies; its social and cultural setting, and its modern changes.

156. Politics and Anthropology. (4)
   Anthropological concepts relevant to the comparative analysis of political ethnohistory.
   Mr. Perelman (Sp)

157. Law and Anthropology. (4)
   (Formerly course 123)
   Comparative survey of the ethnohistory of law; methods and concepts relevant to the comparative analysis of the forms and functions of law.
   Miss Nader (F)

158. Religion and Anthropology. (4)
   (Formerly course 124)
   A consideration of the interplay between religious beliefs and institutions and other aspects of culture.
   Mr. Becker (W)

*159. The Forms of Folklore. (4)
   (Formerly course 130)
   A worldwide survey of the major and minor forms of folklore with special emphasis upon proverbs, riddles, superstitions, games, songs, and narratives.

160. Narrative Folklore. (4)
   (Formerly course 121)
   The study of folktales, myths, legends, and other forms of verbal art; methods and theories of folklore.
   Mr. Bascom (W)

162. Art and Culture. (4)
   (Formerly course 128)
   Graphic and plastic arts and their relations to culture in nonliterate societies; illustrative material from the Lowie Museum of Anthropology.
   Mr. Graburn (F)

165A--165B. Language, Culture, and Society. (4-4)
   (165A formerly course 130)
   Prerequisite: Linguistics 20.
   165A: Language in culture; the design of language, language and cognition, language and evolution, linguistic change and culture change.
   Mr. Berlin (W)
   165B: Language in society; social and linguistic aspects of verbal behavior, speech communities, language and social stratification, language, nation, and state.

*166. Advanced Survey of Social and Cultural Anthropology. (4)
   (Formerly course 197)
   Prerequisite: senior standing or consent of the instructor. Intended primarily for major students.
   Historical survey of anthropological theories, methods, and findings.
   Miss Colson (Sp)

   An introduction to definition of research problems and design techniques for collection, analysis, and presentation of data.

Group IV. Area Courses

175. North American Indians. (4)
   (Formerly course 105A)
   Historical survey of the cultures of the native peoples of the United States and Canada.
   Miss Colson (F)

176. Indians of California. (4)
   (Formerly course 137)
   Survey of the cultures of the native people of California. Tribal divisions, arts, customs, archaeology.
   Mr. Heizer (F)

*178. Native Peoples of South America. (4)
   (Formerly course 105B)
   Archaeology, ethnohistory and ethnography.
   Miss Lyon (Sp)

*179. Contemporary Latin America. (4)
   (Formerly course 191)
   Emphasis on Iberian-Indian assimilation, African influences, development of folk-peasant societies, and the concept of "national" cultures.
   Miss Lyon (W)

180. Mexico and Central America. (4)
   Ethnology of Indian and mestizo cultures with special emphasis on comparative organization, belief systems, law, economics, kinship, language and communication.
   Mr. Berlin (Sp)

* Not to be given, 1966–67.
182. Circumpolar Regions. (4)
(Formerly course 116)
A survey of Arctic cultures. Mr. Graburn (F)

183. European Peasant Societies. (4)
(Formerly course 161)
Representative groups considered in modern and historical perspective, stressing especially rural-urban relationships and the dynamics of change. Mrs. Dia (F)

185. The Near East. (4)
(Formerly course 149)
Cultures of the contemporary Near East, with special emphasis upon Arab populations. Miss Nader (W)

186. Africa South of the Sahara. (4)
(Formerly course 139)
Traditional cultures and social institutions of Sub-Saharan Africa. Mr. Perlman (W)

188A-188B. South Asia. (4-4)
(Formerly course 143A-143B)
188A: Development of cultural traditions. Mr. Benedict (F)
188B: Social organization and rural trends. Mr. Berreman (W)

190A*-190B. China. (4-4)
(Formerly course 182)
Chinese culture and society with emphasis on the village level. 190A: Pre-Communist China. 190B: Communist China. Mr. Potter (Sp)

191. Japan. (4)
(Formerly course 186)
Ethnological treatment of historic and modern Japanese culture.

192. Southeast Asia. (4)
(Formerly course 115)
Races, languages, and cultures of Southeast Asian islands and mainland. Mr. Phillips (W)

194. Pacific Islands. (4)
(Formerly course 147)
The peopling of the Pacific, Oceanian races and cultures. Mr. Kay

Group V. General Courses

195. Undergraduate Seminars. (3)
One 2-hour meeting per week. Prerequisite: grade of B or better in an upper-division course for which an associated seminar is scheduled, and/or consent of the instructor. Enrollment limited.

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 (124) (F); Mr. Clark (128), Mr. Graburn (142), Mr. Becker (158), Mr. Graburn (142), Mr. Graham (125), Mr. Heizer (132) (176), Miss Lyon (179), Mr. Benedict (188), Miss Colson (175), Mr. Phillips (149), Mr. Sarich (102), Mr. Washburn (108) (Sp)

H198. Preceptorial and Reading Course. (4)
Three hours of meetings per week. Restricted to senior honor students. May be repeated without duplication of credit with consent of the instructor.

* Not to be given, 1966-67.

Systematic readings in the history of anthropology and in significant modern developments within the field. Mr. Kay (F); Mr. Anderson (W); Mr. Isaac, (Sp)

199. Special Study for Advanced Undergraduates. (2-4)
Individual conferences to be arranged. (May be taken for one quarter for 4 units, or for two quarters for 2 units.) Restricted to senior honor students. The Staff (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. Washburn (F); Mr. McCown (Sp)

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

(Formerly course 204A-204B)
Two 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. Foster and Staff (F); Mr. Potter and 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 method; k. theory of research; l. additional seminars on special topics to be announced. Mr. Becker, Mr. Kay, Mr. Bascom (F); Mr. Berlin, Mr. Berreman, Mr. Foster, Miss Lyon, Mr. Kay (W); Mr. Phillips (Sp)

251A-251B. Two-Quarter Seminars in Social and Cultural Anthropology. (3)
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. Miss Colson and Mr. Perlman, Mrs. Diaz, Mr. Hammel, Miss Nader. Sequence beginning (W)

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 (Sp)
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. Benedict (W); Mr. Anderson, Mr. Foster, Mr. Mandelbaum (Sp)

295. History and Theory of Anthropology. (3)
(Formerly course 207A–207B.)
Mr. McCown (F); Mr. Becker (W); Mr. Rowe (Sp)

296A–296B. Supervised Research. (3–3)
296A: Practice in original field research under staff supervision. The Staff (W)
296B: Analysis and write-up of field materials. The Staff (Sp)

297. Individual Study. (3–6)
In consultation with Graduate Adviser, intended to provide the opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. degree. The Staff (F, W, Sp)

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 (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 (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 new 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

(Department Office, 232 Wurster Hall)
E. Michael Czaaja, 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.
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 under-

stand 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 69 for impending changes in the curriculum and to consult the ANNOUNCEMENT OF THE COLLEGE OF ENVIRONMENTAL DESIGN for details on specific requirements.

Study Area A—Design Problems

10. 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.
Mr. --- and Staff (F, W, Sp)

100A—100B—100C. Architectural Design. (4-4-4)
One 1-hour lecture and two 3-hour laboratories per week. Prerequisites: course 10 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. --- and Staff (F, W, Sp)

201. Course Series. Design Options Group I.
Two 3-hour laboratory-seminars per week. Prerequisite: course 100A—100B—100C. Various architectural design problems entailing the range of relevant factors and difficulties concerning typical cases. Courses shall present different topical problems as case studies. (201H must be taken concurrently with courses 213 and 222.)
201A. (3) Mr. --- and Staff (F, W, Sp)
210B. (3) Mr. --- and Staff (F, W, Sp)
210C. (3) Mr. --- and Staff (F, W, Sp)
210D. (3) Mr. --- and Staff (F, W, Sp)
210E. (3) Mr. --- and Staff (F, W, Sp)
210F. (3) Mr. --- and Staff (F, W, Sp)
210G. (3) Mr. --- and Staff (F, W, Sp)
210H. (3) Mr. --- and Staff (F, W, Sp)

202. Course Series: Design Options Groups II.
Two 3-hour laboratory-seminars per week. Prerequisite: completion of required courses in course 201 series and required courses plus 6 units of professional electives in the particular study area of the course offering. Design and research in special study areas.
202A—202B. (3-3)
Study in Area B, Environmental Control Systems as related to design problems. Sequence beginning each quarter.
Mr. --- and Staff (F, W, Sp)

202C—202D. (3-3)
Study in Area C, Structure and Production, as related to design problems. Sequence beginning each quarter.
Mr. --- and Staff (F, W, Sp)

202E—202F. (3-3)
Study in Area D, Design Theories and Methods as related to design problems. Sequence beginning each quarter.
Mr. --- and Staff (F, W, Sp)

202G—202H. (3-3)
Study Area E, Social and Economic Factors as related to design problems. Sequence beginning each quarter.
Mr. --- and Staff (F, W, Sp)

203A—203B. Architectural Design and Research. (3-3)
Two 1-hour seminars and two 2-hour laboratories per week. Prerequisite: enrolment in Option I. Review of development of theses; exchange of contents of theses.
203A, Mr. --- (W); 203B, Mr. --- (Sp)

Study Area B—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. --- (F, Sp)

211. Environmental Control Systems. (3)
Two 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 110. Environmental phenomena, controls, and methods of solving environmental problems with emphasis on lighting, power and communication distribution and acoustics.
Mr. --- (F, W)

212. Environmental Control Systems. (3)
Two 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 211. Environmental phenomena, needs, controls, and methods of solving environmental problems with emphasis on ventilation, temperature control, and utilities distribution.
Mr. --- (W, Sp)

213. Design Problems in Environmental Control Systems. (3)
Two 2-hour laboratory-seminars per week. Prerequisite: course 212. Interaction of environmental control systems, relation and integration of natural and artificial systems with other design components.
Mr. --- (F, W, Sp)
Study Area C—Structure and Production

120. Building Materials. (4)
One 4-hour lecture-discussion per week with field trips. Properties and applications of building materials. Specification sources, presentation and informal retrieval. Mr. —— (F, Sp)

221. Construction Systems and Production. (3)
Two 1-hour lectures and one 2-hour laboratory per week. Pre-requisite: completion of engineering sequence or consent of the instructor. Study of building construction techniques, industrialized systems and components. Mr. —— (F, W)

222. Design Problems in Structure and Production. (3)
Two 3-hour laboratory-seminars per week. Pre-requisite: course 221. Synthesis of structural systems and relation to architectural design. Mr. —— (F, W, Sp)

223. Architectural Design for Seismic Forces. (3)
Two 2-hour laboratory-seminars per week. Pre-requisite: course 221 or consent of the instructor. Study of seismic forces, generation and effect on structures, earthquake resistant design and failures. Mr. —— (W)

224. Industrialized Construction. (3)
Two 2-hour laboratory-seminars per week. Pre-requisite: course 221 or consent of the instructor. Implications of industrialized building components and systems; design, fabrication and erection. Mr. —— (Sp)

Two 1-hour seminars and one 2-hour laboratory per week. Pre-requisite: course 221 or consent of instructor. Advanced study in structure and production in architecture.
229A, Mr. —— (F); 229B, Mr. —— (W); 229C, Mr. —— (Sp)

Study Area D—Design Theories and Methods

130. Architectural Design Methods. (4)
Two 1½-hour lectures and one 2-hour lebaratory-seminar per week. Description, testing and comparison of various methods, tools, and techniques which are available in architectural design. Mr. —— (F, Sp)

230. Advanced Design Methods. (3)
Two 1½-hour seminars per week. Pre-requisite: course 130. Intensive study of problem solving techniques developed in other fields as they apply to environmental design problems. Mr. —— (W)

231A–231B. Architectural Programming. (3–3)
Two 3-hour laboratory-seminars per week. Pre-requisite: course 130 or consent of the instructor. 231A. Problem definition and program development. Mr. —— (F, W) 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. Pre-requisite: enrollment in Option I. Research methods and problems. Appraisal of research endeavors. Presentations by instructors and guests, discussion of student reports. Mr. —— (F)

Two 1½-hour seminars per week. Pre-requisite: consent of the instructor.
239A. Symbolic Processes in Architectural Design. Mr. —— (Sp) 239B. Rational Thought and the Design Process. Mr. —— (W) 239C. Explorations Toward a Theory of Form. Mr. —— (F)

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. Identification and definition of recognized “Institutional” forms. Mr. —— (F, W)

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. —— (F, W, Sp)

241. Major Problems of Architecture. (4)
One 2-hour seminar, one 2-hour laboratory and one 4-hour laboratory per week. Pre-requisite: enrollment in Option I. Identification of major problems of architecture; development of approaches to solutions. Problems proposed by the instructor, or the student. Mr. —— (F)

242A–242B. Seminar in Architecture. (2–2)
One 2-hour seminar per week. Pre-requisite: 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)
249A-249B-249C-249D. Seminar, Social and Economic Factors in Architectural and Urban Design. (3-3-3-3)
Two 1½-hour seminars per week. Prerequisite: consent of the instructor.
249A. Social and Cultural Factors. Mr. ——— (Sp)
249B. Behavioral Factors. Mr. ——— (F)
249C. Economic Factors. Mr. ——— (Sp)
249D. Technological Factors. Mr. ——— (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. ——— (F, W, 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. ——— (W)

269A-269B-269C. Seminar in Architectural Administration. (3-3-3)
Two 1½-hour seminars per week. Prerequisite: course 160 or consent of instructor.
269A. Construction Law. Mr. ——— (Sp)
269B. Building Economics. Mr. ——— (F)
269C. Architectural Administration. Mr. ——— (W)

ENVIRONMENTAL DESIGN COURSES

Lower Division Courses

Two 1-hour lectures and two 2-hour laboratory-seminars per week. Theories of perception and communication as applied to environmental design.
Mr. ——— (F, W, Sp)

Env. Design 4. Man and Environment. (4)
Two 1-hour lectures and two 2-hour discussions per week. Man and environment; an overview of the design field as related to other disciplines.
Mr. ——— (F, W, Sp)

Env. Design 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.
Mr. ——— (F, W, Sp)

Upper Division Courses

History of the Environment—
Architecture Study Area G

Env. Design 170. History of the Environment. (4)
(Formerly numbered Architecture 121)
Two 1½-hour lectures and one 1-hour discussion per week. 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)

Env. Design 171. History of the Environment. (4)
(Formerly numbered Architecture 122)
Two 1½-hour lectures and one 1-hour discussion per week. 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)

Env. Design 172. History of the Environment. (4)
(Formerly numbered Design 167)
Two 1½-hour lectures and one 1-hour discussion per week. The history of technology and the theory and practice of product design from pre-industrial handicrafts to mechanical production. Evolution of the machine aesthetic.
Mr. Schaefer (Sp)

Env. Design 173. American Architecture. (4)
(Formerly numbered Architecture 126)
Two 1½-hour lectures per week and other meetings as scheduled. Prerequisites: courses 170 and 171 or consent of instructor. The architecture of America from Colonial times to the present.
Miss Evenson (Sp)

Env. Design 174. Modern Architecture. (4)
(Formerly numbered Architecture 127)
Two 1½-hour lectures per week and other meetings as scheduled. Prerequisites: courses 170 and 171 or consent of instructor. The background and evolution of modern architecture in the 19th and 20th centuries.
Miss Evenson (Sp)

Env. Design 175. Great Cities. (4)
Two 1½-hour lecture-discussions per week and independent student research under faculty guidance. Prerequisites: courses 170 and 171 or consent of the instructor. A study of the major monuments of a great city and its changing character from its founding to the present.
Mr. Kostof (W)

Env. Design 176. The Architecture of Islam. (4)
Two 1½-hour lecture-discussions per week and independent student research under faculty guidance. Prerequisites: 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)

Env. Design 177. Survey of Urban Design. (4)
Two 1½-hour lectures per week and other meetings as scheduled. Prerequisites: courses 170 and 171 or consent of instructor. The evolution of urban form, civic design, and planning theory from ancient times to the present with emphasis on the role of the city in civilization and on structure and function of contemporary cities.
Miss Evenson (F)

1 Offered in even-numbered years.
2 Offered in odd-numbered years.
(4)
(Formerly numbered Architecture 128)
Two 1½-hour lecture-discussions per week. Prerequisites: courses 170 and 171 or consent of instructor.

*Env. Design 179. History of Architectural Theory. (4)
Two 1½-hour lectures per week and other meetings to be arranged. Prerequisites: courses 170 and 171 or consent of instructor. Examination of theories of architecture from Vitruvius to present.

Miss Evenson, Mr. Kostof

Env. Design 180A-180B. Seminar in Architecture of Antiquity. (4-4)
Two 1½-hour seminars per week. Prerequisite: course 170. Special problems selected for concentrated study from the building types of the ancient world. Sequence beginning (F). Mr. Kostof (F, W)

Env. Design 181. Seminar in Modern Architecture. (4)
Two 1½-hour seminars per week and other meetings to be arranged. Prerequisite: course 173 or 174. Consideration in depth of selected aspects of modern architecture.

Miss Evenson (F)

Special Studies

198. Special Group Study. (1 to 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) (F, W, Sp)

199. Special Individual Study. (1 to 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) (F, W, Sp)

296. Special Group Study. (1 to 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) (F, W, Sp)

297. Special Individual Study. (1 to 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) (F, W, Sp)

298. Individual Research. (1 to 4)
To be arranged. Prerequisite: students enrolled in option I. Individual research related to the Master's thesis, undertaken prior to advancement to candidacy for degree. No more than 4 units allowed in any one quarter.

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

299. Individual Research. (1 to 4)
To be arranged. Prerequisite: students enrolled in option I. Individual research related to the Master's thesis, undertaken after advancement to candidacy for degree. No more than 4 units allowed in any one quarter. The Staff (Mr. Hassid in charge) (F, W, Sp)

ART

(Department Office, 238 Kroeber Hall)

Darrell A. Amyx, Ph.D., Professor of Art and Curator of Ancient Mediterranean Art, Museum of Anthropology (Chairman of the Department)

Elmer N. Bischoff, M.A., Professor of Art.

Jean V. Bony, Agrégé, Professor of Art.

James Cahill, Ph.D., Professor of Art and Curator of Oriental Art.

Herschel B. Chipp, Ph.D., Professor of Art and Curator of Modern Art (Vice-Chairman, History of Art).

John C. Haley, Professor of Art.

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

Karl A. Kasten, M.A., Professor of Art (Vice-Chairman, Art).

Erle Loran, 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.

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

Chiura Obata, Associate Professor of Art, Emeritus.

* Not to be given, 1966-67.

** Appointment in the Institute for Creative Arts 1966-67.
Sidney Gordin, Associate Professor of Art.
Robert Hartman, M.A., Associate Professor of Art.
Juergen Schulz, Ph.D., Associate Professor of Art and Associate Curator of Renaissance Art.
David H. Wright, Ph.D., Associate Professor of Art and Associate Curator of Medieval Art.
Boyd G. Allen, M.A., Assistant Professor of Art.
Svetlana Alpers, Ph.D., Assistant Professor of Art and Assistant Curator of Baroque Art.
Guilty Azarpay, Ph.D., Assistant Professor of Art.
Jacques de Caso, Ph.D., Assistant Professor of Art.
James Melchert, M.A., M.F.A., Assistant Professor of Art.
George Miyasaki, M.F.A., Assistant Professor of Art.
Harold Paris, Assistant Professor of Art.
David Simpson, M.A., Assistant Professor of Art.
Patrick Tidd, M.A., Assistant Professor of Art.

→

Alfred Frankenstein, Ph.B., Lecturer in Art.

Major Programs

PAINTING

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

Upper Division  Art 120; 10 units history of art; 24 units of painting (which must include 12 units of courses under three instructors of the regular staff in painting); 4 units of sculpture. Art 100 is required for transfer students.

SCULPTURE

Lower Division  Art 2A, 2B, 3 (2A–2B are prerequisite), 14A, 14B (14A must be taken first), and two of the following: Art 1A, 1B, 1C, 1D.

Upper Division  Art 120; 10 units in history of art; 24 units of sculpture (which must include 12 units under three instructors of the regular staff); 4 units of painting; Art 100 is required for transfer students.

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. Recommended: History 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  Art 160A–160B; 20 units of courses in history of art, of which 10 units must be taken in a two-quarter sequence. Nine units chosen from courses in either painting, sculpture, or history of art. For these 9 units relevant courses in other departments may be substituted at the discretion of the major adviser; compare the list of "Related Courses in Other Departments" at the end of the Art Department section.

Honors Program in the History of Art  Qualified students (with a minimum grade-point average of 3.0, both overall and in the major) 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 concerning enrollment in the honors course (H196) and other requirements.
Graduate Programs

The Department of Art offers programs of graduate study leading to the M.A. degree in Painting, in Sculpture, or in History of Art, and to the Ph.D. degree in History of Art. Further information concerning these programs may be obtained from the Department office, 238 Kroeger Hall.

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.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Courses

1A. History of Ancient Mediterranean Art. (5)
Three hours of lecture per week and additional directed study. From the Stone Age to the end of the Roman Empire.

1B. History of Medieval, Renaissance, and Modern Art—Emphasis on Painting. (5)
Three hours of lecture per week and additional directed study.
Mr. Chipp (W); Mr. de Caso (Sp); ——— (Su)

1C. History of Medieval, Renaissance, and Modern Art—Emphasis on Architecture and Sculpture (5)
Three hours of lecture per week and additional directed study. ——— (F); Mr. Horn (Sp)

1D. History of Oriental Art. (5)
Three hours of lecture per week and additional directed study. The art of India, China, and Japan.
Miss Azarpay (Sp)

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

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

3. Composition in Life Drawing. (4)
Three 3-hour studio classes per week. Introduction to the elements of form and their relationship to the human figure.
The Staff (F, W, Sp, Su)

4. Materials of Painting. (4)
Three 3-hour studio classes per week. An exploration of the techniques and methods of painting.
Mr. Allen and Mr. Kasten (F, W, Sp, Su)

*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 (F, W, Sp, Su)
14B. Introduction to space design and materials, with construction in wood, metal, and plaster.
The Staff (F, W, Sp, Su)

Upper Division Courses

Painting and Sculpture

PAINTING

The various courses in painting differ in content, use of materials, and type of subject matter, depending upon the individual aims of the artist in charge. All but Art 100 and 120 may be repeated for credit. Art 2A, 2B, 3, and 4 are prerequisite to all courses 100 through 107.

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

100. Advanced Drawing and Composition. (4)
Required for transfer students in painting and sculpture.
The Staff (F, W, Su)

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

103. The Human Figure in Drawing. (4)
Principles of space drawing and composition using recognizable form.
103A, Mr. Loran (Sp); 103B, Mr. Ruvolo (F, Sp); 103C, ——— (Sp)

105. Mural Composition. (4)
Prerequisite: as above and four units of upper division painting with senior or graduate standing. Limited to 10 students.
Mr. Haley (Sp)

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

107. Practice in the Graphic Arts: Emphasis on Lithography. (4)
Mr. Paris, Mr. Miyasaki (F, W)

* Not to be given, 1966–67.
SCULPTURE

The various courses in sculpture differ in content, use of materials, and type of subject matter, depending upon the individual aims and objectives of the artist in charge. Art 2A, 2B, 3, 14A, and 14B are prerequisite to courses 112 through 115.

112. Advanced Sculpture: Emphasis on Metal Casting. (4)
112A, ———— (W, Sp); 112B, Mr. Paris, (F, W, Sp)

113. Advanced Sculpture: Emphasis on Carving and Construction. (4)
Mr. O’Hanlon (F, W, Sp)

114. Advanced Sculpture: Emphasis on Welding. (4)
114A, Mr. Gordin (F, W, Sp, Su); 114B, Mr. Melchert (F, W, Sp)

115. Advanced Sculpture: Emphasis on the Human Figure. (4)
Open to advanced architecture and landscape architecture majors who have had Art 14A. The Staff (F, W, Sp, Su)

120. Picture Analysis. (4)
Three 1-hour lectures per week. Prerequisite: course 2A–2B, and 10 units of Art History. Theory concerning values in painting and other visual arts, and its relation to creative expression.
Mr. Simpson (W)

198. Special Studies in Painting or Sculpture. (2–8)
Restricted to honors seniors for selected projects. Staff approval required. The Staff (F, W, Sp, Su)

History of Art

Open to nonmajors. General prerequisite: upper division standing and consent of the instructor. Unless otherwise stated, the “A” part of a sequence is not prerequisite to the “B” part.

All History of Art courses involve three hours of lecture per week and additional directed study.

*128. The Art of Primitive Peoples. (5)
An analysis of the style of the art of Africa, the South Pacific and North America, developed according to art-historical principles.
Mr. Chipp (Su)

130A–130B. Early Chinese Art. (5–5)
130A. Chinese art from the Prehistoric period through the Chou Dynasty. Mr. Cahill (W)
130B. Chinese art from the Han Dynasty through the T’ang Dynasty. Mr. Cahill (Sp)

*131A–131B. Later Chinese Art. (5–5)
*131A. Chinese art of the Sung and Yuan Dynasties.
*131B. Chinese art of the Ming and Ch’ing Dynasties.
Mr. Cahill (Sp)

134. The Art of Japan. (5)
Mr. Cahill (F)

* Not to be given, 1966–67.
177. Eighteenth-Century Art. (5)  

180A–180B. Modern Art. (5–5)  
Three hours of lecture per week and additional directed study.  
180A. Art of the Nineteenth Century.  
Mr. de Caso (F); ———— (Su)  
180B. Art of the Twentieth Century.  
Mr. Chipp (W)  

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)  
Mr. Frankenstein (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 in all courses taken in the department).  
The Staff (Miss Azarpay in charge) (F, W, Sp, Su)  

199. Special Study for Advanced Undergraduates in the History of Art. (1–5)  
Restricted to senior honors students.  
The Staff (Miss Azarpay in charge) (F, W, Sp, Su)  

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) (F, W, Sp, Su)  

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) (F, W, Sp, Su)  

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) (F, W, Sp, Su)  

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) (F, W, Sp, Su)  

298. Special Study for Graduate Students. (2–6)  
Restricted to exceptional projects. Staff approval required.  
The Staff (F, W, Sp, Su)  

History of Art  

Prerequisite: undergraduate history of art courses and a reading knowledge of languages as required by the individual instructor. For information consult the graduate adviser.  

Graduate seminars in the History of Art are normally extended through two successive quarters. Some may meet more intensively and be completed in one quarter. 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. Amyx (W through Sp)  

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

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

254. Seminar in Early Medieval Art. (6)  
Mr. Wright (Su)  

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

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

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

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

281A–281B. Seminar in Nineteenth-Century Art. (3–3)  
Mr. de Caso (W through Sp)  

Mr. Chipp (F through W)  

*286A–286B. Seminar in Twentieth-Century Painting and Sculpture. (3–3)  
Mr. Selz (W through Sp)  

299. Special Study for Graduate Students in the History of Art. (1–6)  
The Staff (Mr. Chipp in charge) (F, W, Sp, Su)  

* Not to be given, 1966–67.
Related Courses in Other Departments

Architectural History—American (Architecture 126)
Architectural History—Nineteenth and Twentieth Centuries (Architecture 127)
Classical Archaeology (Classics 170A–170B–170C)
Greek Cities and Sanctuaries (Classics 175A–175B)
History of Design Since the Industrial Revolution (Design 145)
The Medieval Mind (English 120B)
Seminar in Classical Archaeology (Classics 270A–270B)

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 research. 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 Kroeber 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 1968 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. Henyey, Ph.D., Professor of Astronomy.
Ivan R. King, Ph.D., Professor of Astronomy.
John G. Phillips, Ph.D., Professor of Astronomy, Director of the Leuschner Observatory and Chairman of the Department.
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.

Carl E. Heiles, Ph.D., Acting Assistant Professor of Astronomy.
Leonard V. Kuhi, Ph.D., Acting Assistant Professor of Astronomy.

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

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. Both telescopes are available for photometric and spectroscopic studies. At Hat Creek, 33- and 85-foot fully steerable paraboloidal antennas are in operation. The Lick Observatory has a 20-inch astrograph 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, 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 IBM 7094 and 7040 computers.

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, 2A, 2B, 2C)

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)
Introduction to Statistical and Thermal Physics (Physics 112)
Introduction to Quantum Mechanics (Physics 115)
Introduction to Atomic and Nuclear Physics (Physics 121)
Introductory Nuclear Physics (Physics 124)
Nuclear Physics (Physics 129A–B)
Advanced Calculus for the Applied Sciences (Math. 120A–B–C)
Numerical Analysis (Math. 128A–B)
Introduction to the Theory of Functions of a Complex Variable (Math. 185)
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 shall prepare an acceptable paper on some subject which he shall 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 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 two quarters 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.

Letters and Science List: for regulations governing this list see page 72.

Lower Division Courses

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. Phillips, Mr. Field, Mr. Heiles, (F, W, Sp, Su)

Upper Division Courses

   Three 1-hour lectures and one 1-hour discussion section per week. Prerequisite: Physics 4A, 4B, 4C, 4D, 4E; Mathematics 1A, 1B, 1C, 2A, 2B, 2C. Introduction to the principal fields of modern astrophysical research. Differs from former course 7A-7B in that selected topics are discussed from a more advanced viewpoint. Intended primarily for majors in the physical sciences and engineering.
   Mr. Spinrad (Sp)

207A—207B—207C. Physical Foundations of Astrophysics. (5—5—5)
   Three 1½-hour lectures per week.
   Sequence beginning (F), (Sp)

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

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

Graduate Courses

   Three 1-hour lectures and one 1-hour discussion section per week. Prerequisite: course 127A—127B—127C—127D. The physics of stellar interiors and atmospheres and application to the spectra of astronomical sources. Topics include: the structure and spectrum of the solar atmosphere; the spectra of stars; interstellar matter.
   Mr. Henyey, 217A, 217B, 217C (F, W, Sp); Mr. Field, 217D (F); Mr. Spinrad, 217E (W); Mr. Kuhi, 217F (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)
Three 1-hour lectures and two 1-hour discussion sections per week. Prerequisite: course 127A-127B-127C-127D. The physical foundations of solar system astronomy. The study of planetary atmospheres and surfaces. Meteors, comets and the interplanetary medium. Observational techniques and problems.
Mr. Spinrad (Sp)

225A-225B-225C. Celestial Mechanics. (5-5-5)
Three 1-hour lectures and two 1-hour discussion sections per week. Prerequisite: Physics 105.
Sequence beginning (F), Mr. Cunningham

238. Galactic Radio Astronomy. (5)
Three 1-hour lectures and two 1-hour discussion sections per week. Prerequisite: consent of instructor.

ATMOSPHERIC AND SPACE SCIENCES
(Group Office, 426 Le Conte Hall)
Kinsey A. Anderson, Associate Professor of Physics.
Robert R. Brown, Professor of Physics.
Bruce H. Mahan, Associate Professor of Chemistry.
John H. Reynolds, Professor of Physics.
Samuel Silver, Professor of Engineering Science and Director of the Space Sciences Laboratory.
John Verhoogen, Professor of Geophysics.
Stanley H. Ward, Professor of Mineral Exploration.
Harold F. Weaver, Professor of Astronomy and Director of the Radio Astronomy Laboratory.
Graduate Adviser: Mr. Brown.

The Group in Atmospheric and Space Sciences administers a graduate program in this field leading to the M.A. and Ph.D. degrees.

Preparation For admission to the graduate program the student shall have completed an undergraduate major in one of the physical sciences, with strong emphasis on physics.

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 72.

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. Brown (W)

Principles of radiation physics in the radio range. The nature of the galaxy and extragalactic systems as deduced from radio observations.
Mr. Weaver (F); 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)

292. Seminar.
The Staff (F, W, Sp)

298. Advanced Study and Research at Lick and Leuschner Observatories. (2-10)
Intended for graduate students who require observational experience as well as for those working upon observational problems for their theses.
The Staff (F, W, Sp, Su)

299. Advanced Study and Research. (2-10)
220A–220B. Energetic Particles and Magnetic Fields in Space. (4–4)
Prerequisite: graduate standing in atmospheric and space sciences 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 geomagnetically 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

BACTERIOLOGY AND IMMUNOLOGY

(Bacteriology and Immunology 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 (Chairman of the Department).
Gunther S. Stent, Ph.D., Professor of Bacteriology and of Molecular Biology.
David W. Weiss, Ph.D., D.Phil., Professor of Bacteriology and Immunology.
Leon Wofsy, Ph.D., Associate Professor of Immunology (Vice-Chairman of the Department).
Alvin J. Clark, Ph.D., Assistant Professor of Bacteriology and of Molecular Biology.
George D. Hegeman, Ph.D., Assistant Professor of Bacteriology.
Benjamin W. Papermaster, Ph.D., Assistant Professor of Immunology.

H. Hugh Fudenberg, M.D., Professor of Medicine.
Phyllis B. Blair, Ph.D., Lecturer in Immunology.
Mary L. Human, M.A., Lecturer in Bacteriology.

Departmental Major Advisers: Mr. Papermaster, 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 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 4A–4B; 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 101, 155; Botany 100.

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PLAN II

Lower Division  Chemistry 1A–1B–1C, 5, 8A–8B;  Mathematics 16A–16B;  Physics 2A–2B–2C;  Biology 1A–1B–1C.

Upper Division  Bacteriology 100A–100B, 101A–101B;  Biochemistry 102, 102L;  Public Health 180A–180B.  At least 3 additional units chosen from:  Bacteriology 103;  Molecular Biology 110 or Zoology 150 or Genetics 100;  Public Health 182, 182L;  Zoology 101, 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. Papernaster.

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 4C.  The foreign language requirement should be fulfilled by either French, German or Russian;  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 72.

Lower Division Courses

2.  A Survey of Bacteriology.  (5)

Three 1-hour lectures and two 3-hour laboratories per week.  Designed for students not majoring in bacteriology.  Prerequisite:  Chemistry 1A.

Mr. Hegeman (F, Su)

Upper Division Courses

100A–100B.  General Bacteriology.  (4–4)

Two 1½-hour lectures and a 1-hour discussion per week.  Prerequisite:  Zoology 1A or Biology 11A–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. Doudoroff, Mr. Stanier (W) 100B.  Bacterial physiology and metabolism.  Mr. Clark, Mr. Doudoroff, Mr. Stanier (Sp)

101A–101B.  General Bacteriology Laboratory.  (3–3)

Three 3-hour laboratories per week.  Prerequisite:  course 100A–100B (may be taken concurrently).  Laboratory experiments planned to accompany the lectures in course 100A–100B.  Sequence, beginning (W).

Mr. Clark, Mr. Doudoroff, Mr. Stanier

103.  Biology of Host-Parasite Interactions in Infectious Disease.  (4)

Three 1-hour lectures and one 1-hour recitation per week.  Prerequisite:  Biology 1A–1B–1C;  a course in bacteriology is recommended.  The study of infectious disease as an aspect of ecology;  symbiosis and parasitism;  evolution of the germ theory of disease;  mechanisms of microbial pathogenicity and host resistance;  interaction of genotype and environment in host-parasite relationships.  ——— (W)

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 102 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. Papernaster, Mr. Wofsky (F)

202B.  Two 1-hour lectures per week.  Genetics of immunoglobulin formation;  specific cellular reactivity;  hypersensitivity;  tissue antigens;  complement.  Mr. Papernaster (W)
202C. Immunology-Immunochemistry Laboratory. (4)
Experimental methods of immunology and immunochemistry. Prerequisite: 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 either quarter; under special circumstances a student may arrange to take the course in both quarters and receive credit.

Mrs. Blair, Mr. Papernaster, Mr. Wofsy (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 3-hour laboratory per week. Prerequisite: course 202A–202B; Zoology 1B, or equivalent; a course in genetics. Antigens of normal and neoplastic cells; the homograft reaction; immunogenetics of tissue transplantation.

Mrs. Blair, Mr. Weiss (F)

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 antigens; genetically controlled antigenic variation in microbes and viruses; genetics of immunoglobulins and antibody synthesis. Mr. Fudenberg, Mr. Papernaster (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); Mr. Hegeman, Mr. Wofsy (W, 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)

280. Research. (1–12)
The Staff (F, W, Sp, Su)

297. Individual Study for Graduate Students. (1–9)
Individual study intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D.
The Staff (F, W, Sp, Su)

299. Special Study for Graduate Students. (2–4)
The Staff (F, W, Sp, Su)

BIOCHEMISTRY

(Department Office, 401 Biochemistry Building)

Clinton E. Ballou, Ph.D., Professor of Biochemistry (Chairman of the Department).

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. Kosland, Jr., Ph.D., Professor of Biochemistry.

Choh H. Li, Ph.D., Professor of Biochemistry and Experimental Endocrinology.

John B. Neilands, 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., Sc.D., LL.D., Docteur h.c., Professor of Biochemistry and of Molecular Biology and Director of the Virus Laboratory.

William Z. Hassid, Ph.D., Professor of Biochemistry, Emeritus.

Jack F. Kirsch, Ph.D., Assistant Professor of Biochemistry.

Raymond C. Valentine, Ph.D., Assistant Professor of Biochemistry.

Cluyd D. Willson, Ph.D., Assistant Professor of Biochemistry.

Allan C. Wilson, Ph.D., Assistant Professor of Biochemistry.

C. Arthur Knight, Ph.D., Professor of Molecular Biology.

Departmental Major Advisers: Mr. Kosland, Mr. Snell, Mr. Rabinowitz.

Graduate Advisers: Mr. Carpenter, Mr. Dekker.

* Not to be given, 1966–67.
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 (or 11A–11B).

Plan II: Chemistry 4A–4B–4C (or 1A–1B–1C and 5); Chemistry 8A–8B, 14; Mathematics 16A–16B; Physics 2A–2B–2C; Biology 1A–1B–1C (or 11A–11B and Bacteriology 2).

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 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 72.

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 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. Kirsch, Mr. Valentine

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.

Mr. Kirsch, Mr. Wilson (F); Mr. Ballou, Mr. Willson (Sp)
102L. Biochemistry Laboratory. (4)

One 1-hour lecture 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 student 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.

Mr. Barker (F); Mr. Wilson (Sp)

180. Research. (2 or 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. Willson 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.

(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. Snell 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. Neillands (F); Mr. Dekker (W); Mr. Rabinowitz (Sp)

*202. Carbohydrates. (3)

Three 1-hour lectures per week. Prerequisite: Chemistry 112 or equivalent. Selected topics on the chemistry and biochemistry of carbohydrates.

Mr. Ballou (W)

*204. Biochemistry of Proteins. (3)

Three 1-hour lectures per week. Prerequisite: courses 100A–100B–100C. Chemistry and metabolism of peptides and proteins.

Mr. Cole (Sp)

*205. Biochemistry of Nucleic Acids. (3)

Three 1-hour lectures per week. Prerequisite: courses 100A–100B–100C or consent of the instructor. The chemistry and biochemistry of the nucleic acids and their constituents.

Mr. Dekker (W)

206. Physical Biochemistry. (4)

Three 1½-hour lectures per week. Prerequisite: a year course each of organic and physical chemistry and consent of the instructor. Recommended: course 102 or 100A–100B–100C. Application of modern physical concepts and experimental methods to the problems of large molecules of biological interest.

Mr. Schachman (F)

213. Enzyme Synthesis and Control. (3)

Three 1-hour lectures per week. Prerequisite: course 102 or 100A–100B–100C, or consent of the instructor. Recommended: Bacteriology 107 or Genetics 104. Modern concepts of protein synthesis at a molecular level; information transfer and gene expression; biological regulation, induction, repression, permeation and feedback systems.

Mr. Willson (F)

*214. Mechanisms of Enzyme Action. (3)

Three 1-hour lectures per week. Prerequisite: course 102 or 100A–100B–100C, physical chemistry and advanced organic chemistry, or consent of the instructor. Current concepts of the mode of action 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.

280. Research. (3–9)

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)

290. Seminar. (1)

Graduate student seminar in biochemistry dealing with various topics which differ from year to year. The program for 1966–67 will include several sections each quarter, each emphasizing a different subject. Mr. Neillands, Mr. Rabinowitz, Mr. Snell (W); Mr. Barker, Mr. Carpenter, Mr. Koshland, Mr. Valentine (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)
Morgan Harris, Ph.D., Professor of Zoology (member of Biology 1 Committee).
Roderic B. Park, Ph.D., Professor of Botany (chairman of Biology 1 Committee).
Gunther S. Stent, Ph.D., Professor of Molecular Biology (member of Biology 1 Committee).
Robert H. Haynes, Ph.D., Associate Professor of Medical Physics and of Biophysics (member of Biology 1 Committee).
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 (member of Biology 1 Committee).
Fred H. Wilt, Ph.D., Associate Professor of Zoology (member of Biology 1 Committee).
Carl W. Birky, Jr., Ph.D., Assistant Professor of Zoology.
Daniel Branton, Ph.D., Assistant Professor of Botany (member of Biology 1 Committee).
John C. Gerhart, Ph.D., Assistant Professor of Molecular Biology (member of Biology 1 Committee).
Watson M. Laetsch, Ph.D., Assistant Professor of Botany.

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Philip V. Wells, Ph.D., Visiting Associate Professor of Botany and Acting Director of the Botanical Garden.

Credit Allowance for Lower Division Courses  If Biology 11A–11B is taken after the completion of Botany 10 or Zoology 10, credit is allowed for only half of the sequence, such credit to be withheld until the entire sequence has been completed and then allowed for the last course completed. No credit is allowed for Biology 11A–11B if it is taken after both Botany 10 and Zoology 10 have been completed. Biology 1A–1B–1C may be taken for credit after the completion of all or part of Biology 11A–11B or Botany 10 or Zoology 10. No credit is allowed for Botany 10 or Zoology 10 if all or part of Biology 11A–11B or Biology 1A–1B–1C has been completed.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Courses

1A–1B–1C. General Biology. (5–5–5)

Three 1-hour lectures and one 3-hour laboratory section per week with an additional discussion section, field trip, or laboratory per week. Prerequisites: Chemistry 1A (semester system) or Chemistry 1A–1B (quarter system). Intended for students majoring in biological sciences, but open to all qualified students. Sequence beginning in the fall. Mr. Park (in charge), Mr. Branton, Mr. Gerhart, Mr. Harris, Mr. Haynes, Mr. Paris, Mr. Stent, Mr. Wilt

Biology 1 is administered by the Biology 1 Committee under the auspices of the Biology Council. The administrative office is in Room 4058 Life Sciences Building.

Contemporary Natural Science (Natural Science 1A–1B–1C) (4–4–4)

Sequence, beginning in the fall. Mr. Rief, Mr. Strohman

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. See above for unit allowance in relation to other lower division courses. 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. Laetsch (in charge), Mr. Birky (F); Mr. Birky (in charge), Mr. Laetsch (W)

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

Upper Division Courses

150. General Ecology. (4)

Three 1-hour lectures, one 1-hour conference per week. Prerequisite: Biology 11A–11B; or Contemporary Natural Science 1A–1B–1C; or an introductory 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. Wells (F)

Biology 150 is jointly administered by the departments of Botany and Zoology.
(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, Director of the University Herbarium, and Curator of Seed Plant Collections.
Ralph Emerson, Ph.D., Professor of Botany.
Adriance S. Foster, Sc.D., Professor of Botany.
William A. Jensen,** Ph.D., Professor of Botany.
Leonard Machlis, Ph.D., Professor of Botany (Chairman of the Department).
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.
Herbert L. Mason, Ph.D., Professor of Botany and Director of the University Herbarium, Emeritus.
Melvin S. Fuller, Ph.D., Associate Professor of Botany.
Robert Ornduff, Ph.D., Associate Professor of Botany.
Daniel Branton, Ph.D., Assistant Professor of Botany.
Russell L. Jones, Ph.D., Assistant Professor of Botany.
Watson M. Laetsch, Ph.D., Assistant Professor of Botany.

Peter R. Bell, M.A., Visiting Professor of Botany.
James A. McAlear, Ph.D., Lecturer in Botany.
Philip V. Wells, Ph.D., Visiting Associate Professor of Botany and Acting Director of the Botanical Garden.
John A. West, B.A., Acting Assistant Professor of Botany.

Departmental Major Adviser: Mr. Proskauer.

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, 140L).

The Major

** Lower Division ** Biology 1A–1B–1C; Physics 2A–2B–2C; Chemistry 1A–1B, 8A–8B. Recommended: Chemistry 1C, 5; Mathematics 1A–1B–1C. Students planning graduate study in physiological botany should regard these recommendations as requirements.

** Upper Division ** Biochemistry 102; Botany 100, 105, 110, 120, 140, 140L; an upper division lecture course in genetics. Additional courses in botany or approved

** Appointment in the Miller Institute for Basic Research in Science, 1966–67.**
courses in related departments to complete a minimum of 36 upper division units. 

**Recommended:** Biochemistry 102L (required of students in physiological botany).

**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.

**Unit Allowance for Lower Division Courses** If Biology 11A–11B is taken after the completion of Botany 10 or Zoology 10, credit is allowed for only half of the sequence, such credit to be withheld until the entire sequence has been completed and then allowed for the last course completed. No credit is allowed for Biology 11A–11B if it is taken after both Botany 10 and Zoology 10 have been completed. Biology 1A–1B–1C may be taken for credit after the completion of all or part of Biology 11A–11B or Botany 10 or Zoology 10. No credit is allowed for Botany 10 or Zoology 10 if all or part of Biology 11A–11B or Biology 1A–1B–1C has been completed.

**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 required to pass reading examinations in two foreign languages, French or Russian, and German before taking the oral qualifying examination. Students interested in physiological botany should note the additional physical sciences courses listed above under recommended courses.

**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 competence 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. An additional 18 units of upper division work acceptable for the undergraduate major in botany at Berkeley must also be offered. All new students must take the two-quarter sequence in current research (Botany 280) during their first year of residence; thereafter, 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 and the required independent research program for the Ph.D. degree are worked out individually with the major professor and an advisory committee assigned to the student.

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 72.

**Lower Division Courses**

10. Plant Biology. (4)

Three 1-hour lectures per week and one 2-hour scheduled 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. Emerson (in charge), Mr. Fuller (F); Mr. Papenfuss (W); -- (Su)

**Upper Division Courses**

100. Comparative Morphology of Algae and Fungi. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: Biology 1. Mr. Proskauer (W)
104. Field Studies in Marine Botany. (8)
Full-time study at Bodega Marine Laboratory in first half of summer quarter, including lectures, laboratory, field work and special problems, with emphasis upon marine algae. **Prerequisite: Biology 1 or Biology 11A-11B.**

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

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

115. Plants in Relation to Man. (3)
Three 1-hour lectures per week. **Prerequisite: a course of high school or college biology or botany, or consent of the instructor.** Lectures on man's selection and use of plants for his own purposes, the cultural significance of plants, and man's influence on natural vegetation. Mr. Ornduff (F).

119. Field Studies on the Native Flora. (6)
Approximately ¾ time in first half of summer quarter, including lectures, laboratory, and field work. **Prerequisite: a background in biology.** A study of the native flora as an introduction to taxonomy, involving a survey of the principal orders and families of flowering plants, field observation, identification and the preparation of field notes and of botanical specimens as a foundation for the classification of the flowering plants. Given at Sagehen Creek Field Station, near Truckee, California.

120. Taxonomy of Seed Plants. (4)
Two 1-hour lectures and two 3-hour laboratories per week plus field work. **Prerequisite: Biology 1.** A survey of the spermatophytes, with lectures on phylogeny and classification; laboratory and field work with collection and identification practice.

Mr. Constance (Sp)

130. Plant Cytology. (5)
Three 1-hour lectures and two 3-hour laboratories per week. **Prerequisite: Biology 1.** A synthesis of morphological, biochemical and genetic information on cell function, reproduction and development.

Mr. Bell (F)

140-140L. Plant Physiology. (3–2)
**Prerequisites: Biology 1, Chemistry 8A–8B.**
140: Three 1-hour lectures per week. A study of growth, development, water relations, and mineral nutrition of higher plants and plant cells.

Mr. Jones (F, Sp)

140L: Two 3-hour laboratories per week. Laboratory to accompany course 140. If taken, enrollment must be concurrent with course 140.

Mr. Jones (F, Sp)

152. Field Problems in Plant Geography and Ecology. (3)
Approximately ¼ time in first half of summer quarter, including lectures, laboratory, and field work. **Prerequisite: a background in biology.** A field demonstration of the role of natural selection in the patterns of distribution of plants and their population and community organization. Exercises leading to the discovery of variation in physiological capacity between members of the same species. Given at Sagehen Field Station, near Truckee, California.

199. Special Study for Senior Honor Students. (1–5)
Staff (Mr. Proskauer in charge (F, W, Sp, Su)

Graduate Courses

201. Biology of Lower Fungi. (4)
Two 1-hour lectures and two 3-hour laboratories per week. **Prerequisite: course 201.** Comparative studies of the morphology, development, physiology, reproduction, and significance of Myxomycetes and Phycocyanetes.

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.

Mr. Fuller (in charge), Mr. Emerson (Sp)

*203. Biology of Basidiomycetes. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. **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.

(W)

*204. Algology. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. **Prerequisite: course 100.** A survey of the golden-brown and green algae.

(W)

*205. Algology. (4)
Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. **Prerequisite: course 100.** A survey of the blue-green, brown and red algae.

(Sp)

*206. Bryology. (5)
Three 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. **Prerequisite: course 105.** A general treatment of the morphology and relationships of the bryophytes.

(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. Foster (W)

220. 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)

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. Mr. Ormduff (Sp)

*224. Evolutionary Ecology. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. Prerequisite: course 120 and Genetics 100. A study of processes involved in the development and maintenance of ecological adaptations in individuals, populations, and communities. (Sp)

226. Plant Communities of North America. (3)

Two 1-hour lectures and one 2-hour conference per week. Prerequisite: course 120 Physiognomic and floristic analysis of the vegetation, with emphasis on the Southwest; distribution of communities in relation to climate, physiography, substratum, disturbance, and Pleistocene history; recognition of some dominant species through study of specimens and other illustrative material. Mr. Wells (W)

230A-230B. Structure and Physiology in Plant Development. (4-4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: courses 130, 140–140L, and consent of the instructors. The study of plant development in combined morphological and physiological terms from the molecular to the organismal level. The emphasis in the laboratory will be on the application of modern methods of investigating problems of plant development. Sequence, beginning (W). Mr. Bell; Mr. Laetsch

236. Comparative Subcellular Anatomy. (1)

One 1-hour lecture per week. Prerequisite: course 130; or Zoology 110A–110B, 110L; or Bacteriology 100A; or Physiology 101, 101L. Lectures on the comparative fine structure of cells. Mr. McAlear (F)

242. Physiology of Lower Plants. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Given in alternate years. Prerequisite: course 100 and 140–140L, or consent of the instructor. An intensive treatment of selected topics on the physiology of algae, fungi, and bryophytes. Mr. Fuller (in charge; Mr. West (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. (W)

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. Machlis in charge)

290. Seminar. (2)

One 1-hour meeting per week. Advanced 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. Mr. Constance, Mr. Emerson, Mr. Laetsch, Mr. Froskauer (F); Mr. Branton, Mr. Machlis, Mr. Ormduff, Mr. Papenfuss (W); Mr. Foster, Mr. Fuller, Mr. Papenfuss, Mr. Park (Sp)

297. Special Study. (1–12)

Prerequisite: consent of graduate adviser and instructor. Special study intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. The grade in this course will be satisfactory or unsatisfactory. Staff (F, W, Sp, Su)

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. Mr. McAlear (F)

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 (Mr. Ormduff 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,

* Not to be given, 1966–67.
\*
 Approved for one offering only, 1966–67.
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 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 maintains an herbarium representative of the floras of the world. It contains the original collections sponsored by the Geological Survey of California, the algological herbaria of Setchell and Gardner, the Ira W. Clokey herbarium, the J. P. Tracy herbarium, the H. E. Parks herbarium, the H. M. Hall herbarium, the H. L. Mason herbarium, the Oriental collections amassed by E. D. Merrill, the Joseph Rock collections, and the South American collections made under the auspices of the University Botanical Garden.

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

BUSINESS ADMINISTRATION

(Department Office, 350 Barrows Hall)

David A. Alhadeff, Ph.D., Professor of Business Administration.
Hector R. Anton, Ph.D., Professor of Accounting.
K. Roland A. Artle,† Econ.Dr., Professor of Business Administration.
Frederick E. Balderston, Ph.D., Professor of Business Administration.
John P. Carter, Ph.D., Professor of Business Administration.
Earl F. Cheit, Ph.D., LL.B., Professor of Business Administration.
C. West Churchman, Ph.D., Professor of Business Administration.
Norman R. Collins, Ph.D., Professor of Business Administration and of Agricultural Economics.
Michael Conant, J.D., Ph.D., Professor of Business Law.
Malcolm M. Davisson, J.D., Ph.D., Professor of Economics.
Leonard A. Doyle, C.P.A., Ph.D., Professor of Business Administration.
Joseph W. Garbarino, Ph.D., Professor of Business Administration.
John C. Harsanyi, Ph.D., Professor of Business Administration and of Economics.
Richard H. Holton, Ph.D., Professor of Business Administration.
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.
Sherman T. Maisel,† Ph.D., Professor of Business Administration.
Maurice Moonitz,† C.P.A., Ph.D., Professor of Accounting.
Frederic P. Morrissey, 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.
Arthur M. Ross,† Ph.D., Professor of Industrial Relations.
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 (Vice-Chairman of the Department).
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.
Alan R. Cerf, C.P.A., Ph.D., Associate Professor of Business Administration.
Robert C. Goshay, Ph.D., Associate Professor of Business Administration.
Austen 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.
Thomas A. Marschak, Ph.D., Associate Professor of Business Administration.
Richard V. Mattessich, Dr.rer.pol., Associate Professor of Business Administration.
Francesco M. Nicosa,† 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.
D. Gordon Tyndall, Ph.D., Associate Professor of Business Administration.
Guilford C. Babcock, Ph.D., Assistant Professor of Business Administration.
Richard M. Bailey, D.B.A., Assistant Professor of Business Administration.
Lloyd V. Blankenship, Ph.D., Assistant Professor of Business Administration.
Louis P. Bucklin, Ph.D., Assistant Professor of Business Administration.
James M. Carman, Ph.D., Assistant Professor of Business Administration.
Raymond E. Miles, Ph.D., Assistant Professor of Business Administration.
John G. Myers, Ph.D., Assistant Professor of Business Administration.
Leo Spier, D.B.A., Assistant Professor of Business Administration.

Dawson E. Brewer, M.B.A., Lecturer in Business Administration.
Eugene W. Burgess, Ph.D., Lecturer in Industrial Relations, Emeritus.
William A. Burns, Ph.B., Lecturer in Business Administration.
John E. Butterworth, M.B.A., Associate in Business Administration.
Raymond J. Chambers, B.Econ., Visiting Professor of Business Administration.
Bruno Contini, M.S., Lecturer in Business Administration.
Hans Daellenbach, M.B.A., Acting Assistant Professor of Business Administration.
John H. Denton, LL.B., Lecturer in Business Administration.
Frank D. Deromedi, M.B.A., Lecturer in Business Administration.
Roger A. Dickinson, M.B.A., Lecturer in Business Administration.
Robert E. Einzig, Ph.D., Lecturer in Business Administration.
Edwin M. Epstein, LL.B., M.A., Lecturer in Business Administration.
Bruce P. Fitch, M.S., Acting Assistant Professor of Business Administration.

Undergraduate Curriculum

Lower Division  Students may complete lower division requirements for 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. A student should normally choose the lower division preparation most closely related to the particular field and division of business administration he wishes to enter. Advisers in 310 Barrows Hall will assist lower division students in selecting courses prerequisite to certain upper division courses. Detailed information on lower division preparation is available in the ANNOUNCEMENT OF THE SCHOOL OF BUSINESS ADMINISTRATION.

Upper Division  A minimum of 44 upper division units of courses in business administration, including the following:

100 (The Price System and Business Enterprise)  130 (Financial Management)
101 (Business Fluctuations and Forecasting)  140 (Introduction to Production Management)
110 (Legal Environment of Business)  150 (Industrial Relations)
111 (Social and Political Environment of Business)  160 (Marketing)

A minimum of 8 units beyond the basic course in one field.

The following fields of emphasis are approved: accounting, administration and policy, finance, industrial relations and personnel management, insurance and risk management, international business, managerial economics, marketing, production management, quantitative methods, operations research, real estate and urban land economics, transportation and public utilities. Students who do not wish to elect one of the above fields may (1) fulfill the requirement by approved courses in economics, (2) elect special fields with permission of the Associate Dean of the School.

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), business law, 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 graduate program 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 1 1/2-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, Mr. Vance in charge) (F, W, Sp, Su)

2. Principles of Accounting II. (5)
   (Formerly numbered 1B)
   Two 1 1/2-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, Mr. Vance in charge) (F, W, Sp, Su)

10. General Accounting. (4)
   Three 1 1/2-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) (W, 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. (4)
   Three 1 1/2-hour lectures per week. Prerequisite: Economics 1–3, Mathematics 16A. Not open to students who have taken Economics 100B. 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. Goldner, Mr. Graybeal, Mr. Roberts, (F, W, Sp, Su)

101. Business Fluctuations and Forecasting. (4)
   Three 1 1/2-hour lectures per week. Prerequisite: courses 100 and Statistics 2 or 20. Not open to students who have taken Economics 100A. Analysis of the operation of our enterprise system with emphasis on the factor responsible for economic instability; analysis of public and business policies which are necessary as a result of business fluctuations.
   Mr. Goldner, Mr. Graybeal, (F, W, Sp, Su)

102. Advanced Managerial Economics. (4)
   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.

103. Theory and Models of Economic Forecasting. (4)
   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.

110. Legal Environment of Business. (4)
   (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. Conant, Mr. Denton, Mr. Epstein, Mr. M. Smith, Mr. Votaw (F, W, Sp, Su)

111. Social and Political Environment of Business. (4)
   (Formerly numbered 119)
   Three 1-hour lectures per week. 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. Blankenship, Mr. Epstein, Mr. Kennedy, Mr. Votaw (F, W, Sp, Su)

114. Legal Aspects of Business Transactions. (4)
   (Formerly numbered 109)
   Three 1 1/2-hour lectures per week. A review of the legal implications 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)
117. Law, Government and Economic Enterprise. (4)
Three 1-hour lectures per week. Prerequisite: course 120. The law affecting ownership and use of real property; transfers; titles; development rights and the regulation thereof in the public interest.
Mr. Denton (W, Su)

118. Legal Aspects of Real Estate. (4)
(Formerly numbered 106)
Three 1-hour lectures per week. Prerequisite: course 180. The law affecting ownership and use of real property; transfers; titles; development rights and the regulation thereof in the public interest.
Mr. Conant, Mr. Epstein (F, Su)

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)

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)

121. Financial Accounting I. (4)
(Formerly numbered 121A)
Two 1/4-hour lectures and one 2-hour laboratory per week. Prerequisite: course 2. Required for those specializing in accounting. Theory of accounts and its application. Special emphasis on asset valuation and determination of periodic profit.
Mr. Cerf, Mr. Mattessich, (F, W, Sp, Su)

122. Financial Accounting II. (4)
(Formerly numbered 121B)
Two 1/4-hour lectures and one 2-hour laboratory per week. Prerequisite: course 121 with a grade not lower than C. Required for those specializing in accounting. Continuation of course 121. Accounting for the general business corporation. Discussion of funds flows and analysis of financial statements.
(F, W, Sp, Su)

123. Problems of Financial Reporting. (4)
(Formerly numbered 126)
Two 1/4-hour lectures and one 2-hour laboratory per week. Prerequisite: course 122. Consolidated statements, funds statements, index numbers in accounting, special problems.
(F, W, Sp, Su)

124. Cost Accounting. (4)
(Formerly numbered 122)
Two 1/4-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.
(W, Sp, Su)

126. Auditing. (4)
(Formerly numbered 123)
Two 1/4-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, (F, Sp, Su)

127. Accounting Systems for Management Information and Control. (4)
(Formerly numbered 124)
Two 1/4-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 (W, Su)

128. Income Taxation. (4)
Two 1/4-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, Sp)

130. Financial Management. (4)
(Formerly numbered 131)
Three 1/4-hour lectures per week. Prerequisite: course 130. Sources and demand for investment capital, operations of security markets, determination of investment policy, and procedures for analysis of securities.
Mr. Babcock, Mr. Carter, Mr. Tyndall (F, Sp, Su)

137. Economics of Insurance. (4)
Three 1/4-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. (4)
Three 1/4-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. (4)
Two 1/4-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. Van Gigch, Mr. Rogers, (F, W, Sp, Su)
141. Planning of Production Facilities. (4)  
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 and analysis; systems for maintenance and reliability; applications of linear programming to production planning; materials-handling and other ancillary systems. 

142. Production Control Systems. (4)  
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. Industrial Relations. (4)  
Mr. Garbarino, Mr. Kennedy, —.—(F, W, Sp, Su) 

151. Human Behavior in Organizations. (4)  
Four class hours per week. Prerequisite: course 150 or Economics 150. The management and development of human resources. Problems of motivation, morale, leadership, recruitment, selection, development and compensation of employees. Concerned with the application of basic social science findings to organizational situations. 
Mr. Miles, Mr. Neighbor, Mr. Strauss (W, Sp, Su) 

152. Collective Bargaining Systems. (4)  
Four class hours per week. Prerequisite: course 150 or Economics 150. The nature, institutions and processes of collective bargaining. Analyses 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 (Sp) 

153. Labor Law. (4)  
Four class hours per week. Prerequisite: course 150 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 (F, W) 

160. Marketing. (4)  
Three 1½-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. Hughes, —.—(F, W, Sp, Su) 

161. Industrial Procurement. (4)  
(Formerly numbered 145)  
Three 1½-hour lectures per week. Prerequisite: course 160 or 160G. The problems met in purchasing by industrial organizations; major buying policies; vendor selection; quantity and quality determination; and relation of buying price, production cost, and selling price. 
Mr. Hughes (W) 

162. Retailing. (4)  
Three 1½-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 (W) 

163. Advertising. (4)  
Three 1½-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, —.—(F, W) 

165. Marketing Management. (4)  
Three 1½-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. Bucklin, —.—(F, Sp, Su) 

166. Wholesaling. (4)  
Three 1½-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 (Sp) 

169. Marketing Policies and Programs. (4)  
Three 1½-hour lectures per week. Prerequisite: senior standing with Marketing as a field of emphasis. Analysis of special topics in marketing including geographic market structures, price policy, agricultural marketing and other topics. Course may be repeated for credit. 
Mr. Howard, Mr. Revzan (Sp) 

170. Physical Distribution and Transportation Management. (4)  
Three 1½-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. 
Mr. Tyndall (F) 

174. Contemporary Problems in Transportation. (4)  
(Formerly numbered 179)  
Three 1-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. 
Mr. Tyndall (W) 

175. Introduction to Operations Research I. (4)  
(Formerly numbered 193)  
Two 2-hour meetings per week. Prerequisite: Mathematics 1A–1B–1C or equivalent (one year of calculus). Introduction to the analytic techniques and mathematical models of operations research and management science and their applications to business problems. Deterministic decision models, single and multi-stage. Linear programming. 
Mr. Contini, Mr. McGuire, Mr. Zangwill (F)
176. Introduction to Operations Research II. (4)
Two 2-hour meetings per week. Prerequisite: course 175. Statistics 131 or 134 or equivalent. Continuation of course 175. Stochastic decision models, nonlinear programming, dynamic programming, Markov decision processes.
Mr. Contini, Mr. Zangwill (W)

Two 2-hour meetings per week. Prerequisite: courses 1 and 2. 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. (4)
Three 1½-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. Ratcliff, Mr. Schaaf (F, W, Sp, Su)

181. Valuation of Real Property. (4)
Three 1½-hour lectures per week. Prerequisite: course 180. Land valuation; factors influencing real estate values and income, trends in real property values and appraisal procedures in the urban real estate market. Mr. Ratcliff (F)

183. The Management of Real Estate Resources. (4)
Three 1½-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. Schaaff (Sp)

185. Introduction to International Business. (4)
(Formerly numbered 161)
Three 1½-hour lectures per week. Prerequisite: courses 100 and 101 or the equivalent. Theories of geographical specialization; commercial and financial policies in international business; foreign market analysis and operational strategy for a firm; management problems and development potential of international operations.
Mr. Holton, (F, W, Sp, Su)

188. International Business Environment. (4)
(Formerly numbered 186)
Three 1½-hour lectures per week. Prerequisite: Economics 190A or the equivalent. A framework for relating the complex structure of society to international operations: physical and economic environments; cultural environments; religious, political and ethnic environments; their interactions in international business behavior.
(F, W, Sp, Su)

190. Organization and Administration. (4)
Two 1½-hour lectures and one 2-hour laboratory per week. The nature of organizations including individual behavior and decision-making, small group studies, and the normative and descriptive analysis of complex organizations.
Mr. Blankenship, Mr. Contini, Mr. Harsanyi, Mr. Hoggatt, Mr. Marschak, Mr. McGuire (F, W, Sp, Su)

Two 2-hour lectures per week. Prerequisites: senior standing and courses 100, 140 and 160. Integration of the subject matter of the required courses in business administration through the study of the problems of top management organization, administrative techniques, and policy formulation.

198A—198B—198C—198D. Directed Group Study.
(1–4)
The Staff (Mr. Boutil in charge) (F, W, Sp, Su)

199A—199B—199C—199D. Special Study for Advanced Undergraduates. (1–4)
Designed for senior students with at least a B average.
The Staff (Mr. Boutil in charge) (F, W, Sp, Su)

First-Year Courses for Graduate Students

1006. 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.
Mr. Doyle (F, Sp)

1016. 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. Doyle (F, W, Sp, Su)

1026. Economic Analysis for Business Decisions II. (3)
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. Alhadeff, Mr. Bailey (F, W, Sp, Su)

107G. Quantitative Business Decision Models and Techniques. (4)
Three 1½-hour lectures per week. Uses of formal models, models of the decision problem, rational choice under uncertainty, linear and non-linear programming, sequential descriptive models, multistage control.
Mr. Roberts, (F, W, Sp, Su)

108G. Statistical Analysis for Business Decisions. (3)
(Formerly numbered 103G)
Three 1½-hour lectures per week. Prerequisite: course 107G, may be taken concurrently. Statistical analysis, as used in managerial and other business problems, covers binomial, Poisson, and normal distributions, sampling theory and problems of inference, regression analysis.
Mr. Carman, Mr. Pye (F, W, Sp, Su)
111G. Legal, Political and Social Environment of Business. (3)
Three 1-hour lectures per week. A study of basic ideas, concepts, attitudes, rules and institutions in our society that characterize the legal, political and social framework within which the business system operates. Mr. Conant, Mr. Epstein, Mr. M. Smith, Mr. Volaw (F, W, Sp, Su)

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. Greenhall, (F, W, Sp, Su)

121G. Accounting II. (3)
Three hours of lecture per week. Prerequisite: course 102G 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. Doyle, Mr. Vatter (W, Sp, Su)

122G. Financial Accounting. (4)
(Formerly numbered 121G)
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.

130G. Financial Policies of Business. (3)
(Formerly numbered 131G)
Three 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. Keenan, Mr. Gordon, Mr. Goshay, Mr. Morrissey (F, W, Sp, Su)

140G. Production Organization and Management. (3)
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 of control.
Mr. Rogers, (F, W, Sp, Su)

150G. Industrial and Personnel Relations. (3)
Three 1-hour lectures per week. Objectives and problems of management and labor in modern industrial enterprise. Development of the American industrial relations system, unionism, collective bargaining, economic security. Elements of personnel administration. Mr. Garbarino, (F, W, Sp, Su)

160G. Marketing Organization and Policies. (3)
Three 1-hour meetings per week. Prerequisite: course 100G or equivalent. The evaluation of marketing in the economy; marketing structure, organization and behavior; marketing functions; pricing and price policies; marketing costs and efficiency; public and private regulations.
Mr. Howard, (F, W, Sp, Su)

Graduate Courses

203. Business Forecasting: Techniques and Applications. (4)
Two 2-hour meetings per week. Prerequisite: course 101 or 100G or 102G. Consideration of the techniques of long- and short-run forecasts of business activity both for the economy and for firms and industries. Examination of typical models, data problems, and other projection requirements. Problems and examples in particular forecasts. Mr. Bailey (F)

205. Seminar in Business Economics. (4)
Two 2-hour meetings per week.
Mr. Marschak, Mr. McGuire (W)

(Formerly numbered 210)
Two 1½-hour meetings per week. Prerequisite: consent of instructor. Problems and projects in the computer simulation of economic and industrial processes, thinking and learning, and neural processes. Consideration of problems of artificial intelligence, mechanical linguistics and information retrieval.
Mr. Hoggatt (W, Sp)

211. Seminar on the Modern Corporation. (4)
Three hours of meetings per week. Ownership, control, ideology, appraisal, responsibility. Experiments in self-regulation. Rise of the corporation in the American political order. Mr. Volaw, (W)

217. The Interaction of Business and Government. (4)
Three hours of meetings per week. Theory of the mixed economy. Methods of interaction between government and business. Sources of business leadership. "Inter-penetrated" activities including research and development, space, defense, atomic energy, foreign petroleum operations, basic steel. Relations between government and business in other leading nations.

221. Seminar in Accounting Theory I. (4)
(Formerly numbered 229A)
Two 1½-hour sessions per week. Prerequisite: course 122G or equivalent. Accounting literature with emphasis upon development of accounting theory. Includes early history, formal statements of principles, relation of economics and accounting.
Mr. Chambers, (F, W)

222. Seminar in Accounting Theory II. (4)
(Formerly numbered 229B)
Two 1½-hour sessions per week. Prerequisite: course 221. Current issues in accounting theory, e.g., asset valuation and income determination, with emphasis upon controversial issues.
Mr. Anton, Mr. Moonitz (W, Sp)

224. Seminar in Controllership I. (4)
(Formerly numbered 222A)
Two 1½-hour sessions per week. Prerequisite: courses 121G, 122G, 124 or equivalent. The study 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, Mr. Wheeler (F, W)
225. Seminar in Controllership II. (4)
(Formerly numbered 222B)
Two 1½-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, Mr. Wheeler (Sp)

226. Auditing Practice and Problems I. (4)
(Formerly numbered 223A)
Two 1½-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. Bottell, Mr. Vance (W)

227. Auditing Practice and Problems II. (4)
(Formerly numbered 222B)
Two 1½-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 225A—225B)
Two 1½-hour sessions per week. Prerequisite: course 128 or equivalent. Professional study of tax accounting practice, corporation tax problems, and administrative procedure.
Mr. Cerf, Mr. M. Smith (F, W, Su)

(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. Brewer, Mr. Fitch, Mr. Keenan (F, W, Sp, Su)

232. Money Markets and Financial Institutions. (4)
Mr. Alhadeff, Mr. Einzig (F, W)

233. Securities Markets and Investment Policies. (4)
Three hours of meetings per week. Prerequisite: course 230. 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. Tyndall (W, Sp)

234. Seminar in Business Finance. (4)
Three hours of meetings per week. Prerequisite: course 230 and consent of instructor.
Mr. Gordon, (W, Sp, Su)

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. Pye, (F, W, Sp)

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

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. Godhay (F, Sp)

239. Seminar in Insurance. (4)
Three hours of meetings per week.

241. Facilities Planning and Production Control. (4)
Two 1½-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.

242. Production Planning. (4)
Two 2-hour sessions per week. Prerequisite: course 241 or consent of 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.

255. Seminar in Manpower Economics and Labor Markets. (4)
(Formerly numbered 255A)
Three hours of class per week. Prerequisite: two industrial relations or the equivalent. Manpower and labor market economics. Dynamics of the labor force, manpower policies, employment and unemployment. Analyses 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 class 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. Malm, Mr. Miles, Mr. Strauss (F, Sp, Su)


(Formerly numbered 253B)

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. (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. (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. Revzan (W)

264. Communication Processes in Marketing. (4)

Three hours of meetings per week. Prerequisite: course 160G and 260 or equivalent, or consent of instructor. Behavior of household and organizational buyers; communications research; systemic analysis of mass behavior and communication processes.

Mr. Myers (Sp)

266. Marketing Organization. (4)

Three hours of meetings per week. Prerequisite: three quarter courses in marketing or consent of instructor. Meanings and revolutionary 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; specialization and integration of marketing organization; problems of " orderly" marketing. Mr. Revzan (Sp)

268. Marketing Research. (4)

Three hours of meetings per week. Prerequisite: course 295, marketing section. Nature and significance of marketing research; development of marketing research methods; investigation and analysis of specific marketing research problems, including class research problems; presentation of research results; evaluation of the effectiveness of marketing research.

Mr. Balderston, Mr. Revzan (Sp)

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. Grether, Mr. Revzan (F, W, Sp, Su)

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 (F)

274. Seminar in Transportation. (4)

(Formerly numbered 279)

Three hours of class per week. Mr. Carter (W)

275. Seminar in Operations Research. (4)

(Formerly numbered 293)

Two 2-hour meetings per week. Prerequisite: courses 175 and 176 or equivalent. More advanced treatment of topics selected from those covered in courses 175 and 176. Applications to organizational decision-making. The student will report on a topic of major interest to him.

Mr. Churchman. (Sp)

276. Measurement of Decision Criteria. (4)

(Formerly numbered 294)

Two 2-hour meetings per week. This seminar is essentially a study of models for measuring the values of objectives and a critical discussion of the problems involved.

Mr. Churchman (F)

277. Inventory and Waiting-Line Theory I. (4)

(Formerly numbered 295)

Two 1½-hour meetings per week. Prerequisite: courses 175, 176 and 275. Study of inventory and scheduling problems including construction and analysis of mathematical models and application to practice. Deterministic models, continuous and periodic review models with stochastic demands (s, S) policies.

Mr. Zangwill (F)

278. Inventory and Waiting-Line Theory II. (4)

Two 1½-hour meetings per week. Prerequisite: course 277. Continuation of course 277. Applications of queuing theory and of dynamic programming. Computation of optimal policies, including simulation.

Mr. Zangwill (W)
280. Real Estate and Urban Land Economics. (4)
Two 1½-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, ——— (F, W, Su)

284. Seminar in Real Estate and Urban Land Economics. (4)
(Formerly numbered 289)
Two 2-hour meetings per week. Prerequisite: course 280. 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 (Sp)

(Formerly numbered 261A)
Two 2-hour meetings per week. Tools of international economic theory applicable to problems of international business; commercial and financial policies for the multinational firm in industrial and developing countries. Mr. Holton, Mr. Spier (F, Sp)

286. Theory and Policy in International Business II. (4)
(Formerly numbered 261B)
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. Holton (W, Su)

287. International Financial Management. (4)
Two 2-hour meetings per week. Prerequisite: consent of the instructor. Corporate finance and capital budgeting in the foreign setting; alternative means of financing foreign operations; legal aspects of accounting abroad; interpretation of financial statements of foreign firms, problems of transfer pricing and taxation and their implications for organization of the firm.
Mr. Holton, ——— (W, Su)

291. Seminar in Organization Theory I. (3)
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. (3)
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. (3)
One 2-hour meeting per week. Prerequisite: course 291 and Mathematics 190A—190B—190C 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, ——— (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 skills in the formulation of policy in particular functions and for enterprises as a whole.
Mr. Balderston, 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 299 research project.
Mr. Balderston, Mr. Blankenship, Mr. Jastram (F, W, Sp, Su)

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 (F, W, Sp, Su)

297. Individual Study. (1–9)
By appointment only. 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 the various examinations required of candidates for the Ph.D. Course to be taken on a satisfactory or unsatisfactory basis.
The Staff (Mr. Garbarino in charge) (F, W, Sp, Su)
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 (F, W, Sp, Su)

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

**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.
John I. Toohey, Ph.D., Lecturer in Cell Physiology.

Graduate Adviser: Mr. Arnon.

The Department of Cell Physiology, in the College of Agriculture, 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 Course

299. Research. (1–12)
  Prerequisite: consent of the instructor.
The Staff (Mr. Arnon in charge) (F, W, Sp, Su)
See also Plant Nutrition 222, Unifying Concepts of Photosynthesis, offered by staff members of the Department of Cell Physiology.

**CHEMICAL ENGINEERING**

(Department Office, 105 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. Peterson, 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.
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.
C. Judson King, Sc.D., Associate Professor of Chemical Engineering.
Richard J. Ayen, Ph.D., Assistant Professor of Chemical Engineering.
Simon L. Goren, D.Eng., Assistant Professor of Chemical Engineering.
Edward A. Grens, Ph.D., Assistant Professor of Chemical Engineering.
Robert P. Merrill, Sc.D., Assistant Professor of Chemical Engineering.
John S. Newman, Ph.D., Assistant Professor of Chemical Engineering.
Michael C. Williams, Ph.D., Assistant Professor of Chemical Engineering.

E. Morse Blue, M.S., Lecturer in Chemical Engineering.
Charles F. Oldershaw, M.S., Lecturer in Chemical Engineering.
Otto Redlich, Ph.D., Lecturer in 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 preparing to major in chemical engineering ought to include in their programs chemistry (1 year); physics (1 year); mathematics (3½ years or more) including trigonometry and two years of algebra; and mechanical drawing.

Chemical Engineering Major


Satisfaction of the American History and Institutions requirement (see page 26). Twenty-seven units in the humanities and social sciences, chosen from a list provided by the College of Chemistry. English 1A or Speech 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 one course each quarter on a "passed" or "not passed" basis without affecting his grade-point average, so long as it is not a part of the major program.
3. 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 normally be recommended for awards unless they have taken Chemical Engineering 199H.

Graduate Study

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

140. Introduction to Chemical Engineering. (3)
Two 1-hour lectures and one 1-hour discussion per week. Prerequisite: Chemistry 14 and Chemistry 110A (the latter 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.

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 110A.

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 flow and non flow processes, including catalytic systems. Mr. Merrill (F)

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 conversion to processing conditions. Mr. Petersen (W)

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 equilibria, 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 110A, or consent of instructor. Sequence beginning in the fall and spring.

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 in the fall and spring.

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 conglutination processes.

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.

157. Unit Operations Laboratory. (3)
Three 3-hour laboratories per week. Prerequisite: course 151B. Continuation of course 151B. Advanced experiments in heat, mass, and momentum transfer. Experiments in thermodynamic cycles and transient behavior of systems.

160. Chemical Process Design. (4)
One 1-hour lecture 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.

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.

196. Special Laboratory Study. (2–5)
Prerequisite: courses 145 and 157 or consent of instructor. Special laboratory work for advanced undergraduates.

197. Individual Study for Advanced Undergraduates. (2–5)
Prerequisite: consent of instructor. Independent study on theoretical or computational problems.

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. Hanson in charge) (F, W, Sp, Su)
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. Ayen (F)

231. Analysis of Chemical Engineering Problems. (2)
Two 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. 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. Grens (Sp)

240. Phase Equilibria. (2)
Two 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 Ettinghausen cooling; transport properties of materials at low temperatures; cryogenic techniques in chemical processes. Mr. Lyon

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 244 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. (2)
Two 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 rate processes 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 (F)

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. Wilke (W)

250. Mass Transfer. (3)
Three 1-hour lectures per week. Prerequisite: graduate standing. Diffusion in gases and liquids. Mechanisms of binary and multicomponent systems. Continuous, semicontinuous and batch operation. Mr. King (F)

251. Separation Processes. (2)
Two 1-hour lectures per week. Prerequisite: course 250 or consent of instructor. Concepts of multistage and countercurrent contacting. Techniques for computation, and analysis of binary and multicomponent systems. Continuous, semicontinuous and batch operation. Mr. King (W)

252. Adsorption Separations in Particulate Beds. (2)
Two 1-hour lectures per week. Prerequisite: course 250, or 156 with honor standing; Mathematics 2B or course 230, or equivalent. Introduction to ion exchange, adsorption, partition adsorption and extraction, and regenerative heat transfer. Fixed-bed performance; axial dispersion; theory of chromatography. Moving beds, semicontinuous agitated systems, membrane processes fluidized beds. Mr. Vermeulen (F)

256. Transport Phenomena. (3)
Three 1-hour lectures per week. Prerequisite: course 230. Formulation and rigorous analysis of the laws governing the transport of momentum, heat, and mass with special emphasis on chemical engineering applications. Detailed investigation of laminar flows. Mr. Newman (Sp)

260. Optimization in Chemical Process Design. (3)
Three 1-hour lectures per week. Prerequisite: courses 230 and 160, or equivalent. Applications of linear and nonlinear mathematical programming to problems of optimum design and operation of chemical processes. Mr. Foss (W)
262. Chemical Process Dynamics. (3)
Three 1-hour lectures per week. Prerequisite: course 230 or equivalent. The unsteady behavior of chemical processes interpreted through the interaction of physical and chemical phenomena. Analysis of the distinctive problems of chemical process control.
Mr. Foss (Sp)

265. Design and Engineering of Integrated Chemical Process Systems. (3)
One 1-hour lecture and two 3-hour computation periods per week. Prerequisite: a comprehensive background in chemical engineering; course 260 recommended. Consideration of specific, realistic cases involving the synthesis, evaluation, selection and optimization of processing alternatives. Qualitative and quantitative studies. Computer applications. Criteria for engineering judgment and economic evaluation.
Mr. Foss (Sp)

295. Special Topics in Chemical Engineering. (2)
Prerequisite Open to properly qualified graduate students. Current and advanced study in chemical engineering, primarily for advanced graduate students.
295A. Kinetics in Combustion. Mr. Petersen (Sp)
295C. Air Pollution Control. Mr. Ayen (Sp)
295D. Electrochemical Energy Conversion. Mr. Tobias (W)
295E. Mass and Heat Transfer. Mr. King (W)
295H. Kinetic Theory of Transport Processes. Mr. Goren (F)

295J. Electrical Separation Techniques. Mr. Hanson (Sp)
295L. Molecular and Continuum Rheology. Mr. Williams (W)

296. Special Study for Graduate Students in Chemical Engineering. (2–6)
Prerequisite: consent of instructor. Special laboratory and theoretical studies.
The Staff (Mr. Prausnitz in charge) (F, W, Sp, Su)

297. Individual Study for Graduate Students in Chemical Engineering. (2–4)
Prerequisite: consent of graduate adviser. Individual study in preparation for doctoral qualifying examination.
The Staff (Mr. Prausnitz in charge) (F, W, Sp, Su)

298. Seminar in Chemical Engineering. (2–6)
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. Hanson in charge) (F, W, Sp, Su)

299. Research in Chemical Engineering. (2–12)
The Staff (Mr. Hanson in charge) (F, W, Sp, Su)

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.

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CHEMISTRY

(Department Office, 419 Latimer Hall)
Leo Brewer, Ph.D., Professor of Chemistry.
Melvin Calvin, Ph.D., Sc.D., Professor of Chemistry 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.
Chester T. O’Konski, Ph.D., Professor of Chemistry.
Edwin F. Orlemann, Ph.D., Professor of Chemistry.
Isadore Perlman, Ph.D., Professor of Chemistry and Associate Director of the Lawrence Radiation Laboratory.
Norman E. Phillips, Ph.D., Professor of Chemistry.
George C. Pimentel, Ph.D., Professor of Chemistry (Chairman of the Department).
Richard E. Powell, Ph.D., Professor of Chemistry.

High School Preparation  High school students preparing to major in chemistry ought to include in their programs: chemistry (1 year); physics (1 year); mathematics (3½ years or more) including trigonometry and two years of algebra; and foreign language (2 years), preferably German, Russian, or French.

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: 1A, 1B, 1C, 2A. 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, or 107. At least 25 additional units in upper division chemistry and allied subjects, with at least 12 of these in chemistry.

Satisfaction of the American History and Institutions requirement (see page 26). 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. English 1A or Speech 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: 1A, 1B, 1C. Students who wish to be certified to the American Chemical Society as having taken an approved curriculum must take Mathematics 2A also.

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. O’Konski.

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 one course each quarter on a “passed” or “not passed” basis, without affecting his grade-point average, so long as it is not a part of the major program, or in the College of Letters and Science, a lower division course offered in satisfaction of a breadth requirement.

3. 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 taken Chemistry 114H and Chemistry 199H.

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. Three-quarter sequence beginning (F, Sp, Su).

1A. Stoichiometry and introduction to structural chemistry. The laboratory takes up stoichiometry and thermodynamics.

The Staff (Mr. Powell, Mr. Timms and Mr. Markowitz in charge (F, Sp, Su)

1B. Reversible reactions, equilibrium constants and their dependence on temperature and pressure, and electrical cells. The laboratory takes up equilibria of weak acids and sparingly soluble salts, and electrical cells. The Staff

(Prerequisite: course 1A or 1C, and grade of C or better.

Chlorides and other anions, and their dependence on temperature and pressure, and electrical cells. The laboratory takes up equilibria of weak acids and sparingly soluble salts, and electrical cells. The Staff

(Prerequisite: course 1A or 1C, and grade of C or better.

1C. Systematic survey of the chemistry of metals and nonmetals, from a structural and equilibrium point of view. Includes a brief treatment of carbon. (The laboratory is qualitative analysis.)

The Staff (Mr. Powell, Mr. Timms and Mr. Markowitz in charge) (F, Sp)

Contemporary Natural Science (Natural Science 1A–1B–1C). (4-4-4)
Sequence beginning (F), Mr. Reif, Mr. Strohman

4A–4B–4C. General Chemistry and Quantitative Analysis. (5-5-5)
Three 1-hour lectures and two 3-hour laboratories per week. Prerequisite: high school chemistry (high school physics is also recommended), introductory calculus which may be taken concurrently, and superior performance on an examination given during the week of enrollment. Intended for students of superior facility and preparation in chemistry, but not limited to chemistry majors. Equivalent to courses 1A–1B–1C plus 5 as prerequisite for further courses in chemistry. Covers the principles of general chemistry with a more quantitative emphasis than course 1A–1B–1C, and lays more stress on the applications of thermodynamics and quantum mechanics. Laboratory emphasizes quantitative work.

Three-quarter sequence beginning (F), Mr. Pimentel

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 volumetric, gravimetric, potentiometric and colorimetric methods of analysis, and ion exchange separation.

Mr. Cunningham, Mr. Interrante, Mr. Koch, Mr. Orlemann (F, W, Sp, Su)

8A–8B. Survey of Organic Chemistry. (4-4)
Two 1½-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. A survey of the important classes of organic compounds, with emphasis on materials of interest to students of the biological sciences.

Two-quarter sequence beginning (F) Mr. Calvin; (Sp) Mrs. Jorgenson

Foundations of Physical Science (Physics 11A–11B). (4-4)
Sequence beginning (F) Mr. Knight

12A–12B–112. Organic Chemistry. (5-5-5)
Two 1½-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 biochemistry or chemical engineering. (12A and 12B: primarily concerned with the chemistry of simple functional groups, the laboratory takes up syntheses of aliphatic and aromatic compounds; 112: emphasizes the chemistry of multifunctional and heterocyclic compounds, in the laboratory emphasis is on identification of organic compounds.) Three-quarter sequence beginning (F, Sp, Su).

Mr. Heathcock, Mr. Rapoport, Mr. Scherer, Mr. Streitwieser
112T. Organic Chemistry. (7½)
Four and one-half hours of lecture and 9 hours of laboratory. Prerequisite: course 12 on the semester calendar. Completes the year sequence in organic chemistry, 12A–12B–112 for students who have taken Chemistry 12 on the semester calendar. Mr. Cason (F)

Two 1½-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–112E. Two-quarter sequence beginning (W, Su).

112T. Physical Chemistry. (1½)
Two 1-hour lectures per week. Prerequisite: course 110A on the semester calendar. Prepares students who have taken Chemistry 110A on the semester calendar to take Chemistry 110B on the quarter calendar. Mr. Mahan (F)

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 consent of instructor. Two-quarter sequence beginning (F, W, Su)
111A, Mr. Hearst, Mr. Jura, Mr. Moore, Mr. Timoco; 111B, Mr. Hearst, Mr. Moore, Mr. Somorjai, Mr. Timoco

114H. Advanced Chemical Thermodynamics. (3)
Three 1-hour lectures per week. Prerequisite: course 110B and honors standing. A rigorous presentation of classical thermodynamics. Equilibria involving real gases and real solutions. Application of tabulated thermodynamic data. Systems involving intensive variables besides pressure and temperature.
Mr. Brewer, Mr. Phillips (F); Mr. Phillips (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.
Mr. Myers (W)

127. Physical Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 14 and 8B or 112. Courses 110A–110B and a reading knowledge of German are recommended. Applications of modern theoretical concepts to the chemical and physical properties of organic compounds. Kinetics and mechanism of organic reactions.
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. Noyce (F); Mr. Jensen (W); Mr. Dauben (Sp)
129. Organic Chemistry—Synthetic Methods. (3)
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)

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 colloids, 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) (F, W, Sp, Su)

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) (F, W, Sp, Su)

Graduate Courses

206A–206B. Organic Chemistry. (3–3)
Two 1½-hour lectures per week. The application to synthetic studies of current knowledge of reaction mechanism, molecular structure, and steric factors. Emphasis is on typing of reactions according to mechanism. Two-quarter sequence beginning (W).
Mr. Noyce (W), Mr. Cason (Sp)

207. Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 206B. The chemistry of heterocyclic compounds, with emphasis on those of natural origin.

208. Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 206B. Kinetics and mechanism of organic reactions, mechanism of rearrangements.
Mr. Noyce (Sp)

209. Organic Chemistry. (3)
Two 1½-hour lectures per week. Prerequisite: course 206B. The chemistry of polycyclic compounds of biological interest, with emphasis on sterols 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.
Mr. Dauben (F); Mr. W. (W,

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;

216B. Topics chosen from among the following: liquids solutions, light-scattering, polymeric systems, spectral line shapes, quantum statistics, phase transitions, transport properties.
Mr. Mahan

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).

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 (F)

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. Rasmussen (Sp); Mr. Johnston (F)

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. —— in charge) (F, W, Sp)

297. Individual Study for Graduate Students. (1–6)
Any properly qualified graduate student who wishes to pursue a problem of his own choice, through reading or nonlaboratory study, may do so if the proposed project is acceptable to the member of the staff with whom he works.
The Staff (Mr. —— in charge) (F, W, Sp, Su)

298. 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. —— 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. —— in charge) (F, W, Sp, Su)
CITY AND REGIONAL PLANNING
(Department Office, 228 Wurster Hall)

John W. Dyckman, Ph.D., Professor of City Planning and Chairman, Center for Planning and Development Research.
Donald L. Foley, Ph.D., Professor of City Planning and of Architecture (Chairman of the Department).
T. J. Kent, Jr., M.C.P., Professor of City Planning.
Corwin R. Mocine, B.S., Professor of City Planning and of Architecture.
Jesse Reichek, Professor of 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 and Director, Institute of Urban and Regional Development.
J. Thomas Cooke, M.C.P., Assistant Professor of City Planning.
Andrei Rogers, Ph.D., Assistant Professor of City and Regional Planning.
Michael B. Teitz, Ph.D., Assistant Professor of City and Regional Planning.

John E. Burchard, S.M., LL.D., D.Arch. (hon), Visiting Professor of Environmental Design.
H. Wentworth Eldredge, Ph.D., Visiting Professor of City Planning.
Norma D. Evenson, Ph.D., Assistant Professor of Architectural History.
Claude Gruen, Ph.D., Lecturer in City Planning.
Mellier G. Scott, Jr., A.B., Lecturer in City Planning.
Paul Sedway, M.C.P., Lecturer in City Planning.

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 guide lines 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

‡ In residence fall only, 1966–67.
§ In residence spring quarter only, 1966–67.
¶ In residence fall and winter only, 1966–67.
‖ In residence fall and spring only, 1966–67.
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 72.

**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 programme domains 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.

**Upper Division Courses**

100. City Planning for Architects and Landscape Architects. (4)

Two 2-hour lectures per week. Prerequisite: Architecture 102, advanced standing in 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. Cooke (F); Mr. Mocine (Sp)

100L. City Planning Laboratory for Architects and Landscape Architects. (5)

Two 4-hour studios per week. Prerequisite: Architecture 102 or advanced standing in landscape architecture. (Not open to students who have taken course 110.) Laboratory: individual and group practice in solving typical city planning problems.

Mr. Cooke (F, W)

110. Introduction to City Planning. (5)

Three 3-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. Mr. Eldredge (Sp)

111. Introduction to Housing. (5)

Two 1½-hour lectures per week and five 3-hour field trips. Open to majors 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.

Mr. Rogers (F), Mr. Sedway (Sp)

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.

Mr. Violich (W)

199. Special Study for Advanced Undergraduates. (1-4)
Prerequisite: consent of instructor.
Mr. Teitz in charge (F, W, Sp)

Graduate Courses

200. The Evolution of Cities. (5)
Two 1½-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. Burchard (F)

201. Introduction to City Planning. (3)
Two 1½-hour lectures 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. Wheaton (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-aiding and general-plan preparation for a small urban community; emphasis is on planning for the physical development of new communities.

Mr. Teitz (Sp)

203. Planning and Governmental Decision-Making. (4)

Mr. Webster (W)

204. The Use of Urban Data. (4)
Three 1½-hour lectures per week. Prerequisite: introductory statistics or consent of 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. Rogers (F)

206. City Planning Legislation and Governmental Organization. (4)
Two 1½-hour seminars per week. Prerequisite: CP 201 or consent of instructor. Duties and role of the physical planning agency in municipal and metropolitan governments; major alternative de-
226. 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. Reichek (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 speculations on future social and technological changes and their urban and city influences. Implications for public policy and for strategies of planning.
Mr. Eldredge (Sp)

*228. Seminar on Urban Planning in Latin America. (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. Violiich (Sp)

231. Seminar in City and Metropolitan Planning. (4)
One 2½-hour seminar per week. Prerequisite: graduate standing in a social science department or professional school or consent of instructor. History of American city planning; role of physical planning in local government; the urban general plan and its effectuation; relations between city planners and other professionals.
Mr. Scott (W)

232. City and Metropolitan Planning for Engineers. (4)
Two 1½-hour lectures per week. Prerequisite: graduate standing in transportation or civil engineering or consent of instructor. Survey of theory and practice; functions of planning agency and its principal policy instruments; analytic and design methods; relationship to engineering.
(5p)

233. Introduction to Regional Analysis and Planning. (4)
One 2-hour seminar and one 1-hour seminar per week. Prerequisite: consent of the 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. Teitz (F)

241. 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.
(W)

243. 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.
Mr. Violiich, Mr. Mocine (Sp)

244. Housing and Urban Development. (4)
Two 2-hour lectures per week. Prerequisite: CP 269. Housing and related development in urban fringe areas; social, economic and political implications. Effects upon journey to work, social overhead investment requirements, regulatory policies. New towns, land assembly, open space, and other problems.
Mr. Wheaton (W)

246. Planning Land Use and Communications Systems. (3)
Two 2-hour lectures per week. Structure of urban systems and interdependencies among subsystems. Predictive growth models; valutative frameworks for
policy-making; operational planning strategies. Emphasis upon regional land use, transportation, and communications systems and behavior. Laboratory exercises in application of operational models.

Mr. Rogers (W)

247. Methods of Program Planning. (4)
Two 2-hour lectures per week. Prerequisite: CP 218 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. ——— (W)

250. Theories of the Planning Process. (3)
Two 1½-hour lectures per week. Planning as a special type of decision-making process; applications in guiding urban spatial development. ——— (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. ——— (W)

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.
The Staff (F, W, Sp)

297. Field Study. (No credit)
Required for city planning students who have not had practical city planning office experience.
Mr. Mocine (Su)

298. Group Studies. (1-5)
Prerequisite: consent of instructor.
Mr. Teitz in charge (F, W, Sp)

299. Individual Study or Research. (1-5)
Prerequisite: consent of instructor.
Mr. Teitz in charge (F, W, Sp)

CLASSICS

(Department Office, 5303 Dwinelle Hall)

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.
Louis Alexander MacKay, M.A., Professor of Latin.
William Kendrick Pritchett, Ph.D., Professor of Greek and Curator of Classical Epigraphy, Louie Museum of Anthropology.
Thomas G. Rosenmeyer, Professor of Classics and of Comparative Literature.
William M. Green, Ph.D., Professor of Latin, Emeritus.
William C. Helmold, Ph.D., Professor of Classics, Emeritus.
Ivan M. Linforth, Ph.D., LL.D., Professor of Greek, Emeritus.
H. R. W. Smith, Ph.D., Professor of Latin and Classical Archaeology and Associate Curator of Classical Archaeology, Emeritus.
John K. Anderson, †M.A., Associate Professor of Classical Archaeology and Associate Curator of Classical Archaeology, Museum of Anthropology.
Elroy L. Bundy, Ph.D., Associate Professor of Classics and of Comparative Literature.
W. Gerson Rabinowitz, Ph.D., Associate Professor of Greek.
James T. Hooker, M.A., Assistant Professor of Classics.
George L. Koniaris, Ph.D., Assistant Professor of Classics.
Ronald S. Stroud, Ph.D., Assistant Professor of Classics.
Charles Witke, †Ph.D., Assistant Professor of Classics and of Comparative Literature.

Kenneth James Dover, Sather Professor of Classical Literature for the winter quarter.
Michael Nagler, Ph.D., Acting Assistant Professor of Classics and of Comparative Literature.

Alesandra M. Schmidt, Lecturer in Classics for the fall and winter quarters.

Departmental Major Adviser: (Greek, Latin, Classical Languages) Mr. MacKay.
Departmental Graduate Adviser: (Classics) Mr. W. S. Anderson; (Classical Archaeology) Mr. Stroud.

* Not to be given, 1966-67.
‡ In residence spring quarter only, 1966-67.
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 159, 160A–160B, History 110A–110B.

**Major in Latin** Latin 1, 2, 3, 4, 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, Greek, Sanskrit (see Linguistics), Art 163, History 111A–111B.

**The Major in Classical Languages** Greek 1–2 or 1A–1B–1C; Latin 1, 2, 3, 4, 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 159, 160A–160B, 163, History 110A–110B, 111A–111B.

**Honors Programs** Greek: Greek 150A–150B and at least one part of both Greek 115 and 120 (A, B, C, D, or E). Three terms of Greek H195 taken during the senior year. Latin: Latin 109 and at least one part of both Latin 145 and 150 (A, B, C, D, or E). Three terms of Latin H195 taken during the senior year. **Classical Languages:** Greek 150A or Latin 109. Three terms 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.

**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 subject—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, palaeography, 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 5229 Dwinelle Hall, for Classical Archaeology in 5220 Dwinelle Hall.

Letters and Science List: for regulations governing this list, see page 72.

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. 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. Greek Civilization. Mr. Nagler (F)
10B. Roman Civilization. Mr. W. S. Anderson (W)

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. (F, Su)
17B. Monuments of Greek civilization 700–500 B.C., with particular reference to the life of the citizen. (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. —— (Sp)

28. The Classic Myths. (5)

Three 1½-hour lectures and one 1-hour section meeting 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. Miss Schmidt (W)

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. Hooker (F)

35. Greek Tragedy. (4)

Three 1-hour lectures per week. Lectures on Greek tragic drama with readings of Aeschylus, Sophocles, and Euripides.

Mr. Koniaris (W); —— (Su)

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. —— (F)
100B. Hellenistic literature and Latin literature of the Roman Republic. (W)
100C. Latin literature under the Roman Empire. —— (Sp)

§130. History of Attic Comedy. (3)

Two 1½-hour class meetings per week. The development of Attic comedy to Menander, with special emphasis on Aristophanes.

Mr. Dover (W)

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 (F)

140. Homer and History. (4)

Two 2-hour lectures per week. An archaeological investigation of the civilizations represented in the Homeric poems.

Mr. Hooker (W)

170A–170B–170C. Classical Archaeology. (4-4-4)

Three 1-hour lecture and discussion sessions per week. The later parts may be taken before the earlier.

*170A. Vase-painting in Greece and Italy to 600 B.C. (F)
*170B. Vase-painting in Greece and Italy in the sixth century. (W)
170C. Vase-painting in Greece and Italy from 500 B.C. —— (Sp)
175A–175B. Greek Cities and Sanctoraries. (4–4)
Three 1-hour lectures per week. 175A is not prerequisite to 175B.
175A. Ancient Greek sanctuaries. Mr. Stroud (W)
175B. Topography and monuments of Athens. Mr. Stroud (Sp)

*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

*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.
Mr. Fontenrose

*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.
Mr. Fontenrose

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students.
Mr. Stroud (in charge) (F, W, Sp, Su)

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. Bundy (W)

2. Greek for Beginners. (6)
Four 1-hour class meetings per week. Second part of two-part course in elementary Greek.
Mr. Nagler (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. Pritchett, Mr. Rabinowitz (F, W, Sp)

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. Hooker (F); Mr. Stroud (W)

Upper Division Courses

100. Xenophon. Anabasis. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 1–2 or 1A–1B–1C.
Mr. Stroud (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. Rabinowitz (F)

103. Drama. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 100.
Mr. Stroud (Sp)

115. Senior Course in Greek Poetry. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 103.
115A. Aristophanes. ——— (F)
115B. Sophocles. Mr. Koniaris (W)
115C. Aeschylus. Mr. Hooker (Sp)
115D. Lyric Poetry. Reading of poems of Pindar, Bacchylides, Sappho, and others. ——— (Su)
115E. Theocritus. ——— (F)

120. Senior Course in Greek Prose Authors. (4)
Three 1-hour class meetings per week. Prerequisite: Greek 103.
120A. Demosthenes. ——— (F)
120B. Herodotus. Mr. Bundy (Sp)
120C. Thucydides. Mr. Pritchett (W)
120D. Attic Orators. ——— (Su)
120E. Plato’s Republic. ——— (F)

§130. Aristophanes: Frogs. (2)
One 2-hour class meeting per week. An intensive study of the text.
Mr. Dover (W)

150A–150B. Advanced Greek Prose Composition.
Three 1-hour class meetings per week. Prerequisite: Greek 40A–40B. Advanced instruction in the writing of Attic Greek prose.
Mr. Bundy (Sp)

166. Greek Verse Composition. (1)
One 1-hour class meeting per week.
Mr. Hooker (W)

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 (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students.
Staff (F, W, Sp, Su)
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 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 1, Latin 2, etc.)

1. Elementary Latin. (4)
Five 1-hour class meetings per week.
Miss Schmidt (in charge) (F, W); Mr. Gordon (in charge) (Sp, Su)

2. Elementary Latin. (4)
Three 1½-hour class meetings per week. Continuation of Latin 1. Miss Schmidt (in charge) (W); ——— (in charge) (Sp); Mr. Gordon (in charge) (Su)

3. Latin Readings. (5)
Three 1-hour class meetings per week. Selections from Latin prose and poetry.
——— (F, Sp)

4. Cicero and Catullus. (5)
Three 1-hour class meetings per week. Selections from Cicero's Orations and the poems of Catullus.
——— (F, W)

9A–9B. Latin Composition. (3–3)
Three 1-hour class meetings per week. Prerequisite: Latin 3. 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.
——— (F, W)

Upper Division Courses

104. Vergil. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 4. Selections from Aeneid.
Mr. W. S. Anderson (F); Mr. MacKay (W); Mr. Gordon (Sp); ——— (Su)

105. Livy. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 4. Selected readings. Miss Schmidt (F)

106. Horace: Odes and Epodes. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 4.
Mr. W. S. Anderson (W)

107. Cicero. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 4. Reading of a philosophic essay. Mr. MacKay (Sp)

* Not to be given, 1966–67.

109. Advanced Latin Composition. (3)
Three 1-hour class meetings per week. Prerequisite: Latin 9A–9B. Advanced instruction in the writing of Latin prose.
Mr. Koniaris (Sp)

145. Senior Course in Latin Poetry. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 104 and 106.
145A. Roman Comedy. Mr. MacKay (F)
145B. Lucretius. ——— (W)
145C. Elegiac Poets. ——— (Sp)
145D. Juvenal. Mr. W. S. Anderson (Su)
*145E. Horace: Satires and Epistles. ——— (F)

150. Senior Course in Latin Prose Authors. (4)
Three 1-hour class meetings per week. Prerequisite: Latin 107.
150A. Sallust. Mr. MacKay (F)
150B. Seneca. Mr. MacKay (W)
150C. Cicero's Letters. Mr. Gordon (Sp)
150D. Tacitus. Mr. Gordon (Su)
*150E. Caesar. ——— (F)

166. Latin Verse Composition. (1)
One 1-hour class meeting per week. Prerequisite: Latin 109. Practice in the writing of Latin verse in various meters.
Mr. MacKay (F)

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 (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students.
Staff (F, W, Sp, Su)

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 1½-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. Koniaris (F)
200B. Proseminar to Latin. ——— (W)

210A–210B. Homer. (4–4)
Two 1½-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.
Mr. Nagler (W); Mr. Hooker (Sp)

212A. Early Lyric Poets. (4)
Two 1½-hour class meetings per week. Seminar in the Greek lyric poets before 500 B.C.
Mr. Bundy (F)

213B. Sophocles. (4)
Two 1½-hour class meetings per week. ——— (Sp)
215. Seminar in Greek History. (4)

215A. Herodotus. Mr. Pritchett (Sp)
215B. Thucydides. Mr. Pritchett
215C. Aristotle’s Constitution of Athens. Mr. Stroud (F)
215D. Greek Epigraphy. Mr. Pritchett (Su)

216. Greek Philosophy. (4)

Two 1½-hour class meetings per week.
216A. Presocratics. Mr. Rabinowitz (W)
216B. Plato. Mr. Rabinowitz
216C. Aristotle. Mr. Rabinowitz

231. Lucretius. (4)

Two 1½-hour class meetings per week.

235B. Sallust. (4)

Two 1½-hour class meetings per week.

236B. Juvenal and Persius. (4)

Two 1½-hour class meetings per week.

*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. Mr. Witke
*245B. Latin Literature of the High Middle Ages, 900–1300 A.D. Study of the evolution of mediaeval style with special attention to lyrical and satirical poetry. Mr. Witke

270A–270B. Seminar in Classical Archaeology. (4–4)

Two 1½-hour class meetings per week. Advanced study of ancient Greek art objects and sites. (F, W)

297. Individual Study. (1–6)

For graduate students who are preparing for the qualifying examinations required for admission to candidacy for the Ph.D. Staff (F, W, Sp, Su)

298. Special Study. (1–4)

This course is normally reserved for students writing the doctoral dissertation. Staff (F, W, Sp, Su)

299. Special Study. (1–5)

Special individual study for qualified graduate students. Staff (F, W, Sp, Su)

16. Latin for Graduate Students, First Course.

(No credit) (F, W, Sp)

26. Latin for Graduate Students, Second Course.

(No credit) (F, W, Sp)

Related Courses in Other Departments

For courses in Sanskrit see Department of Linguistics.

Readings in Mediaeval Latin (English 210). (5)

Mr. Jones (Sp)

The Mediaeval Mind (English 220A–220B). (5–6)

Mr. Jones (F, W)

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 comparative literature at Berkeley 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. in comparative literature are listed below.

The Group Major

First and Second Years  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 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.

Third and Fourth Years  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 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 a 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 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 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 (Miss Richardson in charge) (F, W, Sp, Su)

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. Expository writing based on analysis of selected masterpieces of ancient and modern literature. 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. Coolidge, Mr. Nagler (F, W)

41A-41B-41C. Introduction to Literary Forms. (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. Nagler (F)
41B. Forms of the Novel. (W, Su)
*41C. Forms of the Drama. Mr. Prescott (Sp)

Upper Division Courses

Group I: Unrestricted Courses
(Open to all students in the upper division; enrollment not limited.)

Lower Division Courses

1A-1B. English Composition in Connection with the Reading of World Literature. (4-4)

41A-41B-41C. Introduction to Literary Forms. (4-4-4)

*110. The Classical Tradition in Western Literature. (4)
Three 1-hour lectures per week. Examination of selected aspects of the Greco-Roman tradition and their relevance to the study of later literature.
Mr. Nagler (Sp)

120. The Biblical Tradition in Western Literature. (4)
Three 1-hour lectures per week. Examination of selected aspects of the Biblical tradition and their relevance to the study of later literature.
Mr. Coolidge (Sp)

*141. Cultural Background of the Renaissance in Western Europe. (4)
Three 1-hour lectures per week. Not open to students who have received credit for course 151A-151B. Discussion of phases of the movement and contributions of great writers with special reference to Italy.
Mr. Scaglione (W)

*151A-151B. The Literature of the Renaissance in Western Europe. (4-4)
Three 1-hour lectures 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.
Mr. Scaglione (W, Sp)

155. Trends in Contemporary Literature. (4)
Three 1-hour lectures per week. Examination of selected works illustrating the current state of literature in the United States and abroad.
Mr. Prescott (F, Su)

*160. Western Literary Crosscurrents in Twentieth-Century China. (4)
Three 1-hour lectures per week. The impact of western literature on modern China and China’s response in literary theory, movements, and creation.

Group II: Restricted Courses

(Designed primarily for students whose major subject is comparative literature; sections limited to twenty students each.)

The Junior Course

100. Introduction to Comparative Literature. (4)

Three 1-hour lectures 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.

Mr. Duggan (Sp, Su)

The Senior Course

190A. Comparison of Authors: English, French, German. (4)

Three 1-hour lectures 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. Mr. Knapton (W, Su)

190B. Comparison of Authors: English, French, Latin. (4)

Three 1-hour lectures 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. Duggan (Sp)

*190C. Comparison of Authors: English, French, Spanish. (4)

Three 1-hour lectures 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. Duggan (Sp)

190UL. Comparison of Authors: Unlisted Literatures. (4)

Individual conferences to be arranged. Prerequisite: course 100 or equivalent, and at least four quarters in upper division literature, including at least one quarter in a relevant foreign language. Comparison of two or three important authors, including at least one belonging to a literature unlisted in the other 190 courses. The works belonging to the literatures unlisted in the other 190 courses must be read in the original languages. Substantial comparative paper required.

The Staff (Miss Richardson in charge) (F, W, Sp, Su)

* Not to be given, 1966–67.

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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 (Miss Richardson in charge) (F, W, Sp, Su)

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 modern 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 (Miss Richardson in charge) (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (1-5)

Restricted to senior honor students.

The Staff (Miss Richardson in charge) (F, W, Sp, Su)

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, Su)

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. Damon, Mr. Nagler (F)

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. Bundy, Mr. Nagler (F, 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. Rosenmeyer (Sp, Su)
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*202D. Approaches to Dramatic Literature. (4)
Two 3-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. Mr. Prescott, (F)

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 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. Topic for 1966–67: Lyric Poetry.
Mr. Bundy, (Sp)

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. Topic for 1966–67: 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. Topics for 1966–67: Humanism from Petrarch to Erasmus.
Mr. Scaglione (W)
The Bible and the Renaissance. Mr. Coolidge (Sp)

*220A–220B. Studies in Neoclassical 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 1966–67: Neoclassicism and Counter-Reformation.
Mr. Coolidge (F, W)

*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 investigation of a topic in Western literature between the end of the Neoclassical period and the beginning of the contemporary period. Topic for 1966–67: The Symbolist Movement in European Literature.
Mr. Ramsey (W)

230A–230B. Studies in East-West 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. Comparative investigation of a literary topic requiring the study of both Oriental and Western documents. Topics for 1966–67: China and the West.
Mr. Chen (Sp) Israel and the West.
Mr. Augst (F)

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. 235A is not prerequisite to 235B. Application of modern linguistic methods to the comparative study of literature. Topic for 1966–67: Computer Processing of Literary Texts. Mr. Augst (F)

240. Problems in Comparative Literature. (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 1966–67: Aspects of the Pastoral. Mr. Rosenmeyer (Sp) Chaucer and the Rhetorical Tradition. Miss Richardson (W)

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. Topic for 1966–67: Existentialism.
Mr. Johannesson (F, Su)

*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 1966–67: Theory of Genres.
Mr. Augst (W, Su)

Graduate Tutorial Courses

297. Individual Study. (1–10)
Prerequisite: completion of at least 24 units in upper division and graduate courses beyond the A.B., including all the courses required for the M.A. in comparative literature at Berkeley or their equivalent elsewhere. Individual study, in consultation with the graduate adviser, intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. in comparative literature.
The Staff (Mr. Anderson in charge) (F, W, Su)

298. Special Study. (1–5)
Primarily for students engaged in preliminary exploration of a restricted field, involving the writing of a report. May not be substituted for available seminars. The Staff (Mr. Anderson in charge) (F, W, Su)

299. Directed Research. (5–10)
Normally reserved for students directly engaged on the doctoral dissertation.
The Staff (Mr. Anderson in charge) (F, W, Su)
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)

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.
Paul L. Kirk, Ph.D., Professor of Criminalistics.
Joseph D. Lohman, M.A., Professor of Criminology (Chairman of the Department).
Arthur H. Sherry, A.B., LL.B., Professor of Criminology and of Law.
Leslie T. Wilkins, Professor of Criminology.
Austin H. MacCormick, M.A., Professor of Criminology, Emeritus.
Orlando 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.

Nathan Adler, Ph.D., Lecturer in Criminology and in Psychology.
Herbert Blumer, Ph.D., Professor of Sociology.
Herbert S. Breifogle, M.D., Lecturer in Criminology.
Edward V. Comber, M.A., Lecturer in Criminology.
Milton Feldstein, M.A., Visiting Lecturer in Criminalistics.
Robert M. Fisher, A.B., LL.B., Acting Assistant Professor of Criminology.
Joel Goldfarb, Ph.D., LL.B., Lecturer in Criminology.

The requirements for admission to the School of Criminology are listed (on page 77). 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.

100A, Mr. Smith (F), Mr. Korn (Sp); 100B, Mr. Korn (W), Mr. Smith (Su)

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.

Mr. O'Neill (F, Su)

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.

Mr. O'Neill (W, Su)

102A-102B-102C. The Etiology of Crime. (4-4-4)

102A. Sociological. Four lecture hours. Social factors and processes in criminal and delinquent be-
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
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<tr>
<td>111A-115B</td>
<td>The Criminal Law in Action.</td>
<td>4-4</td>
<td>Pre requisite: senior standing.</td>
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<tr>
<td>114</td>
<td>Prevention and Control of Crime in Metropolitan Areas.</td>
<td>(4)</td>
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<td>115</td>
<td>Constitutional and Procedural Problems in Law Enforcement.</td>
<td>(4)</td>
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<td>116</td>
<td>The Prison Community.</td>
<td>(4)</td>
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<td>118A</td>
<td>The Alcoholic and the Narcotic Addict.</td>
<td>(4)</td>
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102A-102B-102C
ogy
1188.
diff e r e nc es as a factor in diff e r e ntia l
ity; l ega l, soc i al, psychological and moral probl e ms
viation; d e velopm e ntal th e ori es of sexua l
ar d s as modus operandi , syn1 b o li c r e a c tion s of t e nsion
of penal insti t u tions. Mr. Wilkins ( F)
control of e thni c h osti liti es. Mr. Car ey (W)
variables as diff e rentiating co nditi ons.
A n exam ination of th e t erms and condi ti ons o f e thical
considerat ion s in th e organization a nd adn1inj s tra ti on
120. Social
dev el opmen t of th e juv e n il e c ourt ; comparison
e mpha s is upon the d e cision-making proc ess .
Mr. Fish e r
dynami cs and th e ir r e l a ti on s hip t o a ntisocial acts
varieties of crim e generat in g cont e mporary s ub c ul­
es p ec i a ll y t o fighting gangs, mobs a nd mas s
124. Nonconformist Cultures. (4)
Principl es of isolating ph ys ical cons titu en t s
nor mal and ab n orma l cons titu en ts t o detern1ine
156. Forensic Toxicology. (5)
One lecture hour and 8 laboratory hours. Pre­
requ it e s: 111 and 111L; Chemistry 5, 12A-12B
and 112, with grade of C (112 may be taken concur­ently). Application of biochemical and immunological principles in the area of physiological material.
155. Comparative Evidence and Evaluation. (5)
Two lecture hours and 6 laboratory hours. Pre­
requ it e s: 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)
156. Forensic Toxicology. (5)
One lecture hour and 8 laboratory hours. Pre­
requ it e s: 151A-151B. Methodology in detection and
estimation of toxic substances by chemical and physical
means. Systematic analysis as scientific study of
normal and abnormal constituents to determine
presence or absence of toxic substances in relation
to legal standards of proof. Mr. Parker (Sp)
163. Problems and Procedures in Criminal
Interrogation. (5)
Three lecture hours and 2 laboratory hours. Survey of
historical and contemporary methods of interrogata­
tion including techniques for detection of deception,
psychological and physiological variables in subject
response, evaluation of responses and instrumental
techniques. Mr. Mieners (Sp)
(4)
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 (F)

118B. Sexual Offenders and Character Disorders. (4)
Four and one-half lecture hours. Prerequisite: 102A-102B-102C or comparable courses in sociolo­
gy and psychology. Psychopathology of sexual de­
viation; developmental theories of sexual abnormal­
ity; legal, social, psychological and moral problems
associated with sexual and character disorders.
Mr. Adler (Sp)
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 enforce­
ment; variations in punitive sanctions, double stan­
dards as modus operandi, symbolic reactions of tension
and conflict, positive and negative factors in the
control of ethnic hostilities.
Mr. Carey (W)
120. Social Policy and Penal Practice. (4)
Four lecture hours. Prerequisite: senior standing.
An examination of the terms and conditions of penal
institutions. Mr. Wilkins (F)
*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.
Mr. Goldfarb (W)
123. Groups, Crowds and Gangs. (4)
Four lecture hours. An examination of group
dynamics and their relationship to antisocial acts,
especially to fighting gangs, mobs and mass distur­
bances as a condition of the violation of legal norms
and their implication for the law-enforcement and
corrective functions. Mr. Fisher (Sp)
124. Nonconformist Cultures. (4)
Four and one-half lecture hours. An analysis of
different types of crime generating contemporary subcul­
tures. Societal norms and legal structures, including
the police, the courts and the correctional system,
are examined as they relate to deviant subcultures.
Mr. Wilkins (Sp)
125. Group Psychotherapy in Correctional
Institutions. (4)
Four lecture hours. Prerequisite: senior standing.
An analysis of alternative techniques of group
therapy as currently employed in penal practice.
Mr. Korn (W)
126. Law Enforcement Policies and Social
Structure. (4)
Four lecture hours. Prerequisite: senior standing.
An examination of law enforcement systems in rela­
tion 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. Lohman (F)

127. Law and Discretion in Criminal Sentencing. (4)
Four and one-half lecture hours. Legal and con­
stitutional factors, the principle of the rule of law
and the ethical goals of the criminal law as limita­
tions upon judicial and administrative discretion in
fixing sentence and determining release on parole.
Mr. Foote (F)
151A-151B. Microanalytic Concepts. (5-5)
One lecture hour and 9 laboratory hours. Pre­
requ it e s: 111 and 111L; Chemistry 5, 12A-12B
and 112, with grade of C (112 may be taken concur­ently). Form and substantive pattern analyses by
means of chemical and physical methods and tech­
niques with relation to forensic purposes. Sequence,
beginning (W). Mr. Kirk (W, Sp)
152. Forensic Aspects of Separation and
Purification. (5)
One lecture hour and 8 laboratory hours. Pre­
requ it e s: 111 and 111L; Chemistry 5, 12A-12B
and 112, with grade of C (112 may be taken concur­ently). Principles of isolating physical constituents
of samples. Mr. Parker (W)
153A-153B. Forensic Applications of Scientific
Instruments. (5-5)
One lecture hour and 9 laboratory hours. Pre­
requ it e s: 151A-151B. Instrumental approaches to
identification and characterization. Sequence, begin­
ing (W). Mr. Parker (W); Mr. Kirk (Sp)
*154. Physiological Concepts. (5)
One lecture hour and 9 laboratory hours. Pre­
requ it e s: 151A-151B. Application of biochemical and
immunological principles in the area of physiological material.

* Not to be given, 1966-67.
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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 (Mr. Smith in charge) (F, W, Sp, Su)

199. Research and Special Study for Advanced Undergraduates. (2–6)
Individual conferences. The Staff (F, W, Sp, Su)

Graduate Courses
The requirements for admission to the Graduate Division are listed on page 29. The requirements for the Master of Criminology and the Doctor of Criminology are listed in the ANNOUNCEMENT OF THE SCHOOL OF CRIMINOLOGY.

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 interrelationship of different aspects of criminological research. Sequence, beginning (F) and (Su).
200A, Mr. Korn (F), Mr. Diamond (Su); 200B, Mr. Fisher (W); 200C, Mr. Korn (Sp)

One 3-hour seminar. 262 or 263 must be taken concurrently. Prerequisites: 102B, 102C or equivalent course 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.
Mr. Diamond (F, W, Sp)

262. Counseling and Psychotherapy: Field Work. (2–6)
Individual conferences.
Mr. Diamond (F, W, Sp, Su)

263. Community Psychiatry: Field Work. (2–6)
Individual conferences.
Mr. Diamond (F, W, Sp, Su)

275. Seminar in Scientific Evidence. (2)
One 2-hour seminar. May be repeated for credit. Topics to vary.
Mr. Kirk (F, W, Sp)

*276. Advanced Forensic Toxicology. (4)
One 2-hour seminar and 4 laboratory hours.

*277. Advanced Forensic Instrumentation. (4)
One 2-hour seminar and 4 laboratory hours.

278. Advanced Comparative Evidence and Evaluation. (4)
One 2-hour seminar and 4 laboratory hours. Mr. Parker and Mr. Wilkins (Sp)

* Not to be given, 1966–67.

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.
Mr. Parker (F)

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 (Sp)

*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 criminogenic and otherwise abortive characteristics of the institutions of criminal justice.

282. Prediction Methods in Parole and Probation. (3)
One 3-hour seminar. Survey of research in methods and techniques of selection for probation and parole, validity of prediction factors and experience tables, application of predictive methods to other aspects of delinquency and criminality, practical implications and limitations for crime control.
Mr. Wilkins (F)

*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.
Mr. 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 it is 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. Mr. Wilkins (W)

288. Seminar in the History of the Discipline of Criminology. (3)
One 3-hour seminar. Mr. Goldfarb (W)
289. Selected Problems in Scientific Evidence. (3)
One-hour seminar and four laboratory hours. May be repeated for credit. Topics to vary.
Mr. Parker (F, W, Sp)

290A–290B. Seminar in Crime Investigation. (3–3)
One 3-hour seminar.
Mr. O'Neill (F, W)

291A–291B. Seminar in Police Administration. (3–3)
One 3-hour seminar.
Mr. Comber (W, Sp)

293A–293B. Seminar in the Administration of Criminal Justice. (3–3)
One 3-hour seminar.
Mr. Holstrom (F, W)

\section*{DESIGN}

(Department Office, 234 Wurster Hall)

Mary A. Dumas, M.A., Professor of Design.
Lucretia Nelson, M.A., Professor of Design.
Charles E. Rossbach, M.F.A., Professor of Design.
Herwin Schaefer,† Ph.D., Professor of Design.
Anna Hadwicke 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 Puymbroek Miller, M.F.A., Professor of Design, Emeritus.
Willard V. Rosenquist, M.A., Associate Professor of Design.
Peter H. Voulkos, M.F.A., Associate Professor of Design.
Ruth McDonald Boyer, Ph.D., Assistant Professor of Design and Assistant Curator of Textiles, Lowie Museum of Anthropology.
Margaret P. Dhaemers (D'Hamer),† M.F.A., Assistant Professor of Design.
Robert Kabak, M.F.A., Assistant Professor of Design.
Ragnhild L. Langlet, Assistant Professor of Design.
Marvin Lipofsky, M.F.A., Assistant Professor of Design.
Donald E. Potts, M.A., Assistant Professor of Design.
Torben Strandgaard, M.A.A., Assistant Professor of Design.
Arne Wolf, Assistant Professor of Design.

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John A. Burchard, S.M., LL.D., D.Arch. (hon.), Visiting Professor of Environmental Design (Chairman of the Department.)

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, 10A, 10B, 11, 12; 4 units chosen from 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**

Eight units from 120A, 120B, 120C (one course repeated for credit), 140A, 140B, 140C; 8 units from upper division studio design courses other than 120A, 120B, 120C, 127A; 6 units from upper division history–theory design courses other than 140A, 140B, 140C, 144A.

**EMPHASIS ON INTERIOR DESIGN**

Eight units from 123A, 123B, 123C (one course repeated for credit), 142A, 142B, 148; 8 units from upper division studio design courses other than 123A, 123B, 123C, 127A; 6 units from upper division history–theory design courses other than 142A, 142B, 144A, 148.

**EMPHASIS ON TEXTILE DESIGN**

*Printed Textiles:* 121A, 121B, 121C, 122A, 141A, 141B, 141C; 8 units from upper division studio design courses other than 121A, 121B, 121C, 122A, 127A; 6 units from upper division history–theory design courses other than 141A, 141B, 141C, 144A. **Recommended:** 193.

*Woven Textiles:* 121A, 122A, 122B, 122C, 141A, 141B, 141C; 8 units from upper division studio design courses other than 121A, 122A, 122B, 122C, 127A; 6 units from upper division history–theory design courses other than 141A, 141B, 141C, 144A. **Recommended:** 193.

**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.

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**

1. **Introduction to Design.** (3)
   
   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.

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

2A–2B. **Design Survey.** (5–5)
   
   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.

   2A. The Ancient World and the Middle Ages. (F)
   2B. The Renaissance to the present. (W)

10A–10B. **Design.** (2–2)
   
   Six hours studio per week. **Prerequisite:** course 1. Fundamentals of design. Sequence, beginning each quarter.

   The Staff (Mr. Wolf in charge) (F, W, Sp, Su)
11. Freehand Drawing for Design. (2)
Six hours studio per week. Prerequisite: course 1. Observation of form and structure in natural objects. Development of abstraction and form.
The Staff (Mr. Wolf in charge) (F, W, Sp, Su)

12. Design. (2)
Six hours studio per week. Prerequisite: course 1. Three-dimensional design experience in the use of machine tools.
The Staff (Mr. Wolf in charge) (F, W, Sp, Su)

20. Form in Clay. (2)
Six hours studio per week. Prerequisite: courses 1, 10A, 10B, 11, 12. Basic processes of ceramics.
Mr. Voulkos (F, W, Sp, Su)

21. Printed Textile Design. (2)
Six hours studio per week. Prerequisite: courses 1, 10A, 10B, 11, 12. Pattern development and structure in textile printing with emphasis on screen and stencil processes. Miss Dumas, Miss Langlet, (F, Sp)

22. Woven Textile Design. (2)
Six hours studio per week. Prerequisite: courses 1, 10A, 10B, 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. Mr. Rosbach (F, Sp)

24. Calligraphy. (2)
Six hours studio per week. Prerequisite: courses 1, 10A, 10B, 11, 12. Laboratory study of calligraphy and letter forms of western civilization since Roman times.
Mr. Wolf (F, W)

25. Form in Metal. (2)
Six hours studio per week. Prerequisite: courses 1, 10A, 10B, 11, 12. An introduction to the basic techniques of metal design.
Mr. Lipofsky (W, Su)

Upper Division Courses

Group A: Studio Courses

120A–120B–120C. Advanced Ceramic Design. (2–2–2)
Six hours studio per week. Prerequisite: courses 1, 10A, 10B, 11, 12. Advanced ceramic processes in construction and glazing. 120C may be repeated for credit.
Sequence beginning (F, Su) Mr. Voulkos

121A–121B–121C. Advanced Printed Textile Design. (2–2–2)
Six hours studio per week. Prerequisite: courses 21, 141A, 141B. Advanced problems of printed textile design through various dyeing and printing processes. 121C may be repeated for credit.
Sequence beginning (F, Su) Miss Dumas (F, Sp); Miss Langlet, (W, Su)

122A–122B–122C. Advanced Woven Textile Design. (2–2–2)
Six hours studio per week. Prerequisite: courses 22, 141A, 141B. Extended problems in design on the loom, exploring techniques of gauze, tapestry, brocade, etc., for understanding of their unique design qualities. Interrelation of techniques and materials is stressed, toward the use of weaving as an expressive design medium. 122C may be repeated for credit.
Sequence beginning (F, Su) Mr. Rosbach

123A–123B–123C. Interior Design. (2–2–2)
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. 123C may be repeated for credit.
Sequence, beginning (F, Su), Mr. Strandgaard

124A–124B. Advanced Calligraphic Design. (2–2)
Six hours studio per week. Prerequisite: course 24. Elements of typography and lettering. Advanced work in calligraphy, integrating calligraphic elements and design through the graphic printing process. 124B may be repeated for credit.
Sequence, beginning (W, Su). Mr. Wolf

125A–125B. Advanced Metal Design. (2–2)
Six hours studio per week. Prerequisite: Course 25. Studies of volume and spatial relationships in metal. 125B may be repeated for credit. Sequence, beginning Sp.
Mr. Lipofsky, Mr. Rosenquist

126A–126B. Form in Glass. (2–2)
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.
Sequence, beginning (F, Sp). Mr. Lipofsky

127A. Advanced Design: Light and Motion. (3)
Nine hours studio per week. Prerequisite: Course 12. Study of relationships of light and motion.
Mr. Rosenquist, (F, Sp)

127B. Advanced Design: Photography. (2)
Six hours studio per week. Prerequisite: Course 12. Basic techniques of photography. Design with light.
Mr. Wolf (F, 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 tradition; 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, techniques and designs.
Mrs. Boyer (F)
141B. The Old World: The Orient, India and the Near East. Early developments and establishment of historic styles to the 17th century.
Mrs. Boyer (W)
141C. The Old World: Mediterranean countries and Europe. Coptic and European tapestry art, influences from Persia, India and the Orient on European textile design in the seventeenth and eighteenth centuries. (Sp)

*Not to be given, 1966–67.
142A–142B. Theory of Interior Design. (4–4)
Three hours lecture per week. Application of the principles to composition of the design, selection and arrangement of furniture, with special consideration for its relation to the architectural background.
Mr. Strandgaard, 142A (F); 142B (W)

143A–143B–143C. Primitive Art. (4–4–4)
Two hours lecture, one hour visual analysis per week. Analysis of selected art styles of non-literate peoples with reference to their cultural contexts. Miss Nelson
143A. Paleolithic West Europe, South and West Africa. (F)
143B. Oceania and South Africa. (W)
143C. Middle and North America. (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 (Su)

145. History of Design Since the Industrial Revolution. (5)
Three hours lecture and one 1-hour section per week. The theory and practice of design from pre-industrial handcrafts to mechanical production and the evolution of a machine aesthetic. ——— (W)

*146A–146B. Historic Costume. (4–4)
Four hours lecture per week. Survey of costume with attention directed toward design, material, cultural factors and contemporary arts.
146A. Native America; Indonesia; Asia.
146B. Classic Mediterranean; Medieval to Modern Europe.
Mrs. Boyer (W)

147. Concept and Expression of Folk Art. (4)
Four hours lecture per week. Survey of representative areas of European folk art to illustrate basic problems and theories. Exploration of aesthetic qualities, 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.
——— (F)

*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 survey of contemporary design.
The Staff (Miss Nelson in charge) (F, 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.

—Not to be given, 1966–67.

193. Non-Woven Textiles. (3)
Two hours per week. Prerequisite: courses 122A, 141B, 141C. Theory and problems concerning the construction and design of ethnic and historic textiles.
Mr. Rossbach (W)

198. Special Studies in the Practice of Design. (2–5)
Prerequisite: restricted to senior honor students and graduates. Advanced studio work in specific design areas. The Staff (Mr. Rosenquist in charge) (F, W, Sp, Su)

199. Directed Research. (2–5)
Prerequisite: restricted to senior honor students and graduates.
The Staff (F, W, Sp, Su)

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) (W)

230. Form in Interior Design. (3)
Analysis of elements relating to interiors. Problems and the 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)
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, (F)

294E. Studies in Form. (3)
Miss Nelson (Sp)

294F. Industrial Design. (3) ——— (Sp)

*294G. Ceramic Design. (3)

298. Special Study in the Practice of Design. (2–6)
The Staff (Mr. Voulkos in charge) (F, W, Sp, Su)

299. Directed Research. (2–6)
The Staff (Mrs. Boyer in charge) (F, W, Sp, Su)
DRAMATIC ART

(Department Office, 120 Dwinelle Annex)

Travis Bogard, Ph.D., Professor of Dramatic Art and English (Chairman of the Department).

Robert W. Goldsby, M.F.A., Professor of Dramatic Art.

Fred Orin Harris, M.F.A., Professor of Dramatic Art.

Henry May, B.A., Professor of Dramatic Art.

Marvin Rosenberg, Ph.D., Professor of Dramatic Art.

Garff B. Wilson, Ph.D., Professor of Dramatic Art and Speech.

William L. Oliver, Ph.D., Associate Professor of Dramatic Art.

George L. Koniaris, Ph.D., Assistant Professor of Dramatic Art and Classics.

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-Bernard Bucky, M.F.A., Acting Assistant Professor of Dramatic Art.

N. Joseph Calarco, M.A., Acting Assistant Professor of Dramatic Art.

Henrietta G. Harris, M.A., Lecturer in Dramatic Art.

Barry Munitz, M.A., Acting Assistant Professor of Dramatic Art.

Toshiro Ogawa, B.A., Lecturer in Dramatic Art.

George Ulnic, B.A., Lecturer in Dramatic Art.

The Major

Lower Division Dramatic Art 10, 20A–20B, 45A–45B, and 49.

Upper Division 36 units of upper division courses in dramatic art including: 120, 160, 181; 8 units of 125A–125B–125C–125D–125E; at least one and not more than 5 units of 190. Recommended: Students interested in acting or directing should arrange to include Theatrical Fencing (Physical Education 12) and Basic Stage Movement (Physical Education 12) in their major programs.

Honors Program Majors in 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 Theater Under the direction of the Department of Dramatic Art, the University Theater 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. For further information, inquire at the office of the Department of Dramatic Art.

Preparation for Graduate Study The background of a student undertaking work toward an M.A. degree should approximate the undergraduate major in Dramatic Art at Berkeley. Deficiencies will be determined by means of a diagnostic examination upon entrance and must be made up immediately.

‡ On leave, fall and winter quarters, 1966–67.
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; French or German reading examination; 90-minute comprehensive oral examination on dramatic literature, criticism and theater 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 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 approved 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 72.

Lower Division Course

1A–1B. English Composition in Connection with Reading of Dramatic Literature. (4–4)
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.
Mr. Calarco, Mr. Munitz (F, W, Sp, Su*)
1B: Three 1-hour lectures and two 1-hour sections per week.
Mr. Munitz (F*, W, Sp, Su*)

10. Theory of Acting: Resources. (4)
Five 1-hour lectures per week. A study of physical, psychological, and spiritual resources for acting.
Mr. F. Harris, Miss H. Harris (F, W, Sp, Su*)

11A–11B. Theory of Acting: Methods. (4–4)
11A. Five 1-hour lectures per week. Prerequisite: Course 10 or consent of instructor. The fundamentals of stage speech and movement.
Mr. F. Harris, Miss H. Harris (F, W, Sp, Su*)
11B. Three 1-hour lectures and two 1-hour sections per week. Prerequisite: Course 11A. Approaches and practices in characterization.
Miss H. Harris (F*, W, Sp, Su*)

20A–20B. Introduction to Dramatic Literature. (4–4)
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.
20A. Aeschylus through Molière. Mr. Bogard (F)
20B. The Restoration to the Present. Mr. Bogard (W)

39A–39B. Introduction to Playwriting. (4–4)
Three 1½-hour lectures per week. Prerequisite: 39A is prerequisite to 39B. Admission to 39B by consent of instructor. Mr. Calarco, 39A (Sp); 39B (F*)

40A–40B. Twentieth-Century World Theater. (4–4)
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. May, 40A (W*); 40B (Sp)

45A–45B. Introduction to Theater. (4–4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: 45A is prerequisite to 45B. The elements of stage practice.
Mr. Ulinic, 45A (F, Sp); 45B (W, Su*)

49. University Theater. (1)
To be arranged. Prerequisite: consent of instructor. May be repeated for credit.
The Staff (Mr. Bogard in Charge) (F, W, Sp, Su*)

Upper Division Courses

110. Advanced Theory of Acting. (4)
Three 1-hour lectures and two 1-hour laboratories per week. Prerequisites: courses 10, 11A–11B, and junior standing, or consent of instructor.
Mr. Goldsby (F, W, Su*)

111. Theory of Acting Styles. (4–4–4)
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.
Mr. Koniaris (Sp)
111B. Acting in Renaissance Styles.
Mr. Prescott (W)
111C. Acting in Major Modes 1700–1900.
Mr. Prescott (F)

112. Theory of Acting: Vocal Resources for Acting. (4)
Three 1-hour lectures and two 1-hour laboratories per week. Prerequisites: courses 10, 11A–11B, and consent of instructor.
Miss H. Harris (W, Sp)

*Not to be given, 1966–67.
120. Dramatic Theory. (4)
Three 1 ½-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. Munitz, Mr. Rosenberg (F, W, Sp, Su*)

125. Dramatic Literature of Western Civilization. (4-4-4-4)
Five 1-hour lectures per week.
125A. Greek and Roman Dramatic Literature
Mr. Koniaris (F)
125B. Dramatic Literature of Western Europe from the Middle Ages to 1600.
Mr. Ogden (W)
125C. Dramatic Literature of Western Europe from 1600 to 1700.
Mr. Bogard (Sp)
125D. Dramatic Literature of Western Europe and the U.S. from 1700 to 1900.
Mr. Munitz (F)
125E. Dramatic Literature of Western Europe and the U.S. from 1900 to the present.
Mr. Munitz (W, Su*)

139A-139B-139C. Playwriting. (4-4-4)
Three 1 ½ 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 Theater. (4)
Five 1-hour lectures per week. The development of the American theater from Colonial times to the twentieth century.
Mr. Wilson (F)
150A-150B. History of theater. (4-4)
Five 1-hour lectures per week. The development of theatrical production in its cultural background, including the theater building and stage, scenery and scene design, costume, acting, and directing.
150A. The beginnings to 1700. (F)
150B. 1700 to the present. (F)

154. Theory of Stage Costume. (4)
Mr. May (W)
Three 1-hour lectures and two 1-hour laboratories per week.

155A-155B. Theory of Design for the Theater. (4-4)
Three 1 ½ hour lectures per week. Prerequisite: 155A is prerequisite to 155B.
Sequence, beginning (F). Mr. May

156. Theory of Lighting Design. (4)
Three 1-hour lectures and two 1-hour laboratories per week.
Mr. Ogawa (F, Sp)

160. Theory of Directing. (4)
Three 1 ½ hour lectures per week. Prerequisite: junior standing.
Mr. Goldsby. (F, Sp)

161. Advanced Directing. (4)
Three 1 ½-hour lectures and two 1 ½-hour laboratories per week. Prerequisite: course 160 and consent of instructor.
Mr. Calarco, Mr. Oliver (F, W, Su*)

161. Senior Proseminar. (4)
Three 1 ½-hour lectures per week. Prerequisite: course 120, senior standing. Sections limited to 20 students. Studies in a single playwright or mode of theatre; not for practice of acting or playwriting. Designed primarily for senior students majoring in dramatic art.
Mr. Ogden, Mr. Calarco (F, W, Sp, Su*)

* Not to be given, 1966–67.

190. Advanced University Theater. (1-4)
To be arranged. Prerequisites: junior standing and consent of instructor. May be repeated for credit.
The Staff (Mr. Bogard in charge) (F, W, Sp, Su*)

H195A. Honors Course. (4)
To be arranged. Prerequisite: candidacy for honors in Dramatic Art. Seminar leading to the preparation of a research paper on a single aspect of the theater.
The Staff (Mr. Bogard in charge) (F, W, Sp, Su*)

H195B. Honors Course. (4)
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. Bogard in charge) (F, W, Sp, Su*)

199. Special Study for Advanced Undergraduates. (1-4)
To be arranged. Prerequisite: 12 or more units in Dramatic Art with an average grade of not less than B. Reading and conference. Restricted to senior honor students.
The Staff (Mr. Bogard in charge) (F, W, Sp, Su*)

Graduate Courses

210A-210B*. Advanced Acting. (5-5)
Five 1-hour lectures per week. Prerequisite: course 110, one section of course 111, and consent of instructor. 210A, Mr. Goldsby (Sp); 210B*, To be arranged.

220. Theater Research. (4)
Two 1 ½ hour lectures per week. An introduction to bibliographical methods and materials for theater research projects.
Mr. Ogden, Mr. Calarco (F, W, Sp, Su*)

222A-222B. Studies in Classical Theater.
222A. Readings in Classical Theater. (1)
One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Ogden (W)
222B. Seminar in Classical Theater. (4)
Three 1-hour lectures per week. Prerequisite: course 222A.
Mr. Ogden (Sp)

223A. Readings in the Theater of Shakespeare. (1)
One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Ogden (F)
223B. Seminar in the Theater of Shakespeare. (4)
Three 1-hour lectures per week. Prerequisite: course 223A.
Mr. Ogden (Sp)

224A-224B. Studies in French Theater.
224A. Readings in French Theater. (1)
One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Goldsby (F)
224B. Seminar in French Theater. (4)
Three 1-hour lectures per week. Prerequisite: course 224A.
Mr. Goldsby (W)

*225A-225B. Studies in Russian Theater.
225A. Readings in Russian Theater. (1)
One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. (Sp)
225B. Seminar in Russian Theater. (4)
Three 1-hour lectures per week. Prerequisite: course 225A. (Su)
226. Studies in Dramatic Genre. (5)
Three 1-hour lectures per week. Prerequisite: course 220; may be taken concurrently. Seminar in one of the major dramatic genres: tragedy, comedy, melodrama, farce. Mr. Rosenberg (F)

227A–227B. Realism in Twentieth-Century Drama.
227A. Readings in realism in twentieth-century drama. (1)
One 1-hour lecture per week. Prerequisite: course 220; may be taken concurrently. Mr. Prescott (F)
227B. Seminar in realism in twentieth-century drama. (4)
Three 1-hour lectures per week. Prerequisite: course 227A. Mr. Prescott (W)

228A–228B. Antirealistic Trends in Twentieth-Century Drama.
228A. Readings in antirealistic trends in twentieth-century drama. (1)
One 1-hour lecture per week. Prerequisite: course 228A; may be taken concurrently. Mr. Oliver (W)
228B. Seminar in antirealistic trends in twentieth-century drama. (4)
Three 1-hour lectures per week. Prerequisite: course 228A. Mr. Oliver (Sp)

229A–229B. Studies in the American Theater.
229A. Readings in the American Theater. (1)
One 1-hour lecture per week. Prerequisite: course 229A; may be taken concurrently. Mr. Wilson (W)
229B. Seminar in the American Theater. (4)
Three 1-hour lectures per week. Prerequisite: course 229A. Mr. Wilson (Sp)

239. Advanced Playwriting. (5)
Three 1½ hour lectures per week. Prerequisite: consent of instructor; not open to undergraduates. Mr. Rosenberg (Sp)

255. Advanced Design for the Theater. (5)
Three 1½ hour lectures per week. Prerequisite: open to qualified seniors, with consent of instructor. Mr. May (Sp)

256A. Lighting Design. (5)
Three 1-hour lectures and two 1-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: courses 160, 161 (or the equivalent), and consent of the instructor. Not open to undergraduates. Mr. Goldsby, Mr. Oliver (F, W, Sp)

290. Theater Laboratory. (1–5)
To be arranged. Prerequisite: course 210A–210B, or 239, 255, or 256A or 260. Advanced practice in theater design, lighting, directing, playwriting, and acting. May be repeated for credit.
The Staff (Mr. Bogard in charge) (F, W, Sp Su*)

298. Special Studies. (5–10)
To be arranged. Reserved for students engaged in work on their doctoral dissertations and productions.
The Staff (Mr. Bogard in charge) (F, W, Sp, Su*)

* Not to be given, 1966–67.

299. Special Studies. (1–5)
To be arranged. Prerequisite: Not open to practice of acting, directing, design, or playwriting. May be repeated for credit.
The Staff (Mr. Bogard in Charge) (F, W, Sp, Su*)
Related Courses in Other Departments

Form in Drawing (Art 2A),
The Classic Myths (Classics 28),
Greek Tragedy (Classics 35),
Mythology (Classics 178),
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),
Drama (Classics: Greek 103),
Nineteenth-Century German Drama (German 115A–115B),
Twentieth-Century German Drama (German 121A–121B),
Italian Literature of the Eighteenth Century (Italian 114),
Italian Literature of the Twentieth Century (Italian 116),
Roman Comedy (Classics: Latin 145A),
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),
Theory of Dance (Physical Education 160A–160B),
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).
The following courses are required: Statistics 2 or an equivalent statistics course and any one of the following: (1) Economics 1 and 3; (2) Economics 1 with a grade of “A” or “B”; (3) Economics 103A; 40 quarter units in upper division and graduate eco-

nomics courses, other than 103A–103B, and including two quarters of economic theory (Economics 100A or 101A and 100B or 101B) and a one quarter course in economic history (Economics 112A, 112B, or 113). The requirements in economic theory and economic history should be satisfied prior to the senior year. The remaining courses shall be selected by the student with the advice and approval of a departmental major adviser. The selection shall include two 5-unit upper division courses in the same field, or an equivalent combination of upper division and graduate courses if approved by the student’s major adviser. Statistics 131, 131L and Economics 142 will satisfy this concentration requirement; Economics 112A–112B will satisfy it provided that 113 is also taken.

It is strongly recommended that economics majors elect upper division courses in related social sciences. Students who may wish to undertake graduate work in economics are urged to satisfy the theory requirement by taking Economics 101A–101B and should therefore take note of its mathematical prerequisites. 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 promising 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 apply at the beginning of or during their junior year. H195A–H195B is an introduction to the current methods and content of economic research. In the senior honors seminar (H196A–H196B), honors theses are written under the direction of a member of the department. Students thought to be eligible for an award of Great Distinction will be allowed to take an oral examination at the end of H196B for the purpose.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Courses

1. Economic Issues and Institutions. (4)
   Two lectures and two section meetings per week. Study of selected current issues of economic policy, such as the unemployment problem and the proper economic functions of government.
   Mr. Gordon, Mr. Rolph (F);
   Mr. Gordon (W, Sp); ———— (Su)

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. Mr. Ward (W, Sp)

Upper Division Courses

Prerequisite: for 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.
103A–103B. Introduction to Economic Principles, Institutions and Policies. (4–4)
Four hours per week. Prerequisite: junior standing. Analysis of determination of prices, income and employment, with applications. Primarily for non-majors, does not count toward upper division requirements for majors.
103A, Mr. Saffran (F); 103B, Mr. Saffran (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. Laidler (W)

106. Economics of Marxism. (5)
Four and one-half hours per week. The economic thought of Marx and his followers. (Sp)

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. (F, Sp)

112A–112B. Economic History of Europe. (5–5)
Four and one-half hours per week. Survey of the development of the economic institutions of Europe; analysis of economic problems and policies in their historical settings.
112A, Mr. Cipolla (F, Su); 112B (Sp)

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. (Sp, Su)

114. Economic Development and Problems of Latin America. (5)
Four and one-half hours per week. Evolution of Latin-American economics in terms of basic institutions and international influences; standards of living; problems of monoeconomies; land tenure systems; problems of improving agricultural methods; foreign investment; industrialization and related problems. (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. (F)

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. Mr. Ward (W)

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)
118B. The Soviet economy (advanced topics); other East European economies; the Communist bloc as a whole. (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. (W, Sp)

130. Government Finance. (4)
Four 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 (F, 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. Diamond (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. Mr. Douglas (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. Laidler (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. Diamond (Sp)

Four and one-half hours per week. Prerequisite: 100A or 101A and 100B or 101B, plus Statistics 131 or equivalent. A survey of applications of statistical methods in economic research and policy analysis. (W)

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, Sp)

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. —— (F)

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.
Mr. Leibenstein (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. —— (W)
190B. International economic policies. —— (Sp)

H195A–H195B. Honors Course. (3–3)
Two hours per week. (Normally taken by honors students in the spring quarter of the junior year and the fall quarter of the senior year.) An introduction to economic research.
H195A, —— (Sp); H195B —— (F)

H196A–H196B. Senior Honors Seminar. (5–5)
Four and one-half hours per week. (Normally taken by honors students in the winter and spring quarters of the senior year.) Preparation of an honors thesis.
Mr. Grossman, H196A (W); H196B (Sp)

199. Special Study for Advanced Undergraduates. (1–5)
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. Goldman (F)
200B. Macroeconomics: determination of national income, employment, price level, growth, distribution. —— (W)

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.
201A, Mr. Letchie (W); 201B, Mr. Letchie (Sp)

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. Goldman, —— (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. Saffran, Mr. Jorgenson (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. ——; —— (F)

206. Linear Models in Economic Theory. (5)
Three hours per week. Prerequisite: course 202A–202B, Mathematics 190A–190B–190C. An introduction to linear programming and input-output analysis.
Mr. Debreu, (F)

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. Debreu (W); 207B, Mr. Radner (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. Debreu (F, Sp); —— (W); —— (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. Cipolla (F, Su) 210B. The industrial revolution in Europe. —— (W)
210C. Economic growth of the United States.
Mr. Fishlow (W)
210D. Economic growth in follower countries. —— (Su)

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. —— (Su)

Three hours per week.
216A. Prerequisite: course 116 or consent of instructor. Economic systems.
Mr. Ward (W)
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. 
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, (W); 217B, Mr. Radner (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.
Mr. Bain (F)

Two hours per week. Public finance and taxation theory; public debt and fiscal policy; public policy with respect to taxation.
Mr. Break (F); Mr. Rolph (W); Mr. Break, Mr. Rolph (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 (F); Mr. Rolph (W); Mr. Break (Sp)

233. Dynamic Aggregative Economics. (5)
Three hours per week. A systematic review of the recent theories of growth and cyclical fluctuation.
Mr. Diamond (F)

234. Monetary Theory. (5)
Three hours per week. Analysis of monetary theory and institutions.
Mr. Laidler (F)

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.
(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.
(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)

240. Introduction to Econometrics. (5)
Three hours per week. 
Prerequisite: Mathematics 190A or equivalent. Problems in the application of statistical methods in economics, illustrated by a representative selection of empirical studies.
(F); Mr. Radner (W)

241A–241B. Econometrics. (5–5)
Three hours per week. 
Prerequisite: Statistics 135B or equivalent and one course in linear algebra.
Sequence beginning 241A, Mr. Jorgenson (W); 241B, (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. Jorgenson (F); (W); Mr. Jorgenson (Sp)

250A–250B–250C. Advanced Labor Economics. (3–3–3)
Two hours per week. 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.
(F); (W); (Sp)

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, (F); 280B, (W); 280C, Mr. Leibenstein (Sp)

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. Fishlow (F); (W)

288. Population and Economic Development. (5)
Three hours per week. Population and migration problems in economic development.
Mr. Leibenstein (Sp)

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. Letiche (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.
(F); (W); (Sp)
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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.
State and local fiscal problems. Mr. Break (W)

297. Dissertation Seminar. (3–5)
Two to three hours per week. Prerequisite: consent of instructor. Primarily for students at the dissertation stage. Sections in different fields to be announced annually. May be repeated for credit.
Sec. 1, Monetary Research, Mr. Laidler (F); Sec. 2 --- (F); Sec. 3 ---, Mr. Laidler (W); Sec. 4 ---, Mr. Laidler (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)

EDUCATION
(Office, 1501 Tolman Hall)

Harold D. Carter, Ph.D., Professor of Education.
Thomas Bentley Edwards, Ph.D., Professor of Education.
Abraham S. Fischler, Ed.D., Professor of Education.
Robert M. Gagné, Ph.D., Professor of Education.
Jack A. Holmes, Ph.D., Professor of Education.
James L. Jarrett, Ph.D., Professor of Education.
Arthur R. Jensen, Ph.D., Professor of Education.
Frederic Lilge, Ph.D., Professor of Education.
Jack London, Ph.D., Professor of Education.
Thomas R. McConnell, Ph.D., LL.D., D.H.L., Professor of Education.
Leland L. Medsker, Ed.D., Professor of Education.
John U. Michaelis, Ph.D., Professor of Education.
J. Cecil Parker, Ed.D., Professor of Education.
Theodore L. Reller, Ph.D., Professor of Education (Chairman of the Department).
Arden K. Ruddell, Ed.D., Professor of Education.
Lawrence H. Stewart, Ed.D., Professor of Education.
James C. Stone, Ed.D., Professor of Education and Head of Teacher Education.
J. 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.
Luther C. Gilbert, Ph.D., Professor of Education, Emeritus.
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.
Charles S. Benson, Ph.D., Associate Professor of Education.
John G. Hurst, Ph.D., Associate Professor of Education.
Walter D. Loban, Ph.D., Associate Professor of Education.
S.E. Torsten Lund, Ph.D., Associate Professor of Education.
Richard D. Mosier, Ph.D., Associate Professor of Education.
Robert B. Ruddell, Ph.D., Associate Professor of Education.

* In residence summer quarter only, 1966–67.
* In residence fall and winter quarters only 1966–67.
* In residence spring and summer quarters only, 1966–67.
Lloyd F. Scott, Ph.D., Associate Professor of Education and Coordinator of Laboratory Schools.

H. Dale Tillery, Ph.D., Associate Professor of Education Associate Director of the Junior College Leadership Program.

Alan B. Wilson, Ph.D., Associate Professor of Education.

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

David L. Elliott, Ed.D., Assistant Professor of Education.

Geraldine Joncich, Ed.D., Assistant Professor of Education.

Nadine M. Lambert, Ph.D., Assistant Professor of Education.

C. Marshall Lowe, Ph.D., Assistant Professor of Education.

Leonard A. Marascuilo, Ph.D., Assistant Professor of Education.

John L. Morris, Ed.D., Assistant Professor of Education.

William A. Watts, Ph.D., Assistant Professor of Education.

Enoch Dumas, Ed.D., Lecturer in Education, Associate Head of Teacher Education, and Supervisor of Teacher Education (Elementary).

Mae J. Durham, B.L.S., Lecturer in Librarianship.

Harold J. Dyck, B.A., Lecturer in Education.

Joseph Fischler, M.A., Lecturer in Education.

Richard H. Gott, M.A.T., Acting Assistant Professor of Education.

Barbara Kirk, M.A., Lecturer in Education.

George H. Kyme, Ph.D., Lecturer in Education and Music and Supervisor of Teacher Education (Music).

Lawrence F. Lowery, Ed.D., Lecturer in Education.

Mark C. Luca, Ph.D., Lecturer in Education and Supervisor of Teacher Education (Art).

Harry M. McPherson, Ed.D., Lecturer in Education.

Karl E. Schevill, Ph.D., Lecturer in Education, Associate Head of Teacher Education, and Supervisor of Teacher Education (Foreign Languages).

Robert T. Stout, B.A., Acting Assistant Professor of 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. Cutright, M.A., Supervisor of Teacher Education (Elementary).

Edmund J. Farrell, M.A., Supervisor of Teacher Education (English).

Barbara J. Grant, M.A., Supervisor of Teacher Education (Elementary).

James R. Gray, M.A., Supervisor of Teacher Education (English).

Donald M. Hatfield, Ph.D., Supervisor of Teacher Education (Science).

Margaret C. Jackson, M.A., Supervisor of Teacher Education (Foreign Languages).

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, A.B., Supervisor of Teacher Education (Foreign Languages).

T. Clyde Polson, Ph.D., Supervisor of Teacher Education (Science).

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).
Upper Division Courses

110. Learning and The Learner. (3)
Two 1½-hour lectures per week. General introduction to educational psychology; primarily for teaching credential candidates.
Mr. Gagné, Mr. Rohwer, Mr. Watts, --- (F); Mr. Gagné, --- (W, Sp); --- (Su)

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. --- (W, Su)

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.
--- (F); Mr. Marascuilo (Sp)

119B. Foundations of Educational Statistics. (3)
Two 2-hour lectures per week. Prerequisite: course 119A 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.
Mr. Marascuilo (W); --- (Su)

130. The School in America. (3)
One 3-hour lecture, or two 1½-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.
Mr. Loban, Mr. Lund, Mr. Schevill, Mr. Stone, Mr. Wilson (F); Miss Joncich, Mr. Loban (W); Miss Joncich, --- (Sp); --- (Su)


131D. Social Sciences.
One 2-hour lecture per week. Prerequisite: consent of instructor.
Mr. Elliott (F); --- (W); Mr. Elliott, --- (Sp); --- (Su)

131E. Foreign Languages.
Three 1-hour lectures per week. Prerequisite: consent of instructor.
--- (Su)

131F. Science.
One 1½-hour lecture and one 1½-hour laboratory per week. Prerequisite: consent of instructor and one year of laboratory science.
Mr. Lowery (F); Mr. Lowery, --- (W); Mr. Lowery, --- (Sp); --- (Su)

170. Introduction to Adult Education. (3)
Two 1½-hour lectures per week. The role of adult education in an industrial society.
Mr. London (F, Sp); --- (Su)

191. Humanistic Foundations of Education. (3)
Two 1½-hour lectures per week and one 1-hour discussion. A history of educational thought with concentration on the epistemological, logical, and ethical foundations of major educational theories from Plato to the present.
Mr. Jarrett (F, W); Mr. Lilge (Sp)

192. Social Foundations of Education. (3)
Two 1½-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.
Miss Joncich, (F); Mr. Fischer (Sp); --- (Su)

193. Psychological Foundations of Education. (3)
Two 1½-hour lectures per week.
Mr. Jensen (F); Mr. Byers (W); --- (Su)

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 1½-hour seminars per week. Lectures and discussion with staff covering concepts related to and areas of contemporary research. The Staff (F, W)

212. Education and the Psychology of Learning. (3–3–3)
Two 1½-hour lectures per week.
Mr. Jensen (W); Mr. Byers (Sp); --- (Su)

212A. The Learning Process. Prerequisite: courses 119A, 119B, and 193, or equivalents.
Mr. Jensen (W); Mr. Byers (Sp); --- (Su)

212B. The Psychology of Reading.
Mr. Holmes (F); --- (Su)
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.

Mr. Byers (F); Mr. Rohwer (Sp)


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.

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 (F)

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 (W)

214. Human Development and Education. (3–3–3)

Two 1½-hour lectures per week.

214A. Cognitive Development.

Prerequisite: courses 193, 119A and 119B or equivalents.

214B. Social and Emotional Development.

Prerequisite: courses 193, 119A and 119B or equivalents.

Mr. Watts (Sp)

214C. Mental Health.

Prerequisite: course 193 or equivalent.

Mr. Watts (W); (Su)

215. Education of Exceptional Children. (3–3)

215A. The Exceptional Child.

Two 1½-hour lectures and one hour of field work per week. Prerequisite: course 193 or equivalent.

Mr. Holmes (W)

215B. Advanced Topics of Exceptional Children.

Two 1½-hour seminars and one 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.

216. Advanced Educational Psychology. (3–3–3)

216A. Advanced Study in Learning.

One 3-hour seminar 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 teaching, programmed instruction and teaching machines.

Mr. Gagné (F, W); Mr. Gagné, Mr. Holmes, or Mr. Jensen (Sp)

216B. Principles and Theories of Psychological Measurement.

Two 1½-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.

Mr. Carter (Sp)

216C. Advanced Studies in Development.

Two 1½-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.

Mr. Rohwer (W)

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, Sena-graph visual speech analyzer, delayed feedback recorder, etc.

Mr. Holmes (F, Sp)

217B. Experimental Education. (3)

One 3-hour seminar and one 3-hour laboratory per week. Prerequisite: course 217A; course 219, topic on analysis of variance recommended; course 290B, topic on experimental research design. Student is expected to design and complete an original advanced laboratory project.

Mr. Holmes (W)

219. Advanced Topics in Educational Statistics. (3)

Two 1½-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.

Mr. Marasculo (F); (W, Sp, Su)

220A. Philosophy of Education: An Introduction. (3)

One 2-hour lecture and one 1-hour conference per week. Axiology, ethics, political philosophy, and aesthetics as they relate to education. Mr. Jarrett (F)

220B. Philosophy of Education: an Introduction. (3)

One 3-hour lecture per week. Epistemology, logic and theory of signs as they relate to education. Mr. Mosier (W); (Su)

221A–221B. History of Educational Thought. (3–3)

One 3-hour lecture per week. The development of educational thought with special reference to the processes of teaching and learning.

Mr. Mosier (F, Sp)

221C–221D. History of American Education. (3–3)

Two 1½-hour lectures per week. Social and intellectual history of American education from the colonial period to the present.

Miss Jonich (F, W)

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. Fischler (F, 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. Fischler (W)
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. —— (F)

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. —— (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: selected educational theorists and trends in educational thought. Mr. Lilge (W); Mr. Jarrett (Sp)

226. History 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. Miss Jonich (Sp); —— (Su)

227. Comparative Education: Advanced Study.

(3—3—3—3—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. Wison (W)


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. —— (W)


(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. Loban (F); Mr. R. Ruddell (W); —— (Su)
230B. Speaking, Listening, and Writing.
Prerequisite: consent of instructor.
Mr. Loban (W)
230C. Literature.
Critical analysis of the literature curriculum.
Mr. Loban (Sp)

230D. Mathematics.
Prerequisite: consent of instructor.
Mr. A. Ruddell (F); —— (Su)
230E. Social Sciences.
Prerequisite: consent of instructor. —— (Su)
230F. Science.
Prerequisite: teaching credential and Physics 11A–11B or Zoology 11A–11B, or consent of instructor. —— (F, Sp); Mr. Fischler, (Su)
230G. Foreign Languages.
Prerequisite: consent of instructor.
Mr. Schevill (Sp)

230H. Art.
Prerequisite: consent of instructor. Mr. Luca (F)
230I. Music.
Prerequisite: consent of instructor. Mr. Kyne (F)

231. Research in Curriculum and Instruction. 

(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:

231A. Reading.
Prerequisite: consent of instructor. Mr. R. Ruddell (F); Mr. Lowery (W); —— (Su)
231B. Speaking, Listening, and Writing.
Prerequisite: course 230B.
Mr. R. Ruddell (W)
*231C. Literature.
Prerequisite: course 230C.

231D. Mathematics.
Prerequisite: consent of instructor.
*231E. Social Sciences.
Prerequisite: consent of instructor. —— (Su)
231F. Science.
Prerequisite: courses 119A and 119B or equivalent; course 230F recommended; and consent of instructor. —— (W); Mr. Fischler (Su)
*231G. Foreign Languages.
Prerequisite: consent of instructor. —— (Su)
231H. Art.
Prerequisite: consent of instructor. Mr. Luca (Sp)
231I. Music.
Prerequisite: consent of instructor. Mr. Kyne (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. Mr. Elliott (W); —— (Su)

235. Theory and Practice in Curriculum and Instruction. (3—3—3—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. One 2-hour seminar and one 1-hour conference per week. Theories, principles and practices of operational techniques for public school curriculum planning. Mr. Parker (W); —— (Su)
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,
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 (F, Sp); —— (Su)

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. —— (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, ——; Sec. 2, Secondary Schools, Mr. Lund (W); —— (Su)

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); —— (Su)

240. Student Personnel and Counseling Psychology. 
(3-3-3-3-3)

Primarily for students working for graduate degrees in this field or for the pupil counseling credential.

240A. Principles and Theories of Guidance. 
(F). One 2-hour lecture and one 2-hour laboratory per week. (Su). Three 1-hour lectures and one 1-hour laboratory per week. Prerequisite: consent of instructor. Development and scope of guidance work as a profession; critical analysis of basic philosophies, ethics, and professional responsibilities. 
Mr. Stewart (F); (Su)

240B. Theoretical Foundations of Counseling. 
One 2-hour lecture and one 2-hour laboratory per week. Prerequisite: consent of instructor. Pertinent theoretical and empirical developments in the social sciences for counseling theories and practices. 
Mr. Low (F)

240C. Environmental Factors in Counselor Adjustment. 
Three 1-hour lectures per week. 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 (W); —— (Su)

240D. Group Guidance. 
Two 2-hour lectures and two 1-hour laboratories per week. 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 (Sp)

240E. Individual Appraisal in Counseling. 
One 2-hour lecture and one 2-hour laboratory per week. Prerequisite: courses 118, 119A, 213A, and consent of instructor. Theory and practice of psychological appraisal of counselors. Emphasis upon integration of appraisal data. 
Mr. Stewart (Sp); —— (Su)

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 (F, Sp)

245B. Case Analysis. 
Prerequisite: course 245A. Illustration of counseling theories and principles through intensive case analysis, evaluation of counseling. 
Mr. Lowe (W)

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. 
Mr. Morris (F); Mr. Stewart (W); Mr. Lowe (S)

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.) (W)

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. Roller; —— (F, Sp)

251B. The Administration of School Personnel and Educational Programs. 
Policies and procedures in the administration of professional and classified personnel, programs of instruction, and student personnel services. 
Mr. Swanson; —— (W)

251C. School Finance, Business Services, and Facilities. 
Financial support of programs in public education and their economic significance; the development and administration of school budgets; school plant programs and facilities. ——, —— (Sp)

252. Administration of the Individual School. (3)

One 2-hour seminar per week. Prerequisite: consent of instructor. Principles and practices in the organization and administration of the elementary and secondary school. 
Mr. Edwards (Sp)
260. The Junior College. (3)
One 3-hour seminar 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.
Sec. 1, Mr. Gott (F); Mr. Tillery (W); Mr. Gott (Sp)
Sec. 2, Mr. Tillery (F)

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.
Sec. 1, (F, W, Sp)

261. Higher Education in The United States. (3)
One 3-hour seminar per week. Prerequisite: master's degree or equivalent, or consent of the instructor. An intensive study of critical problems and major issues in the development of American higher education.
Mr. McConnell (F, Sp); (Su)

264. College Teaching. (3)
One 2-hour seminar per week and one 1-hour conference. Prerequisite: master's degree or equivalent, or consent of the 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.
Mr. Jarrett (Sp)

268. Advanced Study in Higher Education. (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. McConnell (F); Mr. Tillery (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.
Mr. Gott (W, Su)

268C. The Administration of Higher Education. One 3-hour seminar per week. The government, organization, and administration of colleges and universities; the relevance of organizational and administrative theory in other fields to institutions of higher education.
Mr. McConnell (W); (Su)

268D. Teacher Education. (W), 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.
Mr. Stone (W); (Su)

268E. Problems in Junior College Administration. One 3-hour seminar per week. Prerequisite: consent of instructor. Intensive study of selected problems in the education of teachers.
Mr. Medsker (Sp)
268F. Financing Higher Education. 
One 3-hour seminar per week. Prerequisite: course 261 and a course in the principles of economic analysis, or consent of instructor. Intensive study of budgets, allocation of resources, computation of unit costs, means of supporting legislative requests, and measurement of economic returns. 
Mr. Benson (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. London (F); ——— (W, Su)

275. Advanced Study in Adult Education. (3–3–3) 
One 2-hour seminar and one 1-hour conference per week. Prerequisite: consent of instructor. Sociology of Adult Education. A study of the social forces which create and mold various designs of adult education in an industrial society. 
Mr. London (W) 
275B. Problems of Work and Leisure. 
The relationships of work and leisure to the continuing education of adults. Mr. London (Sp) 
275C. Community Development. 
An examination of community development programs in the developing countries and the United States. ——— (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. 
Mr. Wilson (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. ——— (W)

295. Special Topics in Education. (3) 
Hours to be arranged. Sections of this course will deal with the exploration of new subject matter in Education. Topics will vary from quarter to quarter. ——— (F, W, Sp, Su)

296. Special Study. (1–4) 
Hours to be arranged. 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. 
The Staff (F, W, Sp, Su)

297. Individual Study. (1–9) 
Prerequisite: permission of graduate adviser. Individual study for graduate students preparing to take the various qualifying examinations. Work taken on a satisfactory or unsatisfactory basis. (F, W, Sp, Su)

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. 
——— (F, Sp); Mr. Benson, ——— (W)

298B. Student Personnel and Counseling Psychology. 
Prerequisite: courses 240A, 240B, and consent of instructor. 
Mr. Stewart, Mr. Morris (F, W, Sp)

298C. Curriculum and Instruction. 
Prerequisite: consent of instructor. 
Mr. Parker, Mr. A. Ruddell (F); Mr. Elliott (W); 
Loban, Mr. Parker, Mr. A. Ruddell, 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. 
Mr. Medsker (F); Mr. Stone (Sp)

298F. Humanistic and Social Foundations of Education. 
Prerequisite: consent of instructor. ——— (Sp)

298G. Adult Education. 
Prerequisite: consent of instructor. 

299. Directed Research. (3–6) 
The Staff (F, W, Sp, Su) 
Professional Courses

310. 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); ——— (Su)

*311. Field Work in Special Education. (3) 
Hours to be arranged.

The University will accept only those candidates who meet the established requirements. Enrollment is limited to available facilities.
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. 
Mr. Dumas and Staff (F, W, Sp, Su) 
331B. Elementary Supervised Teaching. (4) 
One 3-hour lecture and 8 to 10 hours of laboratory and field work per week. Prerequisite: Design 1, Music 110, Mathematics 15, Physical Education 12 (sections on elementary school activities); two quarters of laboratory science; and course 331A. Seminars, conferences, observation and supervised teaching. 
Mr. Dumas and Staff, (F, W, Sp) 
331C. Elementary Supervised Teaching. (8) 
One 3-hour lecture and 16 to 20 hours of field work per week. Prerequisite: course 110 or former course 100A; course 130 or former course 100B; three or more courses from 131A, 131C, 131D, 131E, 131F; and courses 331B and 331D. Seminars, conferences, observation and supervised teaching. 
Mr. Dumas and Staff (F, W, 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. 
Mr. Dumas and Staff (F, W, Sp)

* Not to be given 1966–67.

The University will accept only those candidates who meet the established requirements. Enrollment is limited to available facilities.

332A. Introduction to Supervised Teaching. (4)
One 1-hour lecture and five hours of field work per week. Conferences, observation, and supervised teaching. Mr. Hatfield and Staff (F, W)

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. Mr. Schevill and Staff (W, Sp)

332C. Secondary Supervised Teaching in Minor Field. (4)
One 1-hour lecture and five hours of field work per week. Conferences, observation, and supervised teaching. Mr. Schevill and Staff (F, W, Sp, Su)

332D. Procedures, Materials, and Curriculum. (3)
One 3-hour lecture, or one 2-hour and one 1-hour lecture per week. The course is concerned with the curriculum, instructional procedures and related learning materials of specific subject-matter areas commonly taught in secondary schools. Supervisory Staff, (F, W, Sp, Su)

333. Practicum in Supervised Teaching. (3-6)
One 1½-hour lecture and five to 12 hours of field work per week. Prerequisite: a course in supervised teaching and consent of instructor. This is an extra-session course which is scheduled to coincide with the calendar of the public schools. Enrollment is limited to available facilities.

Mr. Schevill and Staff (F, W, Sp, Su)

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.

Mrs. Kirk, (F); Mr. Lowe, (W); Mrs. Kirk (W, Sp, Su)

350. Internship in Educational Administration. (3-6)

One 2-hour seminar per week plus supervised field experience. Prerequisite: courses 251A, 251B and 251C; and 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 (F, Sp); (Su)

[Box: ENGINEERING]

- George J. Maslach, B.S., Professor of Aeronautical Engineering and Dean, College of Engineering.
- Irving Fatt, Ph.D., Professor of Engineering Science and Assistant Dean, College of Engineering (Graduate Student Affairs).
- Harold W. Iversen, M.S., Professor of Mechanical Engineering and Associate Dean, College of Engineering (Relations with Schools and Student Affairs).
- James T. Lapsley, Jr., M.S., Associate Professor of Industrial Engineering and Assistant Dean, College of Engineering (Lower Division Student Affairs).
- Walter W. Soroka, Sc.D., Professor of Acoustical Sciences and Assistant Dean, College of Engineering (International Cooperation Programs).
- Charles Suskind, Ph.D., Professor of Electrical Engineering and Assistant Dean, College of Engineering (Office of Research Services).
- Robert L. Wiegell, M.S., Professor of Civil Engineering and Assistant Dean, College of Engineering (Cooperative and Employment Programs).

Don O. Horning, M.E., Lecturer in Engineering.

Civil Engineering

- Harry Bolton Seed, Ph.D., Professor of Civil Engineering (Chairman of the Department).
HYDRAULIC AND SANITARY ENGINEERING

(Division Office, 115 Engineering Building)

Hans Albert Einstein, D.S.T., Professor of Hydraulic Engineering.
Joe W. Johnson, M.S., Professor of Hydraulic Engineering (Chairman of the Division) and Director, Hydraulic Engineering Laboratory.
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.
Erman A. Pearson, Sc.D., Professor of Sanitary Engineering (Vice-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.
David I. Jenkins, Ph.D., Assistant Professor of Sanitary Engineering.

Frank T. Orlob, Ph.D., Lecturer in Civil Engineering.
Frank M. Stead, M.S., Lecturer in Civil Engineering.

STRUCTURAL ENGINEERING AND STRUCTURAL MECHANICS

(Division Office, 215 Engineering Building)

Frank Baron, D.Sc., Professor of Civil Engineering.
Vitelmo Bertero, Sc.D., Professor of Civil Engineering.
Boris Bresler, M.S., Professor of Civil Engineering.
Ray W. Clough, Jr., Sc.D., Professor of Civil Engineering.
Howard D. Eberhart, M.S., Professor of Civil Engineering.
Tung-Yen Lin, 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 (Vice-Chairman of the Division).
Milos 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 (Chairman of the Division).
Alexander C. Scordelis, M.S., Professor of Civil Engineering.
Raymond E. Davis, C.E., D.Eng. (hon.), Professor of Civil Engineering, Emeritus.
Joe W. Kelly, B.S., Professor of Civil Engineering, Emeritus.
Bruce Jameson, B.S., Professor of Civil Engineering, Emeritus.
George E. Troxell, B.S., Professor of Civil Engineering, Emeritus.

Jack G. Bouwkamp, C.I., Associate Professor of Civil Engineering (Vice-Chairman of the Division).
William G. Godden, Ph.D., Associate Professor of Civil Engineering.
James M. Kelly, Ph.D., Assistant Professor of Civil Engineering.
Jacob Lubliner, Ph.D., Assistant Professor of Civil Engineering.
Provindar K. Mehta,† D.Eng., Assistant Professor of Civil Engineering.
Robert L. Taylor, Ph.D., Assistant Professor of Civil Engineering.
Edward L. Wilson, D.Eng., Assistant Professor of Civil Engineering.

TRANSPORTATION ENGINEERING
(Division Office, 107 Engineering Building)
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).
Paul F. Keim,† M.Sc., Professor of Civil Engineering.
W. Norman Kennedy, B.S., Professor of Transportation Engineering and Associate Director of the Institute of Transportation and Traffic Engineering.
Francis H. Moffitt, M.C.E., Professor of Civil Engineering.
Carl L. Monismith, M.S., Professor of Civil Engineering.
Harry Bolton Seed, Ph.D., Professor of Civil Engineering (Chairman of the Department of Civil Engineering).
Francis S. Foote, E.M., Professor of Railroad Engineering, Emeritus.
Ralph A. Moyer, M.S., C.E., Sc.D. (Hon.), Professor of Transportation Engineering, Emeritus.
Gordon F. Newell, Ph.D., Professor of Transportation Engineering.
Paul A. Witherspoon, Ph.D., Professor of Geological Engineering.
Adolf D. May, Jr., Ph.D., Associate Professor of Transportation Engineering.
James K. Mitchell, Sc.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.

Walter E. Gillfillan, M.Eng., Lecturer in Transportation Engineering.
Wolfgang S. Homberger, M.S., Lecturer in Transportation Engineering.
David W. Lambden, B.Sc., Lecturer in Transportation Engineering.
Thomas A. Lang, M.S., Lecturer in Geological Engineering.
Roger F. Rhoades, A.B., 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
(Department Office, 231 Cory Hall)
Diogenes J. Angelakos, Ph.D., Professor of Electrical Engineering and Acting Director, Electronics Research Laboratory (Vice-Chairman of the Department).
Charles K. Birdsall, Ph.D., Professor of Electrical Engineering.
Leonard J. Black, Ph.D., Professor of Electrical Engineering.
Charles F. Dalziel,† E.E., Professor of Electrical Engineering.

‡ On leave, fall and winter quarters, 1966-67.
Charles A. Desoer,** Sc.D., Professor of Electrical Engineering.
Martin H. Graham, Ph.D., Professor of Electrical Engineering and Associate Director of the Computer Center.
Arthur M. Hopkin, Ph.D., Professor of Electrical Engineering (Vice-Chairman of the Department).
Harry D. Huskey, Ph.D., Professor of Electrical Engineering and of Mathematics.
Eliahu I. Jury, Sc.D., Professor of Electrical Engineering.
Ernest S. Kuh, Ph.D., Professor of Electrical Engineering (Vice-Chairman of the Department).
Paul L. Morton, Ph.D., Professor of Electrical Engineering (Vice-Chairman of the Department).
Donald O. Pederson, Ph.D., Professor of Electrical Engineering.
Burtis L. Robertson, Ph.D., Professor of Electrical Engineering.
Victor H. Rumsey,† B.A., 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.
Charles Susskind, Ph.D., Professor of Electrical Engineering.
Aram J. Thomasian, Ph.D., Professor of Electrical Engineering and of Statistics.
George L. Turin,† Sc.D., Professor of Electrical Engineering.
Shyh Wang, Ph.D., Professor of Electrical Engineering.
John R. Whinnery, Ph.D., Professor of Electrical Engineering.
Lotfi A. Zadeh, Ph.D., Professor of Electrical Engineering (Chairman of the Department).
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.
Arthur R. Bergen,† D.Eng.Sc., Associate Professor of Electrical Engineering.
Albert C. English, Ph.D., Associate Professor of Electrical Engineering.
Thomas E. Everhart,† Ph.D., Associate Professor of Electrical Engineering.
Arthur Gill, Ph.D., Associate Professor of Electrical Engineering.
Michael A. Harrison, Ph.D., Associate Professor of Electrical Engineering.
Elijah Polak, Ph.D., Associate Professor of Electrical Engineering.
David J. Sakrison, Sc.D., Associate Professor of Electrical Engineering.
Jerome R. Singer, Ph.D., Associate Professor of Electrical Engineering.
Theodore Van Duzer, Ph.D., Associate Professor of Electrical Engineering.
William J. Welch, Ph.D., Associate Professor of Electrical Engineering.
Eugene Wong, Ph.D., Associate Professor of Electrical Engineering.
John R. Woodyard, Ph.D., Associate Professor of Electrical Engineering.
Elwyn R. Berkelkamp, Ph.D., Assistant Professor of Electrical Engineering.
Howard Frank, Ph.D., Assistant Professor of Electrical Engineering.
Ivan T. Frisch, Ph.D., Assistant Professor of Electrical Engineering.
Leonard H. Haines, Ph.D., Assistant Professor of Electrical Engineering.
Allan J. Lichtenberg, Ph.D., Assistant Professor of Electrical Engineering.
Kenneth K. Mei, Ph.D., Assistant Professor of Electrical Engineering.
Richard S. Muller, Ph.D., Assistant Professor of Electrical Engineering.
William G. Oldham, Ph.D., Assistant Professor of Electrical Engineering.
Roger F.W. Pease, Ph.D., Assistant Professor of Electrical Engineering.
Steven E. Schwarz, Ph.D., Assistant Professor of Electrical Engineering.
Richard M. Van Slyke, Ph.D., Assistant Professor of Electrical Engineering and Industrial Engineering.

Paul O. Vogelhut, Ph.D., Assistant Professor of Electrical Engineering.
Willard H. Wattenburg, Ph.D., Assistant Professor of Electrical Engineering.
Richard M. White, Ph.D., Assistant Professor of Electrical Engineering.

Sydney Fernbach, Ph.D., Lecturer in Electrical Engineering.
Mel Pirtle, M.S., Lecturer in Electrical Engineering.
James Slagle, Ph.D., Lecturer in Electrical Engineering, joint with the Lawrence Radiation Laboratory.
Cornelius A. Tobias, Ph.D., Professor of Medical Physics.

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 Industrial Engineering and Mathematics.
Raymond G. Grassi, M.S., Professor of Industrial Engineering.
Robert M. Oliver, Sc.D., Professor of Engineering Science (Chairman of the Department).
Ronald W. Shephard, Ph.D., Professor of Engineering Science.
Richard E. Barlow, Ph.D., Associate Professor of Industrial Engineering.
William S. Jewell, Sc.D., Associate Professor of Industrial Engineering.
Edward C. Keachie, Ph.D., Associate Professor of Industrial Engineering.
James T. Lapsley, M.S., Associate Professor of Industrial Engineering.
C. Roger Glasssey, Ph.D., Assistant Professor of Industrial Engineering.
Richard M. Van Slyke, Ph.D., Assistant Professor of Industrial Engineering, and Electrical Engineering.
Ronald W. Wolff, Ph.D., Assistant Professor of Industrial Engineering.
Fred W. Glover, Ph.D., Lecturer in Industrial Engineering.

Mechanical Engineering
(Department Office, 5102 Etcheverry Hall)
Maurice Holt, Ph.D., Professor of Aeronautical Sciences.
Ralph A. Séban, Ph.D., Professor of Mechanical Engineering (Chairman of the Department).

AERONAUTICAL SCIENCES
(Division Office, 6105 Etcheverry Hall)
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. Schaaf, 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.

Gilles M. Corcos, 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.

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. Soroka, Sc.D., Professor of Acoustical Sciences.
Cyril P. Atkinson, M.S., M.D., Associate Professor of Applied Mechanics.
Michael M. Carroll, Ph.D., Assistant Professor of Applied Mechanics.
Richard M. Christensen, D.Eng., 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 DeGarmo, 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).
Thomas H. Hazlett, M.S., Professor of Mechanical Engineering.
Alexander S. Levens, 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. Thomsen, Ph.D., Professor of Mechanical Engineering.
Frank E. Hauser, Ph.D., Associate Professor of Mechanical Engineering.
Shiro Kobayashi, Ph.D., Associate Professor of Mechanical Engineering.
James L. Costanza, Ph.D., Assistant Professor of Mechanical Engineering.
Robert R. Donaldson, 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. Comet, Ph.D., Professor of Mechanical Engineering.
Leonard Farber, 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 Conservation Laboratory.
Francis W. Hutchinson, M.S., M.E., Professor of Mechanical Engineering.
Harold W. Iversen, M.S., Professor of Mechanical Engineering.

‡ On leave, fall quarter, 1966-67.
Harold A. Johnson†, M.S., Professor of Mechanical Engineering.
Alan D. K. Laird, Ph.D., Professor of Mechanical Engineering.
Ralph A. Seban, Ph.D., Professor of Mechanical Engineering (Chairman of the Department of Mechanical Engineering).
Ernest S. Starkman, M.S., Professor of Mechanical Engineering (Chairman of the Division).
Paul B. Stewart, Ph.D., Associate Professor of Mechanical Engineering.
Wilbur H. Somerton, Pet. E., Associate Professor of Petroleum Engineering.
Chang-Lin Tien, Ph.D., Associate Professor of Mechanical Engineering.
Ralph Greif, Ph.D., Assistant Professor of Mechanical Engineering.
Robert F. Sawyer, Ph.D., Assistant Professor of Mechanical Engineering.
Kurt S. Spiegler, Ph.D., Professor of Mechanical Engineering in Residence.

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.
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.
Stanley H. Ward, Professor of Geophysical Engineering (Vice-Chairman of the Department).
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.
John A. Putnam, Ph.D., Professor of Petroleum Engineering, Emeritus.
Edward H. Wisser, B.S., LL.D., Professor of Mineral Exploration, Emeritus.
Richard M. Fulrath, D.Eng., Associate Professor of Ceramic Engineering.
Marshall Merriam, Ph.D., Associate Professor of Engineering Science.
Gareth Thomas,‡ Ph.D., Associate Professor of Metallurgy.
Frank H. Morrison, 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, M.S., Lecturer in Materials Science.

Naval Architecture

(Department Office, 202 Hydraulics and Naval Architecture Building)
Henry A. Schade, Dr. Ing., Professor of Naval Architecture.
John V. Wehausen, Ph.D., Professor of Engineering Science (Chairman of the Department).
J. Randolph Pauling, Jr., D.Eng., Associate Professor of Naval Architecture.

Oswald J. Sibul, M.S., Lecturer in Naval Architecture.

Nuclear Engineering

(Department Office, 4105 Etcheverry Hall)

Harvey J. Amster, Ph.D., Professor of Nuclear Engineering.
Paul L. Chambré, Ph.D., Professor of Nuclear Engineering and of Mathematics.
Lawrence M. Grossman, Ph.D., Professor of Nuclear Engineering.
Hans Mark, Ph.D., Professor of Nuclear Engineering (Chairman of the Department).
Thomas H. Pigford, Sc.D., Professor of Nuclear Engineering.
Lawrence Ruby, Ph.D., Professor of Nuclear Engineering.
Donald R. Olander, Sc.D., Associate Professor of Nuclear Engineering.
Virgil E. Schrock, M.S., M.E., Associate Professor of Nuclear Engineering.
Harold P. Smith, Jr., Ph.D., Associate Professor of Nuclear Engineering.
Selig N. Kaplan, Ph.D., Assistant Professor of Nuclear Engineering.

Robert V. Pyle, Ph.D., Lecturer in Nuclear Engineering.
Roger W. Wallace, Ph.D., Lecturer in Nuclear Engineering.

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 184 units is required, including:

I. Lower Division: Science, technical, and humanities requirements indicated on page 65.

II. Upper Division: Required: Civil Engineering 130, 131, 165A–165B, 110, 161, 140, 133, 134, 141, 121A–121B, 170; Electrical Engineering 101A; Mechanical Engineering 104A; 28 additional units of technical electives; humanities and social sciences, see page 66).

Recommended technical electives: Industrial Engineering 120; Civil Engineering 100, 191; Geology 15; Other 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, structural engineering and structural mechanics, transportation, and water resources. For details, please consult the ANNUCOUNCEMENT OF THE COLLEGE OF ENGINEERING.

‡ On leave, fall and winter quarters, 1966–67,
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 66. Upper division requirements are as follows:

**Program A: Electronics, Fields, and Plasmas.**
Electrical Engineering 104A–104B, 105, 108A–108B, 117A–117B, 119, 130; Mechanical Engineering 104A or 155 and 105A; Physics 121; 5 units of senior electrical engineering laboratory; 28 units of technical electives; 12 units of humanities and social sciences. See p. 66.

**Program B: Systems, Information and Control.**
Electrical Engineering 104A–104B, 105, 108A–108B, 117A–117B, 119; Mechanical Engineering 104A or 155, 105A; Physics 121; Statistics 134; 5 units of senior electrical engineering laboratory; 27 units of technical electives; 12 units of humanities and social sciences. See p. 66.

**Program C: Computer Sciences.**

**Program D: General Electrical Engineering.**
Electrical Engineering 104A–104B, 105, 108A–108B, 117A–117B, 119; Mechanical Engineering 104A or 155 and 105A; Physics 121; 5 units of senior electrical engineering laboratory; 32 units of technical electives; 12 units of humanities and social sciences. See p. 66.

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 Orientation Notes," available from the Electrical Engineering Office for Graduate Student Matters, 332 Cory Hall.
Engineering Science

(Administered by the Engineering Science Committee)

The student in engineering science studies a choice of several areas where engineering and the natural sciences closely interact. These include: bioengineering, engineering geoscience, engineering mathematical statistics, engineering mathematics, and engineering physics. The general program allows sufficient flexibility for specialization in one of these areas. 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

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 65. Upper division requirements are as follows (specific courses acceptable in each area are listed in the ANNOUNCEMENT OF THE COLLEGE OF ENGINEERING):

Bioengineering
Biochemistry or molecular biology (4 units); physical chemistry (8 units); electrical engineering (4 units); mathematics (8 units); medical physics (8 units); fluid mechanics (4 units); life science electives (8 units); engineering electives (12 units); Other technical electives (12 units. Premedical students must take zoology); humanities and social sciences, see p. 66.

Engineering Geoscience
Geology (8 units); geophysics (5 units); physics (6 units); fluid mechanics (4 units); continuum mechanics (4 units); mathematics (8 units); physical chemistry (4 units); geology electives (8 units); engineering electives (15 units); other technical electives (8 units); humanities and social sciences, see p. 66.

Engineering Mathematical Statistics
Statistics (16 units); mathematics (8 units); mathematics or statistics elective (4 units); engineering electives (24 units); other technical electives (8 units); humanities and social sciences, see p. 66.

Engineering Mathematics
Mathematics (24 units); statistics (4 units); mathematics or statistics elective (3 units); engineering electives (24 units); other technical electives (14 units); humanities and social sciences, see p. 66.

Engineering Physics
Physics (31 units); mathematics (8 units); fluid mechanics (4 units); continuum mechanics (4 units); engineering physics laboratory (3 units); engineering electives (11 units); other technical electives (8 units); humanities and social sciences (see p. 66.

Industrial Engineering and Operations Research

Industrial engineering is a field concerned with designing, controlling, and improving integrated systems of men, machines, and material. The department emphasizes study of complete systems, rather than intensive work on components. The undergraduate receives sound training in engineering fundamentals and specializes in one of the following areas: (1) human factors in technology, (2) industrial administration, (3) production systems analysis, (4) operations research. The qualified undergraduate should choose his electives in preparation for graduate studies.
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 65. Upper division requirements are as follows:

**Program A: Industrial Administration and Production Systems Analysis**
Industrial engineering 170, 160, 172, 120, 150, 180; business administration 120; civil engineering 130; electrical engineering 100A; mechanical engineering 101, 102A, 104A, 105A, 134A, 135; 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. 66.

**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, 134A, 135; 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. 66.

**Program C: Operation Research**
Industrial engineering 154, 160, 170, 120, 150, 162, 163, 180; electrical engineering 100A; mechanical engineering 105A, 134A; statistics 133, 135A–135B; technical electives (20 upper division units of which 6 must be in the College and of which at least 3 must be in industrial engineering courses); humanities and social sciences, see p. 66.

**GRADUATE PROGRAMS**

Graduate programs leading to the M.S. and Ph.D. degrees are offered in the following fields: administrative engineering, human factors in technology, and operations research. For further information, please consult the Announcement of the College of Engineering, and Chapter III of this catalogue.

**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 65.

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 231.) Materials science deals with natural and man-made materials—their extraction, production, and uses in research, technology, and industry. Engineering geoscience deals with development and utilization of geophysical techniques in exploring for potentially economic geological resources.

A student in the materials science curriculum is provided a basic background in chemistry, physics, and engineering, and then applies this background to a field of specialization: ceramic engineering, extractive metallurgy, or physical metallurgy.

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 dressing or concentration as well as smelting, leaching and electrochemical methods of extractive and refining metals and requires using the most recent advances in chemistry and physics.

Physical Metallurgy This is concerned with the relationship between chemical and physical structures of materials and their properties and how these are affected by thermal and mechanical means. These relationships are complex and must be understood in order to develop new and improved materials and processing methods. Physical metallurgy is a broad field of study within which primary emphasis can be directed toward physical, chemical, or engineering aspects.
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. 66.

**Ceramic Engineering** Materials Science 108, 121, 122, 141, 198-2, 17 units of technical electives.

**Extractive Metallurgy** Materials Science 107, 141, 142; 24 units of technical electives.

**Physical Metallurgy** Materials Science 107, 108, 160, 161, 162; Mechanical Engineering 101 or 123, and 124; 20 units of technical electives.

The upper division curriculum must include at least 45 units in the College of Engineering and permits 8 credits of free electives.

GRADUATE STUDY IN MATERIALS SCIENCE

The graduate programs emphasize research. Qualified holders of the bachelor's degree in fields such as ceramic engineering, metallurgy, physics, chemistry, geology or engineering can successfully undertake graduate study in materials science. Research ranges from engineering applications of materials to fundamental physics and chemistry. Research topics include study of the mechanical, chemical, surface, thermodynamic, electrical, and magnetic properties of materials, study of the kinetics and thermodynamics of the processes by which materials are produced, and applications of optical and electron microscopy and of X-ray and electron diffraction to the relationship between the structure of materials and their properties.

GRADUATE STUDY IN ENGINEERING GEOSCIENCE.

This program provides education in the fundamental subject matter necessary for engineering occupations in mining geophysics, petroleum geophysics, marine geophysics and engineering geophysics. The stress in subject matter is placed on mathematical, physical chemical, geological, and engineering fundamentals rather than on the professional aspects of any one of the disciplines listed. Students obtaining advanced degrees in this program may find rewarding professional or applied research occupations in industry, but may also find that their broad educational base has prepared them for basic research in any environment.

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 232.
Graduate study is offered in the areas of ship structure 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

   (Formerly numbered 48)
   Three 1-hour lectures and one quiz hour per week. Prerequisite: Mathematics 1A (may be taken concurrently). Students will not be given credit for both course 1 and Mathematics 17. General purpose automatic digital computers. The concepts of algorithm, language, and flow charts. The use of computers to solve problems in finite differences, polynomial approximations, solution of equations, etc. Information processing, sorting, storage, and retrieval.
   The Staff (Mr. Morton in charge) (F, W, Sp, Su)

3. Applications of Nuclear Energy. (4)
   Three 1-hour lectures per week. 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. Ruby (F, W, Sp, Su)

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) (F, W, Sp, Su)

   Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: mechanical drawing; and Mathematics 1A (or 3A) 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. Levens (F, W, Su)

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

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. Pirtz, Mr. Muller (F, W, Sp, Su)
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 (F, W, Sp, Su)

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, Mr. Wand (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 treated as 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 (F, W, Sp, Su)

Graduate Courses

230A. Engineering Analysis. (4)

Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: Mathematics 2C. Methods of theoretical analysis of typical engineering systems. Application of complex variable theory, orthogonal expansions and special functions to solve engineering problems.

Mr. Laitone, Mr. McNiven (F)

230B. Engineering Analysis. (4)

Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: Mathematics 2C. Theoretical analysis of typical engineering systems by means of linear operators, linear integral equations, finite difference methods, perturbation methods, and asymptotic expansions.

Mr. Holt, Mr. Berger (W)

241. Optical Radiation Sources. (4)

Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: course 140. Sources of ultraviolet, visible, infrared and thermal radiation considered from atomic and molecular excitation viewpoint. Luminescence, fluorescence, phosphorescence, and electroluminescence, as light-producing phenomena. Infrared and solar radiation calculations. Photocconductivity and photoelectric effects. Laboratory experiments on the characteristics of light sources including fluorescence, gaseous discharge, incandescent and electroluminescent sources. Mr. Finch (F)

Civil Engineering

Lower Division Courses

10. Engineering Survey Measurements. (4)

Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: Mathematics 1A or 3A. Standards, units, calibration; measurement of distance, elevation, angles; systematic and random error analysis in measurements; directions; traverse computations; horizontal and vertical curves; topographic mapping; adjustment of measurements; weighting, principles of least squares.

Mr. Moffitt (F, Sp)

18A–18B. Introduction to Structural Analysis. (4–4)

Three 1-hour lectures and one 3-hour laboratory per week. For students in Architecture.

18A. Prerequisite: Physics 2A or 4A, and Mathematics 1A. Qualitative study of loads on architectural structures and their resulting behavior. A study of Newton’s Equations and their use in obtaining reactions and stress resultants in beams, columns and trusses subjected to loads.

Mr. Lin, Mr. Bresler, Mr. Wilson (F, W, Sp)

18B. Prerequisite: courses 18A, 21, and Mathematics 1B. Deformation of structural members and frames. Introduction to analysis of indeterminate structures using moment distribution and approximate methods.

Mr. Eberhart, Mr. Polivka (F, W, Sp)
21. Plane Surveying. (4)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 110. One 1-hour lecture with approval of instructor. Lectures, laboratory instruction on vertical control, precise leveling; horizontal control; triangulation; trilateration; traverse; electronic distance measurements; least square adjustment of control survey observations; state coordinate system; astronomical observations for azimuth and latitude. Photogrammetry and supplemental control surveys are also presented. Mr. Moffitt (F, W, Sp)

Upper Division Courses

100. Control Surveys. (4)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 110; course 21 with approval of instructor. Lectures, laboratory instruction on vertical control, precise leveling; horizontal control; triangulation; trilateration; traverse; electronic distance measurements; least square adjustment of control survey observations; state coordinate system; astronomical observations for azimuth and latitude. Photogrammetry and supplemental control surveys are also presented. Mr. Moffitt (F, W, Sp)

101. Elementary Photogrammetry. (4)
Two 1-hour lectures and one 4-hour laboratory per week. Prerequisite: Plane surveying or survey measurements, course 10, or consent of instructor. Nature of photogrammetry; precision cameras; geometry of 1½-hour curves; stereoscopic and parallax; radial line plot; mosaics; oblique photographs; stereoscopic plotting instruments. Mr. Moffitt (F)

102. Route Surveying. (4)
Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: course 10. Simple, compound, reverse, and transition horizontal curves; vertical parabolic curves; reconnaissance, preliminary, and location surveys; computations of earthwork and related quantities; field work. Mr. Monismith, Mr. Moffitt (F)

105. Higher Surveying and Geodesy. (3)
(To be offered in even-numbered years)
Two 1½-hour lectures per week. Prerequisite: course 100. Methods of geodetic surveying; geodetic triangulation; geometry of spheroid; computation of geodetic position; figure of the earth; gravity observations; geodetic leveling. Mr. Moffitt (W)

107. Airphoto Analysis and Interpretation. (4)
(To be offered in odd-numbered years)
Two 1-hour lectures and one 4-hour laboratory per week. Prerequisite: senior standing in engineering or geology. Principles of photo reading, analysis and interpretation applied to soils, slopes, geological forms and structures, selection of materials for engineering construction. Mr. Moffitt (W)

110. Properties of Structural Materials. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Engineering 45 and course 130 (may be taken concurrently). Determination of properties of structural materials. Experiments for evaluating behavior under simple conditions. Mr. Pirtz (W, Sp)

113. Concrete and Concrete Materials. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 110. Composition and properties of concrete. Concrete materials. Proportioning of concrete mixes. Selected experiments on physical and mechanical properties of cement pastes, mortars, and concretes. Mr. Polivka (Sp)

114. Soil Properties and Their Engineering Application. (2)
One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: course 121A. Selected lectures and experiments on physical and mechanical properties of soils and their application in design problems. Preparation of engineering reports on the results. Mr. Munson (W, Sp)

115. Asphalt and Asphalt Mixtures. (2)
One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: senior standing in civil engineering. Physical properties of asphalts, aggregates and their combinations; principles and practices in the design, construction, and control of asphalt mixtures; laboratory tests for asphalts, aggregates and mixture design including specimen preparation and stability and durability evaluation. Mr. Monismith (F)

116. Introduction to Fluid Flow in Rocks. (3)
Two 1-hour lectures per week. Prerequisite: course 105A or Mechanical Engineering 105B (either of which may be taken concurrently). Theory of the basic properties of rocks that control the flow of fluids through porous media. Mr. Witherspoon (W)

117. Fluid Flow Properties of Rocks. (1)
One 3-hour laboratory per week. Prerequisite: course 116. Laboratory testing of rocks to determine their fluid flow properties. Mr. Witherspoon (Sp)

118. Engineering Geology. (3)
Two 1-hour lectures and one 3-hour laboratory per week. A full day and a full weekend in the field will replace two and four lab periods. Engineering properties of rocks; analysis of geological structures; geological processes. Mr. Goodman (Sp)

119. Introduction to Geological Engineering. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Geology 5A or 15 or course 118. Exploration of rock systems of engineering works; topics in engineering geology. Lectures and field problems. Mr. Goodman (W)

120. Geological Engineering for Dams and Underground Works. (3)
Three 1-hour lectures per week, two 1-day field trips, and one weekend field problem. Prerequisite: course 119. Application of geological data in engineering for dams and reservoirs and underground openings; engineering report. Mr. Goodman (Sp)

121A. Soil Mechanics. (3)
Three 1-hour lectures per week. Prerequisite: course 130. Soil formations and identifications, physical and mechanical properties of soils; bearing capacities of soils; lateral earth pressures on structures. Mr. Davis, Mr. Mitchell (F, W)

121B. Foundation Engineering. (2)
Two 1-hour lectures per week. Prerequisite: courses 121A and 135 (may be taken concurrently). Site investigations; considerations in the design of sub-structures; design of footing foundations; pile and pile foundations; cofferdams and caissons; construction problems in foundation engineering. Mr. Davis, Mr. Mitchell (W, Sp)
122. Soil Mechanics and Foundation Design. (3)
Three 1-hour lectures per week. Prerequisite: courses 121A and 121B. Principles of foundation design; ultimate bearing capacity of soils; theory of consolidation and its applications in predicting the settlement of structure; allowable bearing pressures; methods of minimizing settlements; effect of settlement on structures; lateral pressures on walls.
Mr. Mitchell, Mr. Seed (F, Sp)

123. Soil and Foundation Engineering. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: not open to undergraduate students in civil engineering. Selected topics in soil mechanics and experiments on physical and mechanical properties of soils including the applications in design problems. Soil mechanics problems in foundation engineering.
Mr. Mitchell (F)

124. Strength of Structural Materials and Systems. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 12B. For students in architecture. Elastic and ultimate resistance of structural materials. Stress and deformation analysis for members subjected to axial force, shear, moment, or torque. Buckling of compression members. Behavior under load of cables, arches, shells, and folded plates.
Mr. Godden, Mr. Scordelis (F, Sp)

126. Design of Structural Elements. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 124. Open only to students in architecture. General principles of structural design. Loads—mechanical behavior of structural materials. Analysis and design methods based on working and ultimate loads. Analysis and design of members made of metals, wood, and reinforced concrete and subjected to tensile, compressive flexural, and combined loading conditions.
Mr. Bertero, Mr. Bresler (F, W)

127. Structural Systems. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 126. Open only to students in architecture. Concept and behavior of structural systems in various materials. Approximate design and dimensioning of continuous beams, rigid frames, flat slabs, arch, suspension and prestressed systems. Multistory buildings, space frames, economics and selection of types.
Mr. Bouwkamp, Mr. Lin (W, Sp)

130. Mechanics of Materials. (4)
Three 1½-hour lectures per week. Prerequisite: Engineering 36. Elastic and ultimate resistance of materials; stress and deformation analysis for bars, shafts, and beams; combined stresses; columns; elements of design for wood and metal members.
Mr. Pister, Mr. Popov (F, W, Sp, Su)

131. Introduction to Structural Analysis. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 130. Analysis of forces and displacements in statically determinate and indeterminate elastic structures by force and displacement methods. Formulation in matrix notation. Introduction to the plastic analysis of structures.
Mr. Eberhart, Mr. Clough (F, W, Sp, Su)

133. Theory of Reinforced Concrete Design. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 130. The analysis and design of reinforced concrete structures.
Mr. Baron, Mr. Raphael (F, Sp, Su)

134. Elements of Metal Structures. (4)
Three 1-hour lectures and one 3-hour computer design, recitation period per week. Prerequisite: course 131. Introduction to design of metal structural members and connections.
Mr. Scordelis (F, Sp, Su)

135. Reinforced Concrete and Prestressed Concrete Design. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: courses 131, 133. Advanced topics in the design of structural systems in reinforced concrete, prestressed concrete, and composite materials. The design of typical floor systems in reinforced concrete. Consideration of deflection, torsion. Prestressed concrete concepts, materials, methods, losses, creep, shrinkage, continuous beam design.
Mr. Raphael, Mr. Lin (W)

136. Advanced Structural Analysis. (3)
Three 1-hour lectures per week. Prerequisite: courses 131, 133, 134. (Intended for students terminating with B.S. degree). Elastic and plastic analysis of statically indeterminate structures. Stability analysis of columns, beam columns and rigid frames. Dynamic analysis of structures simulated by single-degree or lumped parameter multi-degree of freedom systems.
Mr. Scordelis, Mr. Clough (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, Mr. Brown (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 stability consideration of sandwich components; thermal stresses and thermal buckling; high-temperature creep effects.
Mr. Penzien (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: courses 165A, 165B; course 161 (may be taken concurrently). Planning of water and waste systems. Estimates of population and municipal, industrial and agricultural water requirements. Hydrology of surface and ground water sources. Design of impoundment, transmission, and collection systems.
Mr. Kaufman (F, W, Sp) (if necessary)
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. Theory and design of water and waste water treatment plants. Special water conditioning problems including taste and odor removal, desalinization and corrosion control. Water-pollution control and its relation to process design. Mr. Pearson (W, Sp, Su)

142. Sanitary Engineering Design. (3)
One 1-hour lecture and one 3-hour supervised discussion and design period per week. Prerequisite: course 140, 141. 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. McGauhey (Sp)

144. Principles of Sanitary Engineering. (3)
Three 1-hour lectures per week. Prerequisite: for public health, science, and engineering majors. Not open to civil engineering students. The biochemical cycles of synthesis and decay. Energy resources. The hydrological cycles. Drinking water quality collection, treatment, and use. Domestic and industrial waste characteristics, collection, treatment, reclamation and disposal. Water pollution control. Air quality and air pollution control. Mr. Oswald (W), (Sp)

145. Chemistry of Wastes. (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 concentration of the major anions, cations, and dissolved gases comprising the inorganic constituents. Mr. Thomas (F, Su)

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. Thomas (F, W)

146B. Sanitary Chemistry: Organic Laboratory Aspects. (2)
One 1-hour lecture and one 3-hour laboratory per week. Prerequisite: course 146A. Parallels course 146A but emphasis is placed on the analysis and treatment of waters containing organic constituents. Mr. Thomas (F, Su)

147. Organic Chemistry of Water and Waste Water. (3)
Three 1-hour lectures per week. Prerequisite: Chemistry 1B. 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 degradations and cycles, pesticide pollution, detergent pollution, and air pollution fallout. Mr. Thomas (W)

160. Hydrology. (3)
One 3-hour lecture per week. Prerequisite: courses 165A, 165B (may be taken concurrently). Circulation of water on the earth’s land masses, the hydrologic cycle, elements of climatology and meteorology, interrelation between precipitation and runoff, 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. Einstein (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 fluid mechanics applied to the statics and dynamics of incompressible fluids. Mr. Johnson (F)

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 flows and compressible fluids, forces on submerged objects and laws of similarity, hydraulic machinery. Mr. Johnson (W)

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 laboratory per week. Prerequisite: course 166A. Open channel transitions and junctions; energy dissipators and scour prevention; weirs and drop structures; tail-water 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-rap design; cavitation; design of a complete spillway or open channel. Mr. Einstein, Mr. Harder (Sp)

168. Design of Open Channel Flow Systems. (3)
Two 1-hour lectures and one 3-hour laboratory 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. Homburger (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 (Sp)

181. Engineering Construction. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Engineering 120 and course 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.
Mr. Polivka (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. (3)
Two 1½-hour lectures per week. Prerequisite: senior standing. 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. Horonjeff (Sp)

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, Su)

199. Individual Study and Research for Advanced Undergraduates. (1–6)
Prerequisite: enrollment limited to senior students in engineering whose records show an average of grade B or higher or whose records indicate a capacity for independent study. Individual study and/or investigation of a subject in civil engineering in which the student has a special interest.
Mr. Seed (in charge) (F, W, Sp, Su)

Graduate Courses

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. Prerequisite: course 203A or 203B. Application of principles of hydrology in solution of practical engineering problems such as artificial recharge, sea water intrusion, flood forecasting, and hydrograph synthesis. Analytical methods, models, and analogs for study of advanced problems. Basin management and development.
Mr. Todd (Sp)

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.
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 (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, chlorination, and coagulation.
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, and gas chromatography and electrochemistry and application to problems of sanitary engineering. Included are experiments on ion mobility, pesticide analysis, trace pollutant 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 waste treatment. Lectures and experiments on gas transfer, flocculation, sedimentation, softening and denitration.
Mr. Kaufman (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. Kaufman (W)

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)

218A. 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)

218B. Atmospheric Pollution. (3)

Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 218A. Control of atmospheric 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 (Sp)

220A. Statically Indeterminate Structures. (4)

Three 1½-hour lectures per week. Prerequisite: course 131. Analysis of indeterminate structures by force (flexibility) methods and by displacement (stiffness) methods; relaxation and distribution procedures; methods suited for digital computer solution. Virtual work, real and complementary energy. Classical theorems of Clapeyron, Betti, Castiglione, Maxwell, Mohr, and Muller-Breslau.
Mr. Scordilis (F, Sp)

220B. Statically Indeterminate Structures. (3)

Two 1½-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 (W)

221. Advanced Structural Theory. (4)

Three 1½-hour lectures per week. Prerequisite: course 131. The application of classical numerical and approximate methods of 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 procedures. 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 gauging, instrumentation for dynamic strain measurements, stress-coat analysis, analogy methods, photoelasticity, photo-stress and Moiré.
Mr. Bouwkamp, Mr. Eberhart, Mr. Godden (F)

223. Experimental Model Analysis. (3)

Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 222 or consent of instructor. Lectures and laboratory in the principal methods for experimental model analysis, including the theory of models and similitude, direct and indirect model techniques, and extrapolation procedures.
Mr. Bertero, Mr. Bouwkamp, Mr. Godden (W)
Three 1 1/2-hour lectures per week. Prerequisite: consent of instructor. Atomic structure of matter; crystal structures with special reference to silicates. Application of physical-chemical principles to the study of behavior of structural materials: cements, concrete, soils, metals, wood, and polymers.
Mr. Mehta (F)

225A. Dynamics of Structures. (3)
Two 1 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 (F, W)

225B. Dynamics of Structures. (3)
Two 1 1/2-hour lectures per week. Prerequisite: course 225A. Development of techniques for analysis of the response of complex structures to dynamic loadings.
Mr. Clough (Sp)

226. Random Vibrations of Structural Systems. (3)
Two 1 1/2-hour lectures per week. Prerequisite: course 225B. 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 criteria. Applications in earthquake engineering.
Mr. Penzien (F)

227. Structural Design for Dynamic Loads. (3)
Two 1 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. Clough (W)

228. Advanced Study of Cementitious Materials. (3)
Two 1 1/2-hour lectures per week. Prerequisite: course 225A. Composition of different types of portland cements, chemistry of hydration, structure of hydrates and its influence on strength, shrinkage, and durability. Chemistry of expanding cements, aluminous cements and special portland cements.
Mr. Mehta (W)

Three 1 1/2-hour lectures per week. Prerequisite: course 230. Special topics in bending of beams including: beams on elastic foundations, beam column, vibration, stability, thermal stresses, curved beams. Two dimensional problems including thick-walled cylinders, foundations; inelastic effects including creep.
Mr. Pister, Mr. Popov (F)

231. Introduction to Mechanics of Solids. (4)
Three 1 1/2-hour lectures per week. Prerequisite: course 231. 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 1/2-hour lectures per week. Prerequisite: course 230. Elastic and inelastic stability of columns and frames; equilibrium, energy and dynamic methods of analysis, non-conservative problems; beam-column, torsional instability; stability of arches and rings.
Mr. Penzien, Mr. Popov (W)

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 138. 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 1/2-hour lectures per week. Prerequisite: course 231 or 185. 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; applications to viscoelastic, anisotropic and nonhomogeneous plates; thermal stress problems.
Mr. Pister (W)

236. Theory of Thin Shells. (4)
Three 1-hour lectures per week. Prerequisite: course 231. 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) (odd-numbered years)

238. Three-Dimensional Dynamic Problems in Linear Solids. (3)
Three 1-hour lectures per week. Prerequisite: course 231. 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 visco-elastic media.
Mr. McNiven (F) (even-numbered years)

239. Mechanics of Nonlinear Solids. (4)
Three 1-hour lectures per week. Prerequisite: course 231. Constitutive equation of plastic, visco-plastic, 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) (odd-numbered years)
240A. Mechanics of Solids. (3)
Two 1½-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 equation and virtual work; stress equations of motion.
Mr. Lubliner, Mr. Sackman (W) (even-numbered years)

240B. Mechanics of Solids. (3)
Two 1½-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) (even-numbered years)

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 their relative importance. Various kinds of loads, environmental conditions, and structural systems are considered.
Mr. Baron, Mr. Brown (Sp)

243A. Advanced Reinforced Concrete. (2)
Two 2-hour lectures per week during the first five weeks of the quarter. This scheduling is required to accommodate both the prerequisite material in CE 243A and CE 243B in one quarter. Prerequisite: course 243A (may be taken concurrently). Structural behavior of reinforced and prestressed concrete.
Mr. Bresler (F)

243B. Advanced Reinforced Concrete. (4)
One 2-hour lecture per week during the first half of the quarter, then three 2-hour lectures per week during the remaining half. This scheduling is required to accommodate both the prerequisite material in CE 243A and the following CE 243B in one quarter. Prerequisite: course 243A (may be taken concurrently). Structural behavior of reinforced and prestressed concrete elements.
Mr. Bresler, Mr. Lin (F)

244. Advanced Reinforced and Prestressed Concrete Structures. (4)
Three 1½-hour lectures per week. Prerequisite: course 135. Structural behavior and design of concrete structural systems—continuous beams, frames, and slabs in reinforced and prestressed concrete.
Mr. Lin (W)

245. Design of Concrete Shells. (4)
Three 1½-hour lectures per week. Prerequisite: basic course 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 1½-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. Boukwamp (Sp)

247. Analysis and Design of Concrete Dams. (4)
Two 1½-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-buttress dams; problems imposed by construction conditions and use of mass concrete.
Mr. Raphael (F)

248. Plastic Analysis of Structures. (3)
Two 1½-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 ranges of materials; shakedown theorems; minimum weight design; structures under combined stresses.
Mr. Bertero (Sp)

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. Pirtz, 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)

251. Advance Highway Design. (4)
Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: course 170. Location and design of various types and classes of highways. Emphasis on advanced 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)

252. Feasibility Analysis of Transportation Systems. (2)
Mr. Davis (Sp)

253. Transportation Engineering. (4)
Four 1-hour lectures per week. Prerequisite: graduate standing in engineering. Technological characteristics of highway, rail, air, and other transporta-
tion systems. Transportation study techniques. Formulation of traffic network patterns by mathematical and simulation techniques. Forecasting and planning for transportation systems.

Mr. Kennedy (F)

253L. Transportation Engineering Laboratory. (1)
One 3-hour laboratory per week. Prerequisite: course 253. 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 traffic forecasting and planning. Mr. Homburger (W)

254. Deterministic Models of Traffic Flow and Transportation Networks. (3)
Three 1-hour lectures per week. Prerequisite: graduate standing in engineering. Microscopic and macroscopic traffic movement with nonstochastic parameters. Theoretical models and related experimental work. Fundamental models of flow in transportation networks.

Mr. Newell (F)

255. Traffic Engineering. (4)
Four 1-hour lectures per week. Prerequisite: graduate standing in engineering. Analysis of human and vehicular characteristics in traffic streams. Statistical methods and their application to traffic flow problems. Regulation of traffic through laws and control devices. Planning new traffic facilities including ways and terminals. Public transit. Traffic engineering administration.

Mr. Kennedy (W)

255L. Traffic Engineering Laboratory. (1)
One 3-hour laboratory per week. Prerequisite: course 255. The study of traffic flow characteristics and behavior in the field. Application of traffic control and geometric design to specific problems. Instrumentation and procedure in traffic flow research.

Mr. Homburger (Sp)

256. Dynamic Simulation of Transportation. (2)
Two 1-hour lectures per week. Prerequisite: graduate standing in engineering. Development of computer simulation models for the analysis of the performance of complex, multivariable, time-dependent, dynamic transportation systems, with application to surface and air systems.

— (Sp)

257. Stochastic Models in Transportation. (2)
Two 1-hour lectures per week. Prerequisite: Statistics 134. Traffic flow as a stochastic process. The application of queuing and related theories to problems in transportation. Approximate methods of solution.

Mr. Newell (W)

260A–260B. Air Transport Engineering. (2–3)
260A. Two 1-hour lectures per week. — (W)

260B. Three 1-hour lectures per week. — (Sp)

Prerequisite: graduate standing in engineering. Evaluation of requirements for air transport facilities. Planning and design of these facilities with emphasis on airports and heliports; traffic operations in terminal areas, and aircraft performance related to facility requirements.

Mr. Horonjeff (F)

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 mixtures.

Mr. Horonjeff (F)

269. Design, Construction and Performance of Asphalt Pavements. (3)
Two 1½-hour lectures per week. Prerequisite: graduate standing in civil engineering. An advanced course concerned with asphalt paving especially for highway and airport pavements; emphasis is placed on their physical properties of asphalts, aggregates and their combinations and the relationship of these properties to proper design and construction of pavements.

Mr. Monismith (Sp)

270A–270B–270C. Advanced Soil Mechanics. (3–2–3)
Three 1-hour lectures per week. Prerequisite: course 120 or 121A–121B and 114 or equivalent. Advanced theories of soil mechanics including: theories of consolidation; stress distribution; bearing capacity analyses; lateral pressures; design of anchored bulkheads; pile foundations; shear strength of cohesive soils; slope stability and analyses; foundation vibrations; effects of earthquakes and dynamic loads.

Mr. Seed 270A (F); 270B (W); 270C (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 (W)

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 (F)

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 (Sp)

273A. Physico-Chemical Principles and Soil Behavior. (3)
Three 1-hour lectures per week except that three 3-hour laboratory sessions will be worked in during the quarter. Prerequisite: course 114, 121A. 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, conduction phenomena, deformation mechanisms and strength, compaction, frost action, rate processes such as secondary compression, creep and thixotropy.

Mr. Mitchell (W)
274. Theoretical Soil Mechanics. (4)
Three 1-hour lectures per week. Prerequisite: course 270A. Theories of failure and dilatancy of soils. The concept of plastic flow and its application to problems of earth pressure and bearing capacity. Numerical methods for consolidation processes. The theory of subgrade reaction, laterally loaded piles. Arching in siloes. 

275. Soil Dynamics. (4)
Two 2-hour lectures per week. Prerequisite: graduate standing. Vibrations of simple oscillators. Wave propagation in elastic media. Dynamic behavior of soils. Dynamic tests, Blast effects. Analysis of dynamically loaded foundations. Earthquakes and earthquake resistant design of slopes and foundations.

Mr. Lysmer (Sp)

276. Earth Dams. (2)
Two 1-hour lectures per week. Prerequisite: course 271 and 270B or equivalent. Principles of earth dam design; types of failures; design procedures; practical considerations in design and construction.

Mr. Witherspoon, Mr. Goodman (F, W)

280A. Theoretical Rock Mechanics. (3)
Two 1½-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, Mr. Lang (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, Mr. Lang (W)

Two 1½-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, Mr. F, W)

290A. Methods of Analysis of Structural Systems. (4)
Three 1½-hours 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)

290B. Applications of Digital Computers to Structural Problems. (3)
Two 1½-hour lectures per week. Prerequisite: graduate standing. Presentation of numerical analysis techniques suitable for analysis of structures and well adapted to computer programming. Fortran programming will be used in the solution of class problems and term projects.

Mr. Raphael, Mr. Wilson (F)

290J. Vibration of Ship Structures. (3)
Two 1½-hour lectures per week. Prerequisite: graduate standing. Study of the sources of vibration in ship structures and of methods of predicting response of ship structures to dynamic loads.

Mr. Clough (F)

290L. Water Resources Development. (2)
Two 1-hour lectures 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)

290Q. Advanced Topics in Soil Mechanics. (2)
Two 1-hour lectures per week. Prerequisites: course 270A–270B. Advanced topics of recent development, current research studies.

Mr. Mitchell (Sp)

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, Mr. W, Sp)

290S. Advanced Seminar in Transportation and Related Land-Use Models. (2)
One 2-hour seminar per week. Prerequisite: Statistics 134 and Industrial Engineering 162. The application of mathematical techniques in the solution of large-scale problems in transportation and related land-use planning.

Mr. Newell (Sp)

297. Individual Study. (1–6)
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 of candidates for the Ph.D. and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis.

Mr. Seed in charge (F, W, Sp, Su)

298. Group Studies, Seminars, or Group Research. (1–6)
Advanced study in various subjects related to civil engineering, 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 experiment.

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

299. Individual Research. (1–12)
Prerequisite: graduate standing. Research or investigation in selected advanced subjects.

Mr. Seed in charge (F, W, Sp, Su)
Electrical Engineering

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. (F, W, Sp)
100B. Electronic circuits and models; amplifiers, distortion, and oscillators; electrical machinery discussed in terms of basic principles of operation and application; associated laboratory experiments.
Mr. Black Mr. Dalziel (W, Sp)

101A. Circuits, Electronics, and Electrical Machines. (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, 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 (W, Su)

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, i.e., accelerators, betatrons, T.F.I. linear accelerators, synchrotrons, and strong-focus 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 2C and Physics 4C. 104A is prerequisite to 104B.
104B. Elements of Laplace transforms. Elimination method. Impedance, transfer functions, natural frequencies, frequency response. 2-ports.
Network theorems: superposition, Thévenin, reciprocity.
Mr. Desoer, Mr. Kuh (W, Sp, Su)

105. Introduction to Electronic Circuits. (5)
Four 1-hour lectures and one 1-hour recitation per week. Prerequisite: Engineering 17; course 100A–100B or 104B. Charge-control concepts and models for electronic devices; single-stage and cascaded lowpass amplifiers, gain, bandwidth, output power, transformers, distortion; simple feedback amplifiers; selective amplifiers; basic oscillator and wave-shaping circuits; discrete state circuits, logic, memory and trigger 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 selected applications.
Mr. Vogelhut (F, W, Sp)
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. Vogelhut (F, W, Sp)

111. Electrical Machinery. (4)
Three 1-hour lectures per week. Prerequisite: course 104A–104B. 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 Amplidyne, and other specialized machines.
Mr. Roberston (F)

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 of coordination of current interrupters and protective apparatus.
(£) 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. Dalziel (W)

115. Semiconductor Circuits Laboratory. (2)
One 4-hour laboratory per week. Prerequisite: course 105; 105B; and 125 (the last requirement may be taken concurrently). 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 (F, W, Sp, Su)

116. Microwave Communication Systems. (4)
Two 1½-hour lectures per week. Prerequisite: course 117B plus either of the following which may be taken concurrently: course 117C or 124. Microwave frequency sources and amplifiers; radiation and propagation; noise; systems applications.
Mr. Angelakos, Mr. Everhart (F, Sp)

Two 1½-hour lectures per week.
117A. Prerequisite: course 104B. The mathematics of vector fields. Static electric and magnetic fields.
Analytical, graphical, and numerical solutions of the Laplace and Poisson equations. Calculations of capacitance, resistance, and inductance from physical shapes.


117C. Prerequisite: course 117B. Waveguides and resonant cavities. Microwave and optical waveguides, resonant structures and other circuits. Networks. Radiation and antennas. (Sp)

117D. Prerequisite: course 117C. Wave propagation in inhomogeneous and anisotropic media. Microwave and optical fields in nonreciprocal media. Waves in moving media. Applications to ferrite and plasma devices.

Mr. Birdsall, Mr. Mei, Mr. Rumsey, Mr. Susskind, Mr. Van Duzer, Mr. Welch, Mr. White (W)

119. Linear Systems Analysis. (4)

Two 1½-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 an equation of system behavior. Concept of state. Fourier and Laplace transform methods of analysis. Consideration of stability of feedback systems.

Mr. Polak, Mr. Sakrison, Mr. Wong (F, W, Sp)

123. Principles of Circuit Synthesis. (4)

Three 1-hour lectures per week. Prerequisite: course 119. The properties of linear lumped element circuits and their network functions; development of synthesis methods for one-port and two-port circuits; techniques for the design of filters, filter amplifiers, and equalizers.

Mr. Frisch, Mr. Kuh (W, Sp)


Three 1-hour lectures per week. Prerequisite: course 105. Students will not be given credit for both course 124 and 160A–160B. 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, Mr. Wong (F, W)

125. Electronic Circuit Theory and Design. (4)

Three 1-hour lectures per week. Prerequisite: course 105 and 108B; course 119 (may be taken concurrently). General modeling techniques for electronic mechanisms; limitations and design procedures for broadband amplifiers; optimum low-noise performance; potential instability in bandpass amplifiers; feedback amplifier theory and design; realization of circuit functions including oscillation, frequency translation and regenerative switching circuits.

Mr. Pederson (F, W)

126A-126B. Physical Electronics. (3-3)

Two 1-hour lectures and one 3-hour laboratory per week. No credit will be given to students who have taken either course 130 or 170.

126A. Prerequisite: course 105 or Physics 110B or Physics 121. A unified treatment of the physical principles and theory underlying electron devices and measurements in physical electronics, including recent developments.

126B. Prerequisite: course 126A. 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 feedback control systems.


Mr. Bergen, Mr. Hopkin (W, Sp)

130. Electrical Engineering Materials. (4)

Two 1½-hour lectures 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.

Mr. English, Mr. Oldham (W, Sp)

131. Solid-State Electronic Devices. (4)

Two 1½-hour lectures per week. Prerequisite: course 130 or Physics 140. Theory of the physical mechanisms underlying the operation of semiconductor, dielectric, piezoelectric, optical, and magnetic solid-state devices.

Mr. Muller, Mr. Oldham (F, W)

132. Communication Electronics Laboratory. (2)

One 4-hour laboratory per week. Prerequisite: course 105, 105B; 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)

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. Dalziel (W, Sp)

134. Solid-State Electronics Laboratory. (2)

One 4-hour laboratory per week. Prerequisite: course 130. Experiments for 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 (F, W)
136. Quantum Electronics and Magnetism. (3)

Two 1½-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)

148. Introduction to Computers and Information Processing. (4)

Two 1½-hour lectures per week. A survey of the science and art of computing and information processing with emphasis on the realization and mini­mization of switching circuits, the organization and programming of simple computers, and mathematical models for digital computers.

Mr. Harrison, Mr. Morton (F, W, Sp, Su)


Mr. Morton, 151A (F, W); 151B (F, W, Sp); 151C (Sp)

152. Digital Computer Systems. (4)

Three 1-hour lectures per week. Prerequisite: course 148. The organization of stored program digital computers and data processing systems. The logical design for arithmetic, control, and input/output functions.

Mr. Berlekamp (F, W)

153. Programming Systems. (4)


Mr. Huskey, Mr. Wattenburg (F, Sp)

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, Mr. Wong (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)

163. Finite-State Systems. (4)


Mr. Gill, Mr. Harrison (F, Sp)

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. Birdsall (Sp)

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)

Prerequisite: enrollment is limited to senior students whose scholastic records show a grade B average or higher. Additional requirements may be imposed by the instructor concerned. Individual study and/or research on a problem chosen by the student and carried out under guidance of an instructor.

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

Graduate Courses

204. Electron Optics. (3)

Two 1½-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 Duizer (W)

206. Theory of High-Frequency Devices. (4)

Four 1-hour lectures per week. Prerequisite: course 117A–117B. Energy interactions between electromagnetic fields and particles, both stationary and time varying; velocity modulation, space-charge and
cyclofield waves, traveling waves, cross-field interactions; stability, parametric effects, noise, Engineering applications to microwave tubes, accelerators, ion propulsion and allied devices. Superpower micro-wave generation

Mr. Susskind (Sp)


Two 1½-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. Mei (W)

217. Microwave Networks. (4)

Two 1½-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 Systems Theory. (4)

Four 1-hour lectures per week. Prerequisite: course 119; Mathematics 155 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. Zadeh (F, Sp)

223A–223B. Linear Network Theory. (3–3)

Three 1-hour lectures per week.

223A. Topological foundations of network analysis, generalized matrix equations on loop and node basis, topological derivation of network functions. Analysis of n-port networks, limitations on structure of network realization and transformations.

(F)

223B. Prerequisite: course 223A. Energy relations in passive networks, integral relations between real and imaginary parts and magnitude and phase of network functions. State space analysis of networks, properties of driving point impedances.

Mr. Frisch (W)

224. Network Synthesis. (3)

Three 1-hour lectures per week. Prerequisite: course 123, 223A–223B. Synthesis of driving point impedances, transfer functions and n-port admittance and impedance matrices. Frequency and time domain approximation, topological considerations in synthesis.

Mr. Frisch (Sp)

227. Feedback Control Systems. (3)

Two 1½-hour lectures per week. Prerequisite: course 125A–125B. Feedback controls design, statistical optimization with restrictions, realizability, unalterable elements, predictors, minor loops, non-minimum-phase elements, distributed parameters, model and spectral adaptive systems, identification, state and parameter space representations, log frequency and log gain analogs and transformations, multivariate interacting loops.

Mr. Smith (W)

228A–228B. Sampled-Data Control Systems. (3–3)

Three 1-hour lectures per week.

228A. Prerequisite: course 222. Analysis, synthesis, and critical study of sampled-data control systems. General application of the Z-transform method and the state space approach to sampled-data problems.

(F)

228B. Prerequisite: 228A. Study of various non-linearities in sampled-data control systems. Stability of nonlinear discrete systems using the Lyapunov and Popov methods. Design procedures for optimal control of nonlinear discrete systems. Application of discrete theory to biocontrol systems.

Mr. Jury (W)

229A–229B. Nonlinear Control Systems. (3–3)


Mr. Bergen, Mr. Hopkin, 229A (F, W, Sp); 229B (Sp)

230. Solid-State Electronics. (4)

Two 1½-hour lectures per week. Prerequisite: Physics 121; course 130 or Physics 140 or Physics 141A–B; and Physics 115 or Physics 137B concurrently. Semiconductor physics and physical chemistry topics of especial interest to electrical engineers. Crystal growth, X-ray and electron diffraction, crystal defects, control of impurities, diffusion phenomena. Semiconductor energy band structure, effective mass, bulk and surface properties of relevant semiconductors, boundary layer phenomena. Recombination and trapping processes.

Mr. Oldham, Mr. English (W)

231. Solid-State Devices. (4)

Two 1½-hour lectures per week. Prerequisite: Physics 121; Physics 137A–137B 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. Muller, Mr. Wang (Sp)

240A–240B. Nonlinear Active Circuits. (3–3)

Two 1½-hour lectures per week. Prerequisite: course 119 and 125. 240A is prerequisite to 240B. Limiting and optimum performance of nonlinear, discrete-state circuits; piece-wise linear, 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, 240A (F); 240B (W)

241. Linear Active Circuits. (4)

Four 1-hour lectures per week. Prerequisite: courses 123 and 125. Fundamental properties of linear active circuits; gain-bandwidth limitations and optimum performance of amplifiers; theory and design of feedback amplifiers; noise study; application to vacuum tube, transistor, negative-resistance and parametric circuits.

Mr. Kuh (Sp)
251A–251B. Digital Systems Engineering. (3–3)
Two 1½-hour lectures per week. Prerequisite: course 151A–151B–151C. 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, 251A (F); 251B (W)

252. Digital Computer Systems. (4)
Two 1½-hour lectures per week. Prerequisite: course 152. The organization and logical design of digital data processing and control systems. Conventional stored program computers, highly parallel modular computers, digital differential analyzers. Computers for computation, information processing, and control.
Mr. Graham (W)

Two 1½-hour lectures per week. Prerequisite: courses 152 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 multi-program and real-time systems.
Mr. Huskey (Sp)

260. Stochastic Processes in Electrical Engineering. (4)
Four 1-hour lectures per week. Prerequisite: course 119 or 124; Statistics 134 or 200A. Nonrandom signals: Fourier and Hilbert transforms, generalized harmonic analysis, sampling theorems, signal spaces. Stochastic (noise) processes: classification of processes, covariance functions, spectral analysis, orthogonal expansions. The Gaussian process. Physical sources of noise. Analysis of noise in linear and nonlinear systems.
Mr. Wong (F, W)

261. Statistical Communication Theory. (4)
Three 1-hour lectures per week. Prerequisite: course 260 (may be taken concurrently). Decision-theoretic formulation of the design of communication and radar systems. Application to digital and analog communication, and to radar detection and ranging.
Mr. Sakrison, Mr. Turnin (W)

263. Switching and Automata Theory. (3)
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)
Two 1-hour lectures per week. Prerequisite: consent 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)
Two 1½-hour lectures per week. Prerequisite: Statistics 134 or 200A. 265A. Coding for reliable transmission over discrete and continuous 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. Berlekamp, Mr. Thomasian, 265A (F); 265B(W)

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. Berlekamp, Mr. Gill, Mr. Thomasian (Sp)

267. Theory of Formal Languages. (3)
Two 1½-hour lectures per week. Prerequisite: course 265. Models of algorithmic languages relevant to programming and natural languages. Relation between language and grammar. Finite state languages, context-free languages, pushdown automata, context sensitive languages, and linear bounded automa. Other languages obtained from various types of automata.
Mr. Haines, Mr. Harrison (F, Sp)

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. Lichtenberg, Mr. Trivelpiece, 270A (F); 270B (W); 270C (Sp)

290. Advanced Graduate Study in Electrical Engineering.
Current and advanced topics in electrical engineering, primarily for advanced graduate students.
290A. System Theory. (2)
Mr. Bergen, Mr. Desoer, Mr. Frisch, Mr. Gill, Mr. Kuh, Mr. Thomasian, Mr. Zadeh (Sp)
290C. Advanced Circuit Theory. (1–3) Prerequisite: course 222 and 223A–223B.
Mr. Kuh (F)
290D. Quantum Electronics. (4) Prerequisite: course 117A, 130 and Physics 115.
Mr. Singer (W)
290F. Boundary Value Problems in Electromagnetic Theory. (4) Prerequisite: course 210A–210B–210C.
Mr. Mei (F)
290H. Periodic Transmission Systems. (4) Prerequisite: course 177A–177B, 117C or 117D.
Mr. Lichtenberg, Mr. Schwarz, Mr. White (Sp)
290P. Topics in Noise Theory. (2) Prerequisite: course 260.
Mr. Wong (W)
290J. Characterization, Identification, and Interconnection of Systems. (3) Prerequisite: course 222 or 229A–229B (may be taken concurrently).
Mr. Zadeh (Sp)
290K. Theory of Optimal Control. (4) Prerequisite: course 222, 229A–229B, and Mathematics 104A.
Mr. Polak (F)
290M. Topics in Communication Theory. (2) Prerequisite: course 260.
Mr. Turin (Sp)
290P. Topics in Solid-State Electronics. (3) Prerequisite: course 130; course 230 or 231.
Mr. English, Mr. Muller, Mr. Oldham, Mr. Wang, Mr. White (Sp)
290Q. Quantum and Optical Electronics. (4) Prerequisite: course 117B and Physics 115.
Mr. Whinnery (Sp)
290T. Symbol Manipulation and Artificial Intelligence. (2) Prerequisite: consent of instructor.
Mr. Slagle (F)
290V. Adaptive and Identification Systems. (3)
Prerequisite: course 229A–229B, Statistics 200A.
Mr. Smith (F)

290W. Pattern Classification. (2)
Prerequisite: Statistics 202A.
Mr. Wong (Sp)

297. Individual Study. (1–6)
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 of candidates for the Ph.D. and
D.Eng. Course to be taken on a satisfactory or unsatisfactory basis.
The Staff (F, W, Sp, Su)

298. Group Studies, Seminars, or Group Research.
(1–5)
Prerequisite: specific preparation as determined
by the instructor in each group. Advanced group
study in electrical engineering; topics vary from year to year.
May consist of organized lectures or seminar
discussions, devoted chiefly to the research area in
which the group is working.
The Staff (Mr. Zadeh in charge) (F, W, Sp, Su)

299. Individual Research. (1–12)
Investigation of electrical engineering problems.
The Staff (F, W, Sp, Su)

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; economics 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 tech-
niques.
Mr. DeGarmo (F, W, Sp, Su)

146. Pay and Incentive Systems. (4)
Two 2-hour meetings. Prerequisite: upper division
study in engineering. Theory, design, control and
administration of systems of wages, salaries, and
other types of incentives. Evaluation fundamentals;
job and merit rating, influence of technology, gov-
ernment, and unions. Critique of basic assumptions.
Mr. Keachie (Sp)

150. Production Systems Analysis. (4)
Two 1½-hour lectures and one 2-hour problem
session per week. Prerequisite: course 150. Opera-
tions 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. Tech-
nical and economic analysis of automated systems.
Design of product, selection of materials and equip-
ment 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: Engineering I.
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, pro-
duction, replacement and allocation systems.
Mr. Shephard, Mr. Wolff (W, Sp)

162. Linear Programming. (5)
Three 1-hour lectures and two 1-hour problem
sessions per week. Prerequisite: upper division stand-
ing. An introduction to linear programming with
emphasis on formulation, the simplex method, duality
theory, post-optimization problems, and applica-
tions to industrial systems.
Mr. Glassey, Mr. Gale (F, W)

163. Queueing Theory. (5)
Three 1½-hour lectures per week. Prerequisite: Statistics
100A, 133 or 134. Introduction to queue-
ing theory and related stochastic processes. The Pois-
son process, renewal theory, and Markov chains.
The birth and death process. Imbedded Markov chains.
Models of congestion, average queue length and
expected waiting time. Emphasis on steady-state
results.
The Staff (F, W)

164. Introduction to Inventory Theory. (3)
Two 1-hour lectures and one 1-hour problem ses-
sion 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. Jewell, Mr. Shephard (Sp)

170. Introduction to Human Performance
Mechanisms and Measurement. (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 quantita-
tive properties and limitations. Laboratory experi-
ments on analytic and measurement techniques.
Mr. Crossman (F, Sp)

172. Work Systems Design and Measurement. (3)
Two 1-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 meas-
urement and performance standards; control and
administration of work systems. Laboratory exercises
on analytic and measurement techniques.
Mr. Davis (Sp)

174. Introduction to Human Factors Design. (4)
Three 1-hour lectures and one 2-hour laboratory
per week. Prerequisite: course 170. Mechanical En-
gineering 164A (may be taken concurrently). Intro-
duction to design of manned systems using sci-
cific data and models of human performance. Inter-
face design for control and communication; assign-
ment of functions between man and machines; sys-
tem performance measurement; effects of environ-
Mr. Crossman (Sp)
180. Synthesis and Design of Industrial Systems. (4)
Two 2-hour lectures 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.
Staff (F, W, Sp)

198. Directed Group Study for Undergraduates.  (1–8)
Meetings to be arranged. Prerequisite: varies with topic. Group studies of selected topics which vary from year to year.
Staff (F, W, Sp)

199. Individual Study and Research for Advanced Undergraduates. (1–5)
Confereces to be arranged. Prerequisite: upper division standing in engineering, students with at least a B average. Individual study and/or research on a problem chosen by the student and carried out under the guidance of a faculty member.
Staff (F, W, Sp)

Graduate Courses

220. Economic Analysis of Engineering Systems. (4)
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 (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 optimal development of specific industries in particular countries or areas; related technical assistance programs.
Mr. Keachie (W)

251. Production Systems and Facilities. (4)
Two 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: course 163. Advanced study of topics related to production system analysis, design, operation and control with emphasis on model construction and the use of computers.
Mr. Grassi (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. Glassy (Sp)

262. Mathematical Programming. (5)
Two 1½-hour lectures and one 2-hour problem session per week. Prerequisite: course 162. Basic course, simplex algorithm under degeneracy, duality and positive definite theory, quadratic programming, sensitivity analysis and price concepts, game theory, network flows with gains.
Mr. Gale, Mr. Van Slyke (F, Sp)

263. Applied Stochastic Processes. (5)
Two 1½-hour lectures and one 2-hour problem session per week. Prerequisite: course 163. Application of the methods of renewal theory, Markov chains, branching processes, and Markov-renewal processes to applied problems in traffic, queueing, congestion, replacement, and other stochastic systems, with emphasis on asymptotic behavior.
Mr. Jewell, Mr. Wolf (F, Sp)

264. Inventory Theory. (4)
Two 1½-hour lectures and one 1-hour problem session per week. Prerequisite: course 163 or 164. An introduction to inventory theory, with emphasis on deterministic and stochastic models, analysis of the one-stage model, dynamic and approximation to optimal policies.
Mr. Shephard (W)

265. Reliability and Quality Control. (4)
Two 1½-hour lectures and one 1-hour problem session per week. Prerequisite: course 163. An introductory course in the mathematical theory of reliability and quality control with emphasis on the analysis of selected probability models.
Mr. Barlow (Sp)

266. Network Flows and Graphs. (5)
Two 1½-hour lectures and one 2-hour problem session per week. Prerequisite: course 162. Survey of solution techniques and problems that have formulations in terms of flows in networks. Max-flow min-cut theorem. Minimum cost flows. Multiterminal and multimmodity flows. Relationship with linear programming, transportation problems, electrical networks and critical path scheduling.
Mr. Jewell, Mr. Oliver (F, W)

270. Psychological Topics in Human Performance. (4)
Two 1-hour lectures and one 2-hour laboratory per week. Prerequisite: graduate standing. Experimental analysis and theory of individual and human performance in skilled perceptual-motor tasks.
Mr. Crossman (F)

Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 170 and 172. Advanced study of topics in work systems design and work measurement; integrated design of work systems; macro- and micro-work measurement; performance standards and reward and control systems; research methods and experiments in work systems.
Mr. Davis (W, Sp)

One 4-hour laboratory per week Prerequisite: course 170, Mechanical Engineering 164A. Methods of analyzing existing and proposed man-machine systems and principles of synthesis. Design projects which include field work will be undertaken.
Mr. Crossman (W)
290A. Nonlinear Programming. (3)
Two 1¼-hour lectures per week. Prerequisite: course 290E and Mathematics 104A. Nonlinear duality theory and conjugate functions; positive definite theory; bi-matrix games; nonlinear programming algorithms; applications of mathematical programming to optimal control theory; pattern recognition; and curve fitting.
Mr. Mangasarian, Mr. Van Slyke (F)

2900. Integer Programming. (3)
Two 1¾-hour lectures per week. Prerequisite: course 262. Solution methods for optimization problems with combinatorial structure. Integer programming algorithms. Application of mathematical programming to graph theory.
Mr. Glover (Sp)

290E. Advanced Mathematical Programming. (3)
Two 1¼-hour lectures per week. Prerequisite: course 262. Decomposition principle and other techniques for solving large scale planning and control systems, general convex set theory, convex programming, linear control theory.
Mr. Van Slyke (W)

290F. Applied Dynamic Programming. (3)
Two 1¼-hour lectures per week. Prerequisite: course 162 and 163. A course on the methods and applications of dynamic programming to scheduling, control, search, allocation, and routing problems.
Mr. Oliver (W)

297. Individual Study. (1–6)
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 of candidates for the Ph.D. and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis.
The Staff (Mr. Oliver in charge) (F, W, Sp, Su)

298. Group Studies, Seminars, or Group Research. (1–8)
Meetings to be arranged. Prerequisite: varies with topic. Advanced group studies in various fields of industrial engineering on topics which vary from year to year.
The Staff (F, W, Sp, Su)

299. Individual Study or Research. (1–12)
Conferences to be arranged. Individual investigation of advanced industrial engineering problems.
The Staff (F, W, Sp, Su)

For Summer of 1967

IE 120. One Section.
IE 297, 298, 299.

Lower Division Courses

29. 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 a physical means of achieving 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.
Mr. Levens (Sp)

Upper Division Courses

101. Manufacturing Processes. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Engineering 45 and Civil Engineering 130. Principles of manufacturing, shaping of metals, measuring and gaging. Introduction to the theory of plasticity with applications to shaping of metals.
The Staff (Mr. DeGarmo in charge) (F, W, Sp)

102A. Machine Design—I. (4)
Three 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. Machine 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. Hauser in charge) (W, Su)

103. Dynamics. (4)
Three 1-hour lectures and one 1-hour recitation period per week. Prerequisite: course open only to transfer students with a course in statistics. Elements of vector algebra and calculus. Two- and three-dimensional particle dynamics. Two-dimensional dynamics of particle systems and rigid bodies. Moments of inertia. Impulse-momentum. Work-energy. Engineering applications.
The Staff (Mr. Goldsmith in charge) (F, W)

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

104B. Engineering Mechanics—II. (4)
Three 1-hour lectures and one 1-hour recitation period per week. Prerequisite: course 104A or 103. Three-dimensional Newtonian mechanics. Dynamics of a particle; applications to central force motion and the spherical pendulum. Moments and products of inertia, kinetic energy and angular momentum. Dynamics of rigid bodies: Spinning top and gyroscope. Introduction to Lagrange's equations.
The Staff (Mr. Rosenberg in charge) (Sp)

105A. Macroscopic Thermodynamics. (4)
Three 1-hour lectures, one 1-hour discussion period per week. Prerequisite: Physics 4E, Mathematics 2C. First and second laws of thermodynamics; equilibrium properties; reversibility; availability; relations between thermodynamic properties; energy conversion systems.
The Staff (Mr. Starkman in charge) (F, W, Sp, Su)
101B. 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. Starkman in charge) (F, W, Sp, Su)

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. Starkman in charge) (W, Sp, Su)

106. Mechanical Engineering Systems Design. (4)
Two 1-hour lectures, one 1-hour discussion period per week. Prerequisite: course 102B and 107A. Lectures and projects intended to introduce the concepts of design important in engineering systems. The main portion of the course is concerned with a preliminary design by the student of a mechanical engineering system. Mr. Howe (F, W, Sp, Su)

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. Mr. Tien, 107A (F, W, Sp, Su) 107B (W, Su); 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. Starkman (F, Sp)

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. Naghdi (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. Schaff, 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. Dom, Mr. Thomsen, Mr. Kobayashi (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. Thomsen, 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 (F)

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 (F)

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 (F, Su)

126. Nomography. (4)
Two 1½-hour lectures and one hour of supervised computation per week. Prerequisite: Mathematics 2C. Theory and design of currency and aligned nomograms. Nomographic solutions to equations of three or more variables. Representation and analysis of experimental data using nomographic techniques. Mr. Levens (W)

127. Advanced Methods in Mechanical Design. (4)
Two 2-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 semiempirical techniques in machine analysis. Introduction to optimization and reliability considerations. Mr. Frisch (Sp)

129. Applied Stress Analysis. (4)
Three 1-hour lectures per week. Prerequisites: Civil Engineering 130, Engineering 36, Mathematics 2C. 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, gears, and cams. Mr. Radcliffe (F)
132A. Mechanical Vibrations. (3)
Three 1-hour lectures per week. Prerequisite: course 103 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. Brown, Mr. Steidl (F, Sp)

132B. Dynamics of Machinery. (3)
Mr. Radcliffe (W, Su)

134A. Automatic Control Systems—I. (3)
Three 1-hour lectures per week. Prerequisite: Mathematics 2C; Physics 4E; course 116 recommended. Linear differential equations for systems. Transient and steady-state behavior. Block diagrams, Laplace transforms, transfer functions. Frequency-response analysis and synthesis. Stability considerations. Illustrative problems may be taken from the fields of mechanical, chemical, nuclear, aeronautical and electrical engineering.
Mr. Costanza, Mr. Takahashi, Mr. Thal-Larsen (F, W, Sp)

134B. Automatic Control Systems—II. (3)
Three 1-hour lectures per week. Prerequisite: course 134A. Root-locus techniques for linear automatic control systems. Relation between frequency-response and root-locus methods. Describing functions and phase-plane techniques for nonlinear control systems. Introduction to modern control theory; state-space characterization of a system, optimal control.
Mr. Costanza, Mr. Takahashi, Mr. Thal-Larsen (F, W, Sp)

135. Controls Laboratory. (1)
One 4-hour laboratory per week. Prerequisite: course 134A. Experiments with control systems such as might be encountered in mechanical, chemical, mining and metallurgical engineering. Dynamics of level, temperature, pressure, and other control systems. Studies of control-loop components. Investigations by means of machine computations.
Mr. Takahashi, Mr. Thal-Larsen (F, W, Sp)

141. Refrigeration and Cryogenics. (4)
Three 1-hour lectures per week and one discussion section. Prerequisite: course 105C. Thermodynamics of producing low temperature fluids and regions and their application in system design.
Mr. Hutchinson (F)

142. 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 undersea application.
Mr. Hutchinson (W)

145. 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. Farhar, Mr. Sawyer (F, Sp)

146. 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)

147. 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 mechanic and transport process phenomena and analysis system performance. Jet propulsion applications of gas turbines, ram jets and rockets.
The Staff (Mr. Starkman, Mr. Sawyer in charge) (W, Sp)

148A. Petroleum Development Engineering. (4)
Three 1½-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 1½-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 1½-hour lectures per week. Prerequisite: senior in engineering. Compressible flow of real gases; high pressure lines, meters and compressors; multi-phase 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 applications. Subject areas include steady-state and transient system analysis for conduction, free and forced convection, boiling, condensation, and thermal radiation.
Mr. Greif (F, W, Sp)

155. Statistical Thermodynamics. (4)
Three 1-hour lectures, one 1-hour discussion period per week. Prerequisite: course 105A. 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. Tien (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 1½-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. Iverson (F, 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. Laird, Mr. Sherman (W, Sp)

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 161A. Application of gas dynamics and thermochemistry 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)

*172B. Application of Digital Computers to Engineering Problems. (4)  
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)  
Mr. Soroka (W)

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 104B. Lagrangian mechanics and introduction to Hamiltonian mechanics. Hamilton’s principle and principle of least action. Applications to engineering problems. Oscillatory motion. Constrained motion of particles and rigid bodies, Gyrodynamics.  
Mr. Rosenberg, Mr. Leitmann (F, W)

182. Theory of Elasticity. (3)  
Three 1-hour lectures per week. Prerequisite: course 185. 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, plate stress, generalized plane stress and bending of plates.  
Mr. Christensen, Mr. Hsu (W, Su)

185. Introduction to Continuum Mechanics. (4)  
Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Physics 4A and 4E, and Mathematics 2C; course 115 recommended. Kinematics of deformation, the concept of the stress vector, the stress tensor. Principles of conservation of mass, momentum, and moment of momentum; and energy entropy production inequality. Linear constitutive equations for elastic solid, compressible viscous fluid, and viscoelastic media. Some simple solutions.  
Mr. Carroll, Mr. Naghdi (F, Sp)

198. Group Studies for Advanced Undergraduates. (1-5)  
Prerequisite: upper division standing in engineering, plus particular courses to be specified by the instructor for each group. Group studies of selected topics. The Staff (F, W, Su)

199. Individual Study and Research for Advanced Undergraduates. (1-5)  
Enrollment limited to senior students in engineering whose scholastic records show a scholarship average of B or higher or whose records indicate a capacity for independent study. Enrollment is subject to additional requirements imposed by the instructor concerned. Individual study and/or research on a problem chosen by the student and carried out under guidance of an instructor. The Staff (Mr. Starkman for Thermal Systems, Mr. Radeliffe for Mechanical Design, Mr. Naghdi for Applied Mechanics) (F, W, Sp, Su)

Graduate Courses

Graduate standing is required for admission to these courses. In addition, graduate students must have completed at least Mathematics 2A–2B or the equivalent before undertaking any of the following courses, except as noted.
221. Advanced Metal Cutting. (4)
Two 2-hour lectures per week. Prerequisite: course 121 (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. Kobayashi (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 metal 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. Kobayashi, Mr. Thomsen (Sp)

Three 1-hour lectures per week. Prerequisite: course 125 or equivalent. 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-II. (3)
Three 1-hour lectures per week. Prerequisite: course 225A. Numerical solutions for problems involving creep, low-cycle fatigue, impact and fracture. Applications solutions to design of parts and comparison of predictions with actual case histories. Analyses of problems which currently impose limitations on the design of mechanical equipment. These will include such topics as crack formation and propagation in fatigue, plastic deformation and fracture under impulsive loading, creep-rupture under multiaxial stress, and mechanical wear. Mr. Finnie (Sp)

226. Graphical Analysis. (4)
Two 1½-hour lectures and one three-hour design laboratory per week. Prerequisite: course 126 or consent of instructor. Graphical and numerical methods showing the application of calculus and ordinary differential equations to problems in mechanical engineering systems. Advanced methods of nomography applied to the interrelationships among three or more variables. Transformations and validity tests on experimental data. Mr. Levens (Sp)

227. Optimal Design of Mechanical Elements. (4)
Two 2-hour lectures per week. Prerequisite: course 102A-102B 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)
Three 1-hour lectures per week. Prerequisite: course 163. Analysis and design of liquid and gas film journal and thrust bearings. Externally presurized and self-acting operation; dynamics loading and instabilities. Rolling element bearings; friction, wear and boundary lubrication. Mr. Donaldson (F)

229A. Experimental Mechanics I. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 172 or 185, 170 or 164. Exposé of the basic experimental methods used in engineering mechanics. Analysis of measurement systems for static, steady state vibratory, and transient excitation including transducers for displacement, strain, velocity, acceleration, stress, and force, as well as the associated amplifiers and circuitry. Mr. Cunningham (F, Sp)

229B. 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.

231. Advanced Kinematics and Mechanism. (3)
Three 1-hour lectures per week. Prerequisite: course 131. Analysis and synthesis of plane and space mechanism. Constraint criteria. Complex 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)

234A. Advanced Control-I. (3)
Three 1-hour lectures per week. Prerequisite: course 134B. Analysis and design of dynamic systems and controls. Stationary and nonstationary, deterministic and stochastic, lumped and distributed parameter, continuous and discrete time systems via scalar and vector variable viewpoints. Emphasis on linear systems with examples taken from fields pertinent to mechanical and chemical engineering. Mr. Takahashi (F, Sp)

234B. Advanced Control-II. (3)
Three 1-hour lectures per week. Prerequisite: course 134B. Analysis and design of dynamic systems and controls. Nonlinear systems and controls in terms of scalar and state variable formulations. Time and frequency domain stability analysis, theory and methods of realizing optimal control. Examples are chosen from mechanical and chemical engineering. Mr. Takahashi (W)

234C. Advanced Control-III. (3)
Three 1-hour lectures per week. Prerequisite: course 134B. Analysis and synthesis of linear or nonlinear, stationary or nonstationary, open or closed loop control systems based upon state concept. Stability and quality analysis by means of Lyapunov's direct method. Theory of optimal control. Examples are chosen from mechanical and chemical operations. Mr. Thal-Larsen (Sp)

235. Coded Data Control Systems. (3)
Three 1-hour lectures per week. Prerequisite: course 134B or equivalent. Synthesis and analysis of feedback control systems in which the control intelligence appears in a coded digital form. Boolean algebra as a design tool to aid in the synthesis of comparator, counting, and encoding elements. Mr. Costanza (F)
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. Costanza (W)

237. Advanced Control Laboratory. (1)
One 3-hour laboratory per week. Prerequisite: course 134B (may be taken concurrently). Experimental methods in the analysis and synthesis of dynamic systems and controls. Application to mechanical, electromechanical, chemical, and aerospace systems. Investigations may include multivariable, nonlinear, stochastic, time-varying and coded data systems.
Mr. Costanza, Mr. Takahashi
Mr. Thal-Larsen (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 (Sp)

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-stress-thermo-chemical behavior; applications to reservoir behavior, hydraulic fracturing, well stimulation and rock drilling.
Mr. Somerton (W)

248B. Advanced Reservoir Engineering. (4)
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)

251. Heat Conduction. (3)
Three 1-hour lectures per week. Prerequisite: course 151; Engineering 230A. Analytical and numerical methods for the determination of the conduction of heat in solids.
Mr. Seban (W)

252. Heat Convection. (4)
Three 1-hour lectures, one 1-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 (Sp)

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, one 1-hour discussion 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 1-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. Greif (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)
Mr. Cornet (F)

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. Nonequilibrium Thermodynamics in Liquids and Solids. (5)
Prerequisite: course 105A, 105C, or Chemical Engineering 141A–141B. General formulation of coupled transport phenomena. Detailed application to diffusion processes, electrokinetic phenomena, thermodructrics, membrane processes 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-hydorcarbin 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.

297. Individual Study. (1-6)
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 of candidates for the Ph.D. and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis.
The Staff (Mr. Radeliffe for Mechanical Design, Mr. Starkman for Thermal Systems) (F, W, Sp, Su)

298. Group Studies, Seminars, or Group Research. (1-5)
Advanced study in various fields of mechanical engineering on topics which may vary from year to year.
The Staff (Mr. Radeliffe for Mechanical Design, Mr. Starkman for Thermal Systems) (F, W, Sp, Su)

299. Individual Study or Research. (1-12)
Prerequisite: graduate standing in engineering, physics or mathematics.
The Staff (Mr. Radeliffe for Mechanical Design, Mr. Starkman for Thermal Systems) (F, Sp, Su)

AERONAUTICAL SCIENCES

261A-261B. Compressible Fluid Flow. (3)
Three 1-hour lectures per week. Prerequisites: 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 (W, Su)

261C. Hypersonic Flow. (3)
Mr. Sherman (Sp)

262. Theoretical Hydrodynamics. (3)
Three 1-hour lectures per week. Prerequisites: 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)

263A-263B. Viscous Fluid Flow. (3)
Three 1-hour lectures per week. Prerequisites: Engineering 230A, Mechanical Engineering 159 or 162. 263A prerequisite for 263B. Laminar and turbulent flow of homogeneous Newtonian fluids. Exact solutions of Navier-Stokes equations. Low Reynolds number flows. Compressible and incompressible boundary layers. Stability and turbulence.
Mr. Sherman, Mr. Corcos, 263A (W); 263B (Sp)

264. Wing Theory. (3)
Three 1-hour lectures per week. Prerequisites: Engineering 230 and Mechanical Engineering 162. Incompressible airfoil theory for steady flow in two and three dimensions. Cavitating and noncavitating hydrofoils. Introduction to airfoils in compressible flow, and in unsteady motion. Mr. Berger (W)

265. Introduction to Rarefied Gas Dynamics. (3)
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. (3)
Three 1-hour lectures per week. Prerequisites: courses 261C, 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. (3)
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. (3)
Three 1-hour lectures per week. Prerequisite: course 261A. Studies of processes involving mutual interaction between fluid-dynamic, chemico-kinetic, heat- and mass-transfer phenomena.
Mr. Oppenheim (Sp)

269. Experimental Methods in Aerodynamics. (3)
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 (F)

290C. Turbulence. (3)
Three 1-hour lectures per week. Prerequisite: course 263B. A discussion of experimental facts about the characteristics of turbulent flows and about turbulent transport and diffusion. A survey of the status of turbulence theory. Aerodynamic noise. Turbulence as a forcing function on linear systems.
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 of high altitude flight. Physical and chemical characteristics. Atmospheric models. Experimental methods.
Mr. Hurlbut (Sp)

290E. Gas–Wave Dynamics. (3)
Three 1-hour lectures per week. Prerequisites: courses 261A and 268. Nonsteady gas dynamic problems solved by introducing wave generation, propagation, and interaction processes, with particular consideration of explosion and detonation phenomena.
Mr. Oppenheim (W)

290F. Advanced Problems in Jet Propulsion. (3)
Three 1-hour lectures per week. Prerequisite: course 266. Topics in fluid mechanics, physics and chemistry of particular interest to jet propulsion systems.
Mr. Oppenheim (F)

290G. Aircraft Stability and Control. (3)
Three 1-hour lectures per week. Prerequisites: 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 revolving a planetary atmosphere.
Mr. Laitone (Su)

297. Individual Study. (1–6)
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 of candidates for the Ph.D. and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis. The Staff
(Mr. Laitone in charge) (F, W, Sp, Su)

298. Group Studies, Seminars, or Group Research. (1–6)
Advanced study in various fields of aeronautical sciences on topics which may vary from year to year. The Staff (Mr. Laitone in charge) (F, W, Sp, Su)

299. Individual Study or Research. (1–12)
Investigation of advanced problems in aeronautical sciences. The Staff (Mr. Laitone in charge) (F, W, Sp, Su)

**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 slide conditions and inequality constraints. Applications to stationarity and minimum principles and to problems of optimal control and design of dynamical systems.
Mr. Leitmann, Mr. Rosenberg (Sp)

*272. Application of Computers to Problems in Engineering. (4)
Two 1-hour lectures and 1-hour analog session and one 3-hour digital computer laboratory session per week. Prerequisite: Mechanical Engineering 104A and 172A or 172B. The simulation of physical systems by analog and digital techniques. Analog simulation by electronic analog computer, dynamic analogies, resistance networks, conducting sheets; digital simulation by numerical techniques on the digital computer. Comparison of analytic, analog computer and digital computer solutions of selected problems.
Mr. Atkinson (Sp)

273A. Oscillations in Linear Systems. (3)
Mr. Soroka, Mr. Steidel (F, Sp)

273B. Random Oscillations. (3)
Three 1-hour lectures per week. Prerequisite: Mechanical Engineering 104A and Mathematics 2C. Non-deterministic excitation and response of damped and undamped dynamical systems. Probability distribution functions. Mean square values, autocorrelation functions, power spectral densities. Stationary, nonstationary, and ergodic processes. Applications to discrete and continuous dynamical systems, linear and nonlinear.
Mr. Soroka (W)

275. Advanced Dynamics. (4)
Mr. Goldsmith, Mr. Rosenberg (F)

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)

* Not to be given, 1966–67.
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-Cristoffel tensor and its properties, Riemannian and Euclidean spaces. Geometry of a surface, formulas of Weingarden and equations of Gauss and Codazzi. Mr. Nagldi, Mr. Hsu (F)

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. 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. Carroll, Mr. Nagldi, Mr. Hsu (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. 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 theories. Mr. Carroll, Mr. Nagldi, Mr. Hsu (Sp)

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 (F)

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. Multipolar kinematics and principles of conservation of mass, momentum, moment of momentum, and energy in the presence of multipolar stresses, entropy production inequality. Memory functionals, basic invariance principles, nonlinear constitutive equations for special type of continua with application. Mr. Nagldi (W)

286. Theory of Plasticity. (4)
Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 185. Fundamentals of plasticity, concept of yield and associated constitutive equations in the theory of elastic-plastic solids including those for perfectly plastic, and elastic-perfectly plastic solids. General theorems. Application to torsion and plane problems of plasticity. Mr. Christensen, Mr. Nagldi (F)

287. Impact. (4)
Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 185. Collision of solid bodies. Wave propagation and contact processes produced in elastic, plastic, and visco-elastic media by impulse or impact loading. Penetration, perforation and hydrodynamic phenomena. Special topics on materials to impact. Applications to spheres, rods, bars, beams, plates and semi-infinite solids. Mr. Goldsmith (W)

*288. Theory of Elastic Stability. (4)
Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 182 or course 282A. General concept 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 Trefitz, Goodier, Pearson, Hill and others. Mr. Hsu (F)

290A. Topics in Nonlinear Oscillations. (4)
Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: course 285. 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. Rosenbg (Sp)

*290B. 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 electro- and magnetized continua, and nonlinear theory of elastic-plastic continua. Mr. Nagldi (Sp)

*290C. 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 (F)

290D. Self-Excited Oscillations and Flutter. (3)

290E. Selected Topics in Wave Propagation in Anelastic Materials. (4)

290F. 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 ather 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)

* Not to be given, 1966-67.
2906. 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, Whitaker, Hadamard and Levi-Civita. Study basic in bridging micromechanics and macromechanics, also to ergodic theory, statistical thermodynamics, random processes, information handling, control and automation. The problem of three bodies examined in depth.
Mr. Lieber (W)

290H. Variational Principles of Fluid Dynamics and Thermodynamics. (4)
Three 1-hour lectures and one 1-hour discussion period per week. Prerequisite: Mechanical Engineering 175 and 185 is recommended. Formulation of variational principles of fluid dynamics and thermodynamics. Their application to selected theoretical and boundary value problems concerning motion of dissipative flows.
Mr. Lieber (Sp)

2901. Topics in Linear Continuum Theories. (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. Christensen, Mr. Hsu, Mr. Naghdi (W)

297. Individual Study. (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 and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis.
The Staff (Mr. Naghdi in charge) (F, W, Sp, Su)

298. Group Studies, Seminars, or Group Research. (1-6)
Advanced study in various fields of applied mechanics on topics which may vary from year to year.
The Staff (Mr. Naghdi in charge) (F, W, Sp, Su)

299. 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)
141. Particulate Materials. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 104 or Mechanical Engineering 103A 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 of particles.
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 fracturing of crystalline materials; interactions between dislocations and other defects; thermal 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)

198–1. Directed Group Studies for Advanced Undergraduates. (1–5)
Prerequisite: course 101 and 103. Group study of selected topics.
The Staff (F, W, Sp, Su)

198–2. Seminar in Ceramic Science and Engineering. (2)
Two 1-hour periods 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. Fulrath, Mr. Searcy (Sp)

199. Individual Studies or Research for Advanced Undergraduates. (1–5)
Enrollment limited to senior students in engineering, chemistry, geology, or physics whose scholastic records show a scholarship average of grade B or higher or whose records indicate a capacity for independent study.
The Staff (F, W, Sp, Su)

Graduate Courses

206. Nuclear Materials. (4)
Four 1-hour lectures per week. The behavior of fuel, moderator, control and structural materials in nuclear reactor environments with emphasis on the mechanism of irradiation damage and the effect of irradiation damage on the properties of materials.
Mr. Fulrath (W)

230. 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)

231. Applied Interfacial Phenomena. (3)
Three 1-hour lectures per week. Prerequisite: course 230 or equivalent. Applications of surface phenomena to engineering operations and the behavior of materials. Adsorption, wetting, detergents; flotation; corrosion, coagulation of particulate material, nucleation, semiconductor surface phenomena.
Mr. Fuerstenau (Sp)

233. 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, electronbeam melting, etc.); determination of purity.
Mr. Ravitz (F)

235. 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)

240. 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)

251. Solid State Theory. (3)
Three 1-hour lectures per week. Prerequisite: Physics 121 or equivalent and Chemistry 110B. A theoretical study of the metallic state emphasizing those properties of technological importance: bonding forces, crystal structure, electrical properties, magnetic properties, thermal properties, and optical properties.

252. Solid State Theory. (3)
Three 1-hour lectures per week. Prerequisite: course 251. A continuation of course 251. Electrical, magnetic and other physical properties of solids, with special emphasis on structure sensitive properties.

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)

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 104. 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 104 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 nonmetallic 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-fluid 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)

297. Individual Study. (1–6)
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 of candidates for the Ph.D. and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis. The Staff (F, W, Sp, Su)

298. Group Studies, Seminars, or Group Research. (1–5)
The Staff (F, W, Sp, Su)

299. Individual Study or Research. (1–12)
The Staff (F, W, Sp, Su)

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.
Mr. Cohen (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 useful for the solution of geological mapping problems. Intended for geologists, civil engineers, geological engineers, and other nongeophysics majors.
Mr. Ward (Sp)

Graduate Courses

200A–200B. Electromagnetic Propagation. (6–6)
Three 2-hour lectures per week. Prerequisite: Engineering 230A–230B; Physics 110C or Electrical Engineering 117A–117B–117D. Physics 210A–210B advisable. The theory of dispersive propagation, at VLF, ELF, and ULF frequencies, in inhomogeneous, anisotropic and layered media, including plasmas; dipole antennae; diffraction around obstacles of simple form. Numerous assignments are made of problems arising in geophysical engineering.
Mr. Ward (W, Sp)

201. Analysis of Potential Field Data in Geophysics. (4)
Four 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. Ward (Sp)
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 group per week; two 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 1-hour lecture and two 3-hour laboratories per week. Prerequisite: course 152A
154A. Preliminary design of a ship of the student's choice, including weight and size estimates, preparation of a line drawing, and a preliminary structural design. Mr. Paulling (W)
154B. A more detailed study of some single aspect of the design. 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)
Prerequisite: enrollment limited to students in engineering whose scholastic records show a scholarship average of grade B or higher or whose records indicate a capacity for independent study. Enrollment is subject to additional requirements imposed by the instructor concerned. Individual study and/or research on a problem chosen by the student and carried out under guidance of an instructor. The Staff (Mr. Paulling in charge) (F, W)

Graduate Courses

Three 1-hour lectures per week. Prerequisite: course 151. Design and performance of ship structures using rational methods. Predictions of force and moment systems applied to the structure; distributions of stresses, strains, and displacements; and interpretation of large-scale experiments and performance data. Mr. Schade (F, W, Sp)

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) (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. Faulling (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. Faulling (Sp)

297. Individual Study. (1–6)
**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 for the Ph.D. and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis.

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

298. Group Studies, Seminars, or Group Research. (1–5) Advanced study in various fields of naval architecture on topics which may vary from year to year.

The Staff (Mr. Wehausen 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)

**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.

(F, W, Sp)

165. Introduction to Nuclear Engineering. (5)
Three 1½-hour lectures per week. **Prerequisite:** 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.

(F, Sp)

199. Individual Studies for Advanced Undergraduates. (1–5)
**Prerequisite:** enrollment limited to senior students in engineering whose scholastic average is grade B or higher. Individual study and/or research carried out under guidance of an instructor.

(F, W, Sp, Su)

Graduate Courses

Three 1-hour lectures per week. **Prerequisite:** Physics 121 and 124 or 129A, Mathematics 120A–120B–120C. (Mathematics 120C may be taken concurrently with the consent of the instructor.) The physical principles governing the behavior of nuclear fission chain reactors. Neutron reactions, neutron slowing down, diffusion theory, age theory, transport theory, reflected and heterogeneous reactors, reactor kinetics, perturbation theory.

(F, W, Sp)

201. Radiation Detection Laboratory. (2)
One 4-hour laboratory period per week. **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.

(F, W)

202. Experimental Neutronics Laboratory. (2)
One 4-hour laboratory period per week. **Prerequisite:** course 201. Problems in experimental neutronics utilizing a nuclear reactor, subcritical reactor assemblies; accelerators as pulsed neutron sources.

(W, Sp)

203. Applied Science Laboratory. (2)
One 4-hour laboratory period per week. **Prerequisite:** Physics 121 and 124; Physics 112 or Mechanical Engineering 144A or Civil Engineering 144 or Chemistry 109. Problems in vacuum technology, X ray, mass and optical spectroscopy, ion acceleration, thermonic emission, solid state electronics, plasma diodes, lasers, nuclear magnetic resonance, measurement of atomic masses, fluid dynamics and thermodynamics.

252. Reactor Neutronics. (3)
Three 1-hour lectures per week. **Prerequisite:** course 250A and 250B. Neutronic theory applied to fast and thermal power reactors. Fuel depletion, conversion, and breeding; reactivity lifetime theory, fuel cycles; effects of changes in temperature, density, and power upon reactivity; interpretation of critical experiments; neutronics of coupled reactors; criticality in non-reactor systems.

(Sp)

260. Thermal Aspects of Nuclear Reactors. (5)
Three 1½-hour lectures per week. **Prerequisite:** Physics 112 or Mechanical Engineering 105A or Chemical Engineering 141A or Chemistry 109. Continuum conservation relations, reactor heat generation and temperature distribution from fission induced radiations in steady and transient cases. Heat removal by reactor coolants. Thermal stress analysis. Power cycles.
262. Reactor Shielding and Environmental Effects. (4)


264A–264B. Dynamics of Nuclear Systems. (3–3)

Three 1-hour lectures per week. Prerequisites: course 250A; course 264B may not be taken without completing 264A.

264A. Development of reactor system dynamics equations and transfer functions. Measurement of reactor parameters: Time-varying reactivity experiments, neutron waves, pulsed neutron experiments, noise analysis.

264B. Applications of linear techniques to reactor systems. Stability in the large, nonlinear analysis, linear and nonlinear optimal control using the methods of Pontryagin, Bellman and Liapounof. Spatial effects and the application of computers to reactor control problems. 264A (W); 264B (Sp).

270A–270B. Neutron Transport Theory. (3–3)


273. Neutron Scattering Theory. (4)

Three 1 1/2-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. (F, W)

290A. Controlled Thermonuclear Reactions. (4)

Prerequisite: consent of instructor. Electromagnetic, electrostatic and hydromagnetic wave propagation in ionized gases. Plasma instabilities. Current status of fusion research. (F)

290B. Biological Effects of Radiation and Radiation Safety. (5)

Prerequisite: consent of instructor. Safety criteria. Effects of charged particle and gamma radiations on cells and cell growth. (F)

290C. Integral Transform Methods in Neutron Transport Theory. (5)

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. (W)

290D. Thermoelectric and Thermionic Power Systems. (5)

Prerequisite: consent of instructor. Direct conversion of heat to electrical energy. Magnetohydrodynamic power systems. (Sp)

290E. Special Uses of Nuclear Explosives and Large Transients. (5)

Prerequisite: consent of instructor. Applications of nuclear explosives to earth moving, mining and fossil fuel recovery. (W)

290G. Neutron Thermalization. (4)

Prerequisite: consent of instructor. Neutron scattering in liquids and solids. Magnetic scattering, spin waves, polarization effects. (F)

290H. Advanced Topics in Reactor Theory. (3)

Prerequisite: consent of instructor. Gas and liquid phase reactors. Neutronics and transport theory for special systems. Energy conversion. (Sp)

290L. Radiation Damage and Sputtering. (5)

Prerequisite: consent of instructor. Interaction of atomic particles and photons with surfaces and bulk solids. Application to space power and propulsion problems. (Sp)

290M. Two Phase Flow. (3)

Prerequisite: consent of instructor. Two phase flow phenomena with emphasis on applications to nuclear power and propulsion systems. (Sp)

290N. Continuum Transport Phenomena. (5)

Prerequisite: course 260. Compressible flow analysis, shock phenomena in flowing systems and accompanying large transients, equations of state at high temperature and pressure, energy release and self-shutdown accompanying extreme reactor transients, thermal radiation and opacities, transient thermal stresses, flow and diffusion in the lower atmosphere. (Sp)

297. Individual Study. (1–6)

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 of candidates for the Ph.D. and D.Eng. Course to be taken on a satisfactory or unsatisfactory basis. (F, W, Sp, Su)

298. Seminars. (1–4)

Advanced group study in various fields of nuclear engineering. Topics vary from year to year. (F, W, Sp)

299. Individual Research. (1–12)

Investigation of advanced nuclear engineering problems. (F, W, Sp, Su)

Electronics Research Laboratory

Research in electrical sciences covers a vast range of activities, and the fruits of this research affect many of the other sciences and engineering disciplines. The Electronics Research Laboratory reflects this breadth, with investigations in six areas: (1) circuit and system theory; (2) electromagnetic problems in antennas and propagation; (3)
solid-state and semiconductor materials, mechanisms, and devices, including quantum electronics; (4) electron-stream interactions; (5) high- and low-temperature plasmas; (6) magnetic mechanisms and electromechanical energy conversion. The work is largely supported by contracts with the Federal Government, notably the Department of Defense and the National Science Foundation. The Laboratory's function is to coordinate research projects, assist in developing new projects, and provide facilities. The Laboratory is staffed by faculty members from the Department of Electrical Engineering, research assistants and other graduate students, as well as a number of fulltime researchers. 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; a wind-wave channel for studies of wind tides and generation of wind waves in shallow water; a large wave channel, serving also as a towing tank (see Naval Architecture Laboratory, below), for wave action studies on a large scale; and flumes and other facilities for investigations of sediment transportation in open channels.

**Industrial Engineering Laboratories**

The Department of Industrial Engineering maintains a Human Factors in Technology Laboratory, employing also the facilities of the Computer Center for analyses of great complexity. The laboratory is equipped to perform a variety of work measurements and experiments on human performance in control tasks. This laboratory maintains extensive and specialized equipment and instrumentation for graduate study and research. For information on advanced studies in operations research, see the Operations Research Center, described on page 270.

**Inorganic Materials Research Laboratory**

This laboratory is organized as a division of the Lawrence Radiation Laboratory, and is conducted by 25 faculty members and more than 100 graduate and postdoctoral students, plus a number of full-time researchers. Its programs attempt to answer the need for improved understanding of materials with applications or potential use in nuclear reactors, jet and rocket engines, spacecraft frames, and electronic devices. The laboratory's studies encompass a spectrum of research in fundamental properties of metals and inorganic, or ceramic, materials. Research topics include: synthesis of inorganic materials; kinetic and thermodynamic studies of high temperature chemical reactions; evaluation of influences of microstructure, composition, temperature, pressure and other variables of electrical and mechanical properties; radiation-effects studies; solid-state diffusion studies; and spectroscopic and mass spectroscopic investigations of high temperature vapors.

**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.

Berkeley Thermodynamics Laboratory
United States Bureau of Mines

The Berkeley Thermodynamics Laboratory of the United States Bureau of Mines is housed in the Hearst Mining Building and is closely associated with the Department of Mineral Technology of the University. This station has as its major function the measurement and correlation of thermodynamic values (heat capacities at low and high temperatures, entropies, heats of reaction, and free energies of reaction) of pure metallurgical and ceramic substances.

The chief of the laboratory serves as a University lecturer in alternate years and offers a course (Materials Science 240) in advanced metallurgical thermodynamics. He also serves formally as a consultant for the University’s project on thermodynamic properties of metals and alloys and informally as a consultant for other projects of the Department of Mineral Technology and for research of graduate students.

The personnel of the laboratory consists of ten full-time professional employees and two full-time clerical employees.

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, a small nuclear reactor, and subcritical assemblies moderated by light water and graphite. Data analysis is facilitated by three 400-channel pulse-height and time analyzer 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-flux research reactor with pulsing capability will soon be installed in a new on-campus laboratory now under construction.

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 kinetics 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**

The activities of the Operations Research Center are broadly concerned with the science of decision and its application; that is, the formulation and solution in mathematical terms of planning and control problems of man-machine systems.

Typical research topics are: integer programming, convex programming, solution of large-scale linear programming systems, life-test sampling plans, reliability theory, generalized networks, multicommodity networks, critical-path scheduling, Markov-renewal programming, mathematical methods of traffic and transportation systems, programming under uncertainty. Applied areas include forest management and fire control, biomathematical systems and air pollution.

The Center is closely associated with Industrial Engineering. Related graduate courses are listed under that department and also listed as part of the Engineering Science curriculum under the Operations Research options. Faculty, visiting scholars, postgraduate research fellows and graduate research assistants participate in the program of the Center.

**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.

**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, ion exchange, and other schemes.

**Soil Mechanics and Bituminous Materials Laboratory**

The Soil Mechanics and Bituminous Materials Laboratory situated at the Richmond Field Station provides extensive facilities for research on soil properties, soil mechanics, foundation engineering, and the behavior and properties of asphalts and asphaltic mixtures. Graduate students working towards master's or doctoral degrees in the Department of Civil Engineering conduct individual research in the laboratory 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, the supporting capacity of pile foundations, soil compaction, soil stabilization with admixtures, permeability of compacted clays, characteristics and mechanisms of soil creep, and rheologic characteristics and fatigue behavior of asphalt mixtures. The laboratory provides special facilities for work in these areas, in addition to equipment for standard tests on soils, 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 the Engineering Materials Laboratory building, 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.
Travis M. Bogard, Ph.D., Professor of English and of Dramatic Art.
Bertrand H. Bronson, Ph.D., D. ès L. (hon), Professor of English.
Frederick C. Crews, Ph.D., Professor of English.
Bertrand Evans, 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.
John H. Raleigh, Ph.D., Professor of English.
Alain Renoir, Ph.D., Professor of English and of Comparative Literature.
Mark Schorer, Ph.D., Litt.D., Professor of English.
Wayne Shumaker, Ph.D., Professor of English.
Louis A. M. Simpson, Ph.D., Professor of English.
Henry Nash Smith, Ph.D., Professor of English.
John L. Traugott, Ph.D., Professor of English.
Ernest Tuveson, Ph.D., Professor of English.
Lazar Ziff, Ph.D., Professor of English.

Arthur G. Brodeur, Ph.D., LL.D., Professor of English and Germanic Philology, Emeritus.

James M. Cline, Ph.D., Professor of English, 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.
Dorothée Finkelnstein, Ph.D., Associate Professor of English.
Thomas B. Flanagan, Ph.D., Associate Professor of English.
Norman Grabo, Ph.D., Associate Professor of English.
Thomson W. Gunn, M.A., Associate Professor of English.
Howard E. Hugo, Ph.D., Associate Professor of English.
Ulrich Knoepflmacher, 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, Associate Professor of English.

John Paterson, Ph.D., Associate Professor of English.

Norman Rabkin, Ph.D., Associate Professor of English.

Ralph W. Rader, Ph.D., Associate Professor of English.

Hugh M. Richmond, D.Phil., Associate Professor of English.

Robert Tracy, 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.
Elizabeth Closs, Ph.D., Assistant Professor of English.
John S. Coolidge, Ph.D., Assistant Professor of English and of Comparative Literature.
Jack D'Amico, Ph.D., Assistant Professor of English.
Carl Dawson, Ph.D., Assistant Professor of English.
Stanley G. Eskin, Ph.D., Assistant Professor of English.
Stanley E. Fish, Ph.D., Assistant Professor of English.
Donald M. Friedman, Ph.D., Assistant Professor of English.
Robert Haller, Ph.D., Assistant Professor of English.
Anthony Herbold, Ph.D., Assistant Professor of English.
Joseph E. Kramer, Ph.D., Assistant Professor of English.
Ojars Kratins, Ph.D., Assistant Professor of English.
Jay A. Levine, Ph.D., Assistant Professor of English.
David Littlejohn, Ph.D., Assistant Professor of English.
Robin Magowan, Ph.D., Assistant Professor of English.
Jonathan Middlebrook, Ph.D., Assistant Professor of English.
Masao Miyoshi, Ph.D., Assistant Professor of English.
Morton D. Paley, Ph.D., Assistant Professor of English.
Paul H. Piehler, Ph.D., Assistant Professor of English.
James H. Rieger, Ph.D., Assistant Professor of English.
George A. Starr, Ph.D., Assistant Professor of English.
Gardner D. Stout, Jr., Ph.D., Assistant Professor of English.
Herbert L. Sussman, Ph.D., Assistant Professor of English.
Paul Theiner, Ph.D., Assistant Professor of English.
Michael Zimmerman, Ph.D., Assistant Professor of English.
Alex Zwerdling, Ph.D., Assistant Professor of English.

John H. Barry, M.A., Acting Assistant Professor of English.
Noam Chomsky, Ph.D., Visiting Beckman Professor of English.
Mary C. Davison, M.A., Acting Assistant Professor of English.
George Farr, M.A., Lecturer in English.
Richard E. Hutson, M.A., Acting Assistant Professor of English.
E. James Knapton, M.A., Lecturer in English.
Anne Middleton, M.A., Acting Assistant Professor of English.
Raymond Oliver, M.A., Acting Assistant Professor of English.
Franklin Walker, Ph.D., Visiting Professor of English.
Hugh H. Witemeyer, M.A., Acting Assistant Professor of English.

The Department of English offers the undergraduate an opportunity to obtain a broad background in the history of British and American literature, as well as a thorough introduction to the principles of literary analysis and criticism. The major is built around a series of four staff courses taken in successive years. English 1A–1B grounds the student in the fundamentals of composition and literary analysis; English 46A–46B surveys the major works in English from Chaucer to Yeats; English 100 is designed to acquaint the student with a variety of critical approaches and to help him develop valid literary standards; English 151, the senior seminar, allows the student to bring to bear on the work of a single major author the range of techniques and knowledge acquired in previous years. Beyond these courses, the student may select according to the plan outlined below, a range of additional courses from virtually all of British and American literature and language. Collateral study in art, history, literature, philosophy, and language, though not specifically required, is recommended.
The Major


Upper Division 35 units of upper division courses in addition to any taken in the lower division, including English 100 (5) in the junior year; English 151 (5) in the senior year; 5 units of Chaucer or Age of Chaucer (155A, 155B, or 155Ch); 5 units of Shakespeare (117J, 117S, or 151S); 5 units of Milton or Age of Milton (154, 158B, or 151Mi); and 5 units of eighteenth- or nineteenth-century British literature.

Honors Program Students with an overall grade-point average of 3.0 or better may apply to the departmental honors committee 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 honors in English will be required to write a bachelor's thesis in their senior year, beginning the work in a section of English 151 and completing it in English H195 or H197.

Preceptorial Course Qualified English majors may, upon declaration of the major, apply for admission to an English preceptorial. A limited number of students will be accepted for preceptorial sections of no more than twenty-five students. Each will meet regularly during the junior year in noncredit group advisory conferences. In the senior year, the preceptor will be the group's instructor in an English 151 class and English 199 class. Throughout the two upper division years, the preceptor will be major adviser to all the members of the preceptorial. Requirements for admission: junior standing with completion of all English lower division requirements; grade-point average of at least 2.5 overall and 3.0 in English courses. Students may apply only at the beginning of the junior year; members of a preceptorial may drop at the end of any quarter. Students interested should inquire during registration week at the Department of English office, or of any English major adviser.

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 a candidate for the M.A. degree to pass a qualifying examination in French or German; Ph.D., candidates to pass examinations in Latin or Greek and in two of the following three languages: French, German, Italian. A student must pass at least one language examination before being admitted to a seminar and must complete one candidacy seminar to be considered for candidacy in the M.A. program.

Graduate Study

The M.A. Program Course 200 or 208, and course 213 are required for all graduate students, and should be completed as early as possible. While there are no other specific course requirements, the first two years of graduate study are normally spent preparing for the master's oral examination. This preparation should include the passing of at least one foreign language examination, the completion of a seminar, and any other courses which will provide a background sufficient for passing the oral examination. The oral examination will generally require a broad background in the entire history of English literature from Chaucer to the present, and a detailed familiarity with the ages of Chaucer, Shakespeare, and Milton.
The Ph.D. Program For details on requirements for the Ph.D., as well as requirements for the M.A., 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 72.

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. Raleigh in charge) (F, W, Sp, Su)

20. Modern British and American Literature. (5)
Three 1½-hour meetings per week.
Mr. Crews (F, Sp)

25. Language. (5)
Three 1½-hour meetings per week. Designed for sophomores, but open to students in the upper division. The origins and symbols of human speech; pattern, change, and growth in language; the interrelations of language, thought, and civilization. Emphasis on English, as written and spoken.
Miss Miles (W)

30. Introduction to American Literature. (5)
Three 1½-hour meetings per week.
Mr. Bridgman (F); Mr. Crews (W); Mr. Zimmerman (Sp)

33A–33B–33C. American Studies. (5–5–5)
Three 1½-hour meetings per week. Open to sophomores with the consent of instructor. Limited to 15 students. Not open to students taking History 33A–33B–33C or Political Science 33A–33B–33C. An honors course in the study of American culture, drawing on material from history, literature, political science, philosophy, and other fields. Discussion, the writing of essays, and occasional joint meetings with the staff and students of the two equivalent courses (History 33A–33B–33C and Political Science 33A–33B–33C).
Sequence, beginning in the fall. Mr. Breslin

40. Intermediate Expository Writing. (5)
Three 1½-hour meetings per week. Prerequisite: course 1A–1B or Speech 1A–1B or equivalent. (F)

41. Writing in Connection with the Reading of Important Books of the Nineteenth and Twentieth Centuries. (5)
Three 1½-hour meetings per week. Prerequisite: course 1A–1B or Speech 1A–1B, or consent of instructor.
Mr. Paley (W); Mr. Herbold (Sp)

43. Introduction to the Study of Poetry. (5)
Three 1½-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. Simpson (Sp)

44A–44B–44C. Masterpieces of Literature. (5–5–5)
Three 1½-hour meetings per week. Lectures on great works of the world's literature.
44A. Classical literature. Mr. Rabin (F)
44B. Medieval and Renaissance literature. Mr. Richmond (W)
44C. Literature since the seventeenth century. Mr. Hugo (Sp)

46A–46B. Survey of English Literature. (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.
The Staff (Mr. Stout in charge) (F, W, Sp, Su)

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 1½-hour meetings per week.
110A. Structure of English language.
Mr. Boyd (F, W)
110B. History of English language.
(Sp)

COURSES IN LITERATURE

114A–114B–114C. English Drama. (5–5–5)
Three 1½-hour meetings per week.
114A. English drama to 1603. Mr. Kramer (W)
114B. English drama 1603–1700. Mr. Kramer (Sp)
114C. British and American drama from 1860 to the present. Mr. Lutz (Sp)
115. Music and Poetry of the English Renaissance. (2)
Two 1½-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.

Mr. Orgel (Sp)

116. The English Bible as Literature. (5)
Three 1½-hour meetings per week. Mr. Jordan (F)

117A–117B. Shakespeare. (5–5)
Three 1½-hour meetings per week. A chronological survey of Shakespeare's career. 117A, Mr. McNulty (F, Sp); 117B, Mr. McNulty (W)

117E. Shakespeare for Nonmajors. (5)
Three 1½-hour meetings per week.

Mr. Herbold (W)

117J. Shakespeare. (5)
Three 1½-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. Anson (F); Mr. Traugott (W); Mr. McNulty (Sp)

117S. Shakespeare. (5)
Three 1½-hour meetings per week. Lectures on Shakespeare and reading of his best work.

Mr. Booth (F); Mr. Barish (W); Mr. Richmond (Sp)

119. The Age of Johnson. (5)
Three 1½-hour meetings per week. Mr. Alkon (W)

120A–120B. Medieval Literature. (5–5)
Three 1½-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.
120B. Close study of selected classics in translation, including the Nibelungenlied and Dante's Divine Comedy.

Mr. Alkon (W)

121. Romantic Period. (5)
Three 1½-hour meetings per week. Mr. Hugo (F)

122. Victorian Period. (5)
Three 1½-hour meetings per week. Mr. Tracy (W)

123. Nineteenth-Century British Prose. (5)
Three 1½-hour meetings per week.

Mr. Sussman (Sp)

125A–125B. The English Novel. (5–5)
Three 1½-hour meetings per week. 125A is not prerequisite to 125B.
125A. Defoe to Scott.
Mr. Rader (F)
125B. Dickens to Conrad.
Mr. Knoepflmacher (Sp)

125D. The Novel in Europe and America in the Nineteenth and Twentieth Centuries. (5)
Three 1½-hour meetings per week. Mr. Raleigh (F)

125E. The American Novel. (5)
Three 1½-hour meetings per week.
Mr. Ziff (W)

128. Regional Literature: California and the West. (5)
Three 1½-hour meetings per week.

Mr. Walker (W)

130A. American Literature before 1800. (5)
Three 1½-hour meetings per week.
Mr. Ziff (F)

130B. The American Renaissance. (5)
Three 1½-hour meetings per week.
Mr. Bridgman (W)

130C. American Literature: 1865–1900. (5)
Three 1½-hour meetings per week.

F; Mr. Hart (Sp)

130D. American Literature: 1900 to Present. (5)
Three 1½-hour meetings per week.

Mr. Parkinson (Sp)

149. The English Lyric. (5)
Three 1½-hour meetings per week. The development of the English traditions of structure and style in lyric poetry.

Miss Miles (F)

154. Milton. (5)
Three 1½-hour meetings per week.

Mr. Fish (W)

155A–155B. Age of Chaucer. (5–5)
Three 1½-hour meetings per week.

155A. Pearl Poet and early Chaucer.
Mr. Haller (F); Mr. Kratins (Sp)
155B. Langland and late Chaucer.
Mr. Muscatine (W, Su)

*156. Backgrounds of English Literature in the Continental Renaissance. (5)
Three 1½-hour meetings per week. A survey of the principal continental documents which are important to an understanding of the English Renaissance.

158A–158B. The English Renaissance. (5–5)
Three 1½-hour meetings per week.

158A. Beginnings of the English Renaissance, and literature of the sixteenth century.
Mr. Booth (Sp)
158B. Literature of the seventeenth century; satisfies the English major requirement of a course on Milton or the Age of Milton.
Mr. Richmond (F); Mr. Friedman (Sp)

160. British Literature from 1900 to the Present. (5)
Three 1½-hour meetings per week.

(F)

161. Recent British and American Poetry. (5)
Three 1½-hour meetings per week.

Mr. Zwerdling (W)

166. The Augustan Age. (5)
Three 1½-hour meetings per week.

Mr. Levine (F)

Group II: Restricted Courses

THE JUNIOR COURSE

100. Methods and Materials of Literary Criticism. (5)
Three 1½-hour meetings per week. (Sections limited to 20 students each.) Designed primarily for juniors whose major subject is English.

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

* Not to be given, 1966–67.
THE SENIOR COURSE

Sections limited to 20 students each. Prerequisite: course 100. 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. Bronson (F); Mr. Oliver (W);
Mr. Kratins, Miss Middleton (Sp, Su)

151G. Major Authors. (5)
Three 1½-hour meetings per week. The authors chosen vary from year to year. Those offered in 1966–67 are as follows: in the fall quarter, Yeats (Mr. Bloom), T. S. Eliot (Mr. R. Hutson), Melville (Mr. Walker), Donne (Mr. Herbold), and Ezra Pound (Mr. Simpson). In the winter quarter, Conrad (Miss Davison), Joyce (Mr. Raleigh), Pound (Mr. Witemeyer), Dryden (Mr. Levine). Also during the winter quarter preceptorial sections on Conrad (Mr. Burgess) and Swift (Mr. Stout) will be given. In the spring quarter S. Johnson (Mr. Alkon), Whitman (Mr. Breslin), Lawrence (Mr. Eskin), Arnold (Mr. Middlebrook), Pope (Mr. O Hehir), Keats (Mr. Paley), Twain (Mr. Smith).

151MI. Milton. (5)
Three 1½-hour meetings per week.
Mr. Richmond (F); Mr. Friedman (W);
Mr. Richmond (Sp, Su)

151S. Shakespeare. (5)
Three 1½-hour meetings per week.
Mr. D’Amico (F); Mr. Anson (W);
Mr. Booth (Sp, Su)

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. Preceptorial—meetings to be arranged. Prerequisite: open only to students in the honors program who have completed a section of 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. Zwering in charge) (F, W, Sp, Su)

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. Preceptorial—meetings to be arranged. 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. Zwering in charge) (F, W, Sp, Su)

SPECIAL STUDIES

199. Special Study for Advanced Undergraduates. (1–5)
Preceptorial: meetings to be arranged. Open to honor students who have completed 9 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. Bloom in charge) (F, W, Sp, Su)

ADVANCED COMPOSITION

(Open only to upper division students who have the consent of the instructor. With the consent of instructor, courses numbered 142 and 143 may be repeated without duplication for credit.)

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 only to qualified sophomores with consent of instructor. Writing in connection with readings in recent English literature and its continental backgrounds.
Mr. Parkinson (F); Mr. Burgess (Sp, Su)

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. Knapton (F); Mr. Evans (W); Mr. Stout (Sp, Su)

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. Rader, Mr. Stout

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.

*142D. Advanced Prose. (5)
Three 1½-hour meetings per week. Prerequisite: consent of instructor. Special section in advanced prose for teaching assistants, readers, and honors students in departments other than English.
Mr. Rader, Mr. Stout

143A. Short Fiction. (5)
Three 1½-hour meetings per week.
Mr. Burgess (W, Sp)

143B. Verse. (5)
Three 1½-hour meetings per week.
Mr. Simpson (W); Miss Miles (Sp)

*143C. Long Narrative. (5)
Three 1½-hour meetings per week. The student will work throughout the semester on a single project, either fiction (novel) or nonfiction (biography, history).
Mr. Schorer

* Not to be given 1966–67.
143D. Expository and Critical Writing. (5)
Three 1½-hour meetings per week. (Sp)

Teacher's Course

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 22-unit requirement in education for the general secondary credential.
Mr. Evans (F, W); Mr. Knapton (Sp, Su)

*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 Greek 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 1½-hour meetings per week.
Mr. Muscatine

203N. Readings in English Literature of the Neoclassical Period. (5)
Three 1½-hour meetings per week. Prerequisite: open to graduate students and (with consent of instructor) to advanced undergraduates.
Mr. Levine (W)

203R. Readings in Renaissance Literature. (5)
Three 1½-hour meetings per week. Prerequisite: open to graduate students and (with consent of instructor) to advanced undergraduates.
Mr. Orgel (F)

203RV. Readings in British Literature of the Romantic and Victorian Periods. (5)
Three 1½-hour meetings per week. Prerequisite: open to graduate students and (with consent of instructor) to advanced undergraduates.
Mr. Flanagan (F)

*204. Celtic Studies. (5)
Three 1½-hour meetings per week. This course may be repeated for credit.
Mr. Hutson

205. Structure of English. (5)
Three 1½-hour meetings per week. The structure of present-day English—pronunciation, grammar, vocabulary, dialects.
Mr. Boyd (F, W, Sp)

208. Problems in the Study of Literature. (5)
Three 1½-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 1966–67 will be as follows: In the fall quarter, Renaissance Literature (Mr. Barish), English Poetry from 1744–1798 (Mr. Alkon), Comedy (Mr. Taugott), Eighteenth Century Literature (Mr. Stout), Shakespeare (Mr. Rahkin), Modern British and American Literature (Mr. Raleigh), Romantic Theory (Mr. Reiger), Victorian Literature (Mr. Tracy), and Pastoral (Mr. Magowan). In the winter quarter, Renaissance Literature (Mr. Friedman), and James Joyce (Mr. O’Hehir). In the spring quarter, American Literature (Mr. Arp), Modern British and American Literature (Mr. Bloom), Renaissance and Medieval Rhetoric (Mr. Fish), and British Literature of the Romantic and Victorian Periods (Mr. Zwerdling).

210A–210B. Readings in Medieval Latin. (5–5)
Three 1½-hour meetings per week. Prerequisite: Latin 2 or equivalent. An introduction to the central language and literature of the Middle Ages.
210A: Verse, Mr. Jones (W);
210B: Prose, Mr. Jones (Sp)

211A. Introduction to Old English. (5)
Three 1½-hour meetings per week. Open to seniors with consent of the instructor. Rapid reading of Old English texts.
Mr. Theiner (F); Mr. A. Hutson (W);
Mr. Theiner (Sp)

211B. Beowulf. (5)
Three 1½-hour meetings per week.
Miss Middleton (F); Mr. Theiner (W);
Mr. A. Hutson (Sp)

213. Readings in Middle English. (5)
Three 1½-hour meetings per week. Rapid reading of selections in Middle English, and perhaps some entire poems, from the twelfth century to the fifteenth.
Mr. Kratins (W); Mr. Oliver (F, W, Sp);
Mr. Piehler (W); Mr. Theiner (F, W);
Miss Middleton (Sp)

SEMINARS

The following courses are normally given as a two-quarter sequence, with the first quarter prerequisite to the second. Students are expected but not required to complete both quarters of the sequence. In some instances, as specified below, only the second quarter of a course is offered; a course so offered is designed primarily for doctoral candidates and will not satisfy the seminar requirement for the master's degree.

*220A. Medieval Mind. (5)
One 2-to-3-hour meeting per week. Prerequisite: course 210 or equivalent. Literary culture of Western Europe without accent on geographical or linguistic distinctions.
Mr. Jones

220B. Medieval Mind. (5)
One 2-to-3-hour meeting per week.
Mr. Delaisé (Sp)

221A. History of the English Language. (5)
One 2-to-3-hour meeting per week.
Mr. Boyd

* Not to be given, 1966–67.
221B. The Old English Language. (5)

One 2-to-3-hour meeting per week. Prerequisite: a reading knowledge of German is recommended. Designed for students whose special interest is in linguistics. Old English and its Indo-European and Germanic backgrounds.

221C. The Middle English Language. (5)

One 2-to-3-hour meeting per week. Designed for students whose special interest is linguistics. The history of the English language from Late West Saxon to Chaucer.

221D. The Modern English Language. (5)

One 2-to-3-hour meeting per week. Designed for students whose special interest is linguistics. The history of the English language from Chaucer to the present. Rapid survey of contemporary dialects and of the structure of standard English.

223A–223B. Linguistics and Literary Analysis. (5–5)

One 2-to-3-hour meeting per week. The application of linguistic knowledge and methods of analysis to literary works. Mr. Boyd, 223A (W), 223B (Sp)

224A–224B. Forms and Techniques of Old English Literature. (5–5)

One 2-to-3-hour meeting per week. Prerequisite: two semesters of Old English. Sequence, beginning W. Mr. Renoir

225A–225B. Studies in Middle English Literature. (5–5)

One 2-to-3-hour meeting per week. Mr. Pichler (Sp)

226A–226B. The Popular Ballad. (5–5)

One 2-to-3-hour meeting per week. Mr. Bronson

230A. American Studies. (5)

One 2-to-3-hour meeting per week.

230B. American Literature. (5)

One 2-to-3-hour meeting per week.

230C. Regional Literature. (5)

One 2-to-3-hour meeting per week. Mr. Hart

230D. Anglo-American Literary Relations. (5)

One 2-to-3-hour meeting per week. Mr. Tuveson (Sp)

230E. American Drama. (5)

One 2-to-3-hour meeting per week. Prerequisite: consent of the instructor. Studies in American drama from the colonial period to the present.

245A–245B. Elizabethan Nondramatic Literature. (5–5)

One 2-to-3-hour meeting per week. Mr. McNulty


One 2-to-3-hour meeting per week. 247B, Miss Miles (W)

251A–251B. Romantic Period. (5–5)

One 2-to-3-hour meeting per week. 251A, Mr. Jordan (W); 251B (Sp)

252A–252B. Chaucer. (5–5)

One 2-to-3-hour meeting per week. 252B, Mr. Muscatine (Sp)

253A–253B. Studies in Shakespeare. (5–5)

One 2-to-3-hour meeting per week. 253A, Mr. Orgel (W); 253B (Sp); 253A, Mr. Rabkin (W); 253B (Sp)

254A–254B. Elizabethan Drama. (5–5)

One 2-to-3-hour meeting per week. 254A, Mr. Barish, (W), 254B, (Sp)

255A–255B. Restoration and Eighteenth-Century Drama. (5–5)

One 2-to-3-hour meeting per week. Mr. Traugott

256A–256B. Milton and His Contemporaries. (5–5)

One 2-to-3-hour meeting per week. Mr. Coolidge

257A–257B. Literary Criticism. (5–5)

One 2-to-3-hour meeting per week.

258A–258B. Johnson and His Contemporaries. (5–5)

One 2-to-3-hour meeting per week. 258A, 258B, Mr. Rader (W, Sp)

260A–260B. Modern British Literature. (5–5)

One 2-to-3-hour meeting per week. 260A, Mr. Parkinson (W); 260B, (Sp)

262A–262B. Victorian Period. (5–5)

One 2-to-3-hour meeting per week. 262A, Mr. Flanagan (W); 262B, (Sp)


One 2-to-3-hour meeting per week. 264A, Mr. Coolidge (W); 264B, (Sp)

266A–266B. Period from 1660–1744. (5–5)

One 2-to-3-hour meeting per week. 266A, Mr. Traugott (W); 266B, (Sp)

269A–269B. Theory of Fiction. (5–5)

One 2-to-3-hour meeting per week. 269A, Mr. Crews (W); 269B, (Sp); 269A, Mr. Paterson (Sp)

297. Individual Study. (1–10)

Prerequisite: a master's degree from another institution or completion of at least 24 semester hours beyond the A.B. Individual study, in consultation with the graduate adviser, intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D.

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

298. Special Studies. (5–10)

Normally reserved for students directly engaged upon the doctoral dissertation.

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

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) (F, W, Sp Su)

* Not to be given, 1966–67.
ENTOMOLOGY AND PARASITOLOGY

(Department Office, 122 Giannini Hall)

John E. Casida, Ph.D., Professor of Entomology.
Roderick Craig, Ph.D., Professor of Entomology.
Richard L. Doult, Ph.D., LL.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 (Vice-Chairman of the Department).
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. Middlekauff, 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 Invertebrate Pathology.
Robert L. Usinger, Ph.D., Professor of Entomology.
William M. Hoskins, Ph.D., Professor of Entomology, Emeritus.
Abraham E. Michelbacher, Ph.D., Professor of Entomology, Emeritus.
Howell V. Daly, Jr., Ph.D., Associate Professor of Entomology.
Rudolph L. Pipa, Ph.D., Associate Professor of Entomology.
David L. Wood, Ph.D., Associate Professor of Entomology.
John R. Anderson, Ph.D., Assistant Professor of Parasitology.
James H. Oliver, Jr., Ph.D., Assistant Professor of Entomology.
Clarence J. Weinmann, Ph.D., Assistant Professor of Parasitology.

Undergraduate Major Adviser: Mr. Wood.
Graduate Advisers for Entomology: Mr. Freitag, Mr. Middlekauff, Mr. Pipa.
Graduate Adviser for Parasitology: Mr. Weinmann.

The Department of Entomology and Parasitology in the College of Agriculture offers the entomology major in the Agricultural Sciences Curriculum (see page 130). 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 (6); pathology (4); additional biological sciences (23).

**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.

**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, vertebrate 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 or 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, please 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, Mr. Hurd (F)

**Upper Division Courses**

100. General Entomology. (4)

Lectures, 2 hours per week; laboratory, 6 hours per week. 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, 1 hour per week; laboratory, 9 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. (4–4)

Lectures, 2 hours per week; laboratory, 6 hours per week. Prerequisite: upper division standing in

† No units are indicated for this requirement since is 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.
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)
(Formerly numbered 112)
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)
(Formerly numbered 127)
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. Smith, Mr. Messenger (Sp)

109. Entomology Field Practice Course. (5)
(Formerly numbered 49)
Five weeks, daily. Prerequisite: one course in entomology. Mr. Bohart, Mr. Hurd, Mr. Powell (Extrasession)

110. Economic Entomology. (5)
(Formerly numbered 124)
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 (F)

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 trip, 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)

117. Insect Toxicology. (4)
(Formerly numbered 128)
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)

130. Biological Control of Insect and Weed Pests. (4)
(Formerly numbered 129)
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 (F)

140. Insect Pathology. (4)
(Formerly numbered 131)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: course 100, and 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. Helminthology. (6)
(Formerly numbered 117)
Lectures, 3 hours per week; laboratory, 9 hours per week. Helminthic infections of man and domestic animals. Biology, host-parasite interrelationships, identification, prophylaxis, and therapy. Mr. Furman, Mr. Weinmann (Sp)

153. Medical Entomology. (5)
(Formerly numbered 126)
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. (1-6)
The Staff (Mr. Smith in charge) (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (1-5)
The Staff (Mr. Smith in charge) (F, W, Sp, Su)

Graduate Courses

204. Principles of Systematic Entomology. (3)
(Formerly numbered 212)
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, zoogeography, and nomenclature. Mr. Linsley, Mr. Usinger (W)

205. Population Ecology. (3)
(Formerly numbered 227)
Lectures, 3 hours per week. Prerequisite: course 105. To be offered in odd-numbered years. Population dynamics, regulation, and mensuration theory of natural control. Mr. Huffaker, Mr. Messenger (Sp)

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. Biomechanics 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 past and present research topics in forest entomology and the past and current research from which they are derived.
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 103. 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)
(Formerly numbered 231)
Lectures, 3 hours per week; laboratory, 3 hours per week. Prerequisite: courses 102A, 102B, 140. Advanced consideration of infectious and noninfectious diseases of insects, diagnosis, symptomatology, morphopathology, physiopathology, epizootiology, and microbial control.
Mr. Tanada, Mr. Poinar (Sp)

250. Advanced Helminthology. (2)
Lectures, 2 hours per week. Prerequisite: course 150 or Zoology 156. To be given in odd-numbered years. Helminth physiology and host-parasite interactions.
Mr. Furman, Mr. Anderson, Mr. Weinmann (F)

253. Advanced Medical Entomology. (2)
(Formerly numbered 226)
Lectures, 2 hours per week. Prerequisite: course 153; Public Health 180A and 180B. To be given in even-numbered years. The genetics of arthropod-borne and vector-borne diseases.
Mr. Furman, Mr. Anderson, Mr. Weinmann (F)

250. Plant Nematology. (5)
(Formerly numbered 118)
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 nematic infections in cultivated crops.
Mr. Furman, Mr. Anderson, Mr. Weinmann (F)

263. Acarology. (5)
(Formerly numbered 119)
Lectures, 2 hours per week; laboratory, 6 hours per week, plus 3 additional laboratory hours to be arranged. Prerequisite: courses 100, 101, 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 even-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 (F)

*269. History of Entomology. (4)
(Formerly numbered 232)
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)
(Formerly numbered 250)
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)

275. Immature Insects. (4)
Lecture, 1 hour per week; laboratory, 9 hours per week. Prerequisites: courses 100, 101. To be given in odd-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) (F, W, Sp, Su)

290. Seminar in Agricultural Entomology. (2)
May be repeated for credit.
Mr. Allen, 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. Hurd, Mr. MacSwain, Mr. Usinger (W, Sp)

295. Seminar in Insect Ecology and Biological Control. (2)
May be repeated for credit.
Mr. Doty, Mr. Hufacker, Mr. Messenger, Mr. Smith (F, Sp)

296. Seminar in Forest Entomology. (2)
May be repeated for credit.
Mr. Dahlsten, Mr. Stark, Mr. Wood (F)

297. Individual Study. (1–6)
Prerequisite approval of graduate adviser. Individual study intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. The Staff (Mr. Smith in charge) (F, W, Sp, Su)

* Not to be given 1966–67.
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) (F, W, Sp, Su)

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) (F, W, Sp, Su)

Staff Seminar in Entomology. (No credit)
Biweekly meeting for presentation of special topics.
The Staff (Mr. Smith in charge) (F, W, Sp)

☐ 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

German

Italian
130. Dante’s Divine Comedy.
140. Dante, Petrarch, and Boccaccio.

Near Eastern Languages
163A–163B. History of Persian Literature.
168A–168B. Survey of Turkish Literature.

Oriental Languages
22. Indonesian Civilization.
142C. Civilizations of Eastern Asia: China.
142J. Civilizations of Eastern Asia: Japan.
142K. Civilizations of Eastern Asia: Korea.
142M. Civilizations of Eastern Asia: Mongolia.
152. Japanese Literature and the West.
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.
131. Russian Literature from 1880–1917.
132. Russian Literature since 1917.
133A–133B–133C. The Russian Novel and its Relations to West European Literatures.
134A. Dostoevsky.
134B. Tolstoy.
134C. Chekhov.
135. Russian Drama from the Seventeenth Century to the Twentieth.
136. Russian Folklore.
140A–140B–140C. Survey of West and South Slavic Literatures.
143. Introduction to Modern Slavic Literary Theory.
155. Polish Romanticism.
156. The Polish Theater.
159. Contemporary Polish Poetry and Fiction.

Hungarian

Portuguese
39C–39D. Brazilian Literature in English Translation.

Spanish

FOLKLORE

William R. Bascom, Ph.D., Professor of Anthropology (Chairman of the Executive Committee, Folklore Program).
Bertrand Bronson, Ph.D., Professor of English.
Wolfram Eberhard, Ph.D., Professor of Sociology.
Joseph Fontenrose, Ph.D., Professor of Classics.
Alan Dundes, Ph.D., Associate Professor of Anthropology and of Folklore (Graduate Adviser of the Folklore Program).
Ruth Boyer, Ph.D., Assistant Professor of Decorative Art.

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 thirty units of which at least twelve 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 Kroeber.

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 Folktales 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 folklore, and methods of analyzing prose narrative.

298. Readings in Folklore. (3-6)  Individual conferences to be arranged.  The Staff (Mr. Bascom, Mr. Dundes in charge) (F, W, Sp)

299. Directed Research. (3-6)  Individual conferences to be arranged.  The Staff (Mr. Bascom, Mr. Dundes in charge) (F, W, Sp)

Related Courses in Other Departments

The Forms of Folklore (Anthropology 159)
Narrative Folklore (Anthropology 160)
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

(Department Office, 145 Mulford Hall)

Harold H. Biswell, Ph.D., Professor of Forestry.
Robert A. Cockrell, Ph.D., Professor of Forestry.
Robert N. Colwell, Ph.D., Professor of Forestry.

* Not to be given, 1966-67.
Fred E. Dickinson, Ph.D., Professor of Forestry.
Rudolf F. Grah, Jr., Ph.D., Professor of Forestry
Harold F. Heady, Ph.D., Professor of Forestry.
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).
Paul J. Zinke, Ph.D., Associate Professor of Forestry.
John A. Helms, Ph.D., Assistant Professor of Forestry.
William J. Libby, Ph.D., Assistant Professor of Forestry.
William L. M. McKillop, Ph.D., Assistant Professor of Forestry.
Dennis Teeguarden, Ph.D., Assistant Professor of Forestry.
Arthur B. Anderson, Ph.D., Lecturer in Wood Chemistry.
David L. Brink, 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 Wood Technology.
Herbert C. Sampert, M.F., Lecturer in 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 are listed on page 82.

*Letters and Science List. Courses 10, 122, 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 Courses**

10. Forest and Wildland Resource Management. (4)
Three 1-hour lectures and one 1-hour conference per week. Principles of use and management of forests and other wildlands in relation to the needs of society for wood, water, forage, and recreation; forestry and conservation policies and programs.
Mr. Zivnuska (W)

46. Ecology of Forests and Associated Wildlands. (5)
Prerequisite: General Biology 1A-1B-1C. Prerequisite to all required courses in the curriculum in forestry. Offered only at U. C. Forestry Camp, Meadow Valley. 150 hours of field instruction.
Mr. Libby (Extra session)

47. Measurement and Utilization of Forests and Associated Wildland Resources. (5)
Prerequisite: mechanical drawing, one-half year; Engineering 21. Prerequisite to all required courses in the curriculum in forestry. Offered only at U. C. Forestry Camp, Meadow Valley. 150 hours of field instruction.
Mr. Teeguarden (Extra session)

48. Management of Forests and Associated Wildlands. (5)
Prerequisite: mechanical drawing, one-half year; Engineering 21; General Biology 1A-1B-1C. Prerequisite to all required courses in the curriculum in forestry. Offered only at U. C. Forestry Camp, Meadow Valley. 150 hours of field instruction.
Mr. Libby (Extra session)

**Upper Division Courses**

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. McKillop (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 photography; geometry of aerial photographs; mapping from aerial photographs; fundamentals of photographic 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 lectures and one 3-hour laboratory per week. Upper division students in other departments may be admitted with consent of instructor. Not open to students in Option III. Gross and Mi-
mote 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: Physics 2A–2B. 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. Seniors 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. Graham (W)

114. Decision-Making in Resource Management. (5)

Three 1-hour lectures and one 4-hour laboratory per week. One field trip to be arranged. Prerequisite: courses 113 and 125; Mathematics 16A–16B or equivalent. Concepts and techniques of decision-making in forestry and wildland resource management and their application to selected problems. Mr. Teguarden (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 silvic 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: Physics 2A–2B, Soil Science 100. Microclimate, hydrology, and soil as influenced by forests and associated vegetation in relation to the regional variables of climate and air-mass movement, geology, topography, and vegetation type and structure. Mr. Zinke (W)

123. Physiological Plant Ecology. (4)

Three 1-hour lectures and one 4-hour laboratory per week. Prerequisite: Soil Science 100, Botany 140; 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 along various multidimensional environmental gradients. Mr. Stone (Sp)

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. Mr. Schultze (F)

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. Periodicity and patterns of tree growth; stand development; crown and tree classifications; natural and artificial regeneration; methods of improving quality and growth of stands; silvicultural systems of manipulating forests. Regional silviculture on national and local level. Mr. Helms (W)

126. Culture of Nonforest Wildland Vegetation. (3)

Two 1½-hour lectures and one 1-hour discussion section 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 recreational 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: Physics 2A–2B–2C. Seniors 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—
134. Mechanics of Wood. (4)
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: course 131, Engineering 18A–18B; upper division students from other departments may be admitted with consent of instructor. Elasticity, strength, and rheology 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: Physics 2A–2B–2C; Chemistry 8A–8B or Chemistry 12A–12B; upper division or graduate 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)

186. 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 back ground 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) (F, W, Sp)

Graduate Courses

201. Advanced Quantitative Methods. (3)
One 3-hour meeting per week. Statistical estimation of forest quantities and relationships. Models and their use in research and management; equation systems; computer based methods in forestry.
Mr. O'Regan (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 reconnaissance. 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 group conference 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 (F)

211. Seminar in Analysis of the Forest Economy. (3)
One 2-hour seminar and one 1-hour conference 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. Teeuween (W)

Two 1½-hour lecture-discussion periods per week. Prerequisite: course 115 or equivalent.
Mr. Teeguarden (W); Mr. Grah (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)

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)

225. Advanced Silviculture. (3)
Two 1½-hour lectures per week. Prerequisite: course 125.
Mr. Helms (F)

229. Seminar in Silviculture. (3)
One 3-hour seminar per week. Prerequisite: course 125.
Mr. Helms (F)

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 2-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)

297. Individual Study. (1–7)
The Staff (Mr. Zivnuska in charge) (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)

299. Individual Research. (1–12)
The Staff (Mr. Zivnuska in charge) (F, W, Sp)
FRENCH

(Department Office, 4125 Dwinelle Hall)

Alexandre E. Calame,\(^a\) Docteur ès Lettres, Professor of French, (Chairman of the Department).
Francis J. Carmody, \(^a\) Ph.D., Professor of French.
Marie-Louise Dufrenoy, Ph.D., Professor of French, Emeritus.
Alvin A. Eustis, Jr., \(^a\) Ph.D., Professor of French.
Irving Putter, Ph.D., Professor of French.
Warren Ramsey, \(^1\) Ph.D., Professor of French and of Comparative Literature.
Manfred M. G. Sandmann, \(^1\) 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.
Percival B. Fay, Ph.D., Professor of French, Emeritus.
Arnold H. Rowbotham, Ph.D., Professor of French, Emeritus.
Clifford H. Bissel, 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.
Basil Guy, Ph.D., Associate Professor of French.
Edward F. Meylan, Ph.D., Associate Professor of French.
Walter E. Rex, \(^a\) Ph.D., Associate Professor of French.
Joseph J. Duggan, Ph.D., Assistant Professor of French.
Lionel R. Duist, Ph.D., Assistant Professor of French.
Robert W. Greene, Ph.D., Assistant Professor of French.
John L. Grisby, Ph.D., Assistant Professor of French.
Leonard W. Johnson, Ph.D., Assistant Professor of French.
Colin W. Nettelbeck, \(^1\) Dr. d'Université (Paris), Assistant Professor of French.
Jack R. Vrooman, \(^a\) Ph.D., Assistant Professor of French.
Seth L. Wolitz, Ph.D., Assistant Professor of French.

William Daoust, B.A., Lecturer in French.
Andrée M. Darling, Agrégée, Instructor of French.
Michelle Guérin, Diplôme d'Études Supérieures, Acting Instructor of French.
Anne-Marie Lobrot, Licenciée ès Lettres, Lecturer in French and in Comparative Literature.

Anne-Marie Naffakh, Agrégée, Instructor of French.
Anne Prah-Pérochon, Diplôme d'Études Supérieures, Lecturer in French.
Jean Phan-Chan-Thé, Diplôme d'Études Supérieures, Acting Instructor of French.
Jacques Vaillant, Diplôme d'Études Supérieures, Associate 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, 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, 5 (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).

\(^a\) In residence winter and spring only, 1966-67.
\(^1\) Absent on leave, 1966-67.
\(^1\) On leave in residence, fall quarter only, 1966.
\(^1\) On leave in residence spring semester only, 1966-67.
\(^1\) On leave in residence fall and winter quarters, 1966-67.
Certificate of Completion in French

Requires the equivalent of the major and courses 130A, 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 72.

Lower Division Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Elementary French. Beginner's Course. (4)</td>
<td>Four 1-hour classes and two 1-hour laboratories per week.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
<tr>
<td>2.</td>
<td>Elementary French. (Continuation of 1). (4)</td>
<td>Four 1-hour classes and two 1-hour laboratories per week. Prerequisite: course 1 or equivalent.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
<tr>
<td>3.</td>
<td>Intermediate French. (5)</td>
<td>Five 1-hour classes per week. Prerequisite: course 2 or equivalent.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
<tr>
<td>4.</td>
<td>Intermediate French. (Continuation of 3). (5)</td>
<td>Five 1-hour classes per week. Prerequisite: course 3 or equivalent.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
<tr>
<td>5A–5B.</td>
<td>Advanced French. (4–4)</td>
<td>Five 1-hour classes per week. Prerequisite: course 4 or equivalent. Composition and conversation. Sequence, beginning each quarter.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
<tr>
<td>5AB.</td>
<td>Advanced French. (8)</td>
<td>Five 2-hour classes per week. Prerequisite: course 4 with a grade of A or B. Composition and conversation; an intensive course for prospective majors.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
<tr>
<td>5R.</td>
<td>Advanced French. (4)</td>
<td>Five 1-hour classes per week. Prerequisite: course 4 or equivalent. Reading; study and translation of French texts; classroom work in English.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
<tr>
<td>35.</td>
<td>Advanced French. (2)</td>
<td>Three 1-hour classes per week. Prerequisite: course 5B or equivalent. Pronunciation; required for the major.</td>
<td>(in charge) (F, W, Sp Su)</td>
</tr>
</tbody>
</table>

44. Methods of Literary Study. (4)

Five 1-hour classes per week. Prerequisite: course 5B or equivalent. Highly recommended for the major. Mr. Nettlebeck (F, W); Mr. Augst (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.

101. Intensive Reading, Grammar, and Composition. (4)

Three 1-hour classes per week. Prerequisite: courses 5B and 35. Required for the major. ——— (in charge) (F, W, Sp, Su)

102. Intensive Reading, Grammar, and Composition. (Continuation of 101). (4)

Three 1-hour classes per week. Prerequisite: course 101. Required for the major. ——— (in charge) (F, W, Sp, Su)

106A–106B. Introduction to French Linguistics. (4–4)

Three 1-hour classes per week.
106A. Sounds and spelling (introduction to historical grammar); words (elementary semantics and linguistics geography). Mr. Sandmann (W) 106B. Construction (personal and impersonal, verbal and nominal, coordinating and subordinating, etc.). Mr. Sandmann (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. ——— (F, W)


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.

110A–110B. The Middle Ages. (4–4)

Three 1-hour classes per week. Mr. Grigsby (F, W)

*Not to be given, 1966–67.
112A–112B. The Nineteenth Century. (4–4–4)
Three 1-hour classes per week.
Mr. Putter (F, W, Sp)

114A–114B. Contemporary Literature. (4–4)
Three 1-hour classes per week. Mr. Greene (F, W)

115A–115B. Modern Drama. (4–4)
Three 1-hour classes per week. Mr. Augst (F, Sp)

116A–116B. Literature from 1885 to 1914. (4–4)
Three 1-hour classes per week.
Mr. Carmody (W, Sp)

118A–118B. The Sixteenth Century. (4–4)
Three 1-hour classes per week.
Mr. Meylan (F, W)

*120A–120B. The Seventeenth Century. (4–4)
Three 1-hour classes per week. Mr. Eustis (F, W)

121A–121B. The Eighteenth Century. (4–4)
Three 1-hour classes per week. Mr. Guy (F, W)

130A–130B. Advanced Composition. (4–4)
Three 1-hour classes per week. Prerequisite: course 102. 130A is required for the major; 130B is required for the Certificate of Completion in French. Sequence, beginning each quarter:
130A, — (in charge) (F, W, Sp, Su); 130B, — (in charge) (W, Sp)

*130C. Advanced Composition. (4)
Three 1-hour classes per week. Prerequisite: course 130B. — (F, 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, Mr. Johnson (in charge) (W); — (in charge) (Su)

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.
— (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (2–5)
Individual appointments. Restricted to senior honor students with 3.0 or better in French.
The Staff (Mr. Meylan in charge) (F, W, Sp, Su)

Courses in Which No Knowledge of French Is Required

Three 1-hour classes per week.
39A. To the end of the eighteenth century. — (in charge) (F, W, Sp)
39B. The nineteenth century. — (in charge) (W, Sp)
39C. The contemporary period.
Mr. Duggan (F, Sp)

*142A–142B. French Literature of the Middle Ages in English Translation. (4–4)
Three 1-hour classes per week.
142A. Epic, romance, history. — (F, W, Sp)
142B. Drama, lyric and allegorical poetry. — (Sp)

*146A–146B. Contemporary French Literature in English Translation. (4–4)
Three 1-hour classes per week.
Mr. Grigsby (Sp)

Graduate Courses

201A–201B–201C. Historical Grammar. (4–4–4)
One 2-hour class and one 1-hour class per week. Mr. Walpole (F, W, Sp)

202A–202B. Studies in Medieval Literature. (4–4)
One 2-hour class per week. Mr. Walpole (F, W)

203A–203B. French Syntax. (4–4)
One 2-hour class per week.
Mr. Sandmann (F, W)

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.
Mr. Carmody (Sp)

206A–206B. Reading and Interpretation of Typical Old French Texts. (4–4)
One 2-hour class per week.
206A, Mr. Grigsby (F); Mr. Duggan (Sp); 206B, Mr. Grigsby (W); — (Su)

One 2-hour class per week. Mr. Guy (F, W)

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. — (W, Sp)

*210A–210B. Studies in the Eighteenth-Century Drama. (4–4)
One 2-hour class per week. — (W, Sp)

*214A–214B. Seminar on Modern Drama. (4–4)
One 2-hour class per week. Prerequisite: consent of instructor.
Mr. Augst (W, Sp)

*215A–215B. Literary Symbolism and Its Twentieth-Century Developments. (4–4)
One 2-hour class per week. Mr. Ramsey (W, Sp)

*216A–216B. Poetry of the Renaissance. (4–4)
One 2-hour class per week. — (W, Sp)

* Not to be given, 1966–67.
217A–217B. Humanism in the Renaissance. (4–4)
One 2-hour class per week. Mr. Meylan (W, Sp)

218A–218B. Classicism. (4–4)
One 2-hour class per week. Mr. Calame (W, Sp)

219A–219B. Studies in Nineteenth-Century Prose. (4–4)
One 2-hour class per week. Mr. Duisit (W, Sp)

220A–220B. Explication de Textes. (4–4)
One 2-hour class per week. Mr. Duisit (F, Sp); Mr. Duisit (W)

221A–221B. La Dissertation Littéraire. (4–4)
One 2-hour class per week. Required of all candidates for the M.A. degree.
Mr. Duisit (F); Mr. Duisit (W)

225. Seventeenth-Century Religious Texts. (4)
One 2-hour class per week.
Mr. Rex (Sp)

226A–226B. Editing of Medieval Texts. (4–4)
One 2-hour class per week. Prerequisite: consent of instructor.
Mr. Grigsby (W, Sp)

230A*–230B. Literary Criticism. (4–4)
One 2-hour class per week.
230A. From the origins to the end of the eighteenth century. Mr. Eustis (W)
230B. From 1800 to the present. Mr. Eustis (F)

235. Methods of Literary Research. (2)
One 3-hour class per week.
Mr. Grigsby (F)

241A–241B. Studies in Surrealism. (4–4)
One 2-hour class per week.
Mr. Carmody (W, Sp)

295. Special Study for Graduate Students. (2)
Individual appointments. Primarily for students engaged in preliminary research in a given field. May not be substituted for available seminars.
The Staff (Mr. Sandmann and Mr. Walpole in charge) (F, W, Sp, Su)

297. Individual Study. (2–9)
Individual appointments. Prerequisite: an M.A. or completion of at least 24 units beyond the A.B. Intended to allow Ph.D. candidates to bring together their work in a particular field in the quarter immediately preceding the Qualifying Examinations.
The Staff (Mr. Sandmann and Mr. Walpole in charge) (F, W, Sp, Su)

299. Individual Research. (5–9)
Individual appointments. Normally reserved for students directly engaged upon the doctoral dissertation.
The Staff (Mr. Sandmann and Mr. Walpole in charge) (F, W, Sp, Su)

1GA. French for Graduate Students, Beginning. (0)
Three 1-hour classes per week. Preparation for graduate reading examinations in field of English. Course must be taken on a pass or fail basis.

1GB. French for Graduate Students, Advanced. (0)
Three 1-hour classes per week. Preparation for graduate reading examinations in the sciences. Course must be taken on a pass or fail basis.

1GC. French for Graduate Students, Beginning. (0)
Three 1-hour classes per week. Preparation for graduate reading examinations in all other disciplines. Course must be taken on a pass or fail basis.

2GA. French for Graduate Students, Advanced. (0)
Three 1-hour classes per week. Preparation for graduate reading examinations in field of English. Course must be taken on a pass or fail basis.

2GB. French for Graduate Students, Advanced. (0)
Three 1-hour classes per week. Preparation for graduate reading examinations in the sciences. Course must be taken on a pass or fail basis.

2GC. French for Graduate Students, Advanced. (0)
Three 1-hour classes per week. Preparation for graduate reading examinations in all other disciplines. Course must be taken on a pass or fail basis.

100. The Teaching of French at the Secondary Level. (4)
Two 1½-hour classes per week. Required for the Certificate of Completion in French.
Mr. Daoüst (F, Sp)

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.

William J. Libby, Jr., Ph.D., Assistant Professor of Forestry.

* Not to be given, 1966–67.
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 Agriculture, 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 130), are as follows:

**Humanities and Social Sciences**, 36 units as follows: English, speech, or comparative 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**, 44 units as follows: chemistry (20); mathematics (6); statistics (6); 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**, 33 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 (15 units); Chemistry 1A, 1B, 1C (12 units) or 12A, 12B, 112 (15 units); Chemistry 8A, 8B (8 units); Physics 2A, 2B, 2C (12 units); Mathematics 16A, 16B (6 units). Recommended: Chemistry 5, 14.

**Upper Division Courses** Required: Bacteriology 100A, 100B (8 units); Biochemistry 102 (or 100A, 100B, 100C) (4 units); Botany 130 (or Zoology 110A, 110B) (5 units); Genetics 100 (or Zoology 150) (3 units); Genetics 100C, 110, 131, 140 (15 units). Recommended: Molecular Biology 111 (4 units); Public Health 160A, 160B, 160C (12 units); Zoology 101 (4 units).

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, preferably German. 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, please consult the graduate adviser.

†† 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.
10. Heredity and Evolution. (5)
Lectures, 4 hours per week; 1-hour section meeting per week. For students not specializing in biology. No credit to students who have had or are taking upper division genetics, botany, or zoology courses. Inheritance, variation and evolution in plants, animals, and man. Social implications of genetics and evolution. Mr. Lerner (F, Sp)

Upper Division Courses

100. Introductory Genetics. (3)
Lectures, 3 hours per week. Prerequisite: Biology 1A–1B–1C and organic chemistry or equivalents. Recommended for genetics majors. General principles of genetics. Mr. Fristrom (F, W, Sp)

100C. Genetics Laboratory. (1)
Laboratory, 3 hours per week. Prerequisite: course 100 or 101, or Zoology 150 (may be taken concurrently). Principles of genetics utilizing chiefly Drosophila and higher plants. Mr. Fristrom (F, W, Sp)

101. Principles of Genetics. (5)
Lecture, 5 hours per week. Prerequisite: Biology 1A–1B–1C and organic chemistry or equivalents. Recommended for students desiring a terminal course with greater coverage than course 100. To be given in even-numbered years. Mr. Lerner (W, Sp)

102. Biometrical Genetics. (4)
Lectures, 2 hours per week; laboratory, six hours per week. Prerequisite: course 100 or 101, or Zoology 150; elementary statistics. Biometrical methods particularly useful in genetics. Mr. Dempster (W)

110. Biochemical Genetics. (4)
(Formerly numbered 104)
Lectures, 4 hours per week. Prerequisite: course 100 or 101, and a course in biochemistry. Miss St. Lawrence (W)

130. Population Genetics. (4)
(Formerly numbered 105)
Lectures, 4 hours per week. Prerequisite: course 100 or 101, or Zoology 150; elementary statistics. Mr. Dempster (Sp)

131. Organic Evolution. (5)
(Formerly numbered 109)
Lectures, 4 hours per week; discussion, 1 hour per week. Prerequisite: course 100 or 101, or Zoology 150. Mr. Brown (F)

140. Cytogenetics. (5)
(Formerly numbered 101)
Lectures, 4 hours per week; demonstration, 1 hour per week. Prerequisite: course 100 or 101, or Zoology 150; and general cytology. Mr. Brown (Sp)

141. Chromosome Morphology and Behavior. (2)
Laboratory, 6 hours per week. Prerequisite: course 140 (may be taken concurrently). Mr. Cameron (Sp)

142A–*142B. Chromosome Systems. (3–3)
Lectures, 3 hours per week. Prerequisite: course 140. 142A will be given in even- and 142 in odd-numbered years. 142A emphasizes animal cytology; 142B emphasizes plant cytology. Mr. Brown, Mr. Cameron (F)

198. 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)

199. Special Study for Advanced Undergraduates. (1–5)
The Staff (Miss St. Lawrence in charge) (F, W, Sp)

Graduate Courses

210. Developmental Genetics. (2)
(Formerly numbered 206)
Lectures, 2 hours per week. Prerequisite: course 110 or equivalent. Gene action and development. Mr. Dempster (W)

230. Advanced Population Genetics. (3)
(Formerly numbered 205)
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)

297. Individual Study for Graduate Students. (1–9)
Individual study intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. The Staff (Mr. Libby in charge) (F, W, Sp)

298. Directed Group Study. (1–4)
Prerequisite: consent of instructor.
The Staff (Mr. Libby in charge) (F, W, Sp)

299. Research in Genetics. (1–9)
The Staff (Mr. Libby in charge) (F, W, Sp)

Staff Seminar in Genetics. (No credit)
The Staff (F, W, Sp)

Related Courses in Other Departments

Fossil Man (Anthropology 100)
Evolutionary Ecology (Botany 224)
Radiation Genetics (Medical Physics 212)
Molecular Basis of Heredity (Molecular Biology 110)
Biology of Bacterial Viruses (Molecular Biology 200A)
Bacterial Genetics Laboratory (Molecular Biology 205)
Seminar in Molecular Biology (Molecular Biology 270)
Behavioral Genetics (Psychology 114A–114B)
Animal Evolution (Zoology 109)
Human Genetics (Zoology 151)
Developmental Genetics (Zoology 153)
Somatic Cell Heredity (Zoology 216)
Seminar in Genetics (Zoology 253)

* Not to be given, 1966–67.
GEOGRAPHY

(Department Office, 501 Earth Sciences Building)

Clarence J. Glacken, Ph.D. (Chairman of the Department), Professor of Geography.
James J. Parsons, Ph.D., Professor of Geography.
Hilgard O'R. Sternberg, 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.
David J. M. Hooson, Ph.D., Associate Professor of Geography.
James E. Vance, Jr., Ph.D., Associate Professor of Geography.
Theodore M. Oberlander, Ph.D., Assistant Professor of Geography.
John E. Kesseli, Ph.D., Professor of Geography, Emeritus.
John Leighly, Ph.D., Associate Professor of Geography.
Allan Pred,† Ph.D., Assistant Professor of Geography.

Robert N. Colwell, Ph.D., Professor of Forestry.
Norman Drummond, Ph.D., Visiting Associate Professor of Geography.
John B. Jackson, A.B., Lecturer in Landscape Architecture and Geography.
Daniel B. Luten, Ph.D., Lecturer in Geography.
John D. Nystuen, Ph.D., Visiting Associate Professor of Geography.
Gottfried G. Pfeifer, Ph.D., Visiting Professor of Geography.

Departmental Major Adviser: Mr. Oberlander.
Graduate Adviser: 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 and urban landscapes, 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 political processes which influence such geographical conditions as industrial location, urbanization, settlement pattern, and the use of resources. And, because of his concern for the surface of the earth and the delicacy of the balance of nature conditioning the human use of it, he must be able to employ the data of the natural sciences, particularly ecology.

The undergraduate major in geography therefore includes the study of physical, cultural, economic and regional geography as well as map laboratory and field work. Backgrounds in the natural sciences, history, the social sciences or statistical methods are useful to the geography major. In the graduate program there is stress on field study. When this is to be carried out in foreign areas, language preparation is of special importance.

Courses in the 120 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, 2, 5A or 5B.
Upper Division 40 units of upper division work in geography, normally including: 102 or 103, 104 or 105A, 108, 111 or 113, 100A or 100B, 121A or 121B, 150 or 155, 151 or 176, and a second course in regional geography.

† Absent on leave, 1966–67.
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

Many disciplines contribute to geography, and the advanced student of the subject will find much advantage in its pursuit if he possesses a firm background in at least one other field in the natural or the social sciences. 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—physical, cultural and economic geography—during the 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, and an original thesis, normally based on field work. The Ph.D. candidate must complete a minimum of two years of residence (normally three for those entering from other disciplines) and pass a preliminary written examination in the topical or regional area of his specialization as well as the oral qualifying examination. He should be prepared to spend a year in the field following the oral examination. He must also pass reading examinations in two foreign languages—one within the first year of residence. French, German, Russian and Chinese are the preferred languages; Spanish or Portuguese may be substituted for French, and Swedish or Dutch for German, where appropriate. Further details are available from the departmental office.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Courses

1. Introduction to Physical Geography. (4)
   Three lectures and two sections per week.
   Mr. Sternberg, Mr. Drummond, Mr. Oberlander (F, Sp, Su)

2. Introduction to Cultural and Historical Geography. (4)
   Three lectures and two sections per week.
   Mr. Glacken (W, Su)

5A–5B. Economic Geography. (4–4)
   Three lectures and two sections per week. 5A is not prerequisite to 5B.
   5A. Geography of world agriculture.
       Mr. Nystuen (W)
   5B. Forest and mineral resources, manufacturing regions, trade routes, and trade centers.
       Mr. Nystuen (Sp)

Upper Division Courses

100A–100B. Principles of Cultural Geography. (4–4)
   Four hours per week. Either half of the course may be taken independently. 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, W, Su)

101. Field Geography. (4)
   Field trips Saturdays. Prerequisite: course 155 or consent of instructor. Analysis of the structural components of the urban environment of the San Francisco–Oakland Metropolitan Area.
   Mr. Nystuen (W)

102. Field Geography. (4)
   Field trips Saturdays. 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 (Sp)

103. Summer Field Course. (6)
   Five weeks, daily. Prerequisite: consent of instructor. Normally open to geography majors only. Recommended for entering graduate students.
   The Staff (Su)

104. Map Reading and Air Photo Interpretation. (4)
   Six hours per week, lectures and laboratory.
   Mr. Oberlander (W, Su)

105A–105B. Cartography. (4–4)
   Six hours per week, lectures and laboratory. Prerequisite: consent of instructor.
   105A. Cartographic representation.
       Mr. Drummond (Sp)
   105B. Map projections.
       Mr. Oberlander

108. Analysis of Land Forms. (4)
   Four hours per week. Prerequisite: consent of instructor. Origin of land forms. Review of various interpretations of processes involved, with emphasis on recent views.
   Mr. Oberlander (Sp)

109. Topographical Photo Interpretation. (4)
   Five hours per week; additional field exercises. Prerequisite: consent of instructor. The identification and classification of data on air photographs; the solution of selected problems in photogrammetry.
   Mr. Colwell (Sp)

* Not to be given, 1966–67.
### 111. Descriptive Meteorology. (4)
Four hours 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.

*112. Dynamic Meteorology. (4)
Four hours per week. Prerequisite: Physics 2B and Mathematics 1B or equivalent. No credit allowed for students who have had Geography 111.

### 113. Climatology (4)
Four hours per week.

### 117. Geography of the Tropics. (4)
Four hours per week. An analysis of the resources of the warm and wet lands of the equatorial regions; the economic potentialities of the tropics and the obstacles to their exploitation inherent in the physical and cultural environment.

Mr. Sternberg, (W)

### 119. The Arid Lands. (4)
Four hours per week. A comparative survey of the arid and semiarid regions of the world. Climate, landforms, water, soils, and vegetation; population and resources.

Mr. Eder, Mr. Parsons (F), Mr. Parsons (Sp)

### 121A–121B–121C. Geography of North America.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>121A</td>
<td>Eastern United States</td>
<td>4-4-3</td>
</tr>
<tr>
<td>121B</td>
<td>Western United States</td>
<td>4-4-4</td>
</tr>
<tr>
<td>121C</td>
<td>Canada</td>
<td>4-4-4</td>
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</tbody>
</table>

*121A. Eastern United States.
Four hours per week. Mr. Pred

121B. Western United States.
Four hours per week. Mr. Vance (F)

121C. Canada.
Three hours per week. Mr. Vance (W)

### 122A–122B–122C. Geography of Latin America.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>122A</td>
<td>Middle America</td>
<td>4-4-4</td>
</tr>
<tr>
<td>122B</td>
<td>Portugal and Spanish America (Brazil)</td>
<td>4-4-4</td>
</tr>
<tr>
<td>122C</td>
<td>South America</td>
<td>4-4-4</td>
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</tbody>
</table>

*122A. Middle America.
Four hours per week. Mexico, Central America, and the West Indies. Mr. Eder, Mr. Parsons

122B. Portugal and Spanish America (Brazil).
Four hours per week. Mr. Sternberg (W)

122C. Spanish South America.
Four hours per week. The Andean and La Plata Countries.

Mr. Parsons (F)

### 123A–123B. Geography of Europe. (4–4)

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<th>Unit</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>123A</td>
<td>Mediterranean Europe</td>
<td>4-4</td>
</tr>
<tr>
<td>123B</td>
<td>Northwest Europe</td>
<td>4-4</td>
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</tbody>
</table>

*123A. Mediterranean Europe.
Four hours per week.

123B. Northwest Europe.
Four hours per week. Mr. Pfeifer (F, Su)

### 124A–124B. Geography of the Soviet Union. (4–4)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>124A</td>
<td>A systematic survey</td>
<td>4-4</td>
</tr>
<tr>
<td>124B</td>
<td>Special problems in Soviet regional geography. Prerequisite: course 124A or consent of the instructor.</td>
<td>4-4</td>
</tr>
</tbody>
</table>

124A. A systematic survey.
Four hours per week. Mr. Luten (F)

124B. Special problems in Soviet regional geography. Prerequisite: course 124A or consent of the instructor.
Four hours per week. Mr. Luten (F)

### 125A–125B. Geography of Asia. (4–4)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>125A</td>
<td>Southeast Asia</td>
<td>4-4</td>
</tr>
<tr>
<td>125B</td>
<td>China, Japan, and Korea</td>
<td>4-4</td>
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</tbody>
</table>

*125A. Southeast Asia.
Four hours per week.

125B. China, Japan, and Korea.
Four hours per week. Mr. Luten (F, Su)

*129. Geography of the Pacific Islands. (3)
Three hours per week. The islands, seas, and peoples of Melanesia, Micronesia, and Polynesia (including Hawaii). The tropical ocean and the nature of low islands and high islands. Hypotheses of prehistoric migrations and contacts. European explorations and settlements. Contemporary cultures and economies.

### 131. Geography of California. (4)
Four hours per week. Mr. Parsons (F, Sp, Su)

### 140. Transportation Geography. (4)
Four hours per week. The influence of geographical factors in the creation, transformation, and maintenance of transportation forms and functions; the bearing of transportation on urban and regional development and on industrial locations; its role as an "organizing force" in economic geography.

Mr. Vance (Sp)

### 142. Industrial Localization. (4)
Four hours per week. Factors and trends in the geographic distribution of manufacturing industries.

### 145. Energy as a Resource. (4)
Four hours per week. Option field trips. The development of the understanding of energy and of the technology of its use. Distribution of use in relation to (a) the 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 (W)

### 150. Principles of Economic Geography. (4)
Four hours per week. Theories relating to an understanding of the geographic distribution of economic activities; the influence of economic growth and evolutionary processes on the location of economic phenomena; concepts relating to economic regions and spatial interchange.

Mr. Nystuen (F, Su)

### 151. The History of Geographic Thought. (4)
Four hours per week. Prerequisite: three upper division courses in geography. Reports and conferences on the objectives, subdivisions and methods of geography by American and foreign geographers of the late nineteenth and the twentieth centuries.

Mr. Hoosen (F)

### 153. Natural Resources, Population, and Conservation. (4)
Four hours per week. A survey, with emphasis on current literature, of the impact of human populations and technologies on natural resources. The growth of the conservation movement.

Mr. Luten (F, Sp)

### 155. Urban Geography. (4)
Four hours per week. A study of the origin, development, distribution, and regional variation of the world's cities, with emphasis on an analysis of the functions and patterns of American cities.

Mr. Vance (W)

### 176. The Relations between Nature and Culture. (4)
Four hours 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)

* Not to be given, 1966–67.
199. Special Study for Advanced Undergraduates. (1-4)
Prerequisite: restricted to senior honor students.
The Staff (Mr. Vance in charge) (F, W, Sp, Su)

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 Field Study in Geography. (1-4)
Prerequisite: course 101, 102 or 103 or equivalent.
The Staff (Parsons in charge) (W, Sp)

201. Research Seminars. (4)
There will normally be one 2½-hour meeting per week during the first half of the session, two 2½-hour meetings per week during the last half of the session; additional consultation hours.

201A. Latin America. Mr. Sterneberg (F)
201B. East Asia.
201C. Soviet Union.
201E. Cultural Geography.
201F. Urban Geography.
201G. Economic Geography.
201H. Population and Natural Resources.
201J. Physical Geography.
   Section: a. Geomorphology. Mr. Oberlander (Sp)
   Section: b. Climatology. (W)
   Section: c. Biogeography. (W)
   Section: d. Cartography. (W)
   *201K. History of Geography. Mr. Glacken

201. Individual Research. (1-6)
The Staff (F, W, Sp, Su)

*261. Problems in Physical Geography. (4)
Four hours per week.

*263. Advanced Cultural Geography. (4)
Four hours per week.

265. Problems in Economic Geography. (4)
Four hours per week.
Mr. Nystuen (Sp)

267. Advanced Urban Geography. (4)
Four hours per week.
Mr. Vance (F)

*269. Geographical Problems in Regional Development and Resource Utilization. (4)
Four hours per week. The region to be studied will be announced each year.

297. Individual Study. (1-6)
Individual study, in consultation with the graduate adviser, to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D.

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.

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GEOLOGY AND GEOPHYSICS

(Department Office, 301 Earth Sciences Building)

Bruce A. Bolt, Ph.D., Professor of Seismology and Director of the Seismographic Stations.

Garniss H. Curtis, Ph.D., Professor of Geology.
Jack F. Evernden, Ph.D., Professor of Geology and Geophysics.
Charles M. Gilbert, Ph.D., Professor of Geology.
Richard L. Hay, Ph.D., Professor of Geology.
Charles Meyer, Ph.D., Professor of Geology.
Adolf Pabst, Ph.D., Professor of Mineralogy.
Francis J. Turner,** Sc.D., Professor of Geology (Vice-Chairman of the Department).
John Verhoogen, Ph.D., Professor of Geophysics (Chairman of the Department).
Lionel E. Weiss,** Sc.D., Ph.D., Professor of Geology.
Perry Byerly, Ph.D., Professor of Seismology, Emeritus, and Director of the Seismographic Stations, Emeritus.
Howel Williams, Sc.D., Professor of Geology, Emeritus.
Frederick A. F. Berry, Ph.D., Associate Professor of Geology.
Ian S. E. Carmichael, Ph.D., Associate Professor of Geology.
Mark N. Christensen, Ph.D., Associate Professor of Geology.
Bernard W. Evans, Ph.D., Associate Professor of Geology.
Clyde Wahrafftig, Ph.D., Associate Professor of Geology.
Thomas V. McEvilly, Ph.D., Assistant Professor of Seismology.
Stanley H. Ward, Ph.D., Professor of Mineral Exploration.

* Not to be given, 1966–67.
** Appointment to the Miller Institute of Science, 1966–67.
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 or 4A–4B; Physics 4A–4B–4C–4D–4E; Mathematics 1A–1B–1C, 2A–2B–2C; Statistics 2 or 20.

Upper Division Courses  Geology 102A–102B, 118; either Geology 107 and 116 or Geology 119 (8 units); and 12 additional units of upper division courses in geology, geophysics, physics, chemistry, paleontology, engineering, mathematics, as approved by the major adviser. Geology 102C and either 103 or 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 Geology 108 and 8 units of Geology 119 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, 2A–2B–2C.


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 9 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 72.

Geology

Lower Division Course

5A–5B. The Earth. (4–4)

5A. Two 1-hour lectures and two 3-hour laboratory periods or field trips 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. Meyer, Mr. Christensen (F); Mr. Gilbert (Sp)

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. Evenenden (W)

10. Introduction to Geology. (4)

Three 1-hour lectures and one 2-hour laboratory period per week plus one half-day 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. Curtis (F); Mr. Gilbert (Sp)

11. The History of the Earth. (4)

Three 1-hour lectures per week and two half-day field trips. Prerequisite: a college course in physical geology. A sequel to course 10 designed for non-science majors in the College of Letters and Science. Geological history of the earth and the evolution of its animal and plant inhabitants.

Mr. Christensen (F)

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. Berry (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)

102A–102B–102C. Mineralogy. (4–4–4)

102A. Two 1-hour lectures and two 3-hour laboratory periods per week. Introduction to crystallography and the physical properties of crystals.

Mr. Weiss (Sp)

102B. Two 1-hour lectures and two 3-hour laboratory periods per week. Prerequisite: Chemistry 1A. Chemical and structural mineralogy; identification of rock-forming minerals.

(W) 102C. Two 1-hour lectures and two 3-hour laboratory periods per week. Prerequisite: course 102A–102B, or equivalent. Introduction to optical mineralogy and the use of the petrographic microscope; identification of opaque minerals in reflected light.

Mr. Carmichael (F)

103A–103B. Igneous and Metamorphic Petrology. (4–4)

Two 1-hour lectures and two 3-hour laboratory periods per week. Prerequisite: course 102C. Study of igneous and metamorphic rocks in hand specimen and with the petrographic microscope. Introduction to problems relating to origin and evolution of igneous and metamorphic rocks.

Sequence beginning (W). Mr. Carmichael
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 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. One 2-day and one 1-day field trip will be substituted for three laboratory periods. **Prerequisite:** course 102C 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 in charge) (Sp)

111. Geology of Fluids. (4)
Two 1 1/2-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 (W)

112. Stratigraphy and Tectonics. (4)
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. Paleogeologic studies will be undertaken.
Mr. Berry (F)

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). (W)

*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.

118. Summer Field Course. (8)
**Prerequisite:** course 5A or 101, or consent of instructor.
Mr. Christensen (Su)

119. Geologic Field Studies. (2–8)
One to four 1-week trips (6 weeks in summer quarter) to selected areas throughout the Western United States. **Prerequisite:** course 5A or 101 and consent of instructor.
Mr. Hay (F); Mr. Curtis (Sp); Mr. Meyer (Su)

131. Geochemistry. (5)
Three 1-hour lectures and two 1-hour problem and discussion periods per week. **Prerequisite:** course 102B; Chemistry 5 recommended. Geochemical treatment (with an emphasis on thermodynamics) of the formation and mutual association of minerals.
Mr. Evans (F)

132. Introduction to X-Ray Crystallography. (3)
One 1-hour lecture and two 3-hour laboratory periods per week. Theory of X-ray diffraction and application to identification of the crystalline substances.

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. (4)
Restricted to senior honors students wishing to undertake or participate in research under the guidance of a member of the department.
The Staff (Mr. Gilbert 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.

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. Gilbert (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 orebodies.
Sequence beginning (F) 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 (W)

211. Geology of Fluids. (3)
One 1-hour lecture and one 2-hour discussion period. **Prerequisite:** consent of instructor. Courses 111 and 209 recommended. Content will vary from year to year.
Mr. Berry (Sp)

212A–212B. Universal-Stage Petrography. (3–3)
One 3-hour lecture and one 3-hour laboratory per week. **Prerequisite:** consent of instructor. Use of the universal stage; microscope fabric analysis.
Sequence beginning (F) Mr. Turner

*213A–213B. Geomorphology and Pleistocene Geology. (3–3)
Rates and Processes of Erosion. The history of the Pleistocene.
Sequence beginning (W) ———

* Not to be given 1966–67.
One 2-hour lecture and two 3-hour laboratory periods per week. Prerequisite: adequate training in microscopic petrography and geochemistry. A reading knowledge of French or German is required of candidates for the Ph.D. degree.
214A. (3–6) Volcanic Petrology.
Mr. Carmichael, Mr. Turner (F)
214B. (3–6) Plutonic Petrology and Contact Metamorphism.
Mr. Turner (W)
214C. (3–6) Regional Metamorphism.
Mr. Turner (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

216A–216B–216C. Deformed Rocks. (3–3–3)
Two 1-hour lectures per week. Prerequisite: course 116 and consent of instructor.
216A. Introduction to Stress and Strain of Continuous Bodies; Rheological State. (F)
216B. Natural and Experimental Deformation of Minerals and Rocks.
Sequence beginning (W) Mr. Hay
216C. Structures and Fabrics of Naturally Deformed Rocks.
Mr. Weiss

237A. Three 1-hour lectures per week; 237B–237C: Two 1-hour lectures and one 3-hour laboratory per week. Geometrical crystallography, space groups, Hermann-Mauguin symbols, the identification of crystals by means of X-ray diffraction, with practice in the use of the powder, rotation, oscillation, Weissenberg, and precision methods; introduction to the determination of crystal structure.
Sequence beginning (F) Mr. Pabst

280. Research. (4–12)
The Staff (F, W, Sp, Su)

290. Seminar. (2–6)
Topics will be announced each quarter.
The Staff (F, W, Sp)

Geophysics

Upper Division Courses

104A–104B. Mathematical Methods in Geophysics. (4–4)
Three 1-hour lectures per week and computer laboratory. Prerequisite: Mathematics 2A–2B–2C.
104A. Method of least squares; Fourier analysis; probability and scientific 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. Bolt (F)

121A–121B. Seismology. (4–4)
Two 1-hour lectures and one 3-hour laboratory period per week. Prerequisites: Physics 4A–4B, Mathematics 2A–2B–2C.
121A. Causes, effects, and distribution of earthquakes; the seismograph; interpretation of seismographic records in terms of earthquake mechanism and structure of the earth.
Mr. McEvilly (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. Verhoogen (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. Evernden (Sp)

Graduate Courses

204A–204B–204C. Elastic Waves. (2–2–2)
Two 1-hour lectures per week. Prerequisite: Geophysics 104 or equivalent; Geophysics 121A (may be taken concurrently), Physics 105A.
204A. Stress; infinitesimal and finite strain; wave motion in isotropic solids; water waves, with application to tsunamis.
Mr. Evernden (F)
204B. Effects of anelasticity and anisotropy; propagation in layered media; waves in an elastic sphere; terrestrial oscillations.
Mr. McEvilly (W)
204C. Lamb's problem; model earthquake sources; moving 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. (3)
Two 1-hour lectures, one 3-hour laboratory period per week. Mathematical theory of the seismograph. Techniques of modern seismometry.
Mr. McEvilly (Sp)

218. Seminar in Seismology. (2)
One 2-hour discussion period per week. Critical study of problems in current seismological research. Topic will vary from quarter to quarter.
Mr. McEvilly (F); Mr. Bolt (W); Mr. Evernden (Sp)

219. Seminar in Geophysics. (3)
Two 1½-hour discussion periods per week. Critical study of problems in current geophysical research. Content will vary.
Mr. Evernden (W); ——— (Su)
222. Geochronology. (3)
One 3-hour lecture and discussion period per week. Radioisotopes in geology; age of the earth; selected problems in geochronology. Mr. Curtis (W)

224. Geomagnetism. (5)
Five 1-hour lectures per week. Prerequisite: consent of instructor. The geomagnetic field and its variations; magnetohydrodynamics and plasma physics of cosmical phenomena, including self-excited dynamos, origin and propagation of micropulsations; the magnetosphere; geomagnetic storms; ionosphere-exosphere current systems. Mr. Ward (Sp)

*225. Geoelectricity. (5)
Five 1-hour lectures per week. Prerequisite: consent of instructor. VLF, ELF, and ULF propagation in the exosphere, ionosphere, lithosphere, and in the earth-ionosphere cavity; origin of disturbance such as sferics, whistlers, VLF emission; conductivity of the interior of the earth; interactions in the ionosphere-exosphere column. Mr. Ward (Sp)


University of California
Seismographic Stations

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. Currently Advanced Research Projects Agency contract research is under way.

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, as well as record changers at the outstations.

[Department Office, 5317 Dwinelle Hall]

Andrew O. Jászi, 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).
Clair Hayden Bell, Ph.D., Professor of German, Emeritus.
Edward V. Brewer, M.A., Professor of German, Emeritus.
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., 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.
Frederic C. Tubach, 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.
Philip F. Glander, Ph.D., Assistant Professor of German.
Bluma Goldstein, Ph.D., Assistant Professor of German.
Kathleen Harris, Dr. phil., Assistant Professor of German.

* Not to be given 1966–67.
† Absent on leave, 1966–67.
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. 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, both oral and written, covering the field.

**LITERATURE**

**Upper Division**
*Permitted*: 4 courses (16 units). *Required*: 3 courses (12 units): German 142 (Composition and Style), German 145 (Introduction to Descriptive German Grammar), or Linguistics 166 (German Morphology and Syntax), and German 148A (Middle High German).

**Graduate**
A minimum of 5 courses (20 units).

**LINGUISTICS**

**Upper Division**
*Required*: 4 courses (16 units): German 142 (Composition and Style), German 145 (Introduction to Descriptive German Grammar), German 148A (Middle High German), and Linguistics 166 (German Morphology and Syntax).
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. 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 can­
didacy 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 72.

Lower Division Courses

Duplication of Credit  A student will not re­ceive unit credit for German 1, 2, 3, 4, or 5
when these duplicate courses previously com­pleted in secondary school, or for courses pre­vi­ously completed 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 quarter 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 (F, W, Sp, Su)

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 (F, W, Sp, Su)

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 (F, W, Sp, Su)

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 (F, W, Sp, Su)

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 (F, W, Sp, Su)

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.
   Mrs. Hecht (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.
   Mrs. Hecht (W)

39A–39B–39C–39D. German Literature in English
   Translation.
   Four 1-hour lectures per week.
   39A. Medieval Period. (4)  Mr. Scherer (W)
   39B. Eighteenth Century (4)  Mr. Glander (Sp)
   39C. Nineteenth Century. (4)  Mr. Glander (W)
   39D. Twentieth Century. (4)  Miss Goldstein (F)

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 juniors majoring in German.
   Mr. Leckie, Mr. Snapper (F); Miss Wulff (W); Mr. Glander (Sp)

103A–103B–103C–103D. Survey of German
   Literature.
   Four 1-hour lectures per week.
   103A. To 1500 (4)  Mr. Scherer (Sp)
   103B. From 1500 to 1700 (4)  Mr. Hillen (W)
   103C. Eighteenth Century. (4)  Miss Bonwit (F)
   103D. Nineteenth Century. (4)  Miss Wulff (F)

106. Lessing. (4)
   Four 1-hour lectures per week  Mr. Hillen (Sp)

109. Schiller. (4)
   Four 1-hour lectures per week  Miss Harris (W)

112A–112B–112C. Goethe.
   Four 1-hour lectures per week.
   112A. 1749–1786. (4)  Mr. Glander (F)
   112B. 1786–1814. (4)  Mr. Glander (W)
   112C. 1814–1832. (4)  Miss Harris (Sp)

114. Romanticism. (4)
   Four 1-hour lectures per week.  Miss Goldstein (F)
115A-115B. Nineteenth-Century German Drama.
(4-4)
Four 1-hour lectures per week. Miss Wulff (Sp)

118A-118B. Nineteenth-Century German Prose.
(4-4)
Four 1-hour lectures per week.
Miss Bonwit (F); Miss Wulff (W)

121A-121B. Twentieth-Century German Drama. (4-4)
Four 1-hour lectures per week. Mr. Mileck (F, W)

124A-124B. Twentieth-Century German Prose. (4-4)
Four 1-hour lectures per week.
Miss Goldstein (W); Mr. Hillen (Sp)

125. Introduction to Germanic Folklore. (4)
Four 1-hour lectures per week. Mr. Katz (W)

*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. Politzer (Sp)

*130. German Poetry of the Twentieth Century. (4)
Four 1-hour lectures per week. Given every other year.
Mr. Jászi (Sp)

133A-133B. Survey of German Culture and Institutions. (4-4)
Four 1-hour lectures per week. Prerequisite: course 5.
Mr. Tubach (F)

136. German Conversation. (4)
Four 1-hour meetings per week. Prerequisite: course 5.
Mr. Bogner (F); Mrs. Hecht (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).
139A. Mr. Bogner (F, Sp)
139B. Mr. Hillen (W)

142. 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 (F); Mr. Bogner (Sp)

145. 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 German 145 or Linguistics 166.
Mr. Penzl (F, Sp)

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 148A or equivalent.
Mr. Palmer (W)
148C. Selected readings in Middle High German Literature. Prerequisite: course in 148B or equivalent.
Mr. Palmer (Sp)

H195. Special Study for Honors Candidates. (4)
Prerequisite: a 3.5 grade-point average in at least 5 courses (20 units) of upper division German and a 3.0 overall grade-point average.
The Staff (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates.
(1-4)
5 courses (20 units) of upper division German and a 3.0 overall grade-point average.
The Staff (F, W, Sp, Su)

Graduate Courses
(Concerning conditions for admission to graduate courses, see page 307.)

Literature: All graduate courses in literature will meet three hours a week: a 2-hour seminar and a 1-hour tutorial.

*200. Proseminar in Bibliography and Textual Analysis. (4)
Miss Harris (F)

203. Studies in Middle High German Literature. (4)
Prerequisite: course 148A.
Topic: Wolfram von Eschenbach. Mr. Spahr (F)
Topic: Minnesang. Mr. Tubach (W)

*206. German Literature of the Renaissance and Reformation. (4)

*209. German Literature of the Seventeenth Century. (4)
Mr. Spahr (Sp)

212. Lessing. (4)

Mr. Politzer (F)

218. Goethe. 1786-1814. (4)
Miss Harris (W)

221. Goethe. 1814-1832. (4)
Mr. Politzer (Sp)

224. Schiller. (4)
Mr. Mann (Sp)

227. German Romanticism. (4)
Mr. Politzer (F)

*230. Kleist, Büchner, Grabbe. (4)
Mr. Politzer (W)

*233. Grillparzer and the Austrian Drama of the Nineteenth Century. (4)
Mr. Politzer (F)

236. German Realism. 1850-1900. (4)
Miss Bonwit (W)

239. German Naturalism. (4)

242. Hofmannsthal and the Austrian Drama of the Twentieth Century. (4)
Mr. Politzer (W)

*245. Interpretation and Criticism of German Poetry. (4)
Topic: Studies in Rilke.
Mr. Jászi (Sp)

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)

* Not to be given 1966–67.
251. The Theory and Practice of German Tragedy. (4) Miss Goldstein (Sp)

260. Seminar in German Literature. (4) The Staff (F, W, Sp, Su)
- Topic: Eighteenth Century Aesthetics. Mr. Mann (W)
- Topic: The German Novelle. Miss Bonwit (Sp)
- Topic: German Mysticism Mr. Tubach (F)

LINGUISTICS

270. Introduction to the History of the German Language. (4) Three 1-hour lectures per week. Mr. Palmer (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 (F)

*282. Old Saxon. (4) Three 1-hour meetings per week. Mr. Palmer (Sp)

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, Su)

297. Individual Study. (4) Independent study, in consultation with the graduate adviser, 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. The Staff (F, W, Sp, Su)

299. Special Study for Graduate Students in Literature or Linguistics. (1–8) The Staff (F, W, Sp, Su)

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)

301. The Teaching of German in College. (4) Four 1-hour meetings per week; either lecture, demonstration class or Language Laboratory. For all new teaching assistants. Open to all graduate students. Mr. Mueller (F)

Courses to Prepare Graduate Students for Reading Examinations

Each course: one hour daily, five times a week. No unit credit for these courses.

1G. Elementary German.
- Mr. Katz in charge (F, W, Sp, Su)

2G. Intermediate German.
- Mr. Katz in charge (F, W, Sp, Su)

Dutch

101. Elementary Dutch. (4) Five 1-hour class meetings and 1-hour session in the Language Laboratory per week. Open to freshmen. Mr. Snapper (F)

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. Prerequisite: Dutch 102 or equivalent. Mr. Snapper (Sp)

*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. (Su)

Related Courses in Another Department

Linguistics 166. German Morphology and Syntax.
Linguistics 233. German Linguistics.

HISTORY

(Department Office, 3229 Dwinelle Hall)

Walton E. Bean, Ph.D., Professor of History.
Woodbridge Bingham, Ph.D., Professor of History.
Woodrow W. Borah, Ph.D., Professor of History.
William J. Bouwsma, Ph.D., Professor of History (Chairman of the Department).
Robert J. Brentano, D. Phil., Professor of History.
Delmer M. Brown, Ph.D., Professor of History.
Gene A. Brucker, Ph.D., Professor of History.
A. Hunter Dupree, Ph.D., Professor of History.

* Not to be given, 1966–67.
Lawrence A. Harper, † J.D., 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.
Armin Rappaport, Ph.D., 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.
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 P. Hammond, Ph.D., LL.D., Professor of History and Director of the Bancroft Library, 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.
Paul B. Schaeffer, Ph.D., Associate Professor of 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.
Thomas G. Barnes, D. Phil., Associate Professor of History.
L. Perry Curtis, D.Phil., Associate Professor of History.
Leon F. Litwack, Ph.D., Associate Professor of History.
Robert L. Middlekauff, Ph.D., Associate Professor of History.
Richard A. Webster, † Ph.D., Associate Professor of History.
Gunther Barth, Ph.D., Assistant Professor of History.
David E. Bertelson, Ph.D., Assistant Professor of History.
David A. Brading, Ph.D., Assistant Professor of History.
Gerald D. Feldman, † Ph.D., Assistant Professor of History.
Erich S. Gruen, Ph.D., Assistant Professor of History.
Samuel Haber, Ph.D., Assistant Professor of History.
Roger Hahn, Ph.D., Assistant Professor of History.
Eugene F. Irschick, Ph.D., Assistant Professor of History.
Winthrop D. Jordan, † Ph.D., Assistant Professor of History.
Martin A. Klein, Ph.D., Assistant Professor of History.
Ira M. Lapidus, Ph.D., Assistant Professor of History.
Lawrence W. Levine, Ph.D., Assistant Professor of History.
William P. McGreevey, Ph.D., Assistant Professor of History.
Thomas R. Metcalf, Ph.D., Assistant Professor of History.
Robert O. Paxton, Ph.D., Assistant Professor of History.
Sheldon Rothblatt, † 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.
George W. Stocking, Jr., Ph.D., Assistant Professor of History.

Frederic E. Wakeman, Ph.D., Assistant Professor of History.
Mirko Dražen Grmek, M.D., Visiting Associate Professor of History.
Gerhard S. Masur, Ph.D., Visiting Professor of History.
Irwin Scheiner, Ph.D., Lecturer in History.
Edward B. Segel, Ph.D., Acting Assistant Professor of History.
Richard C. Tyler, M.A., Acting Instructor in History.
Reginald E. Zelnik, Ph.D., 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 17A–17B, or 18A–18B, or 19, or two quarters (10 units) of 33A–33B–33C.

2. In the junior and senior years: a total 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.

Lower Division Honors Courses At the freshman and sophomore level, the department offers three honors courses: History 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.

Honors Program Interested juniors with an overall grade-point average of 3.0 and with suitable recommendations from their instructors in lower division honors courses will be automatically admitted to the upper division honors program. Other students with an overall grade-point average of 3.0 are encouraged to apply to the departmental honors committee for admission to the program as juniors. All prospective junior honors program students and returning senior honors program students should consult the Department Office, 3229 Dwinelle Hall, during the week before classes begin, for information and instruction in regard to admission and advising procedures. Course requirements for the honors program will include History 101A–101B and History H102 in the junior year, and the writing of a senior honors thesis (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 consult Chapter III in this catalogue and the Department of History bulletin entitled Higher Degrees in History, and confer with the graduate adviser.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Courses

4. 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.

4A. Ancient. (5) Mr. Brentano (F)
4B. Medieval. (5) Mr. Brucke (W)
4C. Renaissance and Reformation. (5) Mr. Herr (Sp)
4D. Enlightenment and Revolutions. (5) Mr. Herr (Sp)

* Not to be given, 1966–67.
5. Modern Europe. (5)
Three 1-hour lectures and one 1-hour section meeting per week. A survey of modern Europe primarily for students not going on in history.
Mr. Barnes (W); Mr. Slottman (Sp)

17A–17B. United States History. (5–5)
Three 1-hour lectures and one 1-hour section meeting per week.
Pre-requisite: sophomore standing and consent of instructor. Limited to 10 students per section. An honors course including reading, discussion, and reports, focusing on selected problems in American history since 1648. Prerequisite: consent of instructor. --- (Sp)

H17A–H17B. The United States. (5–5)
Two-and-one-half-hours’ discussion per week.
Pre-requisite: sophomore standing and consent of instructor. Limited to 20 students per section. An honors course including reading, discussion, and reports, focusing on selected movements and epochs.
Mr. Tyler (F); Mr. Bertelson (W)

18A–18B. Latin-American History. (5–5)
Three 1-hour lectures and one 1-hour section meeting per week.
Pre-requisite: 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.
Pre-requisite: sophomore standing and consent of instructor.
The Staff in Asian History (F)
19A. Asian Monarchies.
Mr. Bingham
19B. Nationalist Revolutions in Asia.
Mr. Brown
19C. Identity Formation in Asia.
Mr. Irschick
19D. Urban Societies in Asia.
Mr. Lapidus
19E. Asian Classics in National and Cosmopolitan Contexts.
Mr. Levenson
19F. Landlords and Peasants in Asia.
Mr. Metcalf
19G. Christianity in Asia.
Mr. Scheiner
19H. Social Structure in Asia.
Mr. Schurmann
19I. Formation of States in Asia.
Mr. Smith
19J. European Imperialism and Asia.
Mr. Wakeman

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 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 Political Science 33A–33B–33C).
Mr. Bertelson (F, W, Sp)

Upper Division Course

Group I—Unrestricted Courses
(Open to all students in the upper division; prerequisites as noted.)

*110A–110B. Ancient Greece. (5–5)
Three 1-hour lectures and 1 hour of consultation per week.

111A–111B. Ancient Rome. (5–5)
Three 1-hour lectures and 1 hour of consultation per week.
Mr. Gruen (F, W)

*114A–114B. Byzantium. (5–5)
Three 1-hour lectures and 1 hour of consultation per week.

115A–115B. Medieval Europe. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. --- (W, Sp)

*117. European Culture in the Middle Ages. (5)
Three 1-hour lectures and 1 hour of consultation per week.

*118A–118B. Medieval Institutions. (5–5)
Three 1-hour lectures and 1 hour of consultation per week.

120. The Renaissance. (5)
Three 1-hour lectures and 1 hour of consultation per week.
Mr. Starn (Sp)

121. The Reformation. (5)
Three 1-hour lectures and 1 hour of consultation per week.

*122. Age of Absolutism and Enlightenment. (5)
Three 1-hour lectures and 1 hour of consultation per week.

*123. Modern Europe (1789–1870). (5)
Three 1-hour lectures and 1 hour of consultation per week.

*124. Modern Europe (1870–1914). (5)
Three 1-hour lectures and 1 hour of consultation per week.

125. Modern Europe (1914–Present). (5)
Three 1-hour lectures and 1 hour of consultation per week.
Mr. Paxton (Sp)

127A–127B. European Diplomatic History. (5–5)
Three 1-hour lectures and 1 hour of consultation per week.
Mr. Segel (F, W)

Three 1-hour lectures and 1 hour of consultation per week. Thought and art considered in their social and political context. 128C, Mr. Schorske (F)

*129A–129B. Social History of Western Europe. (5–5)
Three 1-hour lectures and 1 hour of consultation per week.

130. Development of Scientific Thought and Technique.
Three 1-hour lectures and 1 hour of consultation per week.

*130A. Ancient and Medieval Science. (5)
130B. Scientific Revolution (1450–1750). (5)
Mr. Hahn (W)

130C. Science since 1750. (5)
Mr. Hahn (Sp)

* Not to be given, 1966–67.
151A–151B–151C. Modern Britain (Since 1500). (5–5–5)
Three 1-hour lectures and 1 hour of consultation per week. *Prerequisite: an elementary knowledge of the history of Western Europe.
151A. Britain 1500–1688. Mr. Barnes (F)
151B. Britain 1688–1832. Mr. Curtis (W)
151C. Britain 1832–present. Mr. Curtis (Sp)

*152A–152B. Constitutional History of England. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Barnes

*154. British Empire and Commonwealth. (5)
Three 1-hour lectures and 1 hour of consultation per week. *Prerequisite: History 151C or equivalent. Mr. Curtis

156A–156B. Social History of Latin America. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. McGeerey (F, W)

160A–160B. Mexico. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Brading (W, Sp)

162A–162B. Caribbean Area. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Borah (F, W)

*163A–163B. Brazil. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Sluiter

*164. Modern Argentina. (5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Brading

165A–165B. The Colonial Period and American Revolution. (5–5)
Three 1-hour lectures and 1 hour of consultation per week.
165A. The Colonial Period. Mr. Middlekauff (F)
165B. The American Revolution. Mr. Middlekauff (W)

*166. The United States, 1787–1845. (5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Sellers

*167A. Era of Sectional Conflict. (5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Stampp

*167B. Reconstruction and the New Nation. (5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Stampp

168A–168B. Recent History of the United States. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Abrams (F); Mr. Levine (W)

170A–170B. The West in United States History. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Barth (F, W)

171A–171B. California. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Bean (W, Sp)

* Not to be given, 1966–67.
172A—172B. Constitutional History of the United States. (3–3)
Three 1-hour lectures and 1 hour of consultation per week. Prerequisite: course 17A—17B or consent of instructor. Mr. Harper

172C—172D. Constitutional History of the United States. (2–2)
An extra hour of class discussion to be taken only with course 172A—172B. Mr. Harper

173A—173B. Diplomatic History of the United States. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Rappaport (W, Sp)

175A—175B. Intellectual History of the United States. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. May (W); Mr. Haber (Sp)

178A—178B. History of Science and Technology in American Society. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Lapidus

182A—182B. Islamic History. (5–5)
A history of the Middle East from the 7th to the 13th centuries; the Arab conquests, the Islamic Empires, the successor states, and the formation of Islam as a religion and culture. Three 1-hour lectures and 1 hour of consultation per week. Mr. Dupree (F, W)

183A—183B. The Middle East. (5–5)
The background, origins, and rise of the Ottomans; the Ottoman Empire, its Arab provinces, Persia and the modern Middle East. Three 1-hour lectures and 1 hour of consultation per week. Mr. Smith (W, Sp)

184A—184B. China. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Levenson

185A—185B. Japan. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Scheiner (W, Sp)

186. Southeast Asia. (5)
Three 1-hour lectures and 1 hour of consultation per week.

187A—187B. India. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Metcalf (W); Mr. Ischick (Sp)

189A—189B. Social History of China and Japan. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Prerequisite: consent of instructor. 189A. China. Mr. Schurmann 189B. Japan.

191A—191B. Africa. (5–5)
Three 1-hour lectures and 1 hour of consultation per week. Mr. Klein (F, 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. Mr. Stocking (F, W); Mr. Stocking (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. Bouwsma, Mr. Brentano (Sp)

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 1½-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.

103A. Ancient. Mr. Gruen (W, Sp) 103B. Europe. Mr. Brucker, Mr. Sauer, Mr. Zelnik (F); Mr. Masur, Mr. Paxton, Mr. Segel, Mr. Starn (W);——, Mr. Segel, Mr. Slottman (Sp)

103C. England. Mr. Tyler (W, Sp) 103D. United States. Mr. Bean, Mr. Bertelson, Mr. Levine, Mr. Litwack, Mr. May, Mr. Tyler (F); Mr. Middlekauff, Mr. Stampp, Mr. Tyler (W); Mr. Barth, Mr. Haber, Mr. Tyler (Sp)

103E. Latin America. Mr. Bradin, Mr. McGreevey (W); Mr. Brading (Sp)

103F. Asia Mr. Brown, Mr. Lapidus (W); Mr. Metcalf, Mr. Scheiner, Mr. Smith (Sp)

103S. History of Science.

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.

Mr. Harper, Mr. Stampp (F); Mr. Bingham, Mr. Sellers, Mr. Stocking, Mr. Slottman (W); Mr. Abrams, Mr. Bingham, Mr. Middlekauff, Mr. Stocking (Sp)

* Not to be given 1966–67.
HONOR COURSES

H198A-H198B. Senior Honors. (5-5)
Limited to senior honors candidates. Directed study centering upon the preparation of an honors thesis. Supervisors will be assigned to each student after consultation with the honors committee.
The Staff (F, W, Sp)

SPECIAL INDIVIDUAL STUDY

199. Special Study for Advanced Students. (4-5)
Restricted to senior honors students.
Graduate Courses
(The Staff (F, W, Sp)

(Concerning conditions for admission to graduate courses, see p. 125.)

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. Gruen (F)
280B. Europe. Mr. Slottman, Mr. Soulis, Mr. Starn (F); Mr. Herr, Mr. Zelnik (W); Mr. Brucker, Mr. Paxton, Mr. Sauer (Sp)
280C. England. Mr. Curtis (Sp)
280D. United States. Mr. Levine, Mr. Middlekauff, Mr. Rappaport, Mr. Stampp (F); Mr. Abrams, Mr. Haber (W); Mr. Litwack, Mr. Sellers, Mr. Stocking (Sp)
280E. Latin America. Mr. Brading, Mr. McGreevey (F); Mr. McGreevey, Mr. Sluiter (Sp)
280F. Asia. (for M.A. candidates). Mr. Ischick (F); Mr. Scheiner, Mr. Smith (W)
280G. Asia. (for Ph.D. candidates). Mr. Bingham, Mr. Brown, Mr. Lapidus, Mr. Wakeman (F)
280H. Africa. (for Ph.D. candidates). Mr. Klein (F)
280S. History of Science. Mr. Hahn (F); Mr. Grmek (Sp)
*280T. Economic History.

281A*-281B. Paleography and Other Auxiliary Sciences. (5-5)
One 2- to 3-hour meeting per week.
Mr. Barnes (F)

283. Historical Method and Theory. (5)
One 2- to 3-hour meeting per week. Designed especially for candidates for higher degrees in History. Stress is laid on practical exercises.
Mr. Bouwsma (F); Mr. Schorske (W); Mr. Borah, Mr. Sontag (Sp)

Group II. Research Seminars

285. 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. A reading knowledge of French or German, and Latin or Greek is required.
285B. Europe. Mr. Brucker, Mr. Herr, Mr. Malia, Mr. Paxton, Mr. Riasanovsky, Mr. Sauer (F, W);

Mr. Bouwsma, Mr. Herda, Mr. Masur, Mr. Schorske, Mr. Sontag, Mr. Zelnik, (W, Sp)
285C. Great Britain. Mr. Curtis (F, W); Mr. Barnes, Mr. Brentano (W, Sp)
285D. United States. Mr. Barth, Mr. Haber, Mr. Litwack, Mr. May (F, W); Mr. Abrams, Mr. Bean, Mr. Dupree, Mr. Harper, Mr. Levine, Mr. Middlekauff, Mr. Rappaport, Mr. Sellers, Mr. Stampp, Mr. Stocking (W, Sp)
285E. Latin America. Mr. Borah (F, W); Mr. King (W, Sp)
285F. Asia. Mr. Metcalf (F, W); Mr. Ischick, Mr. Lapidus, Mr. Schurmann, Mr. Wakeman, Mr. Yamaguchi (W, Sp)
285H. Africa. Mr. Klein (W, Sp)
285S. History of Science. Mr. Hahn (W, Sp)
*285U. Studies in Comparative History. Mr. Rosenberg

Research Seminars. (5)
The following research seminar is limited to one quarter. One 2- to 3-hour meeting per week.

Group III. Individual Research and Study

290. Independent Study for Graduate Students. (3-6)
Primarily for graduate students majoring in other fields than history. The Staff (F, W, Sp)

291. Directed Study for Graduate Students (in Preparation for the Master’s Examination). (3-6)
The Staff (F, W, Sp)

292. Directed Advanced Study for Graduate Students (in Preparation for the Doctor’s Examination). (3-12)
The Staff (F, W, Sp)

294. Independent Research for Graduate Students (Leading to No Higher Degree). (3-5)
Primarily for graduate students majoring in other fields. The Staff (F, W, Sp)

295. Directed Research (Leading to M.A.). (3-6)
The Staff (F, W, Sp)

296. Directed Advanced Research (Leading to Ph.D.). (3-12)
The Staff (F, W, Sp)

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, 103S, 130A, 130B, 130C, 131, 132, 103S, 130A, 130B, 130C, 131, 132

* Not to be given 1966-67.
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, —— (W, Sp)

**HUMANITIES**

Jacques M. de Caso, Ph.D., Assistant Professor of Art.
Vincent H. Duckles, Ph.D., Professor of Music.
Stanley G. Eskin, Ph.D., Assistant Professor of English.
Richard Herr, Ph.D., Professor of History.
Howard E. Hugo, Ph.D., Associate Professor of English.
Michael Senturia, A.B., Assistant Professor of Music.
Randolph Starn, 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 72.

Upper Division Course

101A–101B. Art and Music. (4–4)
Three hours per week. Prerequisite: restricted to seniors in the humanities field major. Analytical and critical methods in music and the visual arts exemplified through careful study of selected masterpieces; problems in the comparison of the arts; the roles of form and content in different media. 101A, 1450–1750; 101B, 1750 to present.

Sequence, beginning (F). Mr. Duckles (F); Mr. de Caso, Mr. Senturia (W)

102A–102B. Literature. (4–4)
Three hours per week. Prerequisite: restricted to seniors in the humanities field major. Study of selected masterpieces in English and in translation; discussion of critical criteria; universality, individuality, and literary tradition; the forms, functions and limitations of language. 102A, 1450–1750; 102B, 1750 to present.

Sequence, beginning (F). Mr. Eskin (F); Mr. Hugo (W)

104A–104B. Topics in the History of Culture. (4–4)
Three hours per week. Prerequisite: restricted to seniors in the humanities field major. An analysis of the historical context in which were produced the works of art, literature, and music which form the subject of the other senior humanities courses. 104A, 1450–1750; 104B, 1750 to present.

Sequence, beginning (W). Mr. Starn (W); Mr. Herr (Sp)

**HUNGARIAN**

(For courses in the Hungarian language and literature, see listing under Department of Slavic Languages and Literatures.)

**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).
Aldo D. Scaglione, Dottore in Lettere, Professor of Italian and of Comparative Literature.
Michele De Filippis, Ph.D., *Professor of Italian, Emeritus.*
Louise G. Clubb, Ph.D., *Associate Professor of Italian and of Comparative Literature.*
Nicolas J. Ferella, Ph.D., *Associate Professor of Italian.*
Gustavo Costa, Dottore in Lettere, *Assistant Professor of Italian.*
Ruggero Stefanini, Dottore in Lettere, *Assistant Professor of Italian.*

Catherine Feucht, B.A., *Lecturer in Italian.*
Cecilia Ross, Ph.D., *Lecturer in Italian.*
Giorgio Spini, Dottore in Lettere e Scienze Politiche, *Visiting Professor, Chair of Italian Culture, for the Fall Quarter 1966.*
Maria Vittoria Tessitore, Dottore in Lettere, *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–101C; 103A–103B–103C. *Recommended:* Appropriate courses in art, classics, comparative literature, English, French, German, history, music, philosophy, Portuguese, Spanish.

**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 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 in Romance languages and literatures requires a reading knowledge of Latin, French, German, and Spanish.

**The Graduate Programs**

The Master of Arts in Italian *requirements:* 40 units of upper division and graduate courses in Italian of which at least 24 must be in graduate courses. (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 Doctor of Philosophy in Romance Languages and Literatures

Requirements: An approved program of courses in view of the qualifying examination; a reading knowledge of Latin, French, German, and Spanish, to be tested by written examination; a preliminary screening examination to determine the student’s readiness for the qualifying examination; the qualifying examination testing the student’s knowledge of Romance philology, French, Hispanic, and Italian literatures with particular emphasis on Italian; a dissertation on a subject of Italian literature; a final examination on the subject of the student’s dissertation.

(For further information please consult Chapter III and the graduate adviser.)

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Courses

1. Elementary Italian. (4)
   Five 1-hour meetings per week.
   Mr. Ferruolo in charge (F, W, Sp, Su)

2. Elementary Italian. (4)
   Five 1-hour meetings per week. Prerequisite: Italian 1 or the equivalent.
   Mr. Ferruolo in charge (F, W, Sp, Su)

3. Intermediate Italian. (5)
   Five 1-hour meetings per week. Prerequisite: Italian 2 or the equivalent.
   Mr. Pipa in charge (F, W, Sp, Su)

4. Intermediate Italian. (5)
   Five 1-hour meetings per week. Prerequisite: Italian 3 or the equivalent.
   Mr. Pipa in charge (F, W, Sp, Su)

5A–5B. Advanced Italian. (4–4)
   Five 1-hour meetings per week. Prerequisite: Italian 4 or the equivalent.
   Mr. Stefanini in charge (F, W, Sp, Su)

   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.
   Mr. Costa, Mr. Ferruolo, Mr. Perella, Mr. Pipa (F, W, Sp, Su)

101A–101B–101C. Advanced Grammar, Composition and Conversation. (4–4–4)
   Three 1-hour meetings per week. Prerequisite: Italian 5B or the equivalent.
   Sequence beginning (F, W) Mr. Stefanini

103A–103B–103C. A Survey of Italian Literature. (4–4–4)

103A. Three 1-hour lectures and one 1-hour conference period per week. From the origins to the end of the XV century. Mr. Perella (F, Su)

103B. Three 1-hour lectures per week. From the XVI century to the end of the XVII century. Mr. Costa (W)

103C. Three 1-hour lectures per week. From the XVIII century to the present. Mr. Costa (Sp)

   Two 1½-hour lectures per week.
   109A. Inferno. Mr. De Negri (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. De Negri (Sp)
   110B. Emphasis on Boccaccio’s Decameron and Petrarch’s Rime. Mr. De Negri (Su)

112A–112B. Italian Literature of the Renaissance. (4–4)
   Three 1-hour lectures and one 1-hour conference period per week.
   112A. Emphasis on Alberti, Ficino, Lorenzo De’ Medici, Poliziano, Leonardo da Vinci, and Castiglione. Mr. Ferruolo (F)
   112B. Emphasis on Machiavelli, Ariosto, Michelangelo Buonarroti, Tasso, and Galileo. Mr. Ferruolo (W)

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 of the Nineteenth Century. (4–4)
   Three 1-hour lectures and one 1-hour conference period per week.
   115A. From Neoclassicism to Romanticism. Mr. Perella (W)
   115B. From Romanticism to Verismo. Mr. Perella (Sp)

116A–116B. Italian Literature of the Twentieth Century. (4–4)
   Three 1-hour lectures and one 1-hour conference period per week.
   116A. Poetry and the Drama, with emphasis on the Hermetic poets and Pirandello. Mr. Pipa
   116B. The Novel from Svevo to the present. Mr. Pipa (F)

* Not to be given 1966–67.
H195. Special Study for Honors Candidates. (4)
Individual conferences to be arranged.
The Staff (Mr. Stefanini in charge) (F, W, Sp, Su)

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. Scaglione (Su)

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. Mr. Scaglione (W)

Graduate Courses and Seminars

201A–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 (Sp)

203. Methods of Literary Study and Stylistic Analysis. (4)
Two 1½-hour meetings per week. Mr. Costa (Sp)

*204. Seminar on Italian Literary Criticism. (4)
Two 1½-hour meetings per week. Course may be repeated for credit when topic changes. Mr. Pipa (W)

209. Seminar on the “Divina Commedia.” (4)
Two 1½-hour meetings per week. Mr. De Negri (F, Su)

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. Ferruolo (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. Scaglione (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. Mr. Scaglione (F)

*217. Seminar on the Renaissance. (4)
Two 1½-hour meetings per week. Course may be repeated for credit when topic changes.

*218. The Age of the Baroque. (4)
Two 1½-hour meetings per week. Especially: the pastoral drama, Marino, and the Marinists. Mr. Ferruolo (W)

*221. Romanticism in Italy. (4)
Two 1½-hour meetings per week. The Romantic movement in Italy in its relationship to European Romanticism, with emphasis on Foscolo, Leopardi, and Manzoni. Mr. De Negri (Sp)

223. Seminar on Contemporary Italian Literature. (4)
Two 1½-hour meetings per week. Course may be repeated for credit when topic changes. Mr. Pipa (W)

225. The Italian Lyric. (4)
One 3-hour meeting per week. A proseminar on the dominant forms and themes of the Italian lyric with the aim of determining the nature and historical relationships of the principal schools and movements. Emphasis will be upon the period from the Renaissance to the present. Mr. Perella (Sp)

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)

16. Beginning Italian for Graduate Students.
(No credit) Mrs. Ross (F, Su)

(No credit) Mrs. Ross (W)

* Not to be given, 1966–67.

** JOURNALISM **

(Department Office, 450 Barrows Hall)

Robert W. Desmond, Ph.D., Professor of Journalism.
Charles M. Hulten, M.A., Professor of Journalism (Chairman of the Department).
Albert G. Pickerell, Ph.D., Professor of Journalism.
Kenneth N. Stewart, B.Litt., Professor of Journalism.
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. Hulten.
The Department of Journalism offers undergraduate students with journalistic objectives a program with a core of courses designed to meet those objectives and also prepares students for graduate study leading to careers in journalism. The core series may be taken in combination with a major in one of the social sciences or humanities. The department recommends the following majors: economics, English, history, political science, sociology, and the group major in social sciences. Other curricula are also 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 for students who wish to select one or two courses as general interest electives.

The Graduate Major

The graduate program leads to the degree of Master of Journalism. Students may qualify for one of two plans: Plan A for students who have not completed an undergraduate major in journalism or its acceptable equivalent but who expect to follow careers in professional journalism; Plan B for certain students who have completed an undergraduate major in journalism or its acceptable equivalent, or who plan to pursue teaching or research careers. Plan A focuses upon a central core course in the news function which progresses through the fall, winter, and spring quarters. Plan B requires the completion of a master’s thesis.

Students interested in graduate study are invited to consult the Dean of the Graduate Division or the graduate adviser of the department.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Course

21. Introduction to Journalism. (4)
Conference periods and reports. Survey of journalistic principles and practices: journalistic writing, including its evolutionary developments, its social and its compositional problems.
Mr. Jacobs (F, W, Sp); --- (Su)

131. The Journalistic Process. (5)
Prerequisite: course 21 or the equivalent. Operation, organization and administration of the news function, with emphasis upon the responsibility of the reporter and editor.
(F, W, Sp, Su)

140. History of American Journalism. (5)
Monitored reading assignments and reports. Political, social, economic, technological and cultural evolution of the press.
Mr. Stewart (W)

141. The Mass Media and Society. (5)
Critical analysis and discussion of contemporary trends, problems and objectives of the media of mass communication.
Mr. Hulten (Sp)

147. Research in Mass Communication. (5)
Prerequisite: consent of instructor. Recent reports of communication research, with special attention to methodology of quantitative research.
Mr. Fuchs (W)

151. The Journalist as Social Critic. (5)
Historical survey of significant reporting by outstanding journalists from Benjamin Franklin to the present, with special attention to their approach to problems of social change.
Mr. Steffens (W)

152. Periodical Journalism. (5)
Prerequisite: upper division standing and consent of instructor. Study of the magazine: its publishing and editing functions.
Mr. Stewart (F, Sp)

165. The Press, the Law and the Constitution. (5)
Historical development of freedom of the press, with analysis of rights and restrictions.
Mr. Fuchs (W)

184. Reporting of Public Affairs. (5)
(Formerly 181L)
Prerequisite: course 21 or its equivalent. News of governmental functions, with emphasis upon judicial, legislative and administrative procedures at the city and county level.
Mr. Jacobs (W, Sp)

190. Comparative World Journalism. (5)
(Formerly 190A–190B)
Examination of international news flow in nations and regions, with attention to sources of information, to media characteristics and conditions of performances.
Mr. Desmond (F, Sp)

195. The Critical Review. (5)
Prerequisite: senior standing and consent of instructor. Theory and technique of evaluating the arts and urban environment.
Mr. Jacobs (F); --- (Su)

196. Government Information Programs. (5)
Prerequisite: senior or graduate standing and consent of instructor. Governmental activities in international information and propaganda.
Mr. Hulten (F)

H198. Honors Program in Journalism. (4–6)
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) 
Prerequisite: senior standing and grade-point average of not less than 3. The Staff (F, W, Sp, Su)

Graduate Courses

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 news gathering and writing, with emphasis on in-depth reporting. In conjunction with two half-quarter seminars, 240 (1) and 241 (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, 290 (1) and 296 (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, 201 (1) and 265 (1). The Staff (Mr. Jacobs in charge) (Sp)

201. Seminar in Communication Research Methods. (1) 
One 1-hour lecture per week for the first five weeks of the quarter. Techniques of communication research. Study of quantitative and qualitative analysis, survey and experimental research design. Mr. Fuchs (Sp)

220. Public Affairs in Perspective. (4) 
The opinion function in columns and commentary, interpretative reporting, editorials and editorial crusades. Mr. Fuchs (F)

231. Communication Theory. (4) 
Study of the broad field of communication theory, with special emphasis on the effects of mass communication. Mr. Fuchs (F)

240. Seminar in the History of the Mass Media. (1) 
First five weeks of the quarter. Social and technological evolution of the press and broadcasting. Mr. Stewart (F)

241. Seminar in Responsibility of the Mass Media. (1) 
Second five weeks of the quarter. Current ethical standards and problems of the media. Mr. Hulten (F)

251. Literature of Journalism. (4) 
Guided research on outstanding men whose journalistic work is of lasting historic and literary worth. Mr. Steffens (F)

252. Advanced Magazine Article Writing. (4) 
Research and preparation of nonfiction articles for general and specialized publications. Attention to editing and marketing. Mr. Stewart (W)

265. Seminar in the Law of Mass Communications. (1) 
Second five weeks of the quarter. Inquiry into contemporary legal controls affecting press, broadcasting, and films. Mr. Pickereill (Sp)

270. Economic Organization of the Press. (4) 
Two 1½-hour lectures per week. A seminar analyzing the business practices and financial structure of the press and its relationship to the community in which it operates. (F)

280. Broadcast Writing. (4) 
Study of radio and television techniques, and practice in script writing. Mr. Pickereill (W)

290. Seminar in Comparative World Journalism. (1) 
First five weeks of the quarter. Study of various press systems and of news flow across national borders. Mr. Desmond (W)

295. Critical Writing. (4) 
Field study and written assignments. Principles and practice of reviewing the arts and evaluating factors in cultural environment. (W)

296. Seminar in International Information. (1) 
Second five weeks of the quarter. Study of government information agencies and propaganda. Mr. Hulten (W)

298. Field Seminar in Mass Communications. (1–4) 
One or more 1- or 1½-hour meetings per week. Conferences, briefings and field study. Focused on basic issues, events and trends in the current news. The Staff (F, W, Sp)

299. Individual Study in Mass Communications. (2–6) 
The units required of all students who elect Plan B of graduate study. Supervised research projects and reports and work on masters' theses. The Staff (F, W, Sp)

LANDSCAPE ARCHITECTURE

(Department Office, 202 Wurster Hall)

Garrett Eckbo, M.L.A., Professor of Landscape Architecture (Chairman of the Department).

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.

R. Burton Litton, Jr., M.L.A., Associate Professor of Landscape Architecture.

Robert J. Tetlow, M.S., Associate Professor of Landscape Architecture.

Michael M. Laurie,* M.L.A., Assistant Professor of Landscape Architecture.

* Absent on leave fall and winter quarters, 1966–67.
The Department of Landscape Architecture offers the opportunity to prepare for professional participation in all types of site planning, land planning and open space design, from private gardens to regional landscape systems. In addition to a broad background in natural and social science and the humanities, the department requires four years of design training; two quarters in construction and two in the use of plant materials. Also required are one quarter of history, and a six-week field trip. A series of lectures and seminars give opportunity to explore the theoretical and practical aspects of the field. Collegewide courses, and courses in the related departments (Architecture, City and Regional Planning, Design) bring out the total scope of the broad field of environmental design, and the interlocking nature of the disciplines within it.

**Preparation for the Major** For courses required in preparation for the major, see page 69. For further information, consult the **ANNOUNCEMENT OF THE COLLEGE OF ENVIRONMENTAL DESIGN**.

**Requirements for the Degree Bachelor of Landscape Architecture**

The curriculum of 180 units and one summer field course leads to the professional degree of Bachelor of Landscape Architecture. The student’s proposed study list must be submitted to the departmental adviser for approval and endorsement before it can be filed with the Dean of the College.

**Specific Courses** Landscape Architecture 21A–21B, 22A–22B–22C, 23, 25, 49, 121A–121B, 122A–122B–122C, 123, 124, 151, 152A–152B, 154; Environmental Design 3, 4, 6; Architecture 10; City and Regional Planning 100, 100L; Biology 11A–11B; General Biology 150; Engineering 21.

**Directed Electives** English and/or Speech (2 courses); Economics, History, Political Science (3 courses); Agriculture, Forestry, Botany, Biology (3 courses); Art, Design, Sculpture (2 studio courses); Geography, Geology, Paleontology (2 courses); Philosophy, Psychology, Anthropology, Social Sciences (2 courses).

**Electives** Additional courses chosen by the student with the approval of the major adviser.

The department will certify to the completion of a major program for graduation only on the basis of at least a grade average of C for all courses taken in landscape architecture.

Students are advised to see page 70 for impending changes in the curriculum.

**The Degree Master of Landscape Architecture**

The graduate program is designed to accommodate and bring together scholars in a number of disciplines such as architecture, design, plant science, forestry, geography, as well as holders of the bachelor’s degree in landscape architecture. It provides for two broadly conceived options, with some specialization in the second year of work. These options are: (a) the urban landscape, and (b) the regional landscape. The background of the student and his particular capabilities should indicate the option he will pursue.
The basic two-year program, with a three-month internship, is directed to the holder of a bachelor's degree from an accredited curriculum in landscape architecture, though unusually gifted graduates of a five-year undergraduate curriculum may find it possible to meet requirements in a slightly less time. Two or more quarters of additional work will be required of the holders of degrees in other disciplines.

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.

Lower Division Courses

11. Delineation. (1)
One 3-hour laboratory per week. Limited to major students in landscape architecture and in city and regional planning. Methods of graphic communication in landscape architecture. May be repeated once for credit. The Staff (F, W, Sp)

21A–21B. Introduction to Landscape Architecture. (1–1)
One 1-hour lecture per week. Lectures, selected reading and discussions on landscape architecture. Mr. Tetslow (F, Sp)

22A–22B–22C. Introduction to Design Laboratory. (4–4–4)
Two 4-hour laboratories per week. Prerequisite: Environmental Design 3, 4, 6, or equivalent; course 22A prerequisite to 22B, 22B to 22C. Elementary program preparation, analytical techniques, and the determinants of form as applied to basic landscape architecture design problems. Mr. Laurie (F, W, Sp)

23. Introductory Plant Materials. (4)
Two 4-hour laboratories per week. Prerequisite: Biology 11A–11B or equivalent. Identification of trees and shrubs. Classification for use in landscape design. Mrs. Arbegast (W)

25. History and Literature of Landscape Architecture. (3)
Three 1-hour lectures per week. Prerequisite: limited to major students in landscape architecture. Developmental history of landscape design; relationships to society, climate, and topography. Mr. Martin (W)

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

Environmental Design 3, 4, 6; Architecture 10; Biology 11A–11B, Engineering 21, Landscape Architecture 22A–22B–22C and 23; or their equivalents, are prerequisite to all upper division courses in landscape architecture for majors in landscape architecture.

100. Survey of Landscape Architecture. (4)
Two 1-hour lectures and one 4-hour laboratory per week. Prerequisite: advanced standing in architecture or city and regional planning. 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 and Intermediate Design. (1–1)
One 1-hour lecture per week. Lectures, selected reading, and discussions on landscape design. Mr. Martin (F, W)

122A–122B–122C. Intermediate Design Laboratory. (4–4–4)
Two 4-hour laboratories per week. Prerequisite: Architecture 10 or equivalent; Landscape Architecture 122A prerequisite to 122B, 122B to 122C, or equivalent. The development of programs and the application of functional requirements in the solution of landscape architectural design problems. Mr. Tetslow (F, W, Sp)

123. Plant Materials and Planting Design. (5)
Two 4-hour laboratories per week. Prerequisite: Landscape Architecture 23 or equivalent. Identification, problems in planting design, plans and specifications. Mrs. Scott (F)

124. Landscape Construction. (4)
Two 4-hour laboratories per week. Prerequisite: plane surveying. Design, calculations, and graphic solutions to construction problems; grading and surfacing, simple structures and materials; working drawings. Mr. Litton (F)

151. Design. (1)
One 1-hour lecture per week. Lectures, reading, and seminars. Mr. Litton (F)

152A–152B. Design Laboratory. (6–6)
Two 4-hour laboratories per week. Prerequisite: Landscape Architecture 122B and 124. Analysis and design of complex site projects. Mr. Quinn (W, Sp)

153. Advanced Planting Design. (4)
Two 3-hour laboratories per week. Prerequisite: Landscape Architecture 23 and 123. Planting design problems of complex projects. Mrs. Scott (W)

154. Landscape Construction and Contract Documents. (5)
Two 4-hour laboratories per week. Prerequisite: Landscape Architecture 124. Design, calculations, and graphic solutions to construction problems; irrigation and drainage; specifications and estimates; continuing investigation of grading, materials, and working drawings. Mr. Litton (F)

162. Park and Recreation Area Planning. (6)
Two 4-hour laboratories per week. Prerequisite: City and Regional Planning 100 and 100L, or 110. Principles, standards, and procedures in planning and design of areas for park recreation use. Mr. Vaughan (F)
172. Site Planning. (6)
Two 4-hour laboratories per week. Prerequisite: City and Regional Planning 100 and 100L, or 110, and 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. Litton (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)

Graduate Courses

201A–201B–201C. Graduate Landscape Design and Theory. (5–5–5)
Fifteen laboratory hours per week. Design problems oriented to the development of analytical, technical and graphic abilities, including basic problems in urban design and regional landscape design and specific work in planting design and construction. Sequence beginning (F) Mr. Eckbo

202A–202B. Seminar. (1–1)
Mr. Violich, Mr. Eckbo (F, W)

Fifteen laboratory hours per week. Design problems related to open space and open space systems in the existing urban environment, and the analysis and design of new communities and cities. Laboratory problems and discussion sections in collaboration with related disciplines.
Sequence beginning (F) Mr. Eckbo

211A–211B. Seminar in Urban Landscape Design. (2–2)
Four hours per week. Mr. Violich (F, W)

220A–220B. Regional Landscape Design. (5–5)
Fifteen laboratory hours per week. Problems concerned with the inventory, analysis and evaluation of regional landscape resources and values. Landscape planning of major physiographic regions. Laboratory problems and discussion sections in collaboration with related disciplines.
Sequence beginning (W) Mr. Vaughan

221A–221B. Seminar in Regional Landscape Design. (2–2)
Four hours per week. Mr. Vaughan (F, W)

298. Group Study. (1–5)
To be arranged. The Staff (F, W, Sp)

299. Individual Research. (1–5)
The Staff (Mr. Vaughan in charge) (F, W, Sp, Su)

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., A.B., 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 Criminology and of Law.
Albert A. Ehrenzweig, † Dr. Jur., J.D., LL.M., J.S.D., Walter Perry Johnson Professor of Law.
Caleb Foote, A.B., M.A., LL.B., Professor of Law and of Criminology.
Edward C. Halbach, Jr., A.B., J.D., LL.M., Professor of Law.
Dan F. Henke, B.S., LL.B., M.L., Professor of Law and Law Librarian.
John R. Hetland, B.S.L., LL.B., Professor of Law.
Ira M. Heyman, A.B., LL.B., Professor of Law.
Richard W. Jennings, A.B., M.A., LL.B., James W. and Isabel Coffroth Professor of Law.
Sanford H. Kadish, B.S.S., LL.B., Professor of Law.
Sam Kagel, A.B., LL.B., Professor of Law.
Herma H. Kay, A.B., J.D., Professor of Law.
Adrian A. Kragen, A.B., LL.B., Shannon Cecil Turner Professor of Law.
William T. Laube, Jr., A.B., J.D., LL.M., A. F. and May T. Morrison Professor of Law.
David W. Louisell, B.S.L., LL.B., Elizabeth Josselyn Boalt Professor of Law.
Frank C. Newman, † A.B., LL.B., LL.M., J.S.D., Professor of Law.
Stefan A. Riesenfeld, B.S., Dr. Jur., LL.B., Dott. in giur., S.J.D., Emanuel S. Heller Professor of Law.
† Absent on leave, 1966–67.
Sho Sato, A.B., LL.B., Professor of Law.
Arthur H. Sherry, A.B., LL.B., Professor of Law and of Criminology.
Preble Stolz, A.B., J.D., Professor of Law.
Justin Sweet, A.B., LL.B., Professor of Law.
Barbara Nachtrieb Armstrong, A.B., J.D., Ph.D., LL.D., A. F. and May T. Morrison Professor of Municipal Law, Emeritus.
William Warren Ferrier, A.B., J.D., Professor of Law, Emeritus.
William Lloyd Prosser, A.B., LL.D., Dr.Jur.h.c., Elizabeth Josselyn Boalt Professor of Law, Emeritus.
Fariborz Amini, A.B., M.D., Visiting Lecturer in Law.
John Page Austin, A.B., LL.B., Lecturer in Law.
Spurgeon Avakian, A.B., LL.B., Lecturer in Law.
Babette B. Barton, B.S., LL.B., Acting Professor of Law.
Newell C. Barnett, A.B., LL.B., Lecturer in Law.
Paul M. Bator, A.B., M.A., LL.B., Visiting Professor of Law.
Bryant M. Bennett, A.B., LL.B., Visiting Lecturer in Law.
William H. Brailsford, A.B., LL.B., Lecturer in Law.
Robert L. Bridges, A.B., LL.B., Lecturer in Law.
Valentine Brookes, A.B., LL.B., Lecturer in Law.
John W. Cowee, M.B.A., Ph.D., LL.B., Professor of Business Administration.
David Daube, Dr.Jur., Ph.D., D.C.L., M.A., LL.D., Visiting Lecturer in Law.
Steven Duke, B.S., LL.B., LL.M., Visiting Associate Professor of Law.
William I. Edlund, A.B., LL.B., Lecturer in Law.
A. Barlow Ferguson, A.B., LL.B., Lecturer in Law.
James B. Frankel, B.S., LL.B., Visiting Lecturer in Law.
Kathryn A. Gehrels, A.B., LL.B., Lecturer in Law.
Frank I. Goodman, A.B., B.A., LL.B., Acting Professor of Law.
Edwin A. Heafey, Jr., A.B., LL.B., Lecturer in Law.
William James Hill, A.B., LL.B., Assistant Dean and Lecturer in Law.
Harry R. Horrow, B.A., J.D., Lecturer in Law.
Tevis Jacobs, A.B., J.D., Lecturer in Law.
George C. Keeler, A.B., LL.B., Visiting Lecturer in Law.
Frank M. Keesling, A.B., LL.B., Lecturer in Law.
Joseph Chanslor Kimble, A.B., LL.B., Lecturer in Law.
Samuel A. Ladar, A.B., J.D., Lecturer in Law.
Dana Latham, A.B., LL.B., Lecturer in Law.
George S. Loquvam, B.S., M.D., Visiting Lecturer in Law.
William D. McKe, B.S., LL.B., Lecturer in Law.
Robert M. McLeod, B.S., LL.B., Visiting Lecturer in Law.
T. Neal McNamara, B.A., J.D., Visiting Lecturer in Law.
John K. McNulty, A.B., LL.B., Acting Associate Professor of Law.
Marc H. Monheimer, A.B., LL.B., Lecturer in Law.
Edward L. Mulliner, B.S., LL.B., Visiting Lecturer in Law.
Harold C. Nachtrieb, A.B., LL.B., Lecturer in Law.
Howard N. Nemerovski, B.S.E., J.D., Visiting Lecturer in Law.
Robert M. O’Neil, A.B., LL.B., Acting Associate Professor of Law.
John A. Pettis, Jr., A.B., LL.B., Lecturer in Law.
Martin N. Pulich, A.B., LL.B., Lecturer in Law.
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.

Professional Curriculum

**First Year**

200A–200B. Contracts. (3–3)

The law of contracts, dealing with the problems of formation, operation and termination.

Mr. Laube, Mr. Sweet

202. Criminal Law and Procedure. (3)

An introduction to criminal law and procedure.

Mr. Collings, Mr. Kadish, Mr. Sherry

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

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. Hetland, Mr. Heyman, Mr. Wilkins

209. Legislative and Administrative Processes. (3)

An introduction to problems that involve the law-making and dispute-settling functions of legislatures and administrative agencies, with emphasis on federal and state administrative procedure acts, lobbying legislation, and similar statutes.

Mr. Newman, Mr. Stolz

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

214A–214B. Introduction to Law. (½–½)

Small group and individual instruction in legal research and legal writing, including the preparation of legal memoranda and appellate briefs.

Mr. O'Neill and 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.

221. Basic Business Associations. (4)

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. Choper

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. Jennings, Mr. McNulty, Mr. Buxbaum

224A–224B. Constitutional Law. (2–2)

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. O'Neill

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, Mr. Riesenfeld
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.

Mrs. Barton, Mr. Halbach,

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,

Third Year

238. Justice and Correctional Administration. (2)
A seminar designed for students who have participated in the internship program of the National Council of Legal Clinics. The functions, procedures, problems, and interrelationships of the major agencies of justice and corrections will be analyzed. There will be visiting lecturers and student reports.

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.

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. Buxbaum

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. Ehrenzweig, Mrs. Kay

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. Jennings

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. Laube

250. Basic Evidence. (3)
The fundamental questions of evidence and theory of proof, including hearsay, business records, documentary proof, privileged 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. Louisell, Mr. Sherry

251. 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.

252. Selected Problems in Constitutional Laws. (2)
Legal problems relating to constitutional law and constitutional litigation.

253. Family Law. (3)
Marriage, annulment, divorce and separation; parent and child; adoption and legitimation; minors' contracts; guardian and ward; the Juvenile Court.

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.

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. Degnan
256. Land Development and Security. (2)
Real property investments including business form, title and tax problems of commercial property development.
Mr. Hetland

257. Insurance. (2)
General principles and current trends in the law and business of insurance.
Mr. Ehrenzweig, Mr. Cowee

258. Law of International Organization. (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

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. Kegal

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.
Mr. Kegal

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, workmen's compensation, and social assistance.
Mr. Kegal

265. Court Administration. (2)
Study of the business of the courts from the vantage point of the court administrator with emphasis on civil cases at the trial court level. Individual research which will typically include some contact with the operation of the local courts.
Mr. Stolz

266. Legislation. (2)
Essential characteristics of the modern legislative process; problems and methods of legislative drafting.
Mr. Wilkins

267. Law and Anthropology. (2)
The seminar will concentrate on discovering what lawyers and anthropologists have to say to each other that will significantly enrich both professions. Students will work on individual research papers with the lawyer and anthropologist working each other as consultants. Enrollment will be limited to six students from each department.
Mrs. Kay

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

270. 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.
Mr. Buxbaum

271. Trial Practice. (2)
Study in strategy and tactics in civil litigation, including trial moot court.
Mr. Hetland, Mr. Heafey

272. 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. Riesenfeld

273. Criminal Procedure and Practice. (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.
Mr. Sweet

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. Halbach

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. Collings

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. Mr. Halbach

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. Mr. Kragen, Mr. McNulty

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. Halbach

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

Graduate Curriculum
285A–285B. Seminar in Administrative Law and Procedure. (2–2) Mr. Newman, Mr. Stoltz

286A–286B. Seminar in Business Associations. (2–2) Mr. Buxbaum, Mr. Jennings

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. Cole, Mr. Heyman, Mr. O'Neil

289A–289B. Seminar in Criminal Law and Procedure. (2–2) Mr. Collings, Mr. Sherry

290A–290B. Seminar in International and Maritime Law. (2–2) Mr. Buxbaum, Mr. Riesenfeld


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

295A–295B. Seminar in Practice and Procedure. (2–2) Mr. Louisell

296A–296B. Seminar in Property and Trust Administration. (2–2) Mr. Halbach, Mr. Hetland, Mr. Heyman, Mr. Kay

297A–297B. Seminar in Public Finance and Taxation. (2–2) Mr. Froehlich, 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)

LIBRARIA DSPHIP

(Department Office, 425 Library)
Donald Coney, M.A. in L.S., Professor of Librarianship and University Librarian.
J. Periam Danton, Ph.D., Professor of Librarianship.
LeRoy Charles Merritt, Ph.D., Professor of Librarianship.
Raynard Coe Swank, Ph.D., Professor of Librarianship (Chairman of the Department).
Edward A. Wight, Ph.D., Professor of Librarianship.
Ray E. Held, Ph.D., Associate Professor of Librarianship.
Anne Ethelyn Markley, M.A. in L.S., Associate Professor of Librarianship.
Frederic John Mosher, Ph.D., Associate Professor of Librarianship.
Robert D. Harlan, Ph.D., Assistant Professor of Librarianship.
Patrick G. Wilson, Ph.D., Assistant Professor of Librarianship.

Mark H. Baer, M.L., Lecturer in Librarianship.
Mae J. Durham, B.L.S., Lecturer in Librarianship.
Grete W. Frugé, Certificate in Librarianship, Lecturer in Librarianship.
Dan F. Henke, M.L., Law Librarian and Professor of Law.
Donald W. Koepp, D.L.S., Lecturer in Librarianship.
Roger Levenson, A.B., Lecturer in Librarianship.
Ralph M. Shoffner, M.S., Lecturer in Librarianship.

For information on programs offered, please see the Announcement of the School of Librarianship.

206. School Library Administration. (3)
Two 1½-hour lectures per week. Prerequisite: consent of the 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, readings, class discussions, and field trips.
Mrs. Durham (F, Sp, Su)

207. Municipal and County Library Administration. (3)
Two 1½-hour lectures per week. Government, objects, 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 (F, Sp, Su)

208. College and University Library Administration. (3)
Two 1½-hour lectures per week. Prerequisite: consent of the 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. Danton (F, W, Sp, Su)

209. Library Work with Children. (3)
Two 1½-hour lectures per week. A general survey of children's books and reading preferences. Historical backgrounds and development: types of children's literature; levels of interest; criticism and evaluation; illustration: trends; book selection; story telling; organization and administration of a children's room in a public library.

210. Children's Literature; Oral Interpretation. (3)
Two 1½-hour lectures per week. Prerequisite: Anthropology 121 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 (W, Sp)

211. Development of the Book. (3)
Two 1-hour lectures and 1-hour laboratory 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 (F, W, Sp, Su)
212A. Special Reference Sources. (3)
Three 1-hour lectures per week. Prerequisite: courses 202A and 202B. Government publications; foreign-language bibliographies and reference materials; special types of information sources.
Mr. Harlan, Mr. Held, Mr. Mosher (F, W, Sp, Su)

212B. Special Bibliography. (3)
Three 1-hour lectures per week. Prerequisite: courses 202A and 202B. The bibliographical organization in major subject fields.
Mr. Harlan, Mr. Held, Mr. Mosher (F, W, Sp, Su)

215. Reading and Reading Interests. (3)
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.
Mr. Koepp (W, Su)

216. Law Librarianship: Legal Research, Reference, and Bibliography. (3)
Two 1½-hour lectures per week. 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 citators and digests, legal periodicals and indexes, secondary materials, legal bibliography tools.
Mr. Henke (Sp)

217. Bibliography of Science and Technology. (3)
Three 1-hour lectures per week. Prerequisite: courses 202A and 202B. Scientific and technical literature with emphasis on reference and bibliographical aids. Periodical and serial literature and its use and control through abstracts and indexes.
Mr. Baer (F)

218. Advanced Cataloging. (3)
One 2-hour lecture per week. Prerequisite: course 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 (W)

219. Advanced Classification. (3)
One 2-hour lecture per week. Prerequisite: course 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 (W)

220A. Descriptive Bibliography. (3)
Two 1½-hour lectures per week. Prerequisite: courses 201B, 202B, 211. Historical 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 (F)

220B. Subject Bibliography. (3)
One 2-hour lecture per week. Prerequisite: courses 201A, 201B, 202B. 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 (F, Sp)

221. Book Collecting for University Libraries. (3)
One 2-hour lecture per week. Prerequisite: courses 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 (Sp)

224. History of Libraries. (3)
Three 1-hour lectures per week. A historical introduction to the libraries of the Western World, from antiquity to the present.
Mr. Held (F)

225A. History of Ancient and Medieval Libraries. (3)
One 2-hour lecture per week. Prerequisite: course 224.
Mr. Held (W)

225B. History of Scholarly Libraries. (3)
One 2-hour lecture per week. Prerequisite: course 224.
Mr. Danton (Sp)

225C. History of Popular Libraries. (3)
One 2-hour lecture per week. Prerequisite: course 224.
Mr. Held (Sp)

226A. Origins of Printing and Publishing in Europe. (3)
Two 1½-hour lectures per week. Prerequisite: course 211.
Mr. Mosher (F)

226B. History of Books and Printing from the Sixteenth Century. (3)
Two 1½-hour lectures per week. Prerequisite: course 211.
Mr. Harlan, Mr. Mosher (F)

226C. History of Printing and Publishing in the United States. (3)
Two 1½-hour lectures per week. Prerequisite: course 211.
Mr. Mosher (Sp)

228. Problems in Reading. (3)
One 2-hour lecture per week. Prerequisite: course 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 effects of reading; the library and adult education.
Mr. Merritt (F)

230. Library Administration. (3)
One 3-hour lecture per week. Prerequisite: courses 206, 207, or 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 232, 233, 234.
Mr. Wight (W)

232. University Library Administration. (3)
One 2-hour lecture per week. Prerequisite: courses 208, 230, 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. Coney (Sp)
233. Junior College Library Administration. (3)
Mr. Merritt (F)

234. Problems in Public Library Administration. (3)
One 3-hour lecture per week. Prerequisite: courses 207, 230. 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 (Sp)

236. Supervision of School Libraries. (3)
Two 1 1/2-hour lectures per week. Prerequisite: course 206 and consent of instructor. 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.
(F, Su)

237. Library Curricular Materials. (3)
Two 1 1/2-hour lectures per week. Prerequisite: course 206 and consent of instructor. The program for evaluation, selection, and use of curricular materials; problems of the supervisor of school libraries in working with coordinators, supervisors, and librarians in the curriculum program.
(F, Su)

238. Library in the Community. (3)
One 3-hour lecture per week. Prerequisite: courses 206, 207 or 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 (Sp)

240. Content Analysis. (3)
One 2-hour lecture per week. Problems in methods of determining maturity level, social and moral attitudes, and other educational and propagandistic assumptions in materials of communication.
Mr. Merritt (Sp)

245. Introduction to Documentation. (3)
One 2-hour lecture per week. Prerequisite: courses 201B, 202B. Survey of activities performed by documentation centers in the production, acquisition, organization, servicing and dissemination of technical reports. Introduction to various systems and devices for the storage and retrieval of information.
Mr. Swank (F, Sp)

246. Introduction to Information System Design. (3)
One 2-hour lecture per week. Prerequisite: courses 201B, 202B. 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 (W)

251A–251B. Methods of Research in Librarianship. (3–3)
Two 1 1/2-hour lectures 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.
The Staff (Mr. Wight in charge) (F, W)

260. Seminar in Comparative Librarianship. (3)
One 2-hour lecture 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 (F)

265. Seminar in Library Education. (3)
One 2-hour lecture per week. Prerequisite: consent of instructor. Origins, development, and effects of education for librarianship in Europe and the United States.
Mr. Danton (W)

297. Individual Study. (3–6)
Prerequisite: consent of instructor. Individual study, in consultation with the graduate adviser, intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for D.L.S. and Ph.D. degrees. Course to be taken on a satisfactory or unsatisfactory basis.
The Staff (Mr. Swank in charge) (F, W, Sp, Su)

298. Directed Individual Research. (1–4)
Prerequisite: consent of the instructor.
The Staff (Mr. Swank in charge) (F, W, Sp, Su)

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) (F, W, Sp, Su)

LINGUISTICS

(Departmental Office, 2337 Dwinelle Hall)

Madison S. Beeler, Ph.D., Professor of Linguistics.
C. Douglas Chrétien, 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 Romance Philology.
David W. Reed, Ph.D., Professor of Linguistics (Chairman of the Department).
William S.-Y. Wang, Ph.D., Professor of Linguistics.
Wallace L. Chafe, Ph.D., Associate 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.
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, 115, 125, 135 and 166) and historical or comparative (145, 155, 156 and 165). Linguistic theory is introduced in the senior year (185) when the basic linguistic skills have been mastered.

The Major

Required: 18 units in French or German; 8 units in Greek or Latin (or three years of either in high school); Linguistics 20, 105, 115, 125, 135, 145, 165, 185 and 190A–190B. Any two courses from the following list: Linguistics 155, 156, 166, 175; Anthropology 172A, 172B, 172S; English 110A, 110B, 131, 205; German 145; Philosophy 133A, 133B; Psychology 131, 132; Speech 100A, 100B.

Recommended: Anthropology 2A–2B; Philosophy 12A–12B.

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 outside the department. Further information on requirements is obtainable from the graduate adviser.

Doctor’s Degree in Linguistics The program follows Plan B, as described in Chapter III of this catalogue. The student must pass reading examinations in French and German, with the possibility of substituting Russian for one of these languages with the approval of the graduate adviser. Before the qualifying examination he must submit three scholarly papers on different subjects, prepared either in a course or independ-
ently, acceptable to the examination committee. None of these papers may form part of the dissertation. The qualifying examination is administered by a committee of five members, at least one chosen from outside the department. Further information on requirements is obtainable from the graduate adviser.

Doctor's Degree in Sanskrit. A graduate student in Sanskrit should have completed Linguistics 190A–190B and such other undergraduate work as may be considered to provide a suitable background for the study of Indology. The program follows Plan B, as described in Chapter III of this catalogue. The student must pass reading examinations in French and German. The programs will ordinarily include: (1) the reading of texts in classical Sanskrit, the Vedas, Pali, and Prakrit; (2) work in Indo-European comparative grammar and in the ethology of India; and (3) studies in a related field (e.g., linguistics, ethnology, comparative literature, folklore, philosophy, or the like). The qualifying examination is administered by a committee of five members, at least one chosen from outside the department. All aspects of the program are subject to the approval of the graduate adviser, from whom further information may be obtained.

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. 335.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Course

20. Language and Linguistics. (5)

Three 1 1/2-hour lectures and one 1 1/2-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. Reed (F); Mr. Ege (Sp)

Upper Division Courses

Graduate students may enter upper division courses with the consent of the instructor, without meeting all of the prerequisites.

105. Descriptive Linguistics. (5)

Three 1 1/2-hour lectures and one 1 1/2-hour section meeting per week. Prerequisite: upper division status or consent of instructor.

Mr. Ege (F); Mr. Wang (W, Su)

115. Phonetics and Phonemics. (5)

Three 1 1/2-hour lectures and one 1 1/2-hour section meeting per week. Prerequisite: Linguistics 105, which may be taken concurrently.

Mr. Ege (W); Mr. Wang (Sp)

125. Linguistic Analysis. (4)

Three 1 1/2-hour lectures per week. Prerequisite: Linguistics 115. Mr. Ege (F); Mr. Kaufman (Sp)

135. Linguistic Structures. (4)

Three 1 1/2-hour lectures per week. Prerequisite: Linguistics 115. Mr. Sawyer (W); Mr. Zimmer (Su)

145. Comparative and Historical Linguistics. (4)

Two 1 1/2-hour lectures per week. Prerequisite: upper division status or consent of instructor.

Mr. Chrétien (F)

155. Geographical and Social Dialects. (4)

Two 1 1/2-hour lectures per week. Prerequisite: Linguistics 105, which may be taken concurrently.

Mr. Reed (W)

*156. American English. (4)

Three 1 1/2-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 1 1/2-hour lectures per week. Prerequisite: Linguistics 105 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 (F); Mr. Ege (Su)

* Not to be given, 1966–67.
185. Linguistic Theories. (4)  
Three 1½-hour lectures per week. Prerequisite: Linguistics 115 or its equivalent.  
Mr. Chafe (Sp); Mr. Ege (Su)

190A–190B. Elementary Sanskrit. (4–4)  
Three 1½-hour lectures per week.  
Sequence, beginning (F) and (W).  
Mr. van Nooten (F, W, Sp)

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

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. Zimmer (F, W); Mr. Chafe (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 (W)

223. Advanced Phonological Analysis. (4)  
Two 1½-hour section meetings per week. Prerequisite: course 115.  
Mr. Kaufman (Sp)

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. Zimmer (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. Chrétien (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.  
Mr. Emeneau (F, W)

241. Linguistic Reconstruction. (4)  
Two 1½-hour section meetings per week.  
Miss Haas (F)

242. Advanced Diachronic Linguistics. (4)  
Two 1½-hour section meetings per week.  
(W)

243. Advanced Dialectology. (4)  
Two 1½-hour section meetings per week. Prerequisite: course 155 and a reading knowledge of French or German or one other Modern European language.  
Mr. Reed (Sp)

244. Advanced Indo-European Comparative Linguistics. (4)  
Two 1½-hour section meetings per week.  
Mr. Beeler (W)

245. American Linguistic Geography. (4)  
Two 1½-hour section meetings per week. Analysis of American dialect materials.  
Mr. Reed (Sp)

251. Ethnolinguistics. (4)  
Two 1½-hour section meetings per week.  
Mr. Kaufman (F)

252. Applied Linguistics. (4)  
Two 1½-hour section meetings per week.  
Mr. Sawyer (Sp)

253. Stylistics. (4)  
Two 1½-hour section meetings per week.  
Mr. Emeneau (W)

261. Computational Linguistics. (4)  
Two 1½-hour section meetings per week. The use of electronic computers in linguistics.  
Mr. Wang (Sp)

262. Statistical Linguistics. (4)  
Two 1½-hour meetings per week.  
Mr. Chrétien (Sp)

281. History of Linguistics. (4)  
Two 1½-hour section meetings per week.  
Mr. Zimmer (W)

291. Problems in Field Linguistics. (4)  
Two 1½-hour section meetings per week.  
Miss Haas (F, Sp)

297. Individual Study. (2–6)  
The Staff (F, W, Sp, Su)

298. Special Study. (2–6)  
The Staff (F, W, Sp, Su)

299. Directed Research. (2–6)  
The Staff (F, W, Sp, Su)

* Not to be given, 1966–67.
Related Courses in Other Departments

- Language and Culture (Anthropology 172A)
- Language and Society (Anthropology 172B)
- Advanced Study in Anthropological Linguistics (Anthropology 172S)
- Language (English 25)
- The English Language (English 110A–110B)
- Structure of English (English 205)
- History of the English Language (English 221A)
- The Old English Language (English 221B)
- The Middle English Language (English 221C)
- The Modern English Language (English 221D)
- Linguistics and Literary Analysis (English 223A–223B)
- German Phonology (German 145)
- Introduction to the History of the German Language (German 270A)
- Historical Phonology and Morphology of German (German 270B)
- Seminar in Germanic Linguistics (German 290)
- Linguistic Structures of South Asian Languages (Near Eastern Languages 193)
- Languages of Eastern Asia (Oriental Languages 100)
- Phonology of Ancient Chinese (Oriental Languages 135)
- Japanese Grammar (Oriental Languages 139A–139B)
- Malayo-Polynesian Linguistics (Oriental Languages 208)
- Seminar in Japanese Linguistics (Oriental Languages 239)
- Linguistic History of the Roman Empire (Romance Philology 200)
- Late Latin Language and Literature (Romance Philology 201)
- General Romance Linguistics (Romance Philology 202)
- Romance Dialect Geography (Romance Philology 205)
- Peninsular Spanish Dialectology (Romance Philology 207)
- Romance Etymology (Romance Philology 208)
- Romance Derivation and Composition (Romance Philology 210)
- Scandinavian Dialects (Scandinavian 215)
- Seminar in Scandinavian Linguistics (Scandinavian 250)
- Comparative Slavic Linguistics (Slavic Languages and Literatures 220)
- General Phonetics (Speech 103)

LOGIC AND THE METHODOLOGY OF SCIENCE

(Group Office, 247 Campbell Hall)

Ernest W. Adams, Ph.D., Associate 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.
William Craig, Ph.D., Professor of Philosophy.
Lester E. Dubins, Ph.D., Associate Professor of Mathematics and of Statistics.
Herbert B. Enderton, Ph.D., Assistant Professor of Mathematics.
John C. Harsanyi, Ph.D., Professor of Business Administration.
Leon A. Henkin, Ph.D., Professor of Mathematics.
Benson Mates, Ph.D., Professor of Philosophy.
Raphael M. Robinson,† Ph.D., 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.

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 agency 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 candidacy 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**.
István Fary, Ph.D., **Professor of Mathematics**.
Jacob Feldman, Ph.D., **Professor of Mathematics**.
Alfred L. Foster, Ph.D., **Professor of Mathematics**.
Bernard Friedman,† Ph.D., **Professor of Mathematics**.
David Gale, Ph.D., **Professor of Mathematics and of Industrial Engineering**.
Henry Helson,‡ Ph.D., **Professor of Mathematics (Chairman of the Department)**.
Leon A. Henkin, Ph.D., **Professor of Mathematics**.
Morris W. Hirsch, Ph.D., **Professor of Mathematics**.

Gerhard P. Hochschild, Ph.D., Professor of Mathematics.
Harry D. Huskey,† Ph.D., Professor of Mathematics and of Electrical Engineering.
Tosio Kato,** D.Sc., Professor of Mathematics.
John L. Kelley,** Ph.D., Professor of Mathematics.
Shosichi 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 Loève, Docteur ès 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.
Raphael M. Robinson,† Ph.D., Professor of Mathematics.
Maxwell A. Rosenlicht,† Ph.D., Professor of Mathematics.
Abraham Seidenberg, Ph.D., Professor of Mathematics.
Hans Lewy, Ph.D., Professor of Mathematics.
Michel Loeve, Docteur ès Sciences, Professor of Mathematics and of Statistics.
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Raphael M. Robinson,† Ph.D., Professor of Mathematics.
Maxwell A. Rosenlicht,† Ph.D., Professor of Mathematics.
Abraham Seidenberg, Ph.D., Professor of Mathematics.
Hans Lewy, Ph.D., Professor of Mathematics.
Michel Loeve, Docteur ès Sciences, Professor of Mathematics and of Statistics.
Calvin C. Moore, Ph.D., Professor of Mathematics. **

** Appointment to the Miller Institute for Basic Research in Science, 1966–67.
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; 2A–2B–2C; 104A; 113A, 113B; 104B or 185; 130 or 140; 134 or 135; three additional upper division courses. Not acceptable: 111, 190A–190B–190C.

The attention of mathematics majors who expect to work in digital computing or to take further study in computer sciences is called to Mathematics 17, 104B, 113C, 125A, 128A, 128B, and 185; 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.
Computer Science  The Group Major in Computer Science is described in the Announcement of the College of Letters and Science.

Major in Mathematics for Teachers  Required: 1A–1B–1C; 2A–2B–2C; 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, enters 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 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, and 250A, 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 72.

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 courses 3A–3B and two-thirds of 4A.)

1A, Mr. Addison, Mr. Lehman, Mr. Potters, Mr. Solovay (F); Mr. Robinson (W); Mr. Miller (Sp).
1B, Mr. Enderton (F); Mr. Addison, Mr. Potters, Mr. Solovay (W); Mr. Robinson (Sp), 1C, Mr. J. Wolf (W); Mr. Addison, Mr. Feldman, Mr. Protters (Sp).

H1A–H1B–H1C. Analytic Geometry and Calculus. (4-4-4)

Three 1-hour lectures and one 1-hour problem session per week. Prerequisite: two years of high school algebra, plane geometry, plane trigonometry.Honors course corresponding to 1A, 1B, 1C, 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.

H1A, Mr. Loève (F); H1B, Mr. Loève (W); H1C, Mr. Loève (Sp)

2A–2B–2C. Second-Year Calculus. (4-4-4)

Two 1-hour lectures and two 1-hour problem sessions per week. Prerequisite: course 1C or 11B. Thorough technique of differential and integral calculus. Analysis of functions of several variables. Partial differentiation, multiple integrals. Differential equations.

2A, Mr. Hirsch, Mr. Kobayashi, Mr. Rhodes (F);
2B, Mr. J. Wolf (Sp), 2B, Mr. Bade (F); Mr. Kobayashi, Mr. Rhodes, Mr. Smale (W);
2C, Mr. Bade (W); Mr. Kobayashi, Mr. Rhodes (Sp).

H2A–H2B–H2C. Second Year Calculus. (4-4-4)

Three 1-hour lectures and one 1-hour problem session per week. Prerequisite: courses H1A, H1B, H1C, or 1A, 1B, 1C and permission of instructor, or 11A, 11B and permission of instructor. Honors course, corresponding to 2A, 2B, 2C, 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.

H2A, Mr. Griffiths (F); H2B, Mr. Griffiths (W); H2C, Mr. Griffiths (Sp).

6. Computers and Data Processing. (4)

Two 1-hour lectures and one 1-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.

Mr. Lehmer (F); Mr. Bremerman (Sp)

10. Mathematics for Liberal Arts Students. (4)

Two 1-hour lectures and one 1-hour problem session per week. Not open to students who have had 1A or 16A. Concepts of modern mathematics for students who have no technical background. The content varies among the following topics: algebra, geometry, set theory, logic, number theory, statistics, mathematical methods in science.

Mr. Kriple (F); Mr. Bremerman (W)

11A-11B. Analytic Geometry and Calculus. (4-4)

Two 1-hour lectures, 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, Mr. Sarason (F); 11B, Mr. Sarason (W)

Introduction to Logic (Philosophy 12A-12B)

15. Concepts of Mathematics for Elementary School Teachers. (4/2)

Four 1-hour lectures per week. Course is intended for prospective elementary school credential candidates. Development and structure of the real number system and its subsystems. Elementary concepts of set theory, numeration, factoring and divisibility, nonmetric geometry, measurement.

Mr. Lund (F, W, Sp)

16A-16B. Analytic Geometry and Calculus. (4-4)

Two 1-hour lectures and two 1-hour problem sessions per week. **Prerequisite: two years of high school algebra, plane trigonometry.** Elements of analytic geometry, differential and integral calculus. The exponential, logarithmic, and trigonometric functions. The algebra of matrices and systems of linear equations. Convexity and systems of linear inequalities. This course does not prepare for further work in mathematics but may be followed by Statistics 16, 20, or 130A.

16A, Mr. R. Moore, Mr. Pugh, Mr. Warner (F); Mr. F. Wolfe, Mr. Wu (W); Mr. Bade, Mr. Sarason (Sp); 16B, ——— (F); Mr. Miller, Mr. Warner (W); Mr. F. Wolfe, Mr. Wu (Sp)

17. Elementary Computer Programming. (4)

Two 1-hour lectures and one 1-hour problem session per week. **Prerequisite: course 1A or concurrent registration.** Computers and their logical structure, binary arithmetic, codes, programming languages, problem-solving by machine. Introductory course for students wishing to study computing.

Mr. Taub (F); Mr. Lehmer (W); ——— (Sp)

Upper Division Courses

Introduction to the Theory of Probability and Statistics. (Statistics 100A-100B-100C)

104A. Introductory Analysis. (4)

Three hours of lecture per week. **Prerequisite: course 2C or consent of instructor.** Sets and functions, real numbers, metric spaces, continuous functions, theory of differentiation, Riemann integration, interchanges of order of limit operations. Students who have completed 2A, 2B, 2C have covered the material of this course.

Mr. Harvey, Mr. Holford, Mr. Kenyon, Mr. Lanford, Mr. Lipkin, Mr. Pedersen, Mr. Sotomayer (F); Mr. Lehman, Mr. Lubin, Mr. Neubauer, Mr. Newberger (W); Mr. Bell, ———, Mr. Rhodes, Mr. Wallach (Sp)

104B. Intermediate Analysis. (4)

Three hours of lecture per week. **Prerequisite: course 112C or 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.

Mr. Kenyon, Mr. Lanford, Mr. Sotomayer (W); Mr. Lubkin, Mr. Pedersen, Mr. Newberger (Sp)

105. Integration. (4)

Three hours of lecture per week. **Prerequisite: course 104B.** Sets and functions in $\mathbb{R}^n$, Lebesgue measure, the Lebesgue integral, convergence theorems, Fubini's theorems, $L_p$ spaces, differentiation and integration, change of variables, more general measures, Radon-Nikodym theorem.

Mr. Helpem, Mr. Neubauer (F); Mr. Lewy, Mr. Wagoner (W); Mr. Kenyon, Mr. Lanford (Sp)

111. Introduction to Linear Algebra. (4)

Three hours of lecture per week. **Prerequisite: course 112C.** 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.

Mr. Gay, Mr. Phillips, Mr. Sotomayer (F); Mr. Diliberto, Mr. Meyer, Mr. Wallach (W); Mr. Diliberto, Mr. Foster (Sp)

113A. Introduction to Abstract Algebra. (4)

Three hours of lecture per week. **Prerequisite: course 112C.** Sets, equivalence relations, integral domains, mathematical induction, rings, fields, field of quotients, unique factorization for integers and polynomials, real and complex numbers.

Mr. Handel, Mr. Lubin, Mr. Rieffel, ———, Mr. Wallach (F); Mr. Fary, Mr. Hochschuld, Mr. Small, ——— (W); Mr. Henkin, Mr. Lewis, Mr. Siedenberg (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.

Mr. Handel, Mr. Hirsch, Mr. Lubkin, Mr. Rieffel (W); Mr. Fary, Mr. Hochschuld, Mr. Small (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.

Mr. Brown, Mr. Rhodes (F); ———, Mr. Handel, Mr. Lubin, Mr. Rieffel, ——— (Sp)

115A. Introduction to Number Theory. (4)

Three hours of lecture per week. **Prerequisite: course 12A.** Divisibility, congruences, numerical functions, theory of primes.

Mr. McGeehe, Mr. Ogg (F); Mr. Robinson (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.

Mr. Ogg (W)
117. Mathematical Problems Seminar. (4)

Three hours of lecture per week. **Prerequisite:** course 2C. Primarily for students in the physical sciences. Mathematics majors and others intending to take further courses in mathematics should take 104 and 185 instead of 120A.

120A. Complex numbers, analytic functions, singularities, contour integration. Mr. Bell, ---, Mr. Gray, Mr. Handel, Mr. Harvey, Mr. C. Moore, Mr. Rosenthal, --- (F); Mr. Cordes, Mr. Greenleaf, Mr. Halpern, Mr. Meyer, Mr. Sotomayor, Mr. Wallach (W); Mr. Brown, Mr. Lanford, Mr. Lewis, Mr. Neubauer, Mr. Phillips, --- (Sp).

120B. Conformal mapping, differential equations, special functions. Mr. Bell, Mr. Harvey, Mr. C. Moore, Mr. Rosenthal (W); Mr. Greenleaf, Mr. Handel, Mr. Meyer (Sp).

120C. Boundary value problems, methods of solution of partial differential equations of mathematical physics. Mr. Bell, Mr. Chambre, Mr. Harvey (Sp).

123. Ordinary Differential Equations. (4)

Three hours of lecture per week. **Prerequisite:** course 185 (may be taken concurrently). 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. --- (W).

125A-125B. Mathematical Logic. (4-4)

Three hours of lecture per week. **Prerequisite:** course 113A 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, Mr. Enderton, Mr. Makkai (F); Mr. McKenzie (F); 125B, Mr. Enderton (W); Mr. McKenzie (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. --- (Sp).

128A. Numerical Analysis. (5)

Three hours of lecture per week and one 3-hour laboratory. **Prerequisite:** course 2C. Students in computer science should take 17 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. Mr. Harrison, Mr. Lehman (F); Mr. Harrison (W); Mr. Harrison (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. Mr. Miller (W).

130. The Classical Geometries. (4)

Three hours of lecture per week. **Prerequisite:** course 113B. 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 hyperquadratics, the projective group and its subgroups, non-Euclidean geometry, inver- sive geometry. Mr. Lewy, Mr. Meyer, Mr. Seidenberg, --- (F); Mr. Brown, Mr. Rosenlicht (W); Mr. Gale, Mr. Small (Sp).

131. Algebraic Curves. (4)

Three hours of lecture per week. **Prerequisite:** course 113A. The complex projective plane, simple and singular points of plane algebraic curves, Bezout's theorem, branches, linear series, cubic curves. Mr. Seidenberg (W).

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. Mr. Gale (W); Mr. Rosenlicht (Sp).

134. Number Systems. (4)

Three hours of lecture per week. **Prerequisite:** course 1C. Especially recommended for prospective teachers. Systems of natural numbers, integers, rational numbers, and real numbers developed both axiomatically and through set-theoretical construction. Proof by induction and definitions by recursion. Mr. McKenzie, Mr. Lewis (F); Mr. Cook (W); Mr. Wallach (Sp).

135. Introduction to the Theory of Sets. (4)

Three hours of lecture per week. **Prerequisite:** courses 113A and 104A. Set-theoretical paradoxes and means of avoiding them. Sets, relations, functions, order and well-order. Proof by transfinite induction and definition by transfinite recursion. Cardinal and ordinal numbers and their arithmetic. Construction of the real numbers. Axiom of choice and its consequences. Mr. Galvin (F); Mr. R. T. Moore, Mr. McKenzie (W); Mr. Cook, Mr. Galvin (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 theory. Mr. Gale, Mr. Gray (F); Mr. McGehee (W); Mr. Sotomayor, Mr. J. Wolf (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; substructures, ideals, direct products; representation theorem. Mr. Galvin (W)

160. History of Mathematics. (4)
Three hours of lecture per week. Prerequisite: courses 2C and 113A. History of algebra, geometry, analytic geometry, and calculus from ancient times through the seventeenth century and selected topics from more recent mathematical history. Mr. Lehmer (Sp)

Introduction to the Theory of Probability (Statistics 165)

185. Introduction to the Theory of Functions of a Complex Variable. (4)
Three hours of lecture per week. Prerequisite: course 124C or 104A. Analytic functions of a complex variable, Cauchy's integral theorem, power series, Laurent series, singularities of analytic functions, the residue theorem with application to definite integrals, conformal mapping. May not be taken for credit in addition to 126A. Mr. Hewlett, Mr. Neubauer (F); Mr. Hochschild, Mr. Lewis, Mr. Robinson (W); Mr. Harvey, Mr. Miller, Mr. Neubauer (Sp)

188. Mathematical Models in Physics and Engineering. (4)
Three hours of lecture per week. Prerequisite: courses 113B and 185. 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, resolvents of linear operators, group invariance, and physical concepts which arise in the study of dynamical systems and wave propagation. Mr. Holford (Sp)

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 sciences. 190A. Analytic geometry, differential and integral calculus. Mr. Foster (F); Mr. Lehman (W) 190B. Calculus of several variables (partial differentiation, extremum problems), complex numbers and trigonometry, vectors and vector spaces. Mr. Foster (W); Mr. Lehman (Sp) 190C. Difference equations, linear algebra. Mr. Foster (Sp)

Students who have studied calculus should 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. Mr. Kobayashi, Mr. McGehee, Mr. Proctor (F) Mr. Halpern, Mr. Pedersen (W); Mr. Sarason (Sp)

202B. Function Spaces. (4)
Three hours of lecture per week. Prerequisite: course 202A. Convergence theory, uniform spaces, spaces of functions, Arzelà-Ascoli theorems, Stone-Weierstrass theorem, further topics selected by the instructor. Mr. Kobayashi, Mr. McGehee, Mr. Proctor (W) Mr. Halpern, Mr. Pedersen (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. Mr. Sarason (F); Mr. Bell (W); Mr. Bungart (Sp)

Stochastic Processes (Statistics 203A–203B–203C)

205. Theory of Functions of a Complex Variable. (4)
Three hours of lecture per week. Prerequisite: course 185. Representation theorems of Weierstrass and Mittag-Leffler, normal families, conformal mapping and Riemann mapping theorem, analytic continuation. Mr. Cordes (F); Mr. Feldman (W) Mr. Lewy (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 Lp and C. Mr. Bade, Mr. Newberger (F); Mr. Rosenthal (W)

206B. Linear Operators. (4)
Three hours of lecture per week. Prerequisite: course 206A. Spectrum and resolvent, Fredholm theory of compact operators, spectral theorem for bounded self-adjoint operators, commutative Banach algebras. Mr. Newberger (W); Mr. Rosenthal (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. Rosenthal (F)

208. Functional Analysis. (4)
Three hours of lecture per week. Prerequisite: course 206B. Locally convex linear topological spaces, distributions, further topics selected by the instructor. Mr. Bade (W)

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 pseudoconvexity and the E. Levi problem, embedding theorem for Stein manifolds, proper mapping theorem, normalization theorems, bounded domains in Cn. Mr. Kripke (F); 212B, Mr. Kripke (Sp)
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, Mr. Hirsch, Mr. Meyer (F); Mr. Phillips (Sp). 215B, Mr. Hirsch (W); Mr. Phillips (Sp). 215C, Mr. Hirsch (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.

(Not given every year) Mr. Lewy (F)

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, Friedrichs asymptotic expansions. Sequence beginning (F), Mr. Diliberto

220A–220B–220C. Higher Mathematics for Physical Sciences and Engineering. (4–4–4)
Three hours of lecture per week. Prerequisite: courses 185 or 120A, 120B, 120C. Primarily for students in engineering.
220A. Special functions of mathematical physics. Mr. Miller, Mr. Ross (F)
220B. Partial differential equations of mathematical physics. Mr. Ross, Mr. Sachs (W)
220C. Integral equations, variational methods. Mr. Ross, Mr. 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, 185, and 206A (206A may be taken concurrently with 222A). 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.
Sequence beginning (F), Mr. Morrey

Three hours of lecture per week. Prerequisite: courses 104A, 185 and 111 or 113C. Introduction to Hilbert space and linear operators. Spectral theory of matrices and ordinary differential operators. Green's functions and solutions of partial differential equations.
223A, Mr. Holford, Mr. Kenyon, Mr. Landford, Mr. Parlett (F); Mr. Friedman, Mr. Lipkin (W); Mr. Holford, Mr. Kenyon, Mr. Parlett (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.
Sequence beginning (F), Mr. Addison

226. Mathematical Logic and Computers. (4)
Three hours of lecture per week. Prerequisite: course 125A. Boolean functions and switching circuits, deterministic computing elements, finite automata, Turing machines, introduction to recursive functions and unsolvable combinatorial problems.

Mr. Cook (F)

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. Enderton (W); Mr. Addison (Sp)

228A–228B–228C. Advanced Numerical Analysis. (4–4–4)
Three hours of lecture per week. Prerequisite: courses 111 or 113B, and 128B. 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), Mr. DeVoglaere (F, W, Sp)

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, Mr. Makkai (W); 229B, Mr. Makkai (Sp)

Three hours of lecture per week. Prerequisite: courses 125A and 135.

235C. Selected topics such as: arithmetic of relation types, generalized continuum hypothesis, inaccessible numbers, constructible sets.
Mr. Galvin (W)

236A–236B. Metamathematics of Set Theory. (4–4)
Three hours of lecture per week. Prerequisite: courses 225C and 235B. Various set theories: comparison of strength, transitive and natural models,

* Not to be given, 1966–67.
finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. The measure problem and axioms of strong infinity.  
236A, Mr. Solovay (F)

240A. Differential Geometry. (4)

Three hours of lecture per week. Prerequisite: courses 113B and 202A. Differential manifolds and maps, abstract vector bundles, tangent bundle, vector fields, flows, Lie derivative, exterior forms, Frobenius theorem, Stokes theorem.  
Mr. Warner (F); — (W); Mr. Meyer (Sp)

240B–240C. Riemannian Geometry. (4–4)

Three hours of lecture per week. Prerequisite: course 240A. Riemannian manifolds, parallelism, geodesics, structure, 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, Mr. Warner (W); 240C, Mr. Warner (Sp)

241A. Riemann Surfaces. (4)

Three hours of lecture per week. Prerequisite: courses 205 and 240A. Compact Riemann surfaces, Riemann surface of an algebraic function, Riemann–Roch theorem, Abel’s theorem, Jacobian variety and linear systems, integrals of 1st, 2nd, and 3rd kind, and period relations.  
Mr. J. Wolf (F); Mr. Smale (Sp)

241B. Complex Manifolds. (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.  
Mr. J. Wolf (W)


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, reduced products, and ultraproducts; free algebras. Applications of general notions to groups, rings, fields, lattices, Boolean algebras, etc.  
245A, Mr. Henkin (F); 245B, Mr. Henkin (W); 245C, Mr. Foster (F); Mr. Henkin (Sp)

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.  
Mr. Brown, Mr. Small, — (F); Mr. Gay (W); Mr. McGehee (Sp)

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.  
Mr. Brown (W); Mr. Gay (Sp)

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.  
Mr. Hochschild (Sp)

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.  
Mr. Hochschild (F)

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.  
Mr. Small (W)

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.  
— (F)


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.  
Sequence beginning (F), 256A, Mr. Ogg (F); 256B, Mr. Ogg (W); 256C, Mr. Ogg (Sp)

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.  

260A. Topological Groups. (4)

Three hours of lecture per week. Prerequisite: courses 202A and 250A. General topological groups, Haar measure, compact groups.  
Mr. Rieffel, (W)

260B. Abstract Harmonic Analysis. (4)

Three hours of lecture per week. Prerequisite: courses 206A and 260A. Banach algebras, convolution algebras, group representations.  
Mr. Rieffel (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.  
Sequence beginning in the fall  
Mr. C. Moore (F, W, Sp)

265A. 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.  
— (F); Mr. Phillips (F); — (Sp)
265B. Topics in Differential Topology. (4)
Three hours of lecture per week. Prerequisite: courses 215B and 265A. Topics chosen from: duality, characteristics classes, structure of manifolds, Morse theory, classification of immersion and imbeddings, singularities of maps. Mr. Phillips (W)

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. Mr. Wehausen (F)

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. Mr. Cordes (W)

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.
Mr. Seidenberg (F); Mr. Rosenlicht (W); Mr. Rosenlicht (Sp)

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.
Mr. Sachs (F); ——— (W); ——— (Sp)

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.
Mr. Fary (F, W, Sp)

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.
Mr. Wu (F, W, Sp)

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.
Mr. Dubins, Mr. Greenleaf, Mr. R. T. Moore (F); Mr. Dubins, Mr. Greenleaf, Mr. R. T. Moore (W); Mr. Feldman, Mr. Greenleaf, Mr. R. T. Moore (Sp)

*279. Topics in Partial Differential Equations. (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.

*280A–280B–280C. Mathematical Theory of Relativity. (4–4–4)
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.

290. Seminars. (2–8)
One 2-hour lecture per week. 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.
Mr. Griffiths, Mr. Lazarz, Mr. Lehner, Mr. McKenzie, Mr. Pugh, Mr. Shepherdson, Mr. Zee-man (F); Mr. Cordes, Mr. Epstein, Mr. Griffiths, Mr. Lazarz, Mr. Lehner, Mr. Pugh, Mr. Seidenberg, Mr. Shepherdson, Mr. Solovay (W); Mr. Adams, Mr. Cordes, Mr. Enderton, Mr. Epstein, Mr. Griffiths, Mr. Lazarz, Mr. Pugh, Mr. Shepherdson, Mr. Solovay (Sp)

295. Individual Research. (2–8)
By appointment. Intended for candidates for the Ph.D. degree.
The Staff (F, W, Sp)

297. Individual Study. (1–9)
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 the various examinations required of candidates for the Ph.D. Course to be taken on the satisfactory or unsatisfactory basis.
The Staff (F, W, Sp)

299. Reading Course for Graduate Students. (2–8)
By appointment. Investigation of special problems under the direction of members of the department.
The Staff (F, W, Sp)

Mathematics Colloquium. (No credit)
Meetings for the presentation of original work by members of the staff, visiting mathematicians, and graduate students.

Logic Colloquium. (No credit)
Reports on current research and scholarly work by members of the staff, visitors, and graduate students.

Related Courses and Programs


Logic  See Group in Logic and the Methodology of Science and Department of Philosophy.

Statistics  See Department of Statistics.
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 (Vice-Chairman).
John H. Northrop, Ph.D., Sc.D., LL.D., Professor of Bacteriology and Professor of Biophysics, Emeritus.
Robert H. Haynes, Ph.D., Associate Professor of Medical Physics and of Biophysics.
Howard C. Mel, Ph.D., Associate Professor of Biophysics.
Alexander V. Nichols, Ph.D., Associate Professor of Medical Physics.

Hans J. Bremermann, † Ph.D., Professor of Mathematics.
Ernest L. Dobson, Ph.D., Lecturer in Medical Physics and in Physiology.
Robert M. Glaeser, Ph.D., Lecturer in Medical Physics.
Thomas L. Hayes, Ph.D., Lecturer in Medical Physics and Biophysics.
Lola S. Kelly, Ph.D., Lecturer in Medical Physics, Biophysics, and Physiology.
Joseph S. Krakow, Ph.D., Lecturer in Medical Physics.
R. Stuart Mackay, Ph.D., Lecturer in Medical Physics.
A. Douglas McLaren, † Ph.D., Professor of Soil Biochemistry.
Donald J. Rosenthal, M.D., Lecturer in Medical Physics.
Roger W. Wallace, Ph.D., Lecturer in Medical Physics.

The Division of Medical Physics emphasizes graduate training in biophysics and medical physics. The courses offered represent the principal areas of biophysics: cellular biophysics, radiation biophysics, theoretical biophysics, and medical physics, and are planned as part of a program for students with strong backgrounds in the physical sciences, who are interested in biology.

An individual major may be arranged for undergraduate students who wish to obtain a broad introduction to the physical sciences and their application to biology.

Advisers: Mr. Tobias, Mr. Lawrence, Mr. Nichols.

Letters and Science List: for regulations governing this list, see page 72.
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 2C, an introductory biology course, or consent of the instructor.

102A. Biological energetics. Thermodynamics of closed and open systems; electrochemical, electrokinetic and bioelectric phenomena; physical and biological transport processes. Mr. Mel (F) 102B. Biological kinetics. Biophysics of colloidal systems and surfaces; reaction rate theory and biological catalysis; advanced tracer kinetics; systems dynamics. Mr. Glaser (W)

103. Human Biology. (4)
Three 1-hour lectures and one 1-hour discussion per week. Prerequisite: Contemporary Natural Science 1A-B-C, or equivalent. A presentation of scientific concepts explaining structure, function and development of the body, the nature and origin of disease, the aging process, demographic and dynamic aspects of human populations. Mr. Jones (W)

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) (F, W, Sp, Su)

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 1½-hour lectures per week. Analysis of membrane properties and function; capacitance and conductance; electro-diffusion and ionic movement; propagation of nerve impulses; models and theories. Mr. Cole, (W)

203. Nucleic Acids and Information Transfer. (3)
Three 1-hour lectures per week. Storage and transfer of information in living systems; specificity in protein synthesis; evolutionary relationships at level of proteins and nucleic acids. Mr. Jukes, Mr. Krakow (F)

204. Advanced Laboratory in Biophysical Research. (4)
Eight hour per week combination lecture and laboratory. Prerequisite: course 102A-102B, or their equivalent, and consent of instructor. Physical properties of biological systems at the atomic, molecular, cellular, and organismal level. Mr. Nichols (W)

Radiation Biophysics

211. Molecular Radiation Biology. (3)
Three 1-hour lectures per week. Analysis of the actions of ionizing, ultraviolet and visible radiations 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 four hours laboratory per week. Prerequisite: Genetics 100 or Zoology 150, course 221 or equivalent with consent of instructor. Genetic effects of radiation; mutation, mitotic recombination, chromosome breakage and rearrangement, genetic effects on population. Mr. Mortimer (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

214. Radiological Physics. (3)
Three 1-hour lectures per week. Prerequisite: course 101 and Physics 124. Interaction of electromagnetic and particulate radiations 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 1½-hour lectures per week. Prerequisite: course 102A or equivalent or consent of instructor. Theoretical foundations of irreversible thermodynamics with applications to problems of biological interest. (Sp)

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; applications of radioactive isotopes to the study of disease processes. Mr. Lawrence, Mr. Rosenthal (W, Sp)
290A-290B-290C. Seminar. (1-3)
Special topics based on current research.
290A, Progress in biophysics; 290B, Progress in medical physics; 290C, Progress in radiation research.
Mr. Tobias and Staff (F, W, Sp)

299. Research; Medical Physics and Biophysics.
(1-12)
The Staff (Mr. Jones in charge) (F, W, Sp, Su)

G. Staff Seminar in Medical Physics. (No credit)
Weekly presentation by members of the staff and visitors. The Staff (Mr. Lawrence in charge) (F, W)

[!]

MILITARY SCIENCE

(Department Office, 151 Harmon Gymnasium)
Kurt G. Radtke, M.B.A., Colonel, Infantry; Professor of Military Science (Chairman of the Department).
Don S. Fletcher, M.B.A., Lieutenant Colonel, Transportation Corps; Associate Professor of Military Science.
William R. Flick, B.A., Captain, Quartermaster Corps; Assistant Professor of Military Science.
Jay C. Franz, M.S., Captain, Corps of Engineers; Assistant 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 Army, its basic missions and responsibilities, an orientation on ROTC; a working knowledge of basic individual weapons; a foundation in the principles of the art of warfare as they are exemplified in American military history and an introduction to map reading 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. Training in military leadership is emphasized.

Admission to the upper division courses is by selection from regularly enrolled students who meet the academic and physical requirements, and who apply for the two-year program. 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 the battalion level 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.

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." Such distinguished students may upon graduation and upon application, be considered for 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.
11. Army Organization and National Security. (1)

One 1-hour lecture and one 1-hour leadership laboratory. The ROTC program. Principles of military organization and training. National defense organization.

The Staff (F)

12. United States Army and National Security. (1)

Prerequisite: course 11. One 1-hour lecture and one 1-hour leadership laboratory. National defense policy; mission and capabilities of the United States defense forces.

The Staff (W)

13. United States Army and National Security, Weapons, Marksmanship. (1)


The Staff

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 strategic patterns. Mr. Flick (F)

22. American Military History and Map and Aerial Photography Reading. (2)

Prerequisite: course 21. Two 1-hour lectures and one 1-hour leadership laboratory. American Military History continued. Basic principles of map reading. Counterinsurgency operations. Mr. Flick (W)

23. Map Reading and Basic Tactics. (2)

Prerequisite: course 22. Two 1-hour lectures and one 1-hour leadership laboratory. Advanced map and aerial photography reading. Basic military teams. Combat formations. Principles of offensive and defensive combat. Counterinsurgency operations. The Staff (Sp)

131. Military Teaching Principles. (2)

Two 1-hour lectures and one 1-hour leadership laboratory. A study of instructional techniques used in planning, presenting and evaluating military instruction including practical application of these techniques.

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.

141. Operations and Logistics. (3)


Mr. Fletcher (F)

142. Army Administration and Military Law. (3)


Mr. Fletcher (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.

Mr. Fletcher (Sp)

MOLECULAR BIOLOGY

(Department Office, 229 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., I.L.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).
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>Course</th>
<th>Quarter Units</th>
<th>Courses</th>
<th>Quarter Units</th>
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<tbody>
<tr>
<td>Chemistry</td>
<td></td>
<td>Mathematics</td>
<td></td>
</tr>
<tr>
<td>General (4A-4B-4C)</td>
<td>15</td>
<td>Calculus (Math. 1A-1B-1C)</td>
<td>16</td>
</tr>
<tr>
<td>Organic (8A-8B)</td>
<td>8</td>
<td>Biology</td>
<td></td>
</tr>
<tr>
<td>Physical (110A-110B)</td>
<td>6</td>
<td>General (Biology 1A-1B-1C)</td>
<td>15</td>
</tr>
<tr>
<td>Biochemistry (102, 102L or 100A-100B-100C)</td>
<td>8-12</td>
<td>Additional Undergraduate work including genetics</td>
<td>9</td>
</tr>
<tr>
<td>Physics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General (Physics 4A-4B-4C-4D)</td>
<td>16</td>
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</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 two foreign languages chosen from French, German, and Russian is required before the qualifying examination can be taken. The student must pass an oral qualifying examination in which he is expected to show familiarity in the special areas he has chosen, and to submit for discussion a detailed proposition in the form of a research proposal.
Further information is available from the graduate adviser in 229 Molecular Biology—Virus Laboratory.

Letters and Science List: for regulations governing this list, see page 72.

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. 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) (F, W, Sp, Su)

Graduate Courses

200. Special Topics in Molecular Biology. (3)
Two 1½-hour lectures per week. Prerequisite: course 220A–220B or consent of instructor. A lecture course dealing with the areas of current interest in molecular biology.
Mr. Maaløe (F); The Staff (W, Sp)

210. Optical Analysis of Biological Structures. (4)
Four 1-hour lectures per week. Prerequisite: Biochemistry 100A or 102; one year of college mathematics; one year of college physics. Study of biological macromolecules and integrated structures by analysis of their effects upon radiation. Light and X-ray scattering, X-ray crystallographic analysis, birefringence and dichroism, electron microscopy.
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, Mr. Schachman (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 102 (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. Mr. Trautner (F) 220B. Structure, growth dynamics, and cellular effects of animal viruses.
Mr. Rubin, Mr. Robinson (W)

221. General Virology Laboratory. (5)
One lecture period and 9 hours of laboratory work per week. Prerequisite: course 220A. Techniques used in research on bacterial, animal, and plant viruses.
Mr. Gerhart, Mr. Roberts, Mr. Robinson, Mr. Trautner (W)

223. Molecular Virology. (3)
Three 1-hour lectures per week. Prerequisite: Biochemistry 100A–100B, or 102. Isolation, composition and chemical characterization of viruses and related particles; chemical structure and conformation of the main components of such particles, i.e., proteins and nucleic acids; their mode of action and their biosynthesis.
Mr. Fraenkel-Conrat (Sp)

230. Bacterial Genetics Laboratory. (8)
Three 1-hour lecture periods and 12 hours of laboratory work per week. Prerequisite: Biochemistry 102 or 100A–100B; course 110 or 220A, the latter may be taken concurrently with consent of instructor. Experimental techniques used in research on the genetics of bacteria.
Mr. Clark (F)

231. Bacterial Genetics. (3)
Three 1-hour lectures per week. Prerequisite: course 220A, or a course in biochemistry and a course in basic genetics, or consent of instructor. An advanced course in bacterial genetics emphasizing current concepts.
Mr. Clark (Sp)

280. Research. (1–12)
Individual research under the supervision of a staff member.
The Staff (Mr. Stanley in charge) (F, W, Sp, Su)

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) (F, W, Sp, Su)

MUSIC

(Department Office, 104 Morrison Hall)

David D. Boydén,† 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. Duckles, Ph.D., Professor of Music and Head of the Music Library.
Arnold Elston,‡ Ph.D., Professor of Music.

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, French, German, and liturgical Latin. 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 registration week. 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 registration week.

The Major

First Year  Courses 1A–1B–1C; 3A–3B.
Second Year  Courses 2A–2B–2C; 3C–3D. Recommended: Performance courses.
Third and Fourth Years  (a) Theory—Courses 101A, 101B. History and Literature—Course 121A–121B–121C, and one additional course from the group 116–119. Performance—Three courses from the group 141–149, preferably in sequence. (b) Additional courses chosen from any of the three groups to complete from the minimum of 36 units to the maximum of 45 units in the series 101–149. (c) Demonstrated ability at the piano or passage of the departmental examination.

Honors Program  Adviser: Mr. Imbrie. 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. Lawton. Attention is called to the following recommended courses: Instrumentation (course 108), Conducting (course 112A–112B), both of which may be used as elective courses for the major in the series 101–149; Vocal Technique (course 428), and Stringed Instruments, Wind Instruments, and Orchestra and Band Repertory (courses 429A, 429B, 429C). See also the ANNOUNCEMENT OF THE SCHOOL OF EDUCATION.

Higher Degrees

All graduate students should consult a graduate adviser during registration week and take the advisory 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 72.

Group I

Courses open to all students in the University.

Lower Division Courses

10. Basic Musicianship. (2)

Three 1-hour meetings per week. Fundamentals of music, with singing, ear training, harmonization of melodies, and conducting.

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


Three 1-hour meetings per week. Ear training, harmony, and counterpoint for the general student.

Sequence beginning (F), Mr. Swackhamer

27. Introduction to Music. (4)

(Formerly numbered 27A)

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. Heartz (F); Mr. Crocker (W); ——— (Su)
**PERFORMANCE**

Audition for enrollment in any performance course will be required during the period of registration. 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.

41. University Symphony Orchestra. (2)
   Two 2-hour rehearsals per week.
   Mr. Senturia (F, W, Sp)

42. University Chamber Band. (2)
   Two 1½-hour rehearsals and one section per week.
   Mr. Berdahl (F)

43. University Concert Band. (2)
   Two 1½-hour rehearsals and one section per week.
   Mr. Berdahl (W, Sp)

44. University Chorus. (2)
   Two 1½-hour rehearsals and one section per week.
   Miss Davidson (F, W, Sp, Su)

45. Repertory Chorus. (2)
   Two 2-hour rehearsals per week.
   Mr. Lawton (F, W, Sp)

46. Chamber Music Ensemble. (2)
   Four class hours per week. Study and interpretation of chamber music for strings and for strings, winds, and piano.
   Mr. Berdahl, Mr. Denny, Miss Poska (F, W, Sp, Su)

48. Piano Ensemble. (2)
   One 3-hour meeting per week. Study and interpretation of four- and eight-hand piano literature.
   Mrs. Petray (F, W, Sp)

Upper Division Courses

110. Basic Musicianship. (2)
   Four 1-hour meetings per week. Prerequisite: course 10 or consent of instructor. A continuation of course 10 for general students who wish to gain additional facility.
   The Staff (Mr. Swackhamer in charge) (F, W, Sp, Su)

127A. History of Music. (4)
   (Formerly numbered 27B)
   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. Heartz (W)

127B. History of Music. (4)
   (Formerly numbered 27B)
   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)
   (Formerly numbered 127A)
   Three 1-hour lectures per week. Prerequisite: course 27. Critical study of seven operas, such as Dido and Aeneas, Gluck's Orfeo, Don Giovanni, Fidelio, Tristan, Otello, Pelléas, and Wozzeck, emphasizing the contribution of music to a total dramatic effect.
   Mr. Crocker (Sp)

128B. The Symphonies of Beethoven. (4)
   (Formerly numbered 127B)
   Three 1-hour lectures per week. Prerequisite: course 27.
   Mr. Brett (W); Mr. Sparks (Su)

128C. Contemporary Music. (4)
   (Formerly numbered 127C)
   Three 1-hour lectures per week. Prerequisite: course 27.
   Mr. Lewin (Sp)

128D. J. S. Bach. (4)
   (Formerly numbered 127D)
   Three 1-hour lectures per week. Prerequisite: course 27.
   Mr. Hunter (F, W)

128E. Mozart and Haydn. (4)
   (Formerly numbered 127E)
   Three 1-hour lectures per week. Prerequisite: course 27.
   Mr. Lawton (Sp)

128F. Symphonic Literature of the Nineteenth Century. (4)
   (Formerly numbered 127F)
   Three 1-hour lectures per week. Prerequisite: course 27.
   Mr. Senturia (F)

**PERFORMANCE**

For particulars, see lower division performance courses.

All courses in this group may be repeated twice without duplication of credit. These courses should be taken in a three-quarter sequence.

141. Advanced University Symphony Orchestra. (2)
   Prerequisite: consent of instructor.
   Mr. Senturia (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.
   Miss Davidson (F, W, Sp, Su)

145. Advanced Repertory Chorus. (2)
   Prerequisite: six units in course 44. Primarily concerned with lesser-known significant choral literature.
   Mr. Lawton (F, W, Sp)

146. Advanced Chamber Music Ensemble. (2)
   Prerequisite: consent of instructor.
   Mr. Berdahl, Mr. Denny, Miss Poska (F, W, Sp, Su)
149. Collegium Musicum. (2)  
Performance of rarely heard ensemble music.  
Mr. Curtis (F, W); Mr. Hunter (Sp)

**Group II**

Courses primarily for students whose major subject is music.

**Lower Division Courses**

**SB. Musicianship. (2)**  
Mr. Swackhamer, Mrs. Clark (F)

**SD. Musicianship. (2)**  
Mr. Sherman (F)

1A-1B-1C. Harmony. (5-5-5)  
Three 1-hour classes per week for written and keyboard work; three 1-hour laboratory sections for ear training, sight singing, and dictation.  
Sequence beginning (F, W, Su), The Staff (Mr. Cushing in charge)

2A-2B-2C. Harmony. (5-5-5)  
A continuation of course 1A-1B-1C, which is prerequisite. Sequence beginning (F, W), The Staff (Mr. Imbrie in charge)

**SB. Harmony. (4)**

**SD. Harmony. (4)**  
Mr. Lewin (F)

3A-3B-3C-3D. The Masterworks of Music.  
(2-2-2-2)  
Two class hours and one section meeting per week. Sequence beginning (F, Sp), Mr. Curtis, Mr. Lewin, Mr. Sparks

**Upper Division Courses**

**THEORY**

101A. Modal Counterpoint. (4)  
Three 1-hour classes per week. Prerequisite: course 2C.  
The Staff (Mr. Nin-Culmell in charge) (F, Sp)

101B. Tonal Counterpoint. (4)  
Three 1-hour classes per week. Prerequisite: course 2C.  
The Staff (Mr. Nin-Culmell in charge) (W, Su)

102A. Keyboard Harmony. (2)  
Three class hours per week. Prerequisite: course 2C and consent of instructor. Mr. Sherman (F)

102B. Score Reading. (2)  
Three class hours per week. Prerequisite: course 2C and consent of instructor. Mr. Sherman (W)

104. Principles of Composition. (4)  
Three class hours per week. Prerequisite: courses 101A-101B.  
Mr. Elston, Mr. Nin-Culmell (Sp)

105A-105B-105C. Composition. (4-4-4)  
Three class hours per week. Prerequisite: course 104. Sequence beginning (F), Mr. Cushing

106. Canon and Fugue. (4)  
Two 2-hour classes per week. Prerequisite: courses 101A-101B. Mr. Denny (Sp)

107A-107B. Studies in Musical Analysis. (4-4)  
Two 1¼-hour classes per week. Prerequisite: course 2C. 107A is prerequisite to 107B. Sequence beginning (F), Mr. Lewin

108. Instrumentation. (4)  
Two 2-hour classes per week. Prerequisite: course 2C. Mr. Denny (W)

*109. Orchestration. (4)  
Two 2-hour classes per week. Prerequisite: consent of instructor. Miss Davidson (F)

112A. Choral Conducting. (4)  
Two 2-hour classes per week. Prerequisite: courses 108 and 112A or consent of instructor. Mr. Senturia (W)

**HISTORY AND LITERATURE**

121A-121B-121C. Development of Musical Style.  
(4-4-4)  
Three 1-hour lectures and one section meeting per week. Prerequisite: courses 2C and 3D or consent of instructor. A study of the development of music from antiquity to the present, listening, technical analysis, and written reports. Sequence beginning (F), Mr. Brett, Mr. Crocker

The following courses will be given in rotation. Prerequisite: courses 2C and 3D or consent of instructor.

(2)  
Prerequisite: Major in English or music or consent of instructor. English music, from the carol to the madrigal and "recitative 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. Brett (Sp)

(4)  
Mr. Curtis

116E. The Performance of Baroque Music. (4)  
Prerequisite: experience in playing an instrument or in singing. Three class hours per week. Mr. Hunter (W)

116G. Bach's Well-Tempered Clavier. (4)  
Mr. Hunter (F)

117B. The Operas of Mozart. (4)  
Mr. Heartz (W)

117C. The String Quartets of Beethoven. (4)  
Three class hours per week. Mr. Sparks (Su)

*117D. Haydn. (4)  
Three class hours per week. Mr. Moe

• Not to be given, 1966-67.
*118B. Piano Music of the Romantic Period. (4)
Three class hours per week. Mr. Nin-Culmell

*118D. Wagner's Ring of the Nibelung. (4)
Mr. Lewin

*118E. Verdi. (4)
Mr. Kerman

119D. Chamber Music of the Twentieth Century. (4)
Mr. Sessions (F)

119E. Contemporary Music. (4)
Mr. Eloy (Sp)

H195. Honors Seminar. (4)
Two 1 1/2-hour meetings per week. Open to senior honor students who have at least a 3.2 average in the major. Mr. Imbrie (Sp)

198. Group Special Study for Advanced Undergraduates. (2 or 4)
Not to serve in lieu of regular courses of instruction.
The Staff (Mr. Lawton 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 124.

(4–8)
Bibliography, research methods, and individual projects typically drawing on manuscripts and early prints in the University of California Music Library. Three 1-hour meetings per week.
Mr. Brett, Mr. Ducksell (F, Sp)

200B. Principles of Notation. (4)
Three 1-hour meetings per week. Mr. Sparks (W)

One 3-hour meeting per week.

203. Seminar in Composition. (4)
One 3-hour meeting per week.
Mr. Imbrie (F, W); Mr. Sessions (Sp)

204. Studies in Musical Analysis. (4)
One 3-hour meeting per week.
Mr. Eloy (F); Mr. Lewin (Sp)

*205A–205B. The History of Theory. (4–4)
Sequence beginning (F), Mr. Crocker, Mr. Lewin

208. Proseminar in Music History. (4)
Two 1 1/2-hour meetings per week.
208A. Chant and Related Forms. Mr. Crocker (F)
208B. Cantus-firmus Polyphony and Related Forms. Mr. Sparks (W)

208C. Humanism, Reformation, and Counterreformation. Mr. Heartz (Sp)

208D. The Seventeenth Century. Mr. Curtis (F)

208E. The Eighteenth Century. Mr. Curtis (W)

208F. Romanticism: C.P.E. Bach to Wagner. Mr. Sparks (Sp)

212. Seminar: Medieval Studies. (4)
One 3-hour meeting per week. The topic for 1966–67 is Problems in Carolingian Chant.
Mr. Crocker (W)

213. Seminar: Music of the Renaissance. (4)
One 3-hour meeting per week. The topic for 1966–67 is Cyclic Masses in the manuscript Bologna Q15.
Mr. Sparks (Sp)

*215. Seminar: Research in Music History. (4)
Mr. Kerman

216. Seminar: Research in Baroque Music. (4)
One 3-hour meeting per week.
Mr. Curtis (F); ——— (W)

*220. Seminar: Problems in Criticism. (4)
Mr. Kerman

(4)
Mr. Curtis

297. Independent Study. (4–8)
Individual study, in consultation with a member of the faculty, intended to provide opportunity for M.A. and Ph.D. candidates to bring together their work in a particular field during the semester immediately prior to the examination.
The Staff (Mr. Ducksell (F); Mr. Sparks (W, Sp) in charge)

298. Group Special Studies. (4–8)
The Staff (Mr. Crocker (F); Mr. Sparks (W, Sp) in charge)

299. Special Study. (2 or 4)
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. Heartz in charge) (F, W, Sp, Su)

Professional Courses

405A–405B–405C. Elementary Piano. (1/2–1/2–1/2)
Required of music majors who do not pass the entrance examination in piano.
Sequence beginning each quarter.
Mr. Nin-Culmell in charge

405D–405E–405F. Elementary Piano. (1/2–1/2–1/2)
Required of music majors who do not pass the entrance examination in piano. Prerequisite: course 405C.
Sequence beginning each quarter.
Mr. Nin-Culmell in charge

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

429A. Stringed Instruments. (2)
May be repeated once without duplication of credit. Mr. Sellin (F, W)

* Not to be given, 1966–67.
FREDERICK REIF, PH.D., PROFESSOR OF PHYSICS.
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.

429B. WIND INSTRUMENTS. (2)
May be repeated once without duplication of credit. Mr. Lord (F); Mr. Silfies (Sp)

429C. ORCHESTRA AND BAND REPERTORY. (2)
Mr. Lord (W)

NATURAL SCIENCE

(Frederick Reif, Ph.D., Professor of Physics.
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. The course satisfies the Letters and Science breadth requirements in both the physical and biological sciences (groups A and B).

Note: A special section of 1B will be offered in the fall of 1966 for students who completed 1A in the spring of 1966.

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.

HORACE H. HOGAN, JR., M.B.A., COMMANDER, U. S. NAVY, ASSOCIATE PROFESSOR OF NAVAL SCIENCE.
HARRY B. BATTIN, A.B., LIEUTENANT, U. S. NAVY, ASSISTANT PROFESSOR OF NAVAL SCIENCE.
RONALD P. DUNWELL, B.S., MAJOR, U. S. MARINE CORPS, ASSISTANT PROFESSOR OF NAVAL SCIENCE.
ROBERT E. LANTSBERGER, A.B., LIEUTENANT COMMANDER (SUPPLY CORPS), U. S. NAVY, ASSISTANT PROFESSOR OF NAVAL SCIENCE.
RALPH H. LOCKLIN, B.A., LIEUTENANT, U. S. NAVY, ASSISTANT PROFESSOR OF NAVAL SCIENCE.
DONALD E. NELSON, B.S., LIEUTENANT, U. S. NAVY, ASSISTANT PROFESSOR OF NAVAL SCIENCE.
DONALD R. YEAGER, M.S., LIEUTENANT COMMANDER, 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. The Navy supplies uniforms and Naval Science textbooks to these students, and pays $40 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 draft exempt. For further details, contact the Professor of Naval Science in Callaghan Hall.

Naval Science courses are the same for both regular and contract students. All courses meet three times a week with a two-hour laboratory session. Second-year NROTC students are required to take Psychology 30 in lieu of a naval science course.

**Lower Division Courses**

*(All courses required.)*

1. **The Naval Service. (3)**

Three 1-hour lectures per week and one 2-hour laboratory per week. Development of customs, traditions and terminology in the Naval Service. Organizational relationships in the Navy and Department of Defense. Functional elements of the modern Navy and its relevant equipment. 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 equipment. Mr. Yeager (F)

1A-2B. **History of Seapower. (3-3)**

Three 1-hour lectures and one 2-hour laboratory. 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.

1A. Ancient times to Civil War.
1B. Civil War to present.

Sequence beginning in the winter, Mr. Yeager (W, Sp)

3A-3B. **Naval Weapons Systems. (3-3)**

Three 1-hour lectures and one 2-hour laboratory 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 fall, Mr. Battin (F, W)

**Upper Division Courses**

*(Six courses required.)*

111. **Naval Operations. (3)**

Three 1-hour lectures and one 2-hour laboratory 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. Naval rules of the road; meteorological effects on fleet operations. Mr. Nelson (F)

112A-112B. **Navy. (3-3)**

Three 1-hour lectures and one 2-hour laboratory 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 applications of principles covered in the readings and lectures.

112B. **Nautical Astronomy.** The principles of celestial navigation. The laboratory work includes the various methods of solution of celestial problems and sight reduction. Mr. Nelson (W, Sp)

121. **Marine Engineering. (3)**

Three 1-hour lectures and one 2-hour laboratory per week. The basic elements of ship construction, stability, and damage control. The basic steam cycle as used aboard ships of the U. S. Navy; the subsystems of the basic steam cycle. Laboratory work includes short field trips to nearby naval bases and ships as well as practical leadership in the Midshipmen Battalion. Mr. Locklin (F)

122. **Marine Engineering and an Introduction to Naval Management. (3)**

Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: Psychology 30. The principles of thermodynamic cycles as applied to ship propulsion, auxiliary machinery, and refrigeration. Introduction to electricity and shipboard electrical equipment, principles of internal combustion engines, gas turbines, and nuclear power propulsion systems. Guest lectures cover some of these subjects. The fundamentals of effective leadership and management from the junior officer standpoint are introduced. Mr. Locklin (W)

123. **Principles and Problems of Naval Leadership and Management. (3)**

Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: Psychology 30. Examination of problems of naval leadership from the junior officer standpoint, using case studies and group discussion. The elements of personnel management are also studied in conjunction with the elements of effective leadership. Laboratory work includes practice of leadership and command of junior midshipmen on the infantry drill field. Mr. Locklin (Sp)

131. **The Organization for Defense Logistics. (3)**

Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: junior standing in the University. Organization structure of the Defense Department, the Department of the Navy and the Defense Supply Agency; their importance to the total defense logistics organization, with Navy funding and accounting policy, controls and reports included. Laboratory work involves the application of what is learned in the weekly lectures toward the completion of practice problem sets. Mr. Lantsberger (F)

132. **The Navy Supply System. (3)**

Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 131. An introduction to the U. S. Navy supply system and its related functions, organization, and responsibilities. A study of supply management procedures, the Navy's financial structure and basic principles of Navy accounting methods. Mr. Lantsberger (W)
133. Navy Supply Management Afloat. (3)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: courses 131 and 132. A detailed study of the Navy supply organization as it pertains to the shipboard supply officer. Procurement, receipt and custodial records procedures are studied; funding and accounting records management for Navy afloat use.
Mr. Lantsberger (Sp)

134. Retailing and Cost Management. (3)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: junior standing in the University. A study of the Navy Supply Corps program in retailing and cost management programs afloat; detailed requirements planning and an analysis of records control. A practice set of records is maintained.
Mr. Lantsberger (F)

135. Cost Management Completed and Naval Leadership. (3)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 134. The completion of a study of Navy Supply Corps programs afloat in the retailing field; an introduction to naval leadership. Principles of management and naval officers' responsibilities pertaining thereto. Uniform Code of Military Justice.
Mr. Lantsberger (W)

151-152-153. History of Land Warfare. (3-3-3)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 151. The study of modem warfare and basic principles, strands and variables of war. Emphasis is placed on those aspects which have modern application.
Mr. Dunwell (F, W, Sp)

154-155. History of Amphibious Warfare. (3-3)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 151.
154. Major amphibious operations from Gallipoli through the campaigns in the Pacific are examined in sufficient detail to trace the development of modern concepts of doctrines and techniques of amphibious warfare.
155. A study of amphibious operations conducted in Europe during World War II and the Korean War.
Mr. Dunwell (F, W)

156. Leadership and the Uniform Code of Military Justice. (3)
Three 1-hour lectures and one 2-hour laboratory per week. The course acquaints the student with psychology, principles and techniques of leadership and personnel management in military organizations. The course also includes a brief study of the procedures of military law under the Uniform Code of Military Justice.
Mr. Dunwell (Sp)

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.
Walter B. Henning, Ph.D., Professor of Iranian Studies.
Henry L. F. Lutz, Ph.D., D.D., LL.D., Professor of Egyptology and Assyriology, Emeritus.
Mounah A. Khouri, Ph.D., Associate Professor of Arabic.
Abbas Zaryab, Ph.D., Associate Professor of Near Eastern Languages.
Rodney F. Algar, Ph.D., Assistant Professor of Near Eastern Languages.
Ariel A. Bloch, Ph.D., Assistant Professor of Near Eastern Languages.
Anne D. Kilmer, Ph.D., Assistant Professor of Assyriology.

R. Prakash Dixit, M.A., Lecturer in South Asian Languages.
Ahmed Fakhry, Ph.D., Visiting Professor of Egyptian Archaeology.
Charlotte Grosman, Associate in Hebrew.
Van Dusen Kennedy, Ph.D., Professor of Industrial Relations.
Jørgen Laessøe, Ph.D., Visiting Professor of Assyriology.
David G. Mandelbaum, Ph.D., Professor of Anthropology and Curator of Ethnology.
Jacob Milgrom, D.H.L., Lecturer in Hebrew and Bible.
Bruce R. Pray, M.A., Acting Assistant Professor of South Asian Languages.

16 On leave, winter and spring quarters, 1966-67.
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, Armenian, 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, 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.

The cooperative arrangement between the University and the newly established Graduate Theological Union permits students in the Department to use the extensive library holdings of the Union and to take selected courses in Palestinian archaeology, Biblical studies; and Semitic epigraphy and philology.

The Major

There are no specific lower division requirements.

Junior and senior students in the following areas: Arabic, Hebrew, Iranian, or Hindi-Urdu, must take 36 units of upper division courses in their major language, plus two quarter lecture courses in the major field totaling not more than 9 units, for a complete total of 45 units.

Junior and senior students in the following areas: Biblical Studies, Comparative Semitics, Cuneiform Studies, Egyptology, Islamic Studies, Turkish, and South Asian Languages, must take from 36 to 45 units of upper division language courses.

Distribution of courses is determined in consultation with the major adviser. With the consent of the department, language or lecture courses to be counted toward the major may be taken in other departments.

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

A student must have fulfilled the equivalent of the departmental requirements for the A.B., although he need not take a second A.B. degree in the event that his undergraduate training was in another field. Requirements for the M.A. degree are: (1) 36 units over and above the A.B. requirements (18 of which must be in graduate courses, the remaining 18 either graduate or upper division courses); (2) a reading examination in German or French; and (3) a comprehensive departmental examination in the areas of the student’s concentration. These areas are varied and are tailored to the needs and interests of the individual student.

Admission to candidacy for the Ph.D. degree depends on satisfaction of the preliminary requirements of the committee appointed to supervise the candidate’s examina-
tion. Such requirements include: (1) a reading examination in French and German, and (2) an oral examination. Depending on the judgment of the committee, there may be required in addition: (1) a written examination, and (2) submission of research papers or seminar reports written in the course of graduate work.

After admission to candidacy a doctoral dissertation written under supervision of a member of the committee must be submitted and approved.

For further details, consult the regulations of the Graduate Division and the graduate adviser in 1229 Dwinelle.

**Letters and Science List:** for regulations governing this list, see page 72.

**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. Hebrew literature in translation.
   Mr. Fischel (F)

**Upper Division Courses**

150A-150B. **Ancient Israel. (4-4)**
   Three 1-hour lectures per week. The history of Israel from the Patriarchal Age to the end of the Second Commonwealth.
   Sequence beginning in the fall. Mr. Milgrom (F, W)

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 (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 in the fall.
   Mr. Henning (F, W)

162A-162B. **Introduction to the Comparative Study of the Iranian Languages. (3-3)**
   Two 1-hour lectures per week. Prerequisite: consent of the 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). Mr. Henning (F, W)

163A-163B. **History of Persian Literature. (3-3)**
   Two 1-hour lectures per week.
   163A. Classical Persian literature from Firdawsí to 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).
   Mr. Henning (F, W)

*165A-165B. Armenian Civilization. (3-3)*
   Two 1-hour lectures per week. A survey of aspects of Armenian history and literature from earliest times to the present.
   (F, W)

*168A-168B. Survey of Turkish Literature. (3-3)*
   Two 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)

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.
   Mr. Laessle (F, W)

†171A-171B. **Ancient Western Asia. (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 (F, W)

*172A-172B. Ancient Mesopotamian Documents. (4-4)*
   Three 1-hour lectures per week. A survey of the writings on clay tablets (in translation). A study of a selection of literary, legal, economic, epistolary, educational, scientific, historiographic, divinatory, and religious texts.
   Mrs. Kilmer (F, W)

173A-173B-173C. **Ancient Egyptian Civilization. (4-4-4)**
   Three 1-hour lectures per week. The history and institutions of ancient Egypt from its earliest period to the Hellenistic period.
   Mr. Fakhry (F, W, Sp)

180A-180B. **Islamic Civilization. (5-5)**
   Three 1-hour lectures per week. The political, legal, and social institutions of Islam will be critically studied in an historical framework.
   Mr. Brinner (F, W)

**South Asian**

*191A-191B-191C. Literary and Cultural Traditions of India. (3-3-3)*
   Two 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)

193. **Linguistic Structures of South Asian Languages. (3)**
   Three 1-hour lectures per week. Prerequisite: Linguistics 105. Structure and typology of selected South Asian languages.
   Mr. Pray (Sp)

* Not to be given, 1966-67.
† Given in alternate years.
Five 1-hour lectures 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 (F, W, Sp)

Hebrew

Lower Division Courses

1A–1B–1C. Elementary Hebrew. (5–5–4)
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. (14)
Ten 1-hour lectures, five 1-hour drill sessions and five 1-hour laboratories per week. Equivalent to Hebrew 1A–1B–1C.
Mr. Fischel (F, W, Sp)

Upper Division Courses

100A–100B–100C. Intermediate Hebrew. (4–3–3)
Four 1-hour recitation sessions per week. Prerequisite: course 1A–1B–1C, or course 10, or equivalent. Sequence beginning (F).
Mr. Greenfield in charge (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)

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. Mr. Fischel (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. Fischel (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 in Hebrew. Mr. Milgrom (F, W, Sp)

brev. Different sections offering a variety of texts from all periods of the literature. May be repeated for additional credit.

290. Special Study. (1–5)
The Staff (F, W, Sp)

Arabic

Lower Division Courses

1A–1B–1C. Elementary Arabic. (5–5–4)
Five 1-hour recitation sessions and one 1-hour laboratory per week. Sequence beginning (F).

10. Intensive Elementary Arabic. (14)
Ten 1-hour lectures, five 1-hour drill sessions and five 1-hour laboratories per week. Equivalent to Arabic 1A–1B–1C.

Upper Division Courses

100A–100B–100C. Intermediate Arabic. (4–3–3)
Four 1-hour recitation sessions per week. Prerequisite: course 1A–1B–1C, or course 10, or equivalent. Sequence beginning (F).

Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C or equivalent. May be repeated for additional credit with consent of instructor. Mr. Bloom (F, W, Sp)

102A–102B–102C. Readings in Modern Arabic. (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. Khouri (F, W, Sp)

103A–103B–103C. Arabic Grammar and Composition. (3–3–3)
Two 1-hour meetings per week. Prerequisite: course 100A–100B–100C and either 101A–101B–101C or 102A–102B–102C or equivalent.
Mr. Bloom (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 in Arabic. Different sections offering a variety of texts from all periods of the literature. May be repeated for additional credit. Mr. Khouri, Mr. Salinger (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 the instructor.
The Staff (F, W, Sp)

Iranian

Lower Division Course

*1A-1B-1C. Elementary Modern Persian. (5-5-4)
Five 1-hour recitation sessions per week. Sequence beginning (F).
Mr. Algar (F, W, Sp)

Upper Division Courses

100A--100B--100C. Intermediate Modern Persian. (4-3-3)
Four 1-hour recitation sessions per week. Prerequisite: course 1A-1B-1C, or equivalent. Sequence beginning (F).
Mr. Algar (F, W, Sp)

101A-101B-101C. Readings in Modern Persian. (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. Zaryab (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. Manichaean Middle Persian texts, with an introduction to Pahlavi.
Mr. Henning (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 Yashts; Achaemenid inscriptions.
Mr. Henning (F, W, Sp)

199. Special Study for Advanced Undergraduates. (1-5)
Restricted to senior honors students.
The Staff (F, W, Sp)

Graduate Courses

200A-200B--200C. Advanced Persian. (3-3-3)
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.
Mr. Henning, Mr. Zaryab (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.
Mr. Henning (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 the instructor.
The Staff (F, W, Sp)

Turkish

Lower Division Course

1A-1B-1C. Elementary Modern Turkish. (5-5-4)
Five 1-hour recitation sessions per week. Sequence beginning (F).
Mr. Tekin (F, W, Sp)

Upper Division Courses

100A--100B--100C. Intermediate Modern Turkish. (4-3-3)
Four 1-hour recitation sessions per week. Prerequisite: course 1A-1B-1C, or equivalent. Sequence beginning (F).
Mr. Tekin (F, W, Sp)

101A-101B-101C. Readings in Modern Turkish. (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. Tekin (F, W, Sp)

102A-102B-102C. Ottoman Turkish Texts. (3-3-3)
Two 1-hour meetings per week. Prerequisite: course 1A-1B-1C or consent of instructor. Study of Turkish texts in Arabic script of the pre-Ataturk Period.
Mr. Tekin (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

*200A-200B--200C. Advanced Turkish. (3-3-3)
Two 1-hour recitation sessions per week. Prerequisite: 28 units of upper division work in Turkish. Different sections offering a variety of texts from all periods of the literature. May be repeated for additional credit.
Mr. Tekin (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 credit with consent of the instructor.
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).
Mr. Tekin (F, W, Sp)

Upper Division Courses

*100A--100B--100C. Intermediate Modern Armenian. (4-3-3)
Four 1-hour recitation sessions per week. Prerequisite: course 1A-1B-1C or consent of instructor. Sequence beginning (F).
Mr. Tekin (F, W, Sp)

* Not to be given, 1966-67.
Hindi-Urdu

Lower Division Course

1A–1B–1C. Elementary Hindi-Urdu. (5–5–4)
Seven 1-hour sessions and two 1-hour laboratories per week.
Sequence beginning (F), Mr. Roadarmel (F, W, Sp)

Upper Division Courses

100A–100B–100C. Intermediate Hindi. (4–4–4)
Four 1-hour meetings per week. Prerequisite: course 1A–1B–1C, or equivalent.
Sequence beginning (F), Mr. Dixit (F, W, Sp)

Two to four 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. Dixit, Mr. Roardarmel (F, W, Sp)

110A–110B–110C. Intermediate Urdu. (4–4–4)
Four 1-hour meetings per week. Prerequisite: course 1A–1B–1C, or equivalent.
Sequence beginning (F), Mr. Pray (F, W, Sp)

111A–111B–111C. Advanced Urdu. (2–4, 2–4, 2–4)
Two to four 1-hour meetings per week. Prerequisite: Intermediate 1A–1B–1C and course 110A–110B–110C 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.

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

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. (5–5–4)
Five 1-hour recitation sessions and two 1-hour lectures per week.
Sequence beginning (F). ———— (F, W, Sp)

2A–2B–2C. Elementary Telugu. (5–5–4)
Five 1-hour recitation sessions and two 1-hour lectures per week.
Sequence beginning (F). ———— (F, W, Sp)

100A–100B–100C. Studies in Dravidian Languages. (4–4–4)
Four 1-hour meetings per week. Prerequisite: course 1A–1B–1C, or 2A–2B–2C, or equivalent.
Sequence beginning (F). ———— (F, W, Sp)

Graduate Courses

290. Special Study. (F, W, Sp)
291. Seminar. (2) The Staff (F, W, Sp)

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). ———— (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.
Sequence beginning (F). ———— (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

Three 1-hour meetings per week. Prerequisite: 9 units of Greek or equivalent.
Sequence beginning (F). ———— (F, W, Sp)

* Not to be given, 1966–67.
201A–201B–201C. Later Stages of Egyptian. (3–3–3)
Three 1-hour meetings per week. Prerequisite: course 101A–101B–101C and 200A–200B–200C 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)

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, Mr. Greenfield (F, W, Sp)

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. Greenfield (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: 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), Mr. Greenfield (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. Greenfield (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)

* Not to be given, 1966–67.
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.
Maynard A. Joslyn, Ph.D., Professor of Food Technology.
Judson T. Landis, Ph.D., Professor of Family Sociology.
Gordon Mackinney, Ph.D., Professor of Food Technology.
Sheldon Margen, M.D., Professor of Human Nutrition.
Harold S. Olcott, Ph.D., Professor of Marine Food Science.
E. L. Robert Stokstad, Ph.D., Professor of Nutrition.
Jessie V. Coles, Ph.D., Professor of Home Economics, Emeritus.
Bessie B. Cook (Bessie Cook Jeffers), Ph.D., Professor of Nutrition, Emeritus.
William V. Cruess, Ph.D., Professor of Food Technology, Emeritus.
Helen L. Gillum, Ph.D., Professor of Nutrition, Emeritus.
Agnes Fay Morgan, Ph.D., Professor of Nutrition, Emeritus.
Ruth Okey, Ph.D., Professor of Nutrition, Emeritus.
W. Duane Brown, Ph.D., Associate Professor of Marine Food Science.
Barbara M. Kennedy (Barbara Kennedy Johnson), Ph.D., Associate Professor of Nutrition.
Richard L. Lyman, Ph.D., Associate Professor of Nutrition.
Mary Ann Williams, Ph.D., Associate Professor of Nutrition.
Daniel B. Menzel, Ph.D., Assistant Professor of Food Science.
Rosemarie Ostwald, Ph.D., Assistant Professor of Nutrition.

Mildred J. Bennett, Ph.D., Lecturer in Nutrition.
Robert B. Bradfield, Ph.D., Lecturer in Nutritional Sciences.
Patricia Collins, D.Sc., Lecturer in Nutritional Sciences.
Cecil Entenman, Ph.D., Lecturer in Nutritional Sciences and Lecturer in Public Health in the School of Public Health.
Karl A. Folker, Ph.D., Lecturer in Vitamin Chemistry.
Henrietta Henderson, B.S., Cert.Diet., Lecturer in Hospital Dietetics.
Ruth L. Huenemann, D.Sc., Associate Professor of Public Health Nutrition.
Thomas H. Jukes, Ph.D., Professor in Residence, Medical Physics.
Samuel Lepkovsky, Ph.D., Professor of Poultry Husbandry.
Virginia R. McMasters, M.S., Lecturer in Dietetics.
Ruth C. Steinkamp, M.D., Lecturer in Human Nutrition and in Public Health Nutrition.

Gaylord P. Whitlock, Ph.D., Lecturer in Nutrition Education.

Undergraduate Major Adviser: Miss Kennedy
Graduate Advisers for Nutrition: Mr. Briggs, Mr. Brown
Graduate Adviser for Food Science: Mr. Brown

Undergraduate Programs

The Department of Nutritional Sciences in the College of Agriculture offers three majors—dietetics, food science, and nutrition—under the agricultural sciences curriculum (see page 130), 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. Major requirements:
Humanities and Social Sciences, 40 units as follows: economics (4); educational psychology (2); English, speech, or comparative literature (8); psychology (4); additional courses (22).

Physical Sciences and Mathematics, 28 units as follows: chemistry—inorganic with laboratory (12); organic with laboratory (8); quantitative analysis (4); physics (4).

Biological and Agricultural Sciences, 23 units as follows: bacteriology with laboratory (5); biochemistry with laboratory (8); physiology with laboratory (6); additional course (4).

Major Field, 55 units as follows: introduction to nutritional sciences (5); food science (16); human nutrition (5); therapeutic nutrition (4); experimental nutrition (5); quantity food service (12); accounting (4); personnel management (4).

Additional courses, 34 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 SCIENCE

The food science major provides basic preparation in the natural and physical sciences for research, management, and other areas in food, pharmaceutical and related industries, or for graduate study. Major requirements:

Humanities and Social Sciences, 36 units as follows: economics (4); English, speech, or comparative literature (8); additional courses (24).

Physical Sciences and Mathematics, 53 units as follows: chemistry—inorganic with laboratory (12); quantitative analysis (4); organic, with laboratory (8); physical (6); calculus (6); statistics or additional mathematics (5); physics with laboratory (12).

Biological and Agricultural Sciences, 21 units as follows: bacteriology with laboratory (5); biochemistry with laboratory (8); physiology (4); additional course (4).

Major Field, 29 units as follows: introduction to nutritional sciences (5); food chemistry (8); human nutrition (3); experimental nutrition (9); additional course in food science (4).

Additional courses, 41 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.

NUTRITION

The program of study under the nutrition major provides a basic preparation in the natural and physical sciences for various types of research, laboratory technical positions in government, industry or institutions, or for graduate study with special emphasis leading to teaching and research in academic institutions. Major requirements:

Humanities and Social Sciences, 36 units as follows: economics (4); English, speech, or comparative literature (8); additional courses (24).

Physical Sciences and Mathematics, 41 units as follows: chemistry—inorganic with laboratory (12); organic with laboratory (8); quantitative analysis (4); physics with laboratory (12); statistics or calculus (5).

Biological and Agricultural Sciences, 23 units as follows: bacteriology with laboratory (5); biochemistry with laboratory (8); physiology with laboratory (6); additional course (4).

Major Field, 27 units as follows: introduction to nutritional sciences (5); food chemistry (4); human nutrition (5); experimental nutrition (9); additional course in nutrition (4).

Additional courses, 53 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, please consult the graduate adviser.

Nutritional Sciences

Lower Division Courses

1. Introduction to Nutritional Sciences. (5)

Lectures, 5 hours per week. Prerequisite: Chemistry 1A. Intended primarily for majors. 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.

The Staff (Mr. Briggs in charge) (F)

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. ———, Mr. Briggs (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 8B 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 (W)

* Not to be given, 1966–67.
**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 and 102L, 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: course 106 (to be taken concurrently).

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: course 106; 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.

Miss Kennedy (Sp)

**108L. Introduction to Food Research Laboratory. (2)**

Laboratory, 6 hours per week. Prerequisite: course 108 (to be taken concurrently). Miss Kennedy (Sp)

**121A–121B–121C. Problems of Quantity Food Service. (2–2–2)**

Lectures, 2 hours per week. Prerequisite: course 12C. Recommended: one course each in accounting and personnel management.

121A. Quantity food problems.

121B. Organization and management of quantity food service.

121C. Institution food service equipment.

Sequence beginning (F). Mrs. Mcmasters (F, W, Sp)

**122A–122B–122C. Problems of Quantity Food Service Laboratory. (2–2–2)**

Laboratory, 6 hours per week. Prerequisite: course 121A–121B–121C (to be taken concurrently).

Sequence beginning (F). Mrs. Mcmasters (F, W, Sp)

**140. Nutrition. (5)**

(Formerly numbered 110)

Lectures, 5 hours per week. Prerequisite: Chemistry 1A or high school chemistry; Physiology 1. 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.

Mrs. Ostwald (F); Miss Williams (Sp)

**144. Laboratory Methods in Metabolism. (6)**

(Formerly numbered 114)

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. (2)**

Lectures, 2 hours per week. Prerequisite: course 106; Biochemistry 102, and a course in physiology or zoology. Principles and experimental aspects of biochemistry and physiology as applied to the nutritional sciences.

Mr. Lyman (Sp)

**150L. Experimental Nutrition Laboratory. (2)**

Laboratory, 6 hours per week. Prerequisite: course 150 (may be taken concurrently). Biochemistry 102L. Quantitative laboratory techniques used in research in nutrition. Mr. Lyman, Mrs. Ostwald (Sp)

**151. Vitamins and Minerals. (3)**

Lectures, 3 hours per week. Prerequisite: course 150. Chemistry, distribution, and metabolism of vitamins and minerals in animals. Mr. Lyman (Sp)

**151L. Vitamins and Minerals Laboratory. (2)**

Laboratory, 6 hours per week. Prerequisite: course 150L, or consent of instructor; 151.

Mrs. Ostwald, Mr. Lyman (F)

**160. Human Nutrition. (3)**

Lectures, 3 hours per week. Prerequisite: courses 1 and 150. Scientific principles of meeting the metabolic and nutritional needs of normal individuals throughout the life span.

Mr. Margen (W)

**160L. Human Nutrition Laboratory. (2)**

Laboratory, 6 hours per week. Prerequisite: courses 106, 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. Briggs in charge) (F, W, Sp, Su)

**199. Special Study for Advanced Undergraduates. (1–5)**

Prerequisite: senior standing, 3.0 grade-point average, and approval of the adviser.

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

Graduate Courses

**201A–201B. Seminar in Nutrition. (1–2)**

Lecture, 1 hour per week for each unit. Prerequisite: limited to first-year graduate students. Introduction to research in nutritional sciences; emphasis on reporting and critical evaluation of topics in the current nutritional science literature.

201A, Mr. Brown, Mr. Briggs (F); 201B, Mr. Brown, Mr. Briggs (W)

**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. Includes experimental methods.

Mr. Brown (Sp)

* Not to be given, 1966–67.
211. Research Methods in Nutritional Sciences. (3)
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.
Mr. Menzel (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. (1-6)
Prerequisite: open to qualified graduate students. May be repeated for credit. Areas of study in the various seminars may vary each quarter, but will include discussions of recent research in experimental nutrition, human nutrition, foods, and dietetics.
The Staff (F, W, Sp)

297. Individual Study. (1-9)
Prerequisite: approval of graduate adviser. Individual study intended to provide opportunity for qualified students to prepare themselves for the various examinations required for candidates for the Ph.D. The Staff (Mr. Briggs in charge) (F, W, Sp, Su)

OPTOMETRY

(Department Office, 101 Optometry Building)

Horace Barlow, M.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).
Gerald Westheimer, Ph.D., Professor of Physiological Optics and Optometry.
Kenneth B. Stoddard, Ph.D., Professor of Physiological Optics and Optometry, Emeritus.
Jack T. Hobson, B.S., Assistant Professor of Optometry, Emeritus.
Darrell B. Carter, Ph.D., Associate Clinical Professor of Optometry.
Merton B. Flom, Ph.D., Associate Professor of Physiological Optics and Optometry.
Henry B. Peters, M.A., Associate Professor of Optometry.
Robert B. Mandell, O.D., Ph.D., Assistant Professor of Physiological Optics and Optometry.
Marshall B. Atkinson, M.D., Assistant Clinical Professor of Ophthalmology.
Morton D. Sarver, M.S., Assistant Clinical Professor of 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.

* Not to be given, 1966-67.
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.

During the period from 1966-1969, the optometry program will be in a state of transition from a three- to a four-year program. Presently enrolled students will complete the three-year program. Students enrolling for the first time in 1966 or later will complete 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 drawn from the School of Optometry and the departments of Physics, Physiology, Psychology and Ophthalmology.

Those interested in this graduate program should familiarize themselves with the regulations of the Graduate Division and, in addition, should contact the chairman 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. The departmental examination is based on the material covered in the Syllabus in Physiological Optics, available to all graduate students.

For further details on the requirements for the M.S. and Ph.D., please consult the chairman of the Group in Physiological Optics.

Letters and Science List: for regulations governing this list, see page 72.

Optometry

Upper Division Courses

100. History of Optometry. (1)
One 1-hour lecture per week. Prerequisite: junior standing. The profession of optometry, its history and present status.

Mr. Morgan (F)

101A-101B. Advanced Geometrical Optics. (3-3)
Three 1-hour lectures per week. Prerequisite: Physics 106A. The mathematical development of the paraxial laws of optical image formation, employing the methods of Gauss. Application to the optical devices used to evaluate and aid the functions of vision. Sequence, beginning (F), Mr. Mandell (F, W)

102A-102B. Advanced Geometrical Optics. (3-3)
Three 1-hour lectures per week. Prerequisite: Optometry 102A–102B. Extension of the principles discussed in Optometry 102A–102B to the functions of the eyes in binocular vision. Stereoscopic vision, physical and physiological aspects of the fusion movements, binocular accommodation and conver-

*103A–103B–103C. Advanced Theoretical Optometry. (3–3–3)
Three 1-hour lectures per week. Prerequisite: Optometry 102A–102B. Extension of the principles discussed in Optometry 102A–102B to the functions of the eyes in binocular vision. Stereoscopic vision, physical and physiological aspects of the fusion movements, binocular accommodation and conver-

* Not to be given after 1966–67.
gence, strabismus and the other anomalies of binocular vision, and ocular paralysis.

Sequence, beginning (F).
Mr. Marg (F, W); Mr. Carter (Sp)

104. Optimallic 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. Optimallic Optics. (3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Optometry 104. Continuation of Optometry 104.
Mr. Peters (F)

†1127. 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: skiatery, keratometry, ophthalmoscopy, visual acuity, subjective refraction, amplitude of accommodation.
Mr. Peters (F)

†1128. 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 1-hour lectures and two 2-hour laboratories per week. Prerequisite: Optometry 127. 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 systemic 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 one 2-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)

††177. Public Health Optometry. (4)
Two 1½-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)

††178. 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)

††185. 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)

Graduate Courses

*209A-209B-209C. Clinical Practice. (6-6-6)
Six 4-clinics per week. Prerequisite: B.S. in optometry or its equivalent. The examination and treatment, with lenses or orthoptic training, of patients with visual anomalies. Sequence, beginning (F).
Mr. Peters and Staff (F, W, Sp)

*212A-212B-212C. Advanced Clinical Procedures. (3-3-3)
Two 1-hour lectures, one 3-hour laboratory, and three 1-clinics per week. Prerequisite: B.S. in optometry or its equivalent. Lectures and class ass-
† To be given for the first time in 1967-68.
†† To be given for the first time in 1968-69.
‡ To be given for the first time in 1969-70.
* Not to be given after 1967-68.
signments on the orthoptics of strabismus and other binocular anomalies, aniseikonia, low vision, telescopic spectacles, contact lens fitting, occupational vision, school surveys and allied subjects.

Sequence beginning (F).
Mrs. Takahashi, Mr. Mandell, Mr. Peters (F);
Mr. Sarver, Mr. Mandell (W);
Mr. Peters Mr. Sarver Sp

**214A–214B–214C. Seminar in Clinical Problems. (2–1–1)**

One 2-hour seminar per week. Prerequisite: Optometry 209A. A discussion of the various phases of optometry associated with problems arising from clinical cases.

Sequence, beginning (F), Mr. Morgan (F, W, Sp)

**216A–216B–216C. Advanced Pathology of the Eye. (2–3–3)**

One 1-hour lecture and one 2-hour clinic per week. Prerequisite: B.S. in optometry or its equivalent. An advanced consideration of topics covered in Optometry 407A–407B–407C with particular reference to the application of this knowledge to the determination of diseases of the visual system in clinical patients.

Sequence, beginning (F),
Mr. Atkinson, Mr. Carter (F, W, Sp)

**217. Optometry Law and Economics. (2)**

One 2-hour lecture per week and two field trips per quarter. Prerequisite: B.S. in optometry or its equivalent. A consideration of the laws governing the practice of optometry and the problems associated with the establishing of a professional optometric practice.

Mr. Sarver (Sp)

**404A–404B–404C. Practical Optometry. (3–3–3)**

Two 1-hour lectures and one 2-hour laboratory per week. Prerequisite: Optometry 102A, 102B, 102C, and Optometry 401A, 401B, 401C. Lectures and problems dealing with the physical eye examinations. A study of instruments and techniques for their use, interpretation of examination data and prescribing of lenses and orthoptic training.

Sequence, beginning (F), Mr. Carter (F, W);
Mr. Flom (Sp)

**406A–406B–406C. Optometry Clinic. (2–2–2)**

One 1-hour lecture, one 4-hour clinic, and one 2-hour dispensary per week. Prerequisite: Optometry 102C. Complete physical eye examinations with clinical patients. The adaptation of lenses to the defective eye and the study of abnormal visual conditions.

Sequence, beginning (F), Mr. Peters and Staff (F);
Mr. Peters, Mr. Sarver and Staff (W, Sp)


One 1-hour lecture per week. Prerequisite: Physiology 115. Lectures and demonstrations dealing with the identification of pathological conditions in the eye, and the manifestation of systemic disease as indicated by the eye.

Sequence, beginning (F), Mr. Lewis (F, W, Sp)

410. Introduction to Clinical Optometry. (2)

One 1-hour lecture and one 4-hour clinic per week. Prerequisite: consent of instructor. Lectures and clinical practice in the technique and interpretation of clinical data.

Mr. Carter and Staff (Su)

412. Contact Lens Clinic. (2)

Two 3-hour clinics per week. Prerequisite: consent of the instructor. Clinical practice and the techniques of fitting contact lenses.

Mr. Mandell (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 clinic 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 453. Examination and prescribing of lenses to clinic patients, special problems in ophthalmic optics.

Mr. Peters and Staff (Sp)

†‡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 453.

Mr. Peters and Staff (Sp)

†‡480A–480B–480C. Advanced Optometry Clinic. (5–5–5)

Three 4-hour clinics and one 3-hour dispensary per week. Prerequisite: Optometry 455. Ophthalmic 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)

†‡483A–483B–483C. Special Clinical Practice. (5–5–5)

Six 2-hour clinics per week. Prerequisite: Optometry 455 and 161. Clinical practice in contact lenses, aniseikonia, subnormal vision, strabismus, orthoptics, and the detection of ocular disease.

Sequence, beginning (F),
Mr. Peters and Staff (F, W, Sp)

†‡486A–486B. 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 102. The macroscopic 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 embryology of the eye.

Mr. Marg (W)

†‡ To be given for the first time in 1968–69.
†‡ To be given for the first time in 1969–70.
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.

Mr. Westheimer (Sp)

*105A-105B-105C. Physiological Optics. (4-4-4)

Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: consent of instructor.

105A: The psychophysics and physiological psychology of the light, form, and color senses and the elements of visual perception.

Sequence, beginning (F), Mr. Barlow (F); Mr. Westheimer (W)

105C: Visual pathways, the pupil and accommodative mechanisms, aberrations of the eye, interaction between radiation and ocular tissue, illumination, ocular motility.

Mr. Mandell (Sp)

†1125. Vegetative Functions of the Eye. (5)

Three 1-hour lectures and two 2-hour laboratories per week. Prerequisite: Physiological Optics 102. Consideration of the physiology of the cornea and lids; formation and function of lacrimal fluid; formation, function, and drainage of the aqueous humor; intraocular pressure; metabolism and circulation in the eye; physiology and biochemistry of the lens; iris and pupil; accommodation, pharmacology; the characteristics of drugs producing miosis, mydriasis, cycloplegia, accommodative spasm, and anesthesia of ocular surfaces.

Mr. Marg (Sp)

†1129. Motility of the Eye. (5)

Three 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: Physiological Optics 102. 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 extraciliary muscles; types of movements, reflex, saccadic, pursuit, versions, vergences; accommodation; accommodative-convergence; convergence accommodation.

Mr. Westheimer (W)

†1132. Visual Stimuli. (5)

Three 1½-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)

†1151. Monocular Sensory Processes of Vision. (5)


Mr. Barlow (F)

†1160. Binocular Vision and Space Perception. (5)

Three 1½-hour lectures and one 2-hour laboratory per week. Prerequisite: consent of instructor. Binocu- lular 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)

2018. 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. Barlow (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.

Mr. Marg (Sp)

*203A–203B. Binocular Vision and Space Perception. (2-2)

Two 1-hour lectures per week. Prerequisite: consent of instructor. A consideration of the precise nature of binocular vision and monocular and binocular space perception.

Sequence, beginning (F), Mr. Flom (F, W)

204. Optical Image Formation in the Eye. (4)

Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: graduate standing in physiological optics. Lectures and laboratory demonstrations. Measurement of optical properties of simple and compound eyes. Image quality and resolution. Optometric instrumentation.

Mr. Westheimer (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 mechanical, physiological, servoanalytical and behavioral aspects of pupil, accommodation and monocular and binocular eye movement responses.

Mr. Westheimer (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. Barlow (Sp)

297. Individual Study in Physiological Optics. (2-5)

Varied. Prerequisite: consent of instructor. Individual study in preparation for the qualifying examination for the Ph.D. Mr. Westheimer (F, W, Sp, Su)

299. Research in Physiological Optics. (2-8)

Varied. Prerequisite: consent of instructor. Research.

Mr. Morgan in charge (F, W, Sp, Su)

†12 To be given for the first time in 1966-67.

†11 To be given for the first time in 1967-68.

† To be repeated for credit. Grad —
**ORIENTAL LANGUAGES**

(Department Office, 102 Durant Hall)

Cyril Birch, Ph.D., Professor of Oriental Languages (Chairman of the Department).

Peter A. Boodberg, Ph.D., Agassiz Professor of Oriental Languages and Literature.

Denzel Carr,† Ph.D., Professor of Oriental Languages.

Kun Chang,† Ph.D., Professor of Oriental Languages.

Shih-Hsiang Chen, B.Litt., Professor of Chinese and Lecturer in Comparative Literature.

Michael C. Rogers, Ph.D., Professor of Oriental Languages.

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.

Douglas E. Mills, Ph.D., Associate Professor of Oriental Languages.

Haruo Aoki, Ph.D., Assistant Professor of Oriental Languages.

James E. Bosson, Ph.D., Assistant Professor of Oriental Languages.

Francis T. Motofuji, Ph.D., Assistant Professor of Oriental Languages.

Elizabeth Huff, Ph.D., Lecturer in Oriental Languages.

Susumu W. Nakamura, M.A., Lecturer in Oriental Languages.

*Departmental Major Advisers:* Mr. Chang (Chinese); Mr. Aoki (Japanese); Mr. Bosson (Altaic Languages).

*Graduate Advisers:* Mr. Schafer (Chinese); Mr. Mills (Japanese).

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; 104 and 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).

**EMPHASIS ON JAPANESE**


† On leave, fall quarter, 1966.

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.—1M, 2M, 3M (for Mongolian emphasis) or Near Eastern Languages 1A, 1B, 1C (for Turkish emphasis); 1J, 2J, 3J or 1K, 2K, 3K; Linguistics 20.

Upper Division.—100, 154A–154B–154C, 176A–176B–176C and other relevant courses as designated by the adviser (e.g., 142M, 164A, 164B, 164C, 194, Near Eastern Languages 102A–102B–102C) to make a total of 36 upper division units.

RECOMMENDED FOR ALL MAJORS

Lower Division.—Art 1D; History 19A–19B; Architecture 24.


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 both in Chinese language and literature and in Japanese language and literature.

M.A. Degree

The first two or three semesters 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 B.A. 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 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.

Letters and Science List: for regulations governing this list, see page 72.

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.
Mr. Chen, Mr. Chang (F)

2C. Elementary Chinese. (5)
Five 1-hour lectures and two 1-hour laboratories per week. Prerequisite: course 1C. Mandarin continued.
Mr. Chen, Mr. Chang (W)

3C. Elementary Chinese. (4)
Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 2C. Mandarin continued.
Mr. Chen, 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.
Mr. Birch (F)

5C. Intermediate Chinese. (3)
(Formerly numbered 4C)
Three 1-hour lectures and two 1-hour laboratories per week. Prerequisite: course 4C or 4J. Introduction to "Classical" Chinese.
Mr. Schafer (F); Mr. Boodberg (W)

6C. Intermediate Chinese. (3)
Three 1-hour lectures and two 1-hour laboratories per week. Prerequisite: course 5C. "Classical" Chinese continued.
Mr. Schafer (W); Mr. Boodberg (Sp)

1J. Elementary Japanese. (5)
Five 1-hour lectures and two 1-hour laboratories per week. Introduction to Modern Japanese.
Mr. Aoki, Mr. Motofuji, Mr. Nakamura (F)

2J. Elementary Japanese. (5)
Five 1-hour lectures and two 1-hour laboratories per week. Prerequisite: course 1J. Modern Japanese continued.
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.
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.
Mr. Nakamura (F)

5J. Intermediate Japanese. (3)
Three 1-hour lectures per week. Prerequisite: course 4J.
Mr. Nakamura (W)

6J. Introduction to Classical Japanese. (3)
(Formerly numbered 4J)
Three 1-hour lectures per week. Prerequisite: course 5J.
Mr. Mills (Sp)

1K. Elementary Korean. (5)
Five 1-hour lectures and two 1-hour laboratories per week.
Mr. Rogers (F)

2K. Elementary Korean (continued). (5)
Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 1K.
Mr. Rogers (W)

3K. Elementary Korean (continued). (4)
Three 1½-hour lectures per week. Prerequisite: course 2K.
Mr. Rogers (Sp)

1M. Modern Mongolian (Khalkha). (5)
Five 1-hour lectures and two 1-hour laboratories per week. An introduction to the official language of the Mongolian People's Republic. Graded readings in literary and expository texts.
Mr. Bosson (F)

2M. Modern Mongolian (Khalkha) (continued). (5)
Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 1M.
Mr. Bosson (W)

3M. Modern Mongolian (Khalkha) (continued). (4)
Three 1½-hour lectures per week. Prerequisite: course 2M.
Mr. Bosson (Sp)

1M/I. Malay/Indonesian. (5)
(Formerly numbered 8)
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.
Mr. Carr (F)

2M/I. Malay/Indonesian (continued). (5)
(Formerly numbered 18)
Five 1-hour lectures and one 1-hour laboratory per week. Prerequisite: course 1M/I.
Mr. Carr (W)

3M/I. Malay/Indonesian (continued). (4)
Three 1-hour lectures and one 2-hour drill session per week. Prerequisite: course 2M/I.
Mr. Carr (Sp)

13. Introduction to the Study of Chinese
Characters. (4)
(Formerly numbered 17)
Two 1½-hour lectures per week. Prerequisite: none.
Mr. Boodberg (F)

16A–16B. Mandarin Composition. (2–2)
Two 1-hour lectures per week. Prerequisite: course 4C. Translation into Mandarin and free composition in Mandarin.
Mr. Birch (W, Sp)

19. Japanese Composition. (2)
Two 1-hour meetings per week. Prerequisite: course 3J. Translation into Japanese and free composition in Japanese.
Mr. Nakamura (Sp)

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.
Mr. Carr (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. Required of all majors in Oriental languages. A survey course on the nature and distribution of the main languages of Eastern Asia.
Mr. Aoki (W)
103. Classical Chinese: Medieval Texts (Cultural and Literary). (5)
(Formerly numbered 143)
Four 1-hour lectures per week. Prerequisite: course 6C.
Mr. Schaefer (F)

104. Studies in Ancient Chinese Literature: Philological Analysis of Texts. (4)
Three 1-hour lectures per week. Prerequisite: course 103. May be repeated for credit. Topics and texts will vary from year to year. Mr. Boodberg (Sp)

106. Contemporary Chinese Writers. (5)
Three 1½-hour lectures per week. Prerequisite: course 6C. Readings in all genres of Chinese literature since 1917.
Mr. Birch (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 128)
Three 1-hour lectures per week. Prerequisite: course 3M/I. Readings in Sejarah Melatau and other standard texts in Roman and Arabic characters.
Mr. Carr (F)

109. Advanced Japanese. (4)
(Formerly numbered 119)
Three 1-hour lectures per week. Prerequisite: course 5J. Readings in Modern Japanese.
Mr. Nakamura (F)

113. Classical Chinese: Historical Texts. (4)
(Formerly numbered 103)
Three 1-hour lectures per week. Prerequisite: course 103.
Mr. Schaefer (W)

118. Introduction to Malayo-Polynesian Linguistics. (4)
Three 1-hour lectures per week. Prerequisite: course 3M/I; an equivalent knowledge of one Malayo-Polynesian language, or Linguistics 130 or 145.
Mr. Carr (W)

119. Readings in Modern Japanese: Expository Prose. (4)
(Formerly numbered 109)
Three 1-hour lectures per week. Prerequisite: course 109.
Mr. Aoki (W)

*124A–124B. Readings in Modern Chinese. (4–4)
Two 1½-hour lectures per week.
*124A. Prerequisite: course 4C. Texts on social and political problems.
Mr. Birch (W)
124B. 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: courses 6J and 109.
Mr. Mills (F)
129B. Prerequisite: courses 6J and 109; course 129A is not prerequisite to 129B.
Mr. Mills (W)

129C–129D. Readings in Classical Japanese Literature: Verse and Drama. (4–4)
129C. Three 1-hour lectures per week. Prerequisite: courses 6J and 109. Course 129A–129B is not prerequisite to course 129C. Verse.
Mr. Mills (Sp)
129D. Two 1½-hour lectures per week. Prerequisite: courses 6J and 109. Courses 129A–129B, 129C are not prerequisite to course 129D. Drama.
Mr. Mototuji (F)

131. Japanese Bibliography. (3)
Three 1-hour lectures per week. Prerequisite: courses 6J and 109.
Mr. Mills (Sp)

133A–133B. Chinese Bibliography. (4–4)
Three 1-hour lectures per week. Prerequisite: course 103. 133A is prerequisite to 133B. Open to seniors.
Miss Huff (F, W)

*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)

139A–139B. Japanese Grammar. (4–4)
Mr. Aoki (F, W)

143. Classical Chinese: Canonical and Philosophical Texts. (4)
(Formerly numbered 113)
Three 1-hour lectures per week. Prerequisite: course 103.
Mr. Schaefer (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: course 5J. 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. Schaefer (Sp)

154A–154B–154C. Classical Mongolian. (4–4–4)
154A–154B. Three 1½-hour lectures per week. Prerequisite: consent of instructor. Literary Mongolian in Uighur script; selected prose texts from seventeenth century to the present.
Mr. Bosson (F, W)
154C. Two 1½-hour lectures per week. Prerequisite: course 154A–154B.
Mr. Bosson (Sp)

156. Readings in Chinese Vernacular Literature. (4)
Three 1-hour lectures per week. Prerequisite: course 106.
Mr. Birch (Sp)

159. Readings in Contemporary Japanese Literature. (4)
Three 1½-hour lectures per week. Prerequisite: course 109.
Mr. Mototuji (Sp)
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 (F)

142. Civilizations of Eastern Asia. (4)
*142C. China. Three 1-hour lectures per week. Emphasis on material culture, technology and science.
Mr. Schaefer (Sp)

142J. Japan. Two 1½-hour lectures per week. A broad survey of Japanese civilization dealing with cultural, literary, religious and social developments.
Mr. Mills (W)

142K. Korea. Three 1-hour lectures per week. The development of Korean civilization; emphasis on Chinese influence.
Mr. Rogers (F)

152. Japanese Literature and the West. (4)
Three 1-hour lectures per week. A comparative approach toward modern Japanese literature.
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, Malaya, Indonesia, other Pacific Islands.
Mr. Carr (W)

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. (3)
One 2-hour seminar. Detailed study of a text with its literary and historical background. Mr. Birch (W)

208. Malayo-Polynesian Linguistics. (3)
One 2-hour seminar. Prerequisite: course 118.
Mr. Carr (Sp)

209. Kambun. (3)
One 2-hour seminar.
Mr. Nakamura (Sp)

212. Seminar in Chinese Literary History. (3)
One 2-hour seminar. Textual and aesthetic criticism.
Mr. Chen (F)

213. Seminar in Philological Analysis of Ancient Chinese Texts. (3)
One 2-hour seminar.
Mr. Boodberg (F, W)

216. Texts on the Civilization of Medieval China. (3)
Two 1-hour seminars.
Mr. Schafer (W, Sp)

217. Seminar in Philological Analysis of Koryŏ and Yi Dynasty Sources. (3)
One 2-hour seminar.
Mr. Rogers (W, Sp)

224. Readings in Altaic Texts. (3)
One 2-hour seminar.
Mr. Bosson (F)
PALEONTOLOGY

(Department Office, 193 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 and Curator of Higher Vertebrates in 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 B. N. Berry,† Ph.D., Associate Professor of Paleontology, Curator of Paleozoic Invertebrates in the Museum of Paleontology and Associate Director of 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. Savage.

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 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.

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 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 72.

Lower Division Courses

1. Introduction to Paleontology. (5)
   Three 1-hour lectures, two 2-hour laboratories per week; field trip. Methods of interpreting the fossil record; fossils as evidence of the history of life; evolution of form and structure in plants and animals; sequence of floras and faunas in the rocks.
   Mr. Welles, Mr. Savage, Mr. Welles (F, W, Su)

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.
   Mr. Arnold (F, Su)

Upper Division Courses

111. Invertebrate Paleontology. (4)
   Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: course 114 or consent of instructor. Paleobiology of microorganisms with emphasis on the Foraminifera.
   Mr. Arnold (W)

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)

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)

*127. Vertebrate Phylogeny and Evolution. (4)
   Two 1-hour lectures and two 3-hour laboratories per week; field trip. Prerequisite: course 125 and 126. Critical examination of selected examples of the fossil record of vertebrates.
   Mr. Gregory (Sp)

* Not to be given, 1966–67.
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. Berry (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 136. 
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)

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 hour lecture 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. 
Prerequisite: courses 125 and 126 or comparative anatomy of vertebrates. 
Mr. Gregory (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. (4-10)
Lectures, demonstrations, and problem-solving in the field. 
Term report and examinations. 
Prerequisite: course 227. 
Mr. Savage (Su)

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. 
During 1966-67 the following seminars will probably be offered. 
(a) Biostratigraphy, Mr. Berry (F); 
(b) Micropaleontology, Mr. Kleinpell (F, W); 
(c) Fossil Mammals, Mr. Gregory (Sp); 
(d) Paleontology of lower vertebrates, Mr. Gregory (F); 
(e) Invertebrate Paleontology, Mr. Durham (F, W); 
(f) Paleobotany, Mr. Fry (W, Sp); 
(g) Paleobiology of microorganisms, Mr. Arnold (F, W); 
(h) Problems in Mammalian Paleontology, Mr. Savage (W).

299. Research in Paleontology. (1-9)
The Staff (F, W, Sp, Su)

Museum of Paleontology

The museum was founded by the late Annie M. Alexander in 1921 to encourage and sponsor research in paleontology. Each academic member of the Department of Paleontology also has the function of curator relative to the specimens in his field of study. The museum collections are used in teaching, and in graduate and faculty research. Research institutes and departments in the University as well as other institutions of learning are served by the museum,
The primary function of the museum as a research institute is to support and sponsor research projects by the staff, the most capable of the graduate students, and visiting scientists.

The museum has large collections of fossil vertebrates, invertebrates, and plants. The best representation of these is from western North America, but there are excellent materials, many of them unique, from every continent. The growth and quality of the collections result from the continually expanding and diversified research program. The specimens are invaluable reference materials for research now in progress and they will become indispensable for the future. The collections are housed in the Earth Sciences Building and in the Campanile, Berkeley campus.

Anyone wishing to utilize the collections or facilities of the museum may address the Director.

Parasitology

For courses in Parasitology, see Entomology and Parasitology.

PHILOSOPHY

(\textit{Department Office, 4401 Dwinelle Hall})

Karl Aschenbrenner, \textit{**} Ph.D., \textit{Professor of Philosophy}.
William Craig, Ph.D., \textit{Professor of Philosophy}.
Lewis S. Feuer, Ph.D., \textit{Professor of Philosophy and Social Science}.
Paul K. Feyerabend, Ph.D., \textit{Professor of Philosophy}.
Isabel C. Hungerland, \textit{†} Ph.D., \textit{Professor of Philosophy}.
Benson Mates, Ph.D., \textit{Professor of Philosophy}.
Wallace I. Matson, Ph.D., \textit{Professor of Philosophy}.
David Rynin, Ph.D., \textit{Professor of Philosophy}.
Edward W. Strong, Ph.D., \textit{Mills Professor of Intellectual and Moral Philosophy and Civil Polity}.
Joseph Tussman, Ph.D., \textit{Professor of Philosophy}.
Jacob Loewenberg, Ph.D., LL.D., \textit{Professor of Philosophy, Emeritus}.
Stephen C. Pepper, Ph.D., L.H.D., LL.D., \textit{Mills Professor of Intellectual and Moral Philosophy and Civil Polity, Emeritus}.
Ernest W. Adams, Ph.D., \textit{Associate Professor of Philosophy (Vice-Chairman of the Department)}.
John R. Searle, D.Phil., \textit{Associate Professor of Philosophy}.
David S. Shwayder, \textit{†} D.Phil., \textit{Associate Professor of Philosophy (Chairman of the Department)}.
Price Charlson, Ph.D., \textit{Assistant Professor of Philosophy}.
Charles S. Chihara, Ph.D., \textit{Assistant Professor of Philosophy}.
Thompson Clarke, Ph.D., \textit{Assistant Professor of Philosophy}.
Barry G. Stroud, Ph.D., \textit{Assistant Professor of Philosophy}.
George Myro, \textit{Acting Assistant Professor of Philosophy}.

\textit{Major Adviser:} Price Charlson, Ph.D.\n\textit{Graduate Advisers:} Ernest Adams, Ph.D., David Shwayder, D.Phil.

The Major

\textit{Lower Division}.—12A, 25A–25B–25C.\n\textit{Upper Division}.—104, 134A.

\( ^* \) In residence fall and winter quarters only, 1966–67.\n\( ^† \) In residence fall quarter only.\n\( ^\star \) Professor, Humanistic Research Fellowship Program, fall and winter quarters.
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 demands 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 72.

**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. Shwayder, Mr. Strong (F); —— (W); —— (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. Stroud, Mr. Searle (F); Mr. Clarke, Mr. Chihara (W); Mr. Feyrerabend (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. Rynim

12A—12B. **Introduction to Logic.** (4-4)

Two 1-hour lectures and two section meetings per week.

Sequence 12A, Mr. Chihara, Mr. Craig, Mr. Mate (F); Mr. Adams (W); —— (Sp).

12B, Mr. Chihara, Mr. Craig, Mr. Mate (W); Mr. Adams (Sp)

25A. **Ancient Philosophy.** (4)

Three 1-hour lectures per week and one weekly section meeting. Mr. Matson (F); —— (Sp)

25B. **Medieval and Early Modern Philosophy.** (4)

Three 1-hour lectures per week and one weekly section meeting. Mr. Charlson (F); Mr. Strong (W)

25C. **Modern Philosophy to Kant.** (4)

Three 1-hour lectures and one section meeting per week. Mr. Stroud (W); Mr. Matson (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.

**Restrictions**

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 courses 2, 4, or 25A–B–C, or their equivalent. It will be accepted as prerequisite for other upper division courses in the department in lieu of courses 2, 4, 25A–25B–25C.

Mr. Feyrerabend (F); Mrs. Hungerland (W)

**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. Mr. Strong (F); —— (W); —— (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. ——— (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. Searle (Sp)

112. Philosophy of Religion. (5)
Three 1½-hour lectures per week. The nature and the validity of religious ideas. ——— (W)

118. Philosophy of Law. (4)
Three 1-hour lectures per week. Philosophical problems arising in the legal context. ——— (Sp)

124. Theory of Historical Inquiry. (5) Mr. Strong (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 (W)

126A–126B. Aesthetics. (4–4)
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. Charlson (F) 126B. Literature and Music. Mr. Charlson (W)

127. Philosophy of History. (5)
Three 1½-hour lectures per week. Theories of history: Augustine, Vico, Hegel, and others. Mr. Charlson (Sp)

128. Political Philosophy. (5)
Three 1½-hour lectures per week. Analysis of political obligation and related problems. ——— (W)

129. Aesthetic Theories. (4)
Three 1-hour lectures per week. A study of aesthetic theories based on historical and recent materials. ——— (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 (W)

133A–133B. Philosophy of Language. (5–5)
Three 1½-hour lectures per week. Sequence beginning (W). Mr. Searle

134A–134B. Theory of Knowledge. (4–4)
Three 1-hour lectures per week. 134A, Mr. Clarke (F); Mr. Mates (Sp); 134B, Mr. Clarke (W)

140A–140B. Philosophy of the Natural Sciences. (5–5)
Three 1½-hour lectures per week. Sequence beginning (F). Mr. Feyerabend

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. ——— (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. (4–4)
Three 1-hour lectures per week. Prerequisite: course 12A–12B or equivalent. Mr. Craig, 143A (F); 143B (W)

144. Philosophy of Mathematics. (5)
Three 1½-hour lectures per week. Foundations of mathematics: logicism, intuitionism, formalism. Set theoretical paradoxes, definition of number, problems of the continuum. Mr. Chihara (Sp)

150. Anglo-American Philosophy, 1900–1945. (5)
Three 1½-hour lectures per week. Mrs. Hungerland (F)

151. Anglo-American Philosophy Since 1945. (5)
Three 1½-hour lectures per week. Mr. Stroud (W)

152. Contemporary Continental Philosophy. (5)
Three 1½-hour lectures per week. Phenomenology, existentialism, and related movements in contemporary European philosophy. ——— (Sp)

159. Semantics. (5)
Three 1½-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. Rynin (F)

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. (4–4)
Three 1-hour lectures per week. Mr. Matson, 160A (F); 160B (W)

161. Aristotle. (5)
Three 1½-hour lectures per week. Mr. Matson (Sp)

168. Medieval Philosophy. (5)
Three 1½-hour lectures per week. ——— (W)

170. Descartes. (4)
Three 1-hour lectures per week. Mr. Myro (F)

171. Hobbes. (4)
Three 1-hour lectures per week. (Sp)
PHYSICAL EDUCATION

(Department Office, 103 Harmon Gymnasium)

Anna S. Espenschade, Ph.D., Professor of Physical Education (Vice-Chairman of the Department).
Franklin M. Henry, Ph.D., Professor of Physical Education.
Deobold B. Van Dalen, Ph.D., Professor of Physical Education (Chairman of the Department).
Pauline Hodgson, Ph.D., Professor of Physical Education, Emeritus.
Carl L. Nordly, Ph.D., Professor of Physical Education, Emeritus.
Sarah R. Davis, A.B., Assistant Professor of Physical Education, Emeritus.
Frederica Bernhard, M.S., Supervisor of Physical Education, Emeritus.
Louise S. Cobb, Ph.D., Supervisor of Physical Education, Emeritus.
Lucile K. Czarnowski, M.S., Supervisor of Physical Education, Emeritus.
Marie H. Glass, A.B., Supervisor of Physical Education, Emeritus.
Eleanor E. Bartlett, A.B., Associate Supervisor of Physical Education, Emeritus.
Joseph Royce, Ph.D., Associate Professor of Physical Education.
Helen M. Eckert, Ph.D., Assistant Professor of Physical Education.
Barbara J. Hoepner, Ph.D., Assistant Professor of Physical Education.
Mary Lou Norrie, Ph.D., Assistant Professor of Physical Education.
Kooman Boychuff, Ph.D., Supervisor of Physical Education.
Lance Flanagan, Ed.D., Supervisor of Physical Education.
Charles J. Keeney, A.B., Supervisor of Physical Education.
Ralf D. Miller, M.A., Supervisor of Physical Education.
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.

The Major

Lower Division
High School chemistry or equivalent; Elementary Statistics; Anatomy 25 or 102; Physics 10; Physiology 1, 1L; 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, 148, 150; 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 an M.A. degree in physical education can be started concurrently.

Preparation for Graduate Study
Students planning to continue toward the M.A. 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, $12; for intermediate sailing, $17.

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 semester, 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 empty locker within designated time, $5.

Letters and Science List: for regulations governing this list, see page 72.

Lower Division Courses

1. Physical Education Activities for Men. (1/2)

Sections meet two hours per week.

Sports Classes. Instruction in the following activities is offered to men in acceptable physical condition: badminton, basketball, bowling, boxing, circuit training, diving, fencing, general conditioning exercise, golf, gymnastics, handball, judo, soccer, squash, swimming, lifesaving, tennis, track and field, volleyball, weight training, and wrestling.

Sports Teams. Advanced instruction and coaching for intercollegiate competition in the following sports is open to men accepted by the intercollegiate team coach and the Student Health Service: baseball, basketball, boxing, crew, cross country, football, golf, gymnastics, rugby, swimming, soccer, tennis, track and field, water polo, and wrestling. A sport "in season" may be taken for one unit.

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

5. First Aid. (2)

Standard and advanced course. Upon successful completion of the course, a Red Cross certificate is awarded. Miss Norrie (F, W, Sp)

12. Physical Education Activities for Men and Women. (1/2)

Sections meet two hours per week. Instruction in the following activities is offered to men and women in acceptable physical condition.

Sports: archery, badminton, bowling, fencing, figure skating, golf, tennis, sailing, and trampoline.

Dance: modern, folk, ballet, and social.

Elementary School Activities: dance and games.

The Staff (Miss White, Mr. Keeney in charge) (F, W, Sp, Su)

26. Physical Education Activities for Women. (1/2)

Sections meet two hours per week. Instruction in the following activities is offered to women in acceptable physical condition.

Sports: badminton, basketball, field hockey, golf, lifesaving, softball, tennis, swimming and officiating.

General Exercise: apparatus, tumbling, trampoline, and rhythmic conditioning exercises.

Individual Exercise: body mechanics, posture and fitness exercises adapted to individual needs.

The Staff (Miss Espenscheid in charge) (F, W, Sp, Su)

Upper Division Courses

101. Kinesiology and Body Mechanics. (4)

Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Physiology I, 1L; Anatomy 25; Physics 10. Physical structure and muscular movements in various physical activities. Anatomical concepts and physical laws related to joint and muscle action. Mr. Royce (F)

102. Adapted Physical Education. (3)

Two 1½-hour lectures per week. Prerequisite: course 101. Adaptation of exercise for individuals with postural deviations from the normal or with physical disabilities requiring modification of activity. Miss Norrie (W)

105A-105B. Physiological Hygiene. (4-4)

Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Physiology I, 1L. The physiology of exercise; diet, ventilation, training, fatigue, and health in relation to physical activity. Individual differences in cardiovascular and respiratory function. Limitations of work in relation to altitude and climate. Mr. Henry (W, Sp)

110. Psychologic Bases of Physical Activity. (4)

Two 1½-hour lectures and one 1½-hour laboratory per week. Prerequisite: Psychology 1A, course
135A. Perception, 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 1A, 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 (Sp)

120. Sports in American Society. (3)

Three 1-hour lectures per week. Prerequisite: Sociology 1 or equivalent. Interrelationships of sports and physical recreation with other aspects of American culture. Emphasis on the twentieth century.

Mr. Flanagan (Sp)

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.

Miss Espschade (Sp)

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 Espschade, Mr. Henry (F)

135B. Three 1-hour lectures per week. Prerequisite: course 135A. Historical development of evaluation in physical education; measurement of physical abilities and specialized 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.

Miss Espschade, Mr. Henry (W)

140. Community Recreation. (3)

Three 1-hour lectures per week. Prerequisite: Sociology 1 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 (F)

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 1A.


Mrs. McComb (Sp)

165. Theory of Sports and Gymnastics. (3)

Two 1-hour lectures and 4 hours of laboratory per week. Prerequisite: courses 12 and 26 (sections in sports and gymnastics), course 101. Mechanics of movement in sports and gymnastics for women. Analysis of complex skills. Game structure and strategy. Competition for women.

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 5A; Physiology 1 or Anatomy 23. 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 (W)

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) (F, W, Sp)

H196. Honors Thesis. (3)

Individual conferences to be arranged.

The Staff (Mr. Van Dalen in charge) (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) (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 (F)

Graduate Courses

200. Seminar in Physical Education. (3)

One 3-hour meeting per week. Critical review of literature and research methods.

(3) (F, W, 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 (W)

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. Henry (F, Su)

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 Espschade, Mr. Henry (Sp, Su)
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. Miss Espenschade (F)

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) (F, W, Sp, Su)

297. Individual Study. (2-4)
Hours to be arranged. Reading or other advanced study by arrangement with a faculty member. The Staff (Mr. Van Dalen in charge) (F, W, Sp, Su)

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) (F, W, Sp, Su)

PHYSICS

(Department Office, 366 LeConte Hall)

Luis W. Alvarez, Ph.D., Professor of Physics.
Robert B. Brode,† Ph.D., Professor of Physics.
Robert R. Brown, Ph.D., Professor of Physics.
Owen Chamberlain, Ph.D., Professor of Physics.
Geoffrey F. Chew, Ph.D., Professor of Physics.
Frank S. Crawford, 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.
Carson D. Jeffries, Ph.D., Professor of Physics.
Robert Karplus, 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.
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 (Chairman of the Department).
Alan M. Portis, Ph.D., Professor of Physics.
Wilson M. Powell, Ph.D., Professor of Physics.
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.
M. Lynn Stevenson,† Ph.D., Professor of Physics.
Robert L. Thornton, Ph.D., Professor of Physics.
Michael Tinkham, Ph.D., Professor of Physics.
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.
Charles Zemach,† Ph.D., Professor of Physics.

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

Students who are considering high school teaching as a career are especially urged to consult with their adviser early.

In his first six quarters the student ordinarily takes courses in introductory physics, differential and integral calculus, and introductory chemistry. The following courses include this material: Physics 4A–4B–4C–4D–4E, Mathematics 1A–1B–1C, 2A–2B–2C (which include differential equations, a prerequisite for much upper division work in physics) and Chemistry 1A–1B. 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); Physics 137C, 124, 129A, 129B, 140, 141A, 141B (any two courses).

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 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. Tobias, 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.

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 Le Conte 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 should inquire from the department concerning special research interests. 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 72.

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 2A-2B-2C is designed for premedical and prepharmacy students, students in architecture, and some students in the biological sciences. Beginning in the fall quarter of 1967, the department proposes to start a course, Physics 6A-6B-6C (which will employ calculus at the level of Math 16A), and to phase out Physics 2A-2B-2C. Courses 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 courses 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)

2A-2B-2C. General Physics Lectures and Laboratory. (4-4-4)

Three 1-hour lectures, one 1-hour discussion section, and one 3-hour laboratory per week. Elective in the College of Letters and Science. Required for premedical students and students in architecture. Mechanics, properties of matter, heat, sound, light, electricity and magnetism, atomic and nuclear physics. Sequence beginning (F, Sp, Su) Mr. Mozer, Mr. White

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. Ely, Mr. Parker, Mr. Smith (F, W, Su)

4B. Physics for Scientists and Engineers. (4)

Three 1-hour lectures, one 1-hour discussion section, and one 3-hour laboratory period per week.

Prerequisites: course 4A; Mathematics 1C should be taken concurrently. Special relativity; electrostatics; conductors and currents; magnetic fields.

Mr. Ely, Mr. Parker, Mr. Smith (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 2A should be taken concurrently. Electromagnetic induction; Maxwell's equations; waves and oscillations; electromagnetic waves; optics.

Mr. Bingham, Mr. Crawford, Mr. Ely, Mr. Kip, Mr. Parker, Mr. Smith (F, W, Sp, Su)

4D. 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 4C. Quantum physics: Planck's constant; spectra; basic phenomena of atoms, molecules and nuclei; introduction to quantum theory.

Mr. Bingham, Mr. Crawford, Mr. Ely, Mr. Kip, Mr. Parker (F, W, Su)

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. Bingham, Mr. Crawford, Mr. Kip (F, W, Sp, Su)

10. Descriptive Introduction to Physics. (5)

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, 11A-11B, or equivalent. May not be given after the summer quarter 1967. A brief presentation of some of the more important phenomena in physics, with experimental illustrations.

Mr. Karplus, Mr. Shugart (F, Sp, Su)

11A-11B-11C. Foundations of Physical Sciences. (3-3-3)

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, quantum theory, chemical reactions, electromagnetism, and quantum theory. Necessary mathematical foundations will be introduced.

Sequence beginning (F), Mr. Knight

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.

The Staff (F, W, Sp, Su)
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.

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.

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 lectures.

106A. Geometrical 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.

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.

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.

111A-111B-111C. Modern Physics and Advanced Electrical Laboratory. (2-2-2)
A laboratory for junior and senior students involving some of the significant experiments of physics. Individual work is encouraged. Any two parts required for physics majors. Three parts may be taken for credit. While there is no strict delineation of topics, the main emphases are: A, atomic physics; B, nuclear physics; C, electromagnetism, optics, and electrical measurements.

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. Portis, Mr. Reif (F, W, Sp, Su)

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.

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.

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.

129A-129B. Nuclear Physics Sequence
Course. (4-4)
Prerequisite: course 137A and 137B. Through coverage of nuclear physics, employing the elements of quantum mechanics; mesons and high energy phenomena.

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.

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.

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. I onic, covalent, molecular, metallic and semiconducting crystals. Dielectric, thermal, magnetic, conductive, and mechanical properties. Superconductivity, ferromagnetism, defects in solids.

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.

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142. Introduction to Plasma Physics. (4)

Prerequisite: course 112, 137A or 121. Microscopic processes in ionized gases, motion of charged particles in electromagnetic fields, macroscopic equations, transport phenomena, magnetohydrodynamics, waves, instabilities, shock waves. Application to natural and man-made plasmas, e.g., in space science, electrical discharges, and controlled thermonuclear research.

Mr. Kunkel (W)

H197. Physics Honors Course. (2)

A proséminar which includes study of a standard book on theoretical physics and reports on current theoretical and experimental problems. May be repeated for credit.

The Staff (F, W, Sp, Su)

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.

Mr. Moyer in charge (F, W, Sp, Su)

Graduate Courses

205A–205B. Advanced Dynamics. (2–3)


205A, Mr. Judd, Mr. Miller (F, W);
205B, Mr. Ely, Mr. Tripp (F, W, Sp)

205C. Advanced Dynamics. (4)

Prerequisite: course 205A and 205B. Advanced topics in classical dynamics, including selections from: hydrodynamics, magnetohydrodynamics, theory 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 121. Emission, absorption, and propagation of light treated classically. Limits of classical theory. Transition to quantum theory through the correspondence principle.

Mr. Davis (W)

209. Modern Optics. (3)

Three hours of lecture per week. Prerequisite: courses 208 and 211, or consent of instructor. Quantization of electromagnetic fields, quantum theory of coherence and correlation; interaction of radiation with matter; emission and absorption; coherent and incoherent scattering; nonlinear optical effects; theory of lasers.

Mr. Shen (Sp)


Prerequisite: course 110A–110B–110C and a working knowledge of differential equations. Classical description of the electromagnetic field, including special relativity and electron theory.

Sequence beginning (F, W, Sp), Mr. Bardakei, Mr. Tripp

212A. Statistical Mechanics. (2)

Two hours of lecture per week. Prerequisite: course 112 or equivalent. Equilibrium statistical mechanics; foundations of statistical mechanics, canonical and grand canonical ensembles, Bose-Einstein and Fermi-Dirac distributions, systems of interacting particles.

Mr. Jeffries, Mr. Haley (F, W, Sp, Su)

212B. Statistical Mechanics. (3)

Three hours of lecture per week. Prerequisite: course 112 or equivalent. Nonequilibrium statistical mechanics and transport theory; Boltzmann equation, calculation of transport coefficients, theory of Brownian motion, irreversibility and Onsager relations.

Mr. Kaufman (F, W, Sp)

213. Advanced Statistical Mechanics. (4)

Prerequisite: course 219 or consent of instructor. Phase transitions, including condensation. Description of imperfect gases. Transport theory and other nonequilibrium phenomena.

Mr. Commins, Mr. Watson (F, W, 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 mechanics, Schroedinger theory; symmetry and invariance principles; theory of angular momentum; stationary state problems; variational principles; time independent perturbation theory.

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.

222. Mathematical Methods of Theoretical Physics. (4)

The setting up and solution of differential and integro-differential equations; statistical and algebraic methods for the treatment of problems of physics.

223A–223B. Group Theory and Quantum Mechanics. (3)

Three hours of lecture per week. Prerequisite: course 221A–221B–221C or consent of instructor. 223B: course 223A or consent of instructor.

223A: Introduction to theory of groups and group representations with illustrative physical applications emphasizing finite groups; the full rotation group and angular momentum.

223B: Systematic but brief survey of quantum mechanics of atoms, molecules, and solids, emphasizing applications of group theory.

223A (F, Sp); 223B (W) Mr. Goldhaber

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

*Not to be given, 1966–67.*
Prerequisite: course 221A–221B–221C or the equivalent. An introduction to the relativistic quantum mechanics of fields and particles. Symmetry principles, S-matrix theory. Quantum electrodynamics. Phenomenological theories of weak and strong interactions. Sequence beginning (F, W). Not given (Su). Mr. Mandelstam, Mr. Wichmann

231. Theory of General Relativity. (4)
An introduction to Einstein's theory of gravitation with applications to cosmology and astrophysics. Mr. Wichmann (W)

Prerequisite: course 221A–221B or the equivalent; course 141A–141B is recommended. Phonon, magnon, 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; Fermi surfaces; neutron scattering; recoilless emission; theoretical methods in magnetic resonance. Sequence beginning (F), Mr. Garland

Prerequisite: course 210A–210B–210C, 212A–212B, 142; or consent of instructor. Analysis of plasma behavior according to the Vlasov, Fokker-Planck equations, guiding center, and hydrodynamic descriptions. Study of equilibria, stability, linear and nonlinear oscillations, transport, and interaction with radiation. Rigorous kinetic theory. Sequence beginning (F), Mr. Kaufman

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

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. (Sp)

290. Seminar. (2) ———— (F, W, Sp)

295. Research. (1–6) ———— (F, W, Sp, Su)

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. Mr. Moyer in charge (F, W, Sp, Su)

MEDICAL PHYSICS (see page 346)

PHYSIOLOGY–ANATOMY

(Department Office, 2549 Life Sciences Building)
Nello Pace, Ph.D., Professor of Physiology and Director of the White Mountain Research Station (Chairman of the Department).
Sherburne F. Cook, Ph.D., Professor of Physiology. Emeritus.
Herbert McLean Evans, M.D., D.med.h.c., Docteur h.c., D.Sch., LL.D., Professor of Anatomy, Emeritus, and Director of the Institute of Experimental Biology, Emeritus.
Miriam E. Simpson, M.D., Ph.D., Docteur h.c., Professor of Anatomy, Emeritus.
Edward S. Evans, Ph.D., Associate Professor of Anatomy.
Walter J. Freeman, M.D., Associate Professor of Physiology.
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.
Paola S. Timiras, M.D., Ph.D., Associate Professor of Physiology.
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.

*Not to be given, 1966-67.
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

An introductory course in the biological sciences, Biology 1A–1B–1C (5–5–5) is recommended; Physics 2A–2B–2C (4–4–4); Chemistry 1A–1B–1C (4–4–4); Chemistry 8A–8B (4–4); either Chemistry 5 (4) or Chemistry 14 (3); either Mathematics 16A–16B (3–3) or Mathematics 1A–1B–1C (4–4–4); either Anatomy 102 (4) or Biochemistry 102 (4). Recommended: Chemistry 109 (3); Physics 132 (4); a course in statistics.

In addition, the undergraduate major must include 36 units of upper division courses in physiology. In this group the following are required: courses 101 (4); 101L (4); 112 (4); 112L (2); 113 (4); 113L (2). The remaining 16 units may be selected from among the other upper division courses in physiology.

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 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 109 (3); Physics 132 (4); a course in statistics; at least 8 units of upper division or graduate courses in anatomy; at least one graduate lecture or seminar course in physiology in each semester of residence; at least 24 units of course 299.

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 related subjects. 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, Mr. Pace.
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 degree program in anatomy: Biology 1A–1B–1C (5–5–5); Chemistry 1A–1B–1C (4–4–4); Chemistry 5 (4); Chemistry 8A–8B (4–4); Physics 2A–2B–2C (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 100 (4); either course 201A–201B (4–4), or courses 203A–203B (3–3) and 205A–205B (4–4); at least 12 units of course 299.

2. The Ph.D. degree in anatomy. Required: course 100 (4); course 201A–201B (4–4); course 203A–203B (3–3); course 205A–205B (4–4); at least 24 units of course 299; Physiology 112–112L, 113–113L (4–2, 4–2); 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, Mr. Srebnik.

Letters and Science List: for regulations governing this list, see page 72.

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.
   Mr. Macey (F); Mr. Forte (W, Su)

Upper Division Courses

101. Cell Physiology. (4)
   Three 1%-hour lectures per week. Prerequisite: Chemistry 8A–8B; Physics 2A–2B–2C; an introductory course in the biological sciences, Biology 1A–1B–1C recommended. Recommended: Mathematics 1A–1B–1C or 16A–16B. Macromolecular and ultrastructural organization of the cell in relation to synthetic, regulatory, and deteriorative processes.
   Mr. Macey (F); Mr. Freeman, Mr. Forte

101L. Cell Physiology, Laboratory. (4)
   Two 4%-hour laboratories per week. Prerequisite: course 101 (should be taken concurrently).
   Mr. Packer (F)

112. General Physiology. (4)
   Three 1%-hour lectures per week. Prerequisite: Chemistry 8A–8B; Physics 2A–2B–2C; an introductory course in the biological sciences. Recommended: Mathematics 1A–1B–1C or 16A–16B. Cellular mechanisms underlying bioelectric, secretory and contractile phenomena in living organisms.
   Mr. Macey (W)

112L. General Physiology, Laboratory. (2)
   One 4%-hour laboratory per week. Prerequisite: course 112 (should be taken concurrently).
   Mr. Macey, Mr. Packer (W)

113. Mammalian Physiology. (4)
   Three 1%-hour lectures per week. Prerequisite: course 112. Function of organ systems in man and other mammals.
   Mrs. Timiras, Mr. Freeman, Mr. Forte (Sp)

113L. Mammalian Physiology, Laboratory. (2)
   One 4%-hour laboratory per week. Prerequisite: course 113 (should be taken concurrently).
   Mrs. Timiras, Mr. Freeman, Mr. Forte (Sp)

123. Comparative Physiology. (4)
   Three 1%-hour lectures per week. Prerequisite: Chemistry 8A–8B; Physics 2A–2B–2C; 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%-hour lectures per week. Prerequisite: Chemistry 1A–1B–1C; Physics 2A–2B–2C; 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%-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. Pace (W)

141. Physiology of the Endocrines. (4)
   Three 1%-hour lectures per week. Prerequisite: an introductory course in the biological sciences. Principles of hormone action in man and other mammals.
   Mr. Rosenberg (F)
141L. Physiology of the Endocrines, Laboratory. (2)  
One 4½-hour laboratory per week. Prerequisite: course 141 (should be taken concurrently).  
Mr. Rosenberg (F)

152. Physiology of Human Development. (4)  
Three 1½-hour lectures per week. Prerequisite: an introductory course in the biological sciences. Recommended: Anatomy 100. 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)

162. Physiology of Sensation. (4)  
Three 1½-hour lectures per week. Prerequisite: an introductory course in the biological sciences. Structure and function of sense organs, afferent pathways, and the nervous centers for handling sensory messages.  
Mr. Barlow (W)

162L. Physiology of Sensation, Laboratory. (2)  
One 4½-hour laboratory per week. Prerequisite: course 162 (should be taken concurrently).  
Mr. Barlow (W)

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. Pace in charge) (F, W, Sp, Su)

Graduate Courses

203. Seminar in Cell Physiology. (2)  
One 1½-hour meeting per week. Prerequisite: courses 101 and 112, or consent of the instructor. Recommended: Chemistry 109, Biochemistry 102. Topics selected from current research on synthesis, regulation, and deterioration of intracellular systems.  
Mr. Packer (Sp)

212. Advanced Mammalian Physiology. (4)  
Two 1-hour lectures and one 4½-hour laboratory per week. Prerequisite: courses 101L and 113L. Detailed study of the neural and hormonal control systems of the body.  
Mr. Freeman, Mr. Nicoll (W)

213. Advanced Mammalian Physiology. (4)  
Two 1-hour lectures and one 4½-hour laboratory per week. Prerequisite: course 212 and Biochemistry 102. Detailed study of the cardiorespiratory, renal, and metabolic systems of the body.  
Mr. Forte, Mr. Rosenberg (Sp)

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)

242. Seminar in Endocrine Physiology. (2)  
Individual conferences to be arranged. Prerequisite: consent of instructor. Selected topics on current research on the endocrine system.  
Mr. Rosenberg (W)

263. Neurophysiology. (4)  
Three 1½-hour lectures per week. Prerequisite: consent of instructor. Mathematical analysis of the neural bases of behavior.  
Mr. Freeman (Sp)

272. Physiological Transport Processes. (2)  
Two 1-hour lectures per week. Prerequisite: differential and integral calculus, elementary physiology. Recommended: Chemistry 110A–110B. 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. Prerequisite: courses 101, 112 and 113. Mode of action of drugs at the organismic and cellular levels.  
Mrs. Timiras (F)

299. Individual Research in Physiology. (4–16)  
Individual arrangement to be made. Prerequisite: consent of instructor. Original research in physiology.  
The Staff (Mr. Pace in Charge) (F, W, Sp, Su)

491. Physiological Surgery. (2)  
One 4½-hour laboratory per week. Prerequisite: courses 113 and 113L, 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)

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 bioelectric phenomena, together with the use and design of transducers.  
Mr. Macey (Sp)

Anatomy

Upper Division Courses

100. Developmental Anatomy. (4)  
Three 1-hour lectures and one 3-hour laboratory per week. Prerequisite: Biology 1A–1B–1C or 11A–11B. Development of tissues and organs in the mammalian embryo and fetus, including teratological phenomena.  
Mr. Srebnik, Mr. E. S. Evans (F)

102. General Human Anatomy. (4)  
Two 1½-hour lectures and one 4½-hour laboratory per week. Prerequisite: Physiology 1 (recommended), or Biology 1A–1B–1C or 11A–11B. Prepared human dissections, models, and microscope slides.  
Mrs. Diamond (F), (Su)

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) (F, W, Sp, Su)

Graduate Courses

201A–201B. Histology. (4–4)  
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: either course 100 or Zoology 105, and Chemistry 8A–8B. Tissues and organs of the mammalian body, including histophysiological and histochemical aspects.  
Mr. E. S. Evans (W, Sp)
203A–203B. Neuroanatomy. (3–3)
Two 1-hour lectures and one 3-hour laboratory per week. Prerequisite: consent of instructor. Structure, functional relationships, and development of the nervous system. Mrs. Diamond (W, Sp)

205A–205B. Systematic and Regional Human Anatomy. (4–4)
Two 1-hour lectures and two 4½-hour laboratories per week. Prerequisite: either course 100 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)

211. Seminar in Hematology. (2)
One 1½-hour meeting per week. Prerequisite: graduate standing in a biological science. Selected topics on the hemoral 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) (F, W, Sp, Su)

299. Individual Research in Anatomy. (4–16)
Individual arrangement to be made. Prerequisite: consent of instructor. Original research in anatomy.
The Staff (Mr. Srebnik in charge) (F, W, Sp, Su)

PLANT PATHOLOGY

(Department Office, 147 Hilgard Hall)

Kenneth F. Baker, 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.
James T. Barrett, Ph.D., Professor of Plant Pathology, Emeritus.
Max W. Gardner, Ph.D., D.Sc (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.
A. Herbert Gold, Ph.D., Associate Professor of Plant Pathology.
John R. Parmeter, Jr., Ph.D., Associate Professor of Plant Pathology.
Robert D. Raabe, Ph.D., Associate Professor of Plant Pathology.
David E. Schlegel, Ph.D., Associate Professor of Plant Pathology.
Milton N. Schrotth, 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.
Samuel H. Smith, Ph.D., Assistant Professor of Plant Pathology.
Tewfik A. Toussoun, Ph.D., Assistant Professor of Plant Pathology.

Robert V. Bega, Ph.D., Lecturer in Forest Pathology.
W. Wayne Wilcox, Ph.D., Lecturer in Forest Products Pathology.

Undergraduate Adviser: Mr. Weinhold.
Graduate Advisers: Mr. Schrotth, Mr. Snyder, Mr. Weinhold.

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 Agriculture 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, please 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 (F)

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) (F, W, Sp, Su)

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)
(Formerly numbered 211)
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)
(Formerly numbered 226)
Lectures, 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)
(Formerly numbered 227)
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)
(Formerly numbered 229)
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. Hancock (F)

218. Physiology of Plant Diseases. (4)
(Formerly numbered 210)
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)
(Formerly numbered 225)
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)
(Formerly numbered 212)
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. Toussoun (F, Sp)
297. Individual Study. (1–9)
Prerequisite: approval of graduate adviser. Individual study intended to provide opportunity for qualified students to prepare themselves for the various examinations required for candidates for the Ph.D.
The Staff (Mr. Snyder in charge) (F, W, Sp, Su)

298. Directed Group Study. (1–5)
Prerequisite: consent of instructor. Advanced study on topics which may vary from quarter to quarter.
The Staff (Mr. Takahashi in charge) (F, W, Sp, Su)

299. Research in Plant Pathology. (1–12)
The Staff (Mr. Snyder in charge) (F, W, Sp, Su)

POLITICAL SCIENCE

(Department Office, 210 Barrows Hall)

Charles Akin, LL.B., Ph.D., Professor of Political Science.
David E. Apter, Ph.D., Professor of Political Science, Acting 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.

Frederick C. Mosher, Ph.D., Professor of Political Science.
Peter H. Odegaard, Ph.D., LL.D., Litt.D., Professor of Political Science.

Robert A. Scalapino, Ph.D., Professor of Political Science.
Paul Seabury, Ph.D., Professor of Political Science.

Jacobus tenBroek, J.S.D., S.J.D., Litt.D., LL.D., Professor of Political Science.

Dwight Waldo, Ph.D., Professor of Political Science and Director of the Institute of Governmental Studies.

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.

Hans Kelsen, Ph.D., D.L., Dr. honoris causa, LL.D., Professor of Political Science, Emeritus.

N. Wing Mah, Ph.D., Associate Professor of Political Science, Emeritus.

Chalmers A. Johnson, Ph.D., Associate Professor of Political Science.

Eugene C. Lee, Associate Professor of Political Science and Associate Director of the Institute of Governmental Studies.

Ralph H. Retzlaff, Ph.D., Associate Professor of Political Science.

Carl C. Rosberg, Jr., Ph.D., Associate Professor of Political Science.

John Schaar, Ph.D., Associate Professor of Political Science.

Gerhard Casper, LL.M., Dr.iur., Assistant Professor of Political Science.

Jyotindra Das Gupta, Ph.D., Assistant Professor of Political Science.

Warren F. Ilichman, 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.

Daniel S. Lev, Ph.D., Assistant Professor of Political Science.

Arend Lijphart, 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.

Michael Rogin, Ph.D., Assistant Professor of Political Science.

Saul Silverman, Ph.D., Assistant Professor of Political Science.

‡ In residence fall and winter only, 1966–67.
† In residence fall quarter only, 1966–67.
†† In residence spring semester only, 1966–67.
The American Institutions Requirement  This requirement may be satisfied by completing an approved course, or by passing an examination. See page 26.

The Major

Freshman or sophomore year: Political Science 1, 2, 3. Sophomore or junior year: Political Science 101, 102. 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.

Students must complete one quarter-course in upper division work outside of the department, preferably in related fields, in consultation with the adviser.

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 72.

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.

--- (F); Mr. Odegard (W); (Sp); Mr. Rogin (Su)

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. Janos (F); Mr. Moore (W); Mr. Lev (Sp); Mr. Janos (Su)

3. Political Theory. (5)

(Formerly numbered 110)

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.

Mr. Jacobson (F, Sp); Mrs. Pitkin (W)

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.

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

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 the 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. Rogin (F, W, Sp)

Upper Division Courses

Core Courses

101. Political Inquiry. (5)
(Formerly numbered 197)
Two 1½-hour lectures and one 1-hour conference per week. Modes and techniques of investigation into the nature of political science. Special attention to empirical techniques in exploring the nature of the political process.

Mr. Sperlich (F, W, Sp)

102. International Relations. (5)
(Formerly numbered 120)
Two 1½-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. Lijphart (F); Mr. Seabury (W); Mr. Silverman (Sp); (Su)

Specialized Courses

*106. The Conduct of American Foreign Relations. (5)
Three 1-hour lectures and one 1-hour conference per week. Constitutional arrangements, federal-state relations, and national supremacy. The rules of the President in his various capacities, the Senate, the House of Representatives, key committees, and pressure groups. The Department of State and the U. S. Foreign Service. The Military, NSC, USIA, other official agencies and Public Opinion.

Mr. Bellquist (W)

*107. The American Executive. (5)
(Formerly numbered 104)
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.

Mr. McFarland (W)

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.

Mr. tenBroek (F)

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.

Mr. tenBroek (F)

110. State Governments. (5)
(Formerly numbered 102)
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.

Mr. tenBroek (F)

111. Urban Government and Politics. (5)
(Formerly numbered 103)
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.

Mr. Jones (F)

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. Odegard (Sp)

113. American Political Theory. (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. Schaar (F); Mr. Jacobson (Sp)

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; Machiavelli and the beginnings of modern political theory.

Mr. Wolin (F)

118B. Political thought during the Reformation; the emergence of liberalism, conservatism, and revolutionary theories.

Mr. Pitkin (W)

118C. The examination of major political theories since the mid-nineteenth century; changing conceptions of the nature of theory.

Mr. Schaar (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.

Not to be given, 1966–67.
122A–122B. International Law. (5–5)
(Formerly numbered 122)
Two 1 1/4-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 person. Diplomatic and consular intercourse; treaties and executive agreements; pacific settlement; war and neutrality.

Mr. Riesenberg (F, W)

123. Regional Communities. (5)
(Formerly numbered 121B)
Three 1-hour lectures and one 1-hour conference per week. Examination of supranational regional communities; the processes of political, cultural, economic and military integration occurring within them.

Mr. Lipson (Sp)

(Formerly numbered 123)
Three 1-hour lectures and one 1-hour conference per week. The interrelations among military strategy, technology, science; relationships between strategic doctrine, national security concepts, and domestic politics.

Mr. Seabury (F)

128. American Foreign Policy. (5)
(Formerly numbered 128A)
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; Wilsonianism, 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 (F); — (Su)

*129. Soviet Foreign Policy. (5)
(Formerly numbered 131)
Two 1 1/4-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.

— (W, Sp)

*139. 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)

140A–140B. Comparative Analysis of Political Systems. (5–5)
Two 1 1/4-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. Moore (F, W)

141A–141B. Government and Politics in the Soviet Union. (5–5)
Two 1 1/4-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. Silverman (F) 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. Mr. Silverman (W)

141C–141D. Government and Politics in Eastern Europe. (5–5)
Two 1 1/4-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.

Mr. Janos (F) 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. Janos (W)

141E–*141F. Political Theory in Communist Societies. (5–5)
(Formerly numbered 116A–116B)
Two 1 1/4-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. Zaninovich (F, W)

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.

*142C. The Middle East in World Affairs. International relations and domestic policies 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, W)

143A–143B–143C. Government and Politics in Northeast Asia. (5–5–5)
(Formerly numbered 143A–143B)
Two 1 1/2-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. Johnson (F, W, Sp)

143D–143E. Government and Politics in Southeast Asia. (5–5)
(Formerly numbered 143C)
Two 1 1/2-hour lectures and one 1-hour conference per week. The structure and evolution of political institutions in Southeast Asia in the post-colonial period.

Mr. Lev (F, W)

* Not to be given, 1966–67.
144A—144B. Government and Politics in Great Britain, Canada, Australia, and New Zealand. (4–4)

(Formerly numbered 147A—147B)
Two 1 1/2-hour lectures and one 1-hour conference per week.

144A. 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 (W)

144B. The development from empire to commonwealth; the contemporary commonwealth, as an association of independent states; centripetal and centrifugal factors; comparative study of the politics and institutions of the older dominions.
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 development of the political systems and social, cultural, economic and psychological factors in these countries.
Mr. Das Gupta (Sp)

145C. American Role in the Far East. (5)

(Formerly numbered 134)
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. Scalapino (W)

145E. Political Theory in Non-Western Societies. (5)

(Formerly numbered 115)
Two 1 1/2-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 (F)

146A—146B—146C. Government and Politics in Africa. (5—5—5)

Two 1 1/2-hour lectures and one 1-hour conference per week.

146A. Political development and change in Africa. Major constituent factors shaping African politics and institutions; concepts and patterns of political change; nationalism, political groups, ideology and nation building.
Mr. Rosberg (F)

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 those 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 legal systems; their political groups; their colonial legacies, the influence of the area of judicial supervision of administrative acts, and of the liability of public offices and of the state based on misuse of administrative power.
Mr. Moore (Sp)

147A—147B. Government and Politics in Western and Northern Europe. (5–5)

148A—148B. Government and Politics in Latin America. (5–5)

Three 1-hour lectures and one 1-hour conference per week.

148A. Basic characteristics of the political process in Latin America; problems of development, modernization, and political change. Inter-American relations in Latin-American world affairs. (W)

148B. Constitutionalism; government structure; political groups; problems of foreign policy of Latin America on a country by country basis. Special emphasis on Mexico, Argentina, Brazil, and Chile.

*150. Comparative Law. (5)

Two 1 1/2-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.
Mr. Casper (W)

151. Legal Theory. (5)

Two 1 1/2-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.
Mr. Casper (F)

152. Legal Institutions. (5)

(Formerly numbered 10)
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.
Mr. tenBroek (W)

*156. Administrative Law. (5)

Two 1 1/2-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 (W)


Two 1 1/2-hour lectures and one 1-hour conference per week.

157A. The Federal System. Mr. Aikin (F)

157B. Civil Liberties. Mr. Aikin (W); Mr. tenBroek (Su)

*157C. Judicial Control of the Economy.

160. Pressure Groups. (5)

Two 1 1/2-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. Rogin (W)

161A—161B—161C. Political Behavior. (5–5–5)

Two 1 1/2-hour lectures and one 1-hour conference per week. The individual and group aspects of political behavior.

* Not to be given, 1966–67.
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. Sperlich (F, W); Mr. Di Palma (Sp)

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

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 (F)

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.

190A-190B-190C. Honors Program. (5-5-5)

(Formerly numbered 198A-198B)

Section I: Political Theory. Mr. Sebarr

Section II: International Relations. Mr. Liphart

Section III: Comparative Politics. Mr. Das Gupta

Section IV: Political Behavior.

Section V: Law and Legal Theory.

Section VI: Public Administration.

Mr. Ichman, Mr. Lepawsky (F, W, Sp)

199. Special Study for Advanced Undergraduates. (1-5)

Restricted to senior honor students. The Staff (Mr. Bellquist in charge) (F, W, Sp, Su)

Graduate Courses

A statement on admission to graduate work may be obtained from the graduate office in the department. Properly qualified undergraduates may be admitted to graduate courses or seminars with special permission of the instructor.

Comparative Analysis

COURSES

201A-201B. Comparative Analysis of Western Political Systems. (4-4)

(Formerly numbered 240A-240B)

201A. The comparative study of politics in Western societies; development of subject matter and methodology; political culture and social structure; electoral and parliamentary systems; governmental structures and functions. Mr. Di Palma (W)

210B. The comparative study of political parties in Western societies; the origins, development, structures, programs and clienteles of parties; the relation of party systems to constitutional focus; the comparative study of interest groups.

* Not to be given, 1966-67.
202A—202B. Comparative Analysis of Developing Political Systems. (4–4)
(Formerly numbered 240C–240D)
One 2-hour session and one 1-hour conference per week. The comparative analysis of the processes of political modernization and change in developing countries. Major emphasis will be given to comparative analytical theory and methodology.
Mr. Scalapino (F, W)

203A—203B. Comparative Analysis of Communist Political Systems. (4–4)
(Formerly numbered 240E–240F)
One 2-hour session and one 1-hour conference per week. An analysis of the interrelations between Communist systems with particular reference to institutional and ideological differences, presented at an advanced level for graduate students. Discussion and paper required.
Mr. Scalapino (W); Mr. Lenezowski (Sp)

204. Theories for Comparative Analysis. (4)
Two 1½ hour sessions per week. Mr. Apter (F)

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
207. Revolutionary Change. (4)
(Formerly numbered 216)
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 (W)

Political Theory COURSES
213. American Political Theory. (4)
One 2-hour session and one 1-hour conference per week. Basic problems of political theory will be examined within the context of American political development.
Mr. Jacobson (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.
Sequence beginning (F), Mr. Wolin

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 (F)

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.
214A, 214B, Mrs. Pitkin (F, W); 214C, Mr. Zaninovich (Sp)

215. Marxist Theories. (4)
One 2-hour session and one 1-hour conference per week.
Mr. Zaninovich (Sp)

219B. Perspectives in Political Theory. (4)
One 2-hour session and one 1-hour conference per week. Politics and political theory as art.
Mrs. Pitkin (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. Haas (F)

221. American Foreign Policy. (4)
(Formerly numbered 228A)
One 2-hour session and one 1-hour conference per week. Strategic-military, political, economic, and cultural aspects of American foreign policy.
Mr. Seabury (W)

*222. Nationalism and Imperialism. (4)
(Formerly numbered 221)
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. Relationship between research techniques, research concepts and theory-building in international politics. ——— (W)

SEMINARS
225. International Law. (4)
(Formerly numbered 222A—222B)
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)
(Formerly numbered 230)
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)

* Not to be given, 1966–67.
Area Studies

SEMINARS

240A–240B–240C. Western and Northern European Politics. (4–4–4)
(Formerly numbered 247A–247B, 240G–240H)
One 2-hour session and one 1-hour conference per week.
240A, Mr. Lipson (F); 240B, Mr. Lipson (W); 240C, Mr. Bellquist (W)

One 2-hour session and one 1-hour conference per week.
241A, Mr. Silverman (F); 241B, Mr. Silverman (W); 241C, Mr. Janos (Sp, Su)

242A–242B. Politics and Diplomacy in the Middle East. (4–4)
One 2-hour session and one 1-hour conference per week.
Mr. Lenczowski (F, W)

242C. Political Thought in Non-Western Societies. (4)
(Formerly numbered 218 and 217)
Two hours of lecture and one 1-hour conference per week.

Section I: Political thought in the Middle East. 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. Lenczowski

Section II: Indian political thought. A study of contemporary 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, Marxist theory, Hindu policy, indigenous “socialism,” liberal and humanist elements.
Miss Bondurant (W)

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.
250A, Mr. Casper (F)*; 250B, Mr. Daube (W); 250C, Mr. Casper (Sp)*

*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 epistemological, methodological, and substantive questions in their relation to the political environment.
Mr. Casper (Sp)

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. Akin (F, W, Sp)

258A–258B. Judicial Administration. (4–4)
One 2-hour session and one 1-hour conference per week. Selected problems.
Mr. tenBroek (W, Sp)
Political Behavior (American and Comparative)

COURSES

260A-260B-260C. Research Methods and Procedures. (4-4-4)
(Formerly numbered 269A-269B)
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.

260A-260B, (W, Sp)

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. McClosky (F, W, Sp)

262A-262B. Parties, Public Opinion, and Interest Groups. (4-4)
(Formerly numbered 260A-260B, 262A-262B, and 263A-263B)
Two hours of lecture and one 1-hour conference per week.
262A. Some problems of political analysis in the American political system. Mr. Odégar (Sp)
262B. Selected topics on the relation of groups to politics. Mr. Regin (Su)

SEMINARS

*263A-263B-263C. Research Seminar in Political Behavior. (4-4-4)
(Formerly numbered 261C-261D)
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.
Mr. McClosky

*265A-265B. Political Behavior. (4-4-4)
(Formerly numbered 261C-261D)
One 2-hour session per week. Research on special topics of political behavior. Mr. sperlich

*267. The Legislative Process. (4)
(Formerly 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. (Sp)

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. (W)

*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

Public Administration and Public Policy (American and Comparative)

COURSES

270. Public Administration. (4)
(Formerly numbered 271A)
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. Mr. Martin (F)

271. Public Policy. (4)
(Formerly numbered 271B)
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, Su)

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. (Sp)

273. Comparative National Bureaucracy. (4)
(Formerly numbered 287A)
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)
(Formerly numbered 203B)
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. Martin (W)

275. Government and Politics in Metropolitan Areas. (4)
(Formerly numbered 203)
One 2-hour session and one 1-hour conference per week. The relationship of the governmental, economic, social and physical organization of metropolitan areas to metropolitan planning, decision-making, and administration. Mr. Martin (Sp)

276A-276B. Municipal Administration. (4-4)
(Formerly numbered 272A-272B)
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 (W, Sp)

* Not to be given, 1966-67.
277. Administration of the Public Service. (4)  
(Formerly numbered 283)  
One 2-hour session and one 1-hour conference per week. Categories and methods of employment of public servants; problems in public service administration.  
Mr. Mosher (Sp)  

278. Financial Administration and Budgeting. (4)  
(Formerly numbered 284)  
One 2-hour session and one 1-hour conference per week. 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. Mosher (Sp)  

*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.  
Mr. Mosher  

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. Waldo (W)  

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. Waldo  

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.  
(Formerly numbered 289)  
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. La Porte  

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.  
287A. Development Administration.  
(Formerly numbered 287C)  
The structure and functions of public administration in the development process of "low-income" countries; the relationship of administration to a nation's political regime, social structure, and economic organization and objectives.  
Mr. Ilchman (F)  
287B. National Administration in Selected Areas.  
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 1966–67: Administrative Systems of South Asia.  
Mr. Ilchman (W)  

Nonfield Courses  

291. Independent Study in Preparation for the  
M.A. Essay. (1–6)  
Open only to qualified first-year graduate students working towards the M.A. degree.  
The Staff (—— in charge) (F, W, Sp, Su)  

292. Directed Advanced Study. (1–9)  
(Units and grade or no grade at discretion of the instructor). 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.  
The Staff (—— in charge) (F, W, Sp, Su)  

298. Professional Preparation for Teaching Assistants. (4)  
Special guided research and analysis for teaching assistants assigned to undergraduate courses.  
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); Mr. McDaniel (F, W, Sp)
POULTRY HUSBANDRY

(Department Office, 100 Poultry Husbandry Laboratory)

Samuel Lepkovsky, Ph.D., Professor of Poultry Husbandry.
Lewis W. Taylor, Ph.D., Professor of Poultry Husbandry.

I. Michael Lerner, Ph.D., Professor of Genetics.
Wilbur O. Wilson, Ph.D., Professor of Poultry Husbandry (Chairman of the Department), Davis.

Adviser: Mr. Taylor.

Although poultry husbandry is no longer offered as a major, the Department of Poultry Husbandry in the College of Agriculture permits students interested in this field to take course work at Berkeley under the agricultural science major. The degree must be completed on the Davis campus where the required major courses are offered. See the Agricultural Science section for details. Graduate work is pursued in several group fields. Additional information may be obtained from the adviser.

Upper Division Courses

102. Experimental Incubation. (4)
Lectures, 3 hours per week; discussion and demonstration, 2 hours per week. Prerequisite: Zoology 100, or equivalent; Chemistry 8A-8B. Problems of embryonic development, principles of artificial incubation, causes of avian embryonic mortality and terata. Mr. Taylor (Su)

198. Directed Group Study. (1-3)
Prerequisite: senior standing and consent of instructor. Study of methods employed in poultry production and management. Mr. Taylor (F, W)

PSYCHOLOGY

(Department Office, 3210 Tolman Hall)

Frank A. Beach, Jr., Ph.D., D.Sc., Professor of Psychology and Director of the Field Station for Behavioral Research.
Jack Block, Ph.D., Professor of Psychology.
Tom N. Cornsweet, Ph.D., Professor of Psychology.
Richard S. Crutchfield, Ph.D., Professor of Psychology.
Edwin E. Ghiselli, Ph.D., Professor of Psychology (Chairman of the Department).
Harrison G. Gough, Ph.D., Professor of Psychology and Associate Director, Institute of Personality Assessment and Research.
Mason Haire, † Ph.D., Professor of Psychology.
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.
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.
Alex C. Sherriffs, Ph.D., Professor of Psychology.
M. Brewster Smith, Ph.D., Professor of Psychology and Director, Institute of Human Development.
Robert Choate Tryon, Ph.D., Professor of Psychology.
Read D. Tuddenham, Ph.D., Professor of Psychology.
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, Ph.D., Associate Professor of Psychology.
Hubert S. Coffey,† Ph.D., Associate Clinical Professor of Psychology.
Gilbert M. French, Ph.D., Associate Professor of Psychology.
Rheem F. Jarrett, Ph.D., Associate Professor of Psychology.
Geoffrey Keppel, Ph.D., Associate Professor of Psychology.
John P. McKee, Ph.D., Associate Professor of Psychology.
William M. Meredith, Ph.D., Associate Professor of Psychology.
Lymam W. Porter,† Ph.D., Associate Professor of Psychology.
Benbow F. Ritchie, Ph.D., Associate Professor of Psychology.
Edward E. Sampson, Ph.D., Associate Professor of Psychology.
Martin V. Covington, Ph.D., Assistant Professor of Psychology.
Philip A. Cowan, Ph.D., Assistant Professor of Psychology.
Kenneth H. Craik, Ph.D., Assistant Professor of Psychology.
Jonas Langer, Ph.D., Assistant Professor of Psychology.
Wayne C. Lee, Ph.D., Assistant Professor of Psychology.
Arnold L. Leiman, Ph.D., Assistant Professor of Psychology.
Peter B. Lenrow, Ph.D., Assistant Professor of Psychology.
Gerald A. Mendelsohn,† Ph.D., Assistant Professor of Psychology.
Dan I. Slobin, Ph.D., Assistant Professor of Psychology.
Frank A. Heller, Ph.D., Lecturer in Psychology.
Marjorie P. Honzik, Ph.D., Lecturer in Psychology.
Willard N. Runquist, Ph.D., Visiting Associate Professor of Psychology.
William F. Soskin, Ph.D., Lecturer in Psychology.
Susan Ervin-Tripp, Ph.D., Lecturer in Psychology and Associate Professor of Speech.

THE MAJOR

Completion of course 1, course 2 or 3, and any one of the following courses: Psychology 5, Statistics 2, Sociology 40.

Not less than 36 upper division units in psychology, including: (1) either course 103 or 104; (2) at least four core courses, two courses elected from each of the following groups: Group A: 110A, 110B, 120, 121, 123. Group B: 130, 140, 150, 160, 170, 180; (3) two further 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) or (2) above.

Honors Program Each student must fulfill requirements (1) and (2) 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 72.

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. Postman (F); Mr. Riley (W); Mr. Tryon (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); Mr. McKee (Sp); ——— (Su)

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. Ballachey (W); ——— (Sp); ——— (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 or Sociology 40 are equivalent courses which will satisfy the major requirement.) Arrays of experimental measurements, central tendencies, variability, correlation, estimation, and testing of hypotheses. Mr. Jarrett (W); Mr. Lingoës (Sp)

30. Personal and Social Adjustment. (4)
Three 1-hour lectures and one 1-hour section meeting per week. Prerequisite: course 1. Primarily for nonmajors. Dynamics of normal personality development. Family relationships, social adjustment, and factors modifying self-evaluation.
Mr. Sherriffs (F, Sp)

40. Childhood and Adolescence. (4)
Three 1½-hour lectures per week. Prerequisite: course 1. Primarily for nonmajors. Intellectual, social, and personality development during childhood and adolescence.
Mr. McKee (W)

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. Mr. Krench (W)

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. Jarrett (F, Sp)

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.
——— (F, 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, configurational scoring, stochastic models for psychological tests, theoretical basis of psychometric methods, factor analysis, multidimensional scaling, personnel classification and assignment problems.
Mr. Lingoës (W)

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, reference, and evaluation.
Mr. Lee (Sp)

107. General Traits and Types of Individuals. (4)
Two 1½-hour lectures and one 3-hour laboratory per week. Prerequisite: course 103 or 104. Introduction to cluster and factor analysis of individual and group differences; methods and findings.
Mr. Tryon (W)

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. Leiman (F); Mr. French (W); Mr. Zucker (Sp)

111A-111B. Laboratory in Biological Psychology. (4-4)
Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: courses 110A-110B and consent of instructor. Experimental studies of relations between behavioral and biological processes.
Mr. Leiman (F); Mr. Rosenzweig (W)

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 phylectic 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 (F); ——— (W); Mr. French (Sp)

*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

* Not to be given, 1966-67.
133. Psychology of the Unconscious. (5)
Three 1½-hour lectures per week. Nature and role of unconscious psychological processes in behavior.
Mr. MacKinnon (W)

134. Programmed Instruction and Learning. (5)
Three 1½-hour lectures per week. Prerequisite: course 5 or an equivalent course, and consent of instructor. Study of psychological principles of 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. Coviington (Sp)

140. Developmental Psychology. (5)
Three 1½-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. Musson (F); Mr. McKee (Sp); --- (Su)

141. Laboratory in Developmental Psychology. (2)
Two 3-hour laboratories per week. Prerequisite: course 140, and consent of instructor. Empirical methods of investigation used in developmental psychology. Group and individual research projects.
Mr. McKee (W); Mr. Langer (Sp)

142. Psychology of Infancy. (3)
Two 1½-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. Mrs. Honzik (W)

143. Advanced Problems in Developmental Psychology. (5)
Three 1½-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.
Mr. Langer (W)

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. Block (F); Mr. Soskin (Sp)

151. Assessment of Personality. (5)
Two 1½-hour lectures and two 1½-hour laboratories 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. Sarbin (W); --- (Su)

* Not to be given, 1966-67.
153. Stress and Adjustment. (5)
Three 1½-hour lectures per week. Prerequisite: course 150, and consent of instructor. Examines stress theory and research from clinical field and laboratory settings dealing with the psychological issues involved in adjustment to life stresses. —— (W)

160. Social Psychology. (5)
Three 1½-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. Ballachey (F); —— (Sp)

161. Psychology of Social Problems. (5)
Three 1½-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.) Mr. Smith (F)

162. Attitudes, Belief, and Influence Processes. (5)
Three 1½-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. Ballachey (Sp)

163. Small Group Structure and Processes. (5)
Two 1½-hour lectures and two 2-hour laboratories per week. Prerequisite: course 5 or an equivalent course, and course 160. Primarily for majors. Lectures, research laboratory, and sensitivity training groups. Social psychological theories, research methods, and training techniques in the area of small groups. Mr. Sampson (W, Sp)

164. Social Structure, Culture, and Personality. (5)
Three 1½-hour lectures per week. Prerequisite: course 150 or 160. Relationships among social structure, culture, and personality. Mr. Sarbin (Sp)

170. Differential Psychology. (5)
Three 1½-hour lectures per week. Prerequisite: course 5 or an equivalent course. Hereditary 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. (3)
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 (W); —— (Su)

171L Laboratory in Abilities and Aptitudes. (2)
One 1-hour lecture and one 2-hour laboratory per week. Prerequisite: course 171 and consent of instructor. (May be taken concurrently with 171.) Laboratory to accompany course 171. Mr. Tuddenham (W); —— (Su)

172. Appraisal of Personality Differences. (3)
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. Mr. Tuddenham (Sp)

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. Mr. Tuddenham (Sp)

173. Laboratory on Tests of Infants and Preschool Children. (3)
One 1½-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. Mrs. Honzik (W)

Course 151 is also directly relevant to the above courses in differential psychology.

180. Industrial Psychology. (5)
Three 1½-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. —— (F); —— (Sp)

181. Psychological Problems in Industry. (5)
Three 1½-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. —— (W); —— (Su)

182. Personnel Psychology. (4)
Two 1½-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. Campbell (Sp)

183A–183B. Social Psychology of Industry. (5–5)
Three 1½-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. —— (W); —— (Sp)

H190A-H190B-H190C. Honors Seminar in Social and Personality Psychology. (2–2–2)
One 2-hour meeting per week. Prerequisite: senior major honor status. Mr. Crutchfield (F, W); Mr. Block (Sp)

H191A-H191B-H191C. Honors Seminar in Experimental and Biological Psychology. (2–2–2)
One 2-hour meeting per week. Prerequisite: senior major honor status. Mr. Kreh (F, W); Mr. Ritchie (Sp); —— (Su)

H192A-H192B-H192C. Honors Seminar in Developmental and Differential Psychology (2–2–2)
One 2-hour meeting per week. Prerequisite: senior major honor status. Mr. Lingoes (F), Mr. Lee (W, Sp)

H195. Special Study for Honors Students. (2)
Prerequisite: senior honor status and consent of instructor. The Staff (F, W, Sp, Su)
199. Special Study for Advanced Undergraduates.
(1-5)
Prerequisite: Restricted to senior honor students with adequate preparation in psychology.
The Staff (F, W, Sp, Su)

Graduate Courses
Graduate standing and the consent of the instructor are prerequisites for all graduate offerings.

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 (Sp)

210A-210B-210C. Proseminar in Experimental Psychology. (3-3-3)
One 3-hour lecture per week.
Mr. Krench, Mr. Ritchie (F); Mr. Keppel, — (W); Mr. Rosenzweig, Mr. French (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.
——— (W); Mr. Leiman (Sp)

212A-212B-212C. Measurement in Psychobiological Research. (3-3-3)
One 2-hour lecture and one 3-hour laboratory per week.
212A. Basic principles of instrumentation.
Mr. Cornsweet (F)
212B. Application of instrumentation in learning and perception.
Mr. Cornsweet, Mr. Leiman (W)
212C. Applications of instrumentation in neuro-psychological research.
Mr. Leiman (Sp)

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. Ritchie (W); Mr. Runquist (Sp)

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. Block, Mr. Cowan, Mr. Langer (F); Mr. Gough, Mr. Smith (W); Mr. Block, Mr. Craik, Mr. Sampson (Sp)

251A-251B-251C. Theory and Method of Clinical Assessment. (4-4-4)
One 2-hour lecture and two 1½-hour laboratories per week. Prerequisite: completion of first-year clinical program and/or consent of instructor. This sequence is required of graduate students in the clinical program, normally to be taken in the second year. Principles and methods of clinical interviewing, intellectual testing, and objective and projective personality testing are taught through guided practice and discussion.
Mr. Cowan, Mr. Lenrow (F); Mr. Gough (W)

252A-252B-252C. Advanced Clinical Psychology. (5-5-5)
Approximately 20 hours per week, to include case conferences, ad hoc seminars and colloquia, and individual supervised clinical experience. Prerequisite: courses 251A-251B-251C and/or consent of instructor. Study of psychodiagnosis and individual and group psychotherapy, through supervised experience in the Psychology Clinic and associated facilities. All three courses are required of graduate students in the clinical program, normally to be completed during the third year of graduate study.
Mr. Korchin, Mr. Soskin, Mr. Stein (F); Mr. Korchin, Mr. Lenrow, Mr. Soskin, Mr. Stein (W); Mr. Cowan, Mr. Korchin (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 psychology will be emphasized. Normally taken in the third year by students in clinical program with particular interest in children.
Mr. Cowan (W, 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. Sampson (F)

271A-271B-271C. Appraisal of the School-Age Child. (4-4-4)
One 2-hour lecture and two 3-hour laboratories, or field work per week. Primarily for first-year graduate students in clinical, developmental, and differential psychology. 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.
(F); — (W); — (Sp)

281. 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. Campbell, Mr. Ghiselli (F)

290. Seminars. (3)
(a) Measurement, Mr. Lingoes (F); (b) Biological, Mr. Rosenzweig (F); (c) Comparative, Mr. French (F); (d) Learning and Behavior, Mr. Keppel (W); Mr. Riley, Mr. Ritchie (Sp); (e) Perception; (f) Thinking, Mr. Crutchfield (W); (g) Language and Communication, Mr. Slobin (F); (h) Developmental, Mr. Langer (F), Mr. Langer, Mr. Musen (W); (i) Personality, Mr. Mackinnon (F); Mr. Lazarus, Mr. Sarbin (W); (j) Social, Mr. Sarbin (Sp); (k) Clinical, Mr. Soskin (W); (l) Differential,
* Not to be given, 1966-67.
Mr. Tryon (W); (m) Industrial, Mr. Heller (F); Mr. Kirchner (W); —— (Sp); (n) Mathematical Models in Learning and in Psychophysics, Mr. Lee (F); (o) Analysis of Variance Techniques, Mr. Keppel (F); (p) Additional seminars on special topics to be announced.

298. Directed Study. (1-6)
Special study under the direction of a member of the staff. The Staff (F, W, Sp, Su)

299. Research. (1-6)
Individual research. The Staff (F, W, Sp, Su)

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. Mr. Krech (F)

401. Clinical Internship (Psychology Clinic). (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.

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

402. Clinical Internship. (Off-Campus). (3-12)
Prerequisite: consent of Clinical Training Committee. Individual programs of practice and supervision in approved off-campus agencies. (F, W, Sp, Su)

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.
Jacob Fong, Ph.D., Professor of Immunology and Medical Microbiology.
William Griffiths, Ph.D., Professor of Public Health.
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. McGauhey, 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.
Sven Nissen-Meyer,† M.D., Ph.D., Professor of Biostatistics.
William J. Oswald, Ph.D., Professor of Public Health.
William C. Reeves, Ph.D., M.P.H., Professor of Epidemiology.
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.
Charles Edward Smith, A.B., M.D., D.P.H., Professor of Public Health (Chairman of the Department).
Reuel Stallones, M.D., M.P.H., Professor of Epidemiology.
William W. Stiles, B.S., M.D., M.P.H., Professor of Public Health.
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.
William F. Taylor, Ph.D., Professor of Biostatistics.
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.
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.
Nell F. Hollinger, Ph.D., Associate Professor of Public Health.
Ruth L. Huenemann, Sc.D., Associate Professor of Public Health Nutrition.
Demosthenes Pappagianis, Ph.D., M.D., Associate Professor of Public Health and of Medical Microbiology.
John V. Slater, M.D., Associate Professor of Public Health.
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.
Dwight E. Barnett, A.B., M.D., Lecturer in Public Health.
Rodney R. Beard, M.D., M.P.H., Lecturer in Public Health.
Albert R. Behnke, Jr., A.B., M.D., Lecturer in Public Health, and Clinical Professor of Preventive Medicine (San Francisco).
John E. Bell, Ed.D., Lecturer in Public Health.
Mortimer A. Benioff, M.D., Lecturer in Public Health.
Barbara Blackwell, M.S., M.P.H., Dr.P.H., Lecturer in Public Health.
Henrik L. Blum, M.D., M.P.H., Clinical Professor of Public Health Administration.
Howard L. Bodily, Ph.D., Lecturer in Medical Microbiology.
Edna J. Brandt, M.S., Lecturer in Public Health.
Lester Breslow, M.D., Lecturer in Public Health.
Adolph F. Brewer, M.D., Lecturer in Public Health.
George M. Briggs, Ph.D., Lecturer in Public Health, and Professor of Nutrition.
William H. Bruvold, Ph.D., Lecturer in Public Health.
Henry B. Bruyn, Jr., M.D., Lecturer in Public Health, and Director of the Student Health Service.
Alfred W. Childs, A.B., M.D., M.P.H., Associate Clinical Professor of Medical Care Administration.
Harold D. Chope, M.D., Dr.P.H., Lecturer in Public Health.
Morris F. Collen, B.E.E., M.B., M.D., Lecturer in Environmental Health.
Rita Conlon, M.A., Associate in Public Health.
W. Clark Cooper, M.D., M.P.H., Lecturer in Environmental Health.
Hugh T. Croley, Ph.D., M.P.H., Lecturer in Public Health.
John L. Cutler, A.B., M.D., M.P.H., Ph.D., Lecturer in Epidemiology.
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.
Seymour M. Farber, M.D., Lecturer in Public Health.
Alan Foord, M.D., M.P.H., Clinical Professor of Maternal and Child Health.
David B. Francy, M.S., M.P.H., Associate in Public 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.
Charles R. Gardipee, M.D., M.P.H., Lecturer in Public Health.
Emma Fisk Gilman, M.P.H., Lecturer in Public Health.
John C. Greene, D.M.D., M.P.H., Lecturer in Epidemiology.
Harold C. Gustafson, Dr.P.H., Lecturer in Public Health.
Mary C. Hampton, M.S., Lecturer in Public Health.
James L. Hardy, Ph.D., Lecturer in Medical Microbiology.
Harold A. Harper, Ph.D., Lecturer in Public Health, and Professor of Biochemistry (San Francisco).
Patrick H. Harris, M.S., Lecturer in Maternal and Child Health Nursing.
John M. Heslep, Ph.D., Lecturer in Radiological Science.
John M. Hess, Ph.D., Acting Assistant in Public Health.
Frank E. Hesse, B.S., M.D., M.P.H., Lecturer in Public Health.
Charles H. Hampton, M.D., Lecturer in Public Health, and Clinical Professor of Pharmacology and Preventive Medicine (San Francisco).
Arthur C. Hollister, Jr., M.D., M.P.H., Lecturer in Public Health.
George Hottle, Ph.D., Lecturer in Public Health.
Howard N. Jacobson, M.D., Acting Associate Professor of Obstetrics and Gynecology (San Francisco).
Edwin W. Jackson, M.D., Lecturer in Epidemiology.
Harald N. Johnson, M.A., M.D., Lecturer in Epidemiology.
Barbara Bradley Kar, M.P.H., Associate in Public Health Education.
George M. Keranen, M.D., M.P.H., Lecturer in Public Health.
James M. Kilker, M.P.H., Lecturer in Public Health.
Alexis J. Kniazeff, Ph.D., D.V.M., Lecturer in Medical Microbiology.
Richard A. Koch, M.D., M.P.H., Lecturer in Public Health, and Associate Clinical Professor of Preventive Medicine (San Francisco).
Adelien Larson, A.B., Lecturer in Medical Microbiology and Immunology.
Marian E. Leach, M.P.H., Ph.D., Lecturer in Public Health.
Edwin H. Lennette, M.D., Ph.D., Lecturer in Virology.
Alvin R. Leonard, M.D., M.P.H., Clinical Professor of Public Health.
Richard N. Lvnness, M.P.H., Associate in Public Health.
Christine Mackenzie, M.A., Lecturer in Public Health.
George A. McKray, LL.M., M.P.H., Lecturer in Public Health and Medical Administration.
Sheldon Margen, M.D., Professor of Human Nutrition and of Social Welfare.
Ben H. Mathews, M.P.H., Associate in Public Health.
Theodore A. Montgomery, M.D., M.P.H., Lecturer in Public Health.
Mary Murai, M.S., Dr.P.H., Assistant Clinical Professor of Public Health Nutrition.
John H. Nelson, M.P.H., Lecturer in Health Education.
Paul F. O'Rourke, M.D., M.P.H., Lecturer in Public Health.
Alberta Parker (Alberta Parker Horn), M.D., M.P.H., Lecturer in Public Health.
Beulah Parker (Beulah Parker Vaughn), M.D., Lecturer in Public Health.
George N. Parlette, M.P.H., Lecturer in Public Health.
William E. Reynolds, B.S., M.D., M.P.H., Clinical Professor of Epidemiology.
Octavio I. Romano-V, Ph.D., Lecturer in Public Health.
Helen S. Ross, M.P.H., Lecturer in Public Health.
Edith P. Sappington, M.A., M.D., Dr.P.H., Lecturer in Public Health.
Frederick L. Schaffer, Ph.D., Lecturer in Medical Microbiology.
Leona R. Shapiro, M.S., Lecturer in Public Health.
Kathleen G. Shimmin, M.A., Associate in Public Health.
James M. Smith, Jr., M.E., Lecturer in Radiological Engineering.
Esther C. Spencer, M.S.S., Lecturer in Public Health.
Ann Sproul (Ann Sproul Spreck), M.D., Assistant Clinical Professor of Maternal and Child Health, and Assistant Clinical Professor of Pediatrics (San Francisco).
William W. Stadel, A.B., M.D., Lecturer in Hospital Administration.
John M. Switzer, M.P.H., Lecturer in Public Health.
S. Leonard Syme, Ph.D., Lecturer in Epidemiology.
Richard M. Taylor, M.D., Dr.P.H., Lecturer in Public Health.
Constantine H. Tempelis, Ph.D., Lecturer in Public Health.
Ronald L. Thiele, B.S., M.D., Lecturer in Public Health.
Yoshiye Togasaki, A.B., M.D., M.P.H., Lecturer in Maternal and Child Health.
Helen E. Walsh, M.A., Lecturer in Public Health.
Howard J. Weddle, M.S., M.P.H., Lecturer in Public Health.
Alvin D. Wiggins, Ph.D., Lecturer in Biostatistics.
George U. Wood, Ph.C., F.A.C.H.A., Lecturer in Hospital Administration.

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)

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. Leonard (W, 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 (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. For students not specializing in medical care administration. Organization and administration of medical care programs; principles of health economics; studies of selected programs. 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. Mrs. Inghram, Mr. Hess (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. McKray (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. Jacobson (F)

125C. Mental Retardation and Associated Handicaps. (2)

One 2-hour lecture per week. Prerequisite: consent
126A. Application of Genetics to Public Health. (2)  
Two 2-hour lectures per week. Prerequisite: consent of instructor. Basic principles of genetics and recent advances with their application to public health programs.  
Mr. Eisner (F)

126B. International Maternal and Child Health. (2)  
One 2-hour lecture per week. Prerequisite: consent of instructor. Maternal and child health programs outside of the United States. May be repeated for credit.  

126C. Principles of Maternal and Child Health. (2)  
One 2-hour lecture per week. Health and social problems of mothers and children.  
Mr. Dooley, Mr. Eisner, Mrs. Gorman, Mr. Thiele (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.  
Miss Roberts (F)

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.  
Miss Roberts (Sp)

133. Introduction to Group Process. (2)  
One 1-hour lecture, one 2-hour laboratory per week. Dynamics of interpersonal relationships.  
Mr. Griffiths (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 theory, 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 1½-hour lecture-discussions per week. Designed for nonnutrition majors. Basic nutrition concepts and their implications for community health.  
Miss Murai, Miss Huenemann (W)

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. Slater, 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, Mr. Slater (Sp)

149A. Occupational Health and Industrial Hygiene: Introduction. (4)  
Four 1-hour lectures per week. Occupational hazards and their control; industrial safety; industrial health administration and organization.  
Mr. Tebbens, Mr. Tabershaw (F)

149B. 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.  
Mr. Burkhalter (Sp)

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: course 175 or equivalent, or consent of instructor. Environmental sanitation in rural and international health; cultural aspects of sanitation; relationship of environmental sanitation to preventive medicine.  
Mr. Bliss (F, 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, one 3-hour laboratory per week. Prerequisite: two years of high school algebra. Descriptive statistics, probability, probability distributions, point and interval estimation, hypothesis testing, applications.
Mr. Chiang (F)

160B. Probability and Statistics in Biology and Public Health. (4)
Three 1-hour lectures, one 3-hour laboratory per week. Prerequisite: course 160A and one quarter of calculus, or consent of instructor. Bivariate distributions, regression, correlation, analysis of variance.
Mr. Chiang (W)

160C. 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, multivariate normal distributions, biometrical applications.
Mr. Wiggins (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. Taylor (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. Taylor (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. Taylor (Sp)

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. Yerushalmy (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. Yerushalmy (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. Chiang (Sp)

Three 1-hour lectures per week. Prerequisite: course 162A or consent of instructor. Evaluation designs, indices and measures, sample designs, analysis.
Mr. Yerushalmy (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: course 162A. Population trends, mortality, fertility, migration, urbanization, age and sex structure, population and levels of living.
Mrs. Davis (Sp)

175. Introduction to Epidemiology. (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. Rerves, Mr. Stallones (W)

180A—180B. Medical Microbiology. (4—4)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: Chemistry 5A—B or 12A—B; Biology 1A, 1B, 1C. 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.
180A, Mr. Fong, Mr. Elberg, Miss Larson (F); 180B, Mr. Fong, Mr. Elberg, Miss Larson (W)

181. Public Health Microbiology. (5)
Two 1-hour lectures, one 1-hour discussion, two 3-hour laboratory 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.
Miss Hollinger (Sp)

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. Madin, 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. Madin, 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 102; course 180A—180B. Fundamentals of hematopoiesis, hemoglobin formation and estimation, blood fluidity and immunohematology.
Miss Hollinger (W)
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. Leonard, Mr. Blum, Miss Arnold (W)

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, Miss A. Parker (F, W, Sp)

200C. New Frontiers in Community Health. (3)

One 2-hour lecture-discussion, one 3-hour laboratory per week. Prerequisite: course 200A or consent of instructor. Case studies on an interdisciplinary basis of new and expanding aspects of community health practice. Includes field observation of current programs and team analysis of findings.

Miss A. Parker, Miss Arnold (Sp)

201. Dental Health Administration. (3)

One 3-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, Mr. Richards, Mr. Hansen (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. McKray (W)

204A. Principles of Public Health Administration. (2)

One 2-hour group 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. Leonard, Mr. Blum, Miss A. Parker, Miss Arnold (F)

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, Mr. Blum, Miss A. Parker, Miss Arnold (W)

204C. Principles of Community 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 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, Miss Arnold (Sp)

205. Consultation in Public Health Practice. (2)

One 2-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)

One 2-hour seminar per week. May be repeated for credit. Prerequisite: consent of instructor. Consideration of theory and research in human ecology 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, Mr. Rogers (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 (Sp)

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. Inghram, Mr. Hess (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 (F)

212B. Hospital Organization and Administration. (2)

One 2-hour lecture, one 2-hour discussion per week. 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 (W)

212C. Hospital Organization and Administration. (2)

One 2-hour lecture, one 2-hour discussion per week. Prerequisite: course 212A. Limited to graduate students in hospital administration. The application of management practices in the hospital.

Mr. K. Taylor (Sp)

213A. The Hospital and the Community. (2)

Two 1½-hour lecture-discussions, one 1-hour discussion per week. Limited to graduate students in hospital administration. The development of the hospital as a modern complex organization, its role and functions in the community, and its relationships to other community agencies and health services.

Mrs. Inghram (F)

213B. The Patient and Hospital Care. (2)

Two 1½-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.

Mrs. Inghram (W)

213C. Patient Care Programs in the Hospital. (2)

Two 1½-hour lecture-discussions, one 1-hour discussion per week. Prerequisite: course 213B. Limited to graduate students in hospital administration. Trends in hospital patient care, including psychiatric and geriatric care. Planning and coordination of hospital programs with other health care programs.

Mrs. Inghram (W)

214A. Theory and Research in Hospital Administration. (2)

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 and related health organizations, systematic analysis of theory, research methods and techniques.

Mr. Hess (F)

214B. Theory and Research in Hospital Administration. (2)

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)

214C. Theory and Research in Hospital Administration. (2)

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)


One 2-hour lecture per week; individual conferences. Prerequisite: 215A is prerequisite to 215B; 215B to 215C. Limited to nurses enrolled in graduate programs.

215A. Theory and practice in public health nursing administration; nursing functions in public health programs.

215B. Organization and administration of public health nursing services; structure, staffing, control procedures.

215C. Evaluation of public health nursing services, current trends and issues in public health nursing administration.

Sequence beginning (F), Miss MacKenzie


One 2-hour lecture-discussion per week. For M.P.H. students not specializing in Public Health Social Work, or consent of instructor. Analysis of social welfare problems, programs, and issues as related to public health.

Mrs. Gorman (Sp)

225A–225B–225C. Problems and Programs in Maternal and Child Health. (2–2–2)

Two 2-hour seminars per week plus conference periods. Prerequisite: previous training in pediatrics or obstetrics, or equivalent experience. Consent of instructor required for other than M.C.H. majors. 225A is prerequisite to 225B; 225B to 225C. Health and social needs of mothers and children. Programs for meeting these needs.

Sequence beginning (F), Miss Wallace, Mr. Dooley, Mr. Eisner, Miss Harris, Mrs. Gorman, Mr. Thiele, Miss Fraser

231. Communications Research Applicable to Educational Aspects of Public Health. (3)

One 2-hour lecture, one 1-hour laboratory per week. Prerequisite: consent of instructor. Communication theory and research and its application to public health.

Miss Roberts (W)

232. Concepts Basic to Change Process. (3)

One 2-hour lecture, one 1-hour discussion per week; scheduled conferences. Prerequisite: consent of instructor. An examination of social-psychological concepts and theories basic to the practice of public health education.

Mr. Griffiths, Miss Roberts (F)

233. Group Work Procedures in Health Education. (3)

One 1-hour lecture, one 2-hour laboratory per week. Prerequisite: consent of instructor. Social and psychological factors which determine the effectiveness of group work in promoting public health activities.

Mr. Griffiths, Miss Roberts (F)

234A–234B. Community Organization as an Educational Approach. (3–3)

One 2-hour lecture, one 1-hour discussion per week; scheduled conferences. Prerequisite: consent of instructor. Analysis of community organization process, theory and research, and relationship to the practice of public health education.

234A. One-half day of field work required.

Mr. Griffiths (W)

234B. One day of field work required.

Mr. Griffiths (Sp)

238. Advanced Study in Behavioral Sciences in Public Health. (3)

One 2-hour seminar per week and tutorial. Prerequisite: major in behavioral sciences in public

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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 (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 nutri-
tion or consent of instructor. Critical evaluation of
current literature related to public health nutrition
problems and implications for new programs and
research.
Miss Huenemann, Miss Shapiro,
Miss Murai, Mr. Behnke, Mr. Entenman (Sp)

242. Current Concepts in Metabolism and Clinical
Nutrition. (2)
One 2-hour lecture per week. Prerequisite: pre-
vious course work in biochemistry. Recent develop-
ments in biochemical and metabolic aspects of nu-
trition.
Mr. Harper, Mr. Margen,
Mr. Entenman, Mrs. Hampton (F)

243A-243B-243C. Group Study in Public Health
Nutrition. (2-2-2)
Two 2-hour discussions per week. Prerequisite:
admittance 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. Prerequi-
site: previous course work in nutrition and biochem-
istry. Implications of current nutritional findings for
public health program planning. Course designed
for physicians, nutritionists, and other public health
workers meeting prerequisite. Miss Huenemann,
Mr. Margen, Miss Steinkamp (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. Slater, Mr. Kaufman (Sp)

249A. Occupational Health Practices. (3)
Two 2-hour lectures per week. Prerequisite: con-
sent of instructor. Advanced concepts in occupational
diseases, occupational disease control and admin-
istration of occupational health programs.
Mr. Tebbens, Mr. Tabershaw (F)

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 (W)

249C. Industrial Hygiene Practices. (3)
Two 3-hour lecture-discussions per week. Pre-
requisite: 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 en-
vironmental control. Mr. Tebbens and Staff (W)

251A. Environmental Health Standards. (4)
Four 1-hour lectures per week. Public health im-
plications 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 tox-
cology; measurement and control of chemical haz-
ards, natural and man-made.
Mr. Tabershaw, Mr. Burkhalter (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 synthe-
sis 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. Pre-
requisite: course 253 of consent of instructor. Policy,
organization, and fiscal decisions by management
of institutional and industrial programs in environ-
mental health and safety.
Mr. Bliss (Sp)

255A-255B-255C. Environmental Health and
Safety. (2-2-2)
One 2-hour lecture-discussion per week. Pre-
requisite: course 255A prerequisite to 255B; 255B pre-
requisite to 255C. Principles and theory of the pre-
vention 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. Pre-
requisite: 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 bio-
logical organisms for environmental control. Funda-
mental aspects of energy conversion, food produc-
tion, 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 micro-
biology of food, water, air, and wastes.
Mr. R. Cooper (Sp)
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. Taylor

265A–265B–265C. Advanced Graduate Study in Biostatistics. (3–3–3)
Three 1-hour lectures per week. Prerequisite: course 260 or 261. Limited to advanced graduate students in biostatistics. Recent developments in biostatistical research.
Mr. Yerushalmy, 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. Stallones, Mr. Smith (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, Mr. Reynolds (W)

276. Current Problems in Epidemiology. (3)
One 3-hour lecture, one 3-hour discussion per week. Prerequisite: prior doctoral degree in biomedical science and completion of courses 275 and 275L, or consent of instructor. Guest lecturers and staff present their current epidemiologic research, emphasizing the bases for development of epidemiologic research programs, methods employed, and difficulties encountered.
Mr. Reeves, Mr. Stallones (Sp)

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. R. M. Taylor (F)

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. Stallones (Sp)

279. Population Genetics and Epidemiology. (3)
Two 1-hour lectures, one 3-hour laboratory per week. Prerequisite: prior doctoral degree in a biomedical science, 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. Day (Sp)

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 auto-immune disorders.
Mr. Pappagianis, Mr. Tempelis (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 fungal pathogenic for man and animals.
Mr. Pappagianis (W)

282. Experimental Pathology. (4)
Two 1-hour lectures, two 3-hour laboratories per week. Prerequisite: course 180A–180B or 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. Prerequisite: course 180A–180B, 182, 182L, or consent of instructor. Characteristics of microbial aerosols and factors which affect their survival relation to the spread of respiratory infections of man and animals.
Mr. Madin, Mr. Dimmick, Mr. Goldberg (Sp)

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.
Mr. C. Smith, Mr. Stallones (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)

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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 Mackenzie, 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 (F)
Biological aspects of family planning and physiology of conception.
Miss Mackenzie, Miss Wallace (W)
Community approach and analysis of educational aspects of family planning programs.
Mr. Griffiths, Miss Roberts (F, W, Sp)

294Z. 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.
Mrs. Hume (Sp)

295. Seminars. (1-4)  
The Staff (F, W, Sp)

296. Special Study. (2-8)  
The Staff (F, W, Sp)

These courses will deal with the exploration and development of new subject material.

297. Individual Study. (1-8)  
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, Su)

Note: The following sections have been established for courses 295 through 299. 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

[ ] RANGE MANAGEMENT  
(Committee Office, 145 Mulford Hall)

Harold H. Biswell, Ph.D., Professor of Forestry.
Harold F. Heady, Ph.D., Professor of Forestry.
R. Merton Love, Ph.D., Professor of Agronomy, Davis.
William C. Weir, Ph.D., Professor of Animal Husbandry, Davis.
William A. Williams, Ph.D., Professor of Agronomy, Davis.
John A. Zivnuska, Ph.D., Professor of Forestry (Chairman of the Committee).

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

Undergraduate Advisers: Mr. Biswell, Mr. Heady.
Graduate Advisers: Mr. Biswell, Mr. Heady.

Curriculum in Range Management

Range management is the only major offered in the curriculum of the same name. It is given by an interdepartmental group representing Forestry at Berkeley and Agronomy and Animal Husbandry at Davis. It provides a four-year program in which undergraduates may prepare for careers which focus on the use of grassland and range areas. Graduates find careers either in professional land management with privately owned ranches or with federal, state, or local governmental agencies; in research; or in teaching.

The first two years of the curriculum 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 Agriculture,
BERKELEY, or the Announcement of the School of Forestry, 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 Agriculture 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.

### Upper Division Courses


Lectures, four hours per week. Management and improvement of range land for livestock grazing; interrelationships of livestock, 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)**

Lectures, three hours 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. (2-10)**

Mr. Biswell, Mr. Heady (F, W, Sp, Su)

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**ROMANCE PHILOLOGY**

Francis J. Carmody, Ph.D., Professor of French.
Yakov Malkiel,† Ph.D., Professor of Romance Philology.
Arshi Pipa, Dottore in Lettere, Assistant Professor of Italian.
Manfred M. G. Sandmann, Ph.D., Professor of French and Romance Philology.
Aldo D. Scaglione, Dottore in Lettere, Professor of Italian.
Ruggiero Stefanini, Dottore in Lettere, Assistant Professor of Italian.
Ronald N. Walpole, Ph.D., Professor of French.

Graduate Advisors: ——— (F, W); Mr. Malkiel (Sp, Su).

† On Leave fall and winter quarters, 1966–67.
SCANDINAVIAN

(Departmental Office, 1305 Dwinelle Hall)

Haakon Hamre, C.Phil., Professor of Scandinavian.
Assar Götrik Jannén, † Ph.D., Professor of Scandinavian.
Eric O. Johansson, Ph.D., Associate Professor of Scandinavian and of Comparative Literature.
Børge Gedso Madsen, Ph.D., Associate Professor of Scandinavian (Chairman of the Department).
Lars C. Lönroth, Ph.D., Assistant Professor of Scandinavian.
Gregory P. Nybo, † Ph.D., Assistant Professor of Scandinavian.
Madison S. Beeler, Ph.D., Professor of German and Linguistics.
Iver W. Kjaer, ‡ cand., mag., Acting Assistant Professor of Scandinavian.
Ulla-Britta Lagerroth, Ph.D., Visiting Associate Professor of Scandinavian.

*200. Linguistic History of the Roman Empire. (2)
Pre-requisite: graduate standing in languages. Problems of methodology in historical linguistic reconstruction, applied to the Latin and minor Romance languages.
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 (F)

*202. General Romance Linguistics. (2)
Pre-requisite: graduate standing and undergraduate major in languages. Problems of methodology in diachronic and synchronic projection.
Mr. Malkiel (W)

*203A-203B-203C. Old Provençal. (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)
Pre-requisite: 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.
Mr. Scaglion (W)

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)
Pre-requisite: 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)
Pre-requisite: 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)
Pre-requisite: 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 (F)

210. Romance Derivation and Composition. (2)
Pre-requisite: graduate standing and consent of instructor. Methods and assumptions in the study of Romance word formations, with special attention to derivational suffixes and to compositional patterns.
Mr. Malkiel (W)

211. Seminar in Albanian Language, Literature, and Folklore. (2)
Two 1-hour lectures. General survey and individual research projects in the field of Albanian, with special reference to Albania's links with Latin and Romance culture.
Mr. Pipa

299. Special Advanced Study. (1-4)
The Staff (F, W, Sp)

The Age of Chaucer (English 155).
The Medieval Mind (English 220).
Historical Grammar (French 201A-201B).
Reading and Interpretation of Typical Old French Texts (French 206A-206B).
Gothic (German 265).
Dante's Divina Commedia (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).
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.

**The Graduate Major**

Prerequisite for admission to full graduate standing is an A.B. degree with an undergraduate major in Scandinavian.

**M.A. Degree with Emphasis on Literature**

**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 203 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 examination, followed, upon successful completion, by a two-hour oral examination. These examinations will test the student's knowledge of (a) the history of Scandinavian literature, with special emphasis on the literature in the student's major language, and (b) the works of 25 selected authors, all studied in their original linguistic form. (A reading list may be obtained from the Department of Scandinavian.)

**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.

**Letters and Science List:** for regulations governing this list, see page 72.

**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. Lönroth (F)

1B. Elementary grammar, conversation, easy prose reading.

Mr. Lönroth (W)

1C. Elementary grammar, conversation, reading, composition.

Mr. Lönroth (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. Hamre (F)

3B. Elementary grammar, conversation, easy prose reading.

Mr. Nybo (W)

3C. Elementary grammar, conversation, reading, composition.

Mr. Nybo (Sp)
199. Special Study for Advanced Undergraduates. (2–5)
   Restricted to senior honors students.
   The Staff (Mr. Hamre in charge) (F, W, Sp)

Courses in Scandinavian Literature

Courses listed below require no knowledge of a Scandinavian language. They are now open to students with at least a junior standing and, with consent of instructor, to properly qualified students with sophomore standing.

100A–100B. History of Scandinavian Literature. (4–4)
   Prerequisite: junior standing or, with consent of instructor, sophomore standing. Survey course: reading of selected works of Danish, Norwegian, and Swedish literature in translation; three 1-hour lectures per week.
   100A. From 1300 to 1800. Mr. Lönnroth (F)
   100B. From 1800 to 1890. Mr. Nybo (W)
   100C. From 1890 to the present. Mr. Lönnroth (Sp)

108. 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.
   Mrs. Lagerroth (W, Su)

108. Strindberg and His Writings. (5)
   Two 2-hour lectures per week. Reading and discussion of Strindberg's works in connection with his biography.
   Mrs. Lagerroth (Sp)

109. Scandinavian Drama of the Twentieth Century. (4)
   Three 1-hour lectures per week. Reading of modern Scandinavian dramas in translation; discussions.
   Mr. Madsen (W, Su)

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.
   120A, Mr. Johannesson (F, W); 120B, Mr. Nybo (Sp, Su)

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. Lönnroth (Sp)

160. Scandinavian Mythology. (4)
   Three 1-hour lectures per week. Critical survey of mythology in ancient Scandinavia. Lectures and readings of selected material in English translation.
   Mr. Kjaer (W)

* Not to be given, 1966–67.
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. Johannesson (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 265) is required and knowledge of German is indispensable.

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 (W)

202. Old Icelandic. (4)

Three 1-hour lectures per week. Prerequisite: an A.B. degree with an undergraduate major in Scandinavian. Descriptive and historical phonology and grammar, texts. Some attention is given to Old Norwegian. 

Mr. Beeler (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. 

Mr. Kjaer (Sp)

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 (W)

*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 (W, 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 (W)

*230. Eighteenth-Century Scandinavian Literature. (4)

Three 1-hour lectures per week. Reading and analysis of representative works. 

Mr. Johannesson (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. 

Mrs. Lagerroth, Mr. Lönroth, Mr. Madsen (F, W, Sp, Su)

298. Special Study for Graduate Students. (2–6)

Variable number of lecture hours per week. 

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

SLAVIC LANGUAGES AND LITERATURES

(Department Office, 5416 Dwinelle Hall)

Oleg A. Maslenikov, Ph.D., Professor of Slavic Languages and Literatures (Chairman of the Department). 

Czeslaw Miosz, Mag. Jur., Professor of Slavic Languages and Literatures.

* Not to be given, 1966–67.
Francis J. Whitfield, Ph.D., Professor of Slavic Languages and Literatures.
Waclaw Lednicki, Ph.D., LL.D., Professor of Slavic Languages and Literatures, Emeritus.
Gleb Struve, A.B., Professor of Slavic Languages and Literatures, Emeritus.
Simon Karlinsky, Ph.D., Associate Professor of Slavic Languages and Literatures.

James M. Curtis, M.A., Acting Assistant Professor of Slavic Languages and Literatures.
Robert P. Hughes, M.A., Acting Assistant Professor of Slavic Languages and Literatures.
Andrew O. Jászi, Ph.D., Professor of German.
Serge Kassatkin, M.A., Lecturer in Russian.
Barbara D. Korpan, M.A., Acting Assistant Professor of Russian and of Comparative Literature.
Ralph Lindheim, M.A., Associate in Russian.
Ludmilla A. Patrick, M.A., Lecturer in Russian.
Michael K. Pawlikowski, LL.M., Lecturer in Slavic Languages and Literatures.
Krystyna Przybylska, M.A., Lecturer in Polish.
Olga Sorokin, Ph.D., Lecturer in Russian.
Irwin R. Titunik, Ph.D., Visiting Assistant Professor of Slavic Languages and Literatures.
Robert H. Whitman, Ph.D., Visiting Assistant Professor of Slavic Languages and Literatures.
Robert E. Whyte, M.A., Acting Assistant Professor of Slavic Languages and Literatures.

*Departmental Major Advisers: Mr. Kassatkin, Mr. Whitfield.*
*Departmental Graduate Adviser: Mr. Karlinsky.*

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 nonintensive 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 all the Slavic peoples and requires at least an elementary knowledge of the Russian language. Courses in the grammatical structure of Russian are especially recommended to prospective teachers. Honor students are given the opportunity to prepare themselves for graduate studies in a seminar 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**  
Russian 1, 2, 3 or their equivalents.

**Upper Division**  
26 units in upper division lecture courses in Slavic Literatures, including: 130A–130B–130C; 140A–140B–140C; 187 or 188 for majors in Russian. Eleven units in upper division language courses, including 128A–128B or 129A–129B; comprehensive examinations in the major language and literature.

**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 6 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 72.*

1. Elementary Russian, Beginners' Course. (5)
   Five 1-hour meetings and two 1-hour laboratories per week.
   The Staff (Mr. Whitman in charge) (F, W, Sp, Su)

2. Elementary Russian. (5)
   Five 1-hour meetings and two 1-hour laboratories per week. *Prerequisite: course 1.*
   The Staff (Mr. Whitman in charge) (F, W, Sp, Su)

3. Elementary Russian. (4)
   Five 1-hour meetings and one 1-hour laboratory per week. *Prerequisite: course 2.*
   The Staff (Mr. Curtis in charge) (F, W, Sp, Su)

4. Intermediate Russian. (4)
   Five 1-hour meetings and one 1-hour laboratory per week. *Prerequisite: course 3.*
   The Staff (Mr. Hughes in charge) (F, W, Sp, Su)

5. Intermediate Russian. (4)
   Three 1-hour meetings and one 1-hour laboratory per week. *Prerequisite: course 4.*
   Mr. Kassatkin, Mrs. Sorokin, Mr. Titunik

6. Intermediate Russian. (4)
   Three 1-hour meetings and one 1-hour laboratory per week. *Prerequisite: course 5.*
   Mr. Kassatkin, Mrs. Sorokin, Mr. Titunik

*12A-12B-12C. Elementary Bulgarian. (4-4-4)*
   Three 1-hour meetings per week. *Prerequisite: course 6 or course 21B.*

21A–21B–21C. Intensive Russian. (8–8–8)
   Ten 1-hour meetings and two 1-hour laboratories per week. *Prerequisite: course 21A.*
   Sequence beginning (F), Mr. Kassatkin

   Ten 1-hour meetings per week. *Prerequisite: course 20.*
   Mrs. Przybylska (F)

24A–24B. Intermediate Polish. (4–4)
   Four 1-hour meetings per week. *Prerequisite: course 23.*
   Sequence beginning (W), Mrs. Przybylska

   Ten 1-hour meetings per week. *Prerequisite: course 24A.*
   Mr. Whyte (F)

26A–26B. Intermediate Serbo-Croatian. (4–4)
   Four 1-hour meetings per week. *Prerequisite: course 25.*
   Sequence beginning (W), Mr. Whyte

   Ten 1-hour meetings per week. *Prerequisite: course 29.*
   Mrs. Przybylska (W, Su)

30A–30B. Intermediate Czech. (4–4)
   Four 1-hour meetings per week. *Prerequisite: course 30.*
   Sequence beginning (W), Mr. Whyte

39. Great Writers of Russian Literature. (4)
   Four 1-hour meetings per week. No knowledge of Russian is required
   Mr. Lindheim (W, Su)

40. Specialized Russian Reading. (3)
   Three 1-hour meetings per week. *Prerequisite: course 4 or consent of instructor.*
   Miss Kopan (F, W, Sp, Su)

Upper Division Courses

103A–103B–103C. Advanced Russian. (3–3–3)
   Three 1-hour meetings and one 1-hour laboratory per week. *Prerequisite: course 6 or course 21C.*
   Sequence beginning (F), Mr. Kassatkin, Mrs. Sorokin

104A–104B–104C. Russian Composition. (3–3–3)
   Three 1-hour meetings per week. *Prerequisite: course 103C.*
   Sequence beginning (F), Mr. Karlinsky, Mrs. Sorokin, Mr. Struve

108A–108B. Polish Reading, Grammar, and Composition. (4–4)
   Four 1-hour meetings per week. *Prerequisite: course 24B.*
   Sequence beginning (W), Mrs. Przybylska

112A–112B. Serbo-Croatian Reading, Grammar, and Composition. (4–4)
   Four 1-hour meetings per week. *Prerequisite: course 26B.*
   Sequence beginning (W), Mr. Whyte

116A–116B. Czech Reading, Grammar, and Composition. (4–4)
   Four 1-hour meetings per week. *Prerequisite: course 30B.*
   Sequence beginning (W),
125A–125B. Introduction to Descriptive Russian Grammar. (4–4)
Two 1½-hour classes per week. Prerequisite or corequisite: course 103A (to 125A), course 103B (to 125B). Recommended for prospective teachers. Sequence beginning (F), Mr. Whitfield

128A–128B. Readings in Russian Literature. (1–1)
One 1-hour meeting per week. Prerequisite or corequisite: course 5 (to 128A), course 6 (to 128B). Corequisite: an upper division course in Czech, Polish, or Serbo-Croatian literature. Required for majors in Russian. Must be taken concurrently with courses 130B and 130C. Sequence beginning (W), Mr. Hughes

129A–129B. Readings in Czech, Polish, and Serbo-Croatian Literatures. (1–1)
Individual or group conferences. Prerequisite or corequisite: course 24A or course 26A or course 30A (to 129A), course 24B or course 26B or course 30B (to 129B). Corequisite: an upper division course in Czech, Polish, or Serbo-Croatian literature. Required for majors in Czech, Polish, or Serbo-Croatian. Must be taken concurrently with a corresponding literature course. 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.

130A–130B–130C. Survey of Russian Literature and Intellectual Trends. (4–4–4)
Three 1-hour meetings per week. Students in the major program are advised to take this course in sequence. 130A. From the eleventh century to 1845. Mr. Curtis (F) 130B. From 1845 through the nineteenth century. Mr. Titunik (W) 130C. The twentieth century. Mr. Hughes (Sp)

131. Russian Literature from 1880 to 1917. (4)
Three 1-hour meetings per week. Mr. Maslenikov (F)

132. Russian Literature Since 1917. (4)
Three 1-hour meetings per week. Mr. Struve (Sp)

133A–133B–133C. The Russian Novel and its Relations to West European Literatures. (4–4–4)
Two 1½-hour meetings per week. Prerequisite to 133B: 133A or 130A or permission of the instructor; to 133C: 133B or 130B or permission of the instructor. 133A. to 1845 (F) 133B. 1845 to 1865 (W) 133C. 1865 to 1885 (Sp)

134A. Dostoevsky. (4)
Three 1-hour meetings per week. Mr. Struve (Sp)

134B. Tolstoy. (4)
Three 1-hour meetings per week. Mr. Curtis (W)

134C. Chekhov. (4)
Three 1-hour meetings per week. Mr. Lindheim (Sp)

135. Russian Drama from the Seventeenth Century to the Twentieth. (4)
Three 1-hour meetings per week. Mr. Karlinsky (W)

136. Russian Folklore. (4)
Three 1-hour meetings per week. Mr. Miosz (F)

140A–140B–140C. Survey of West and South Slavic Literatures. (2–2–2)
One 1-hour meeting per week, with a second hour for discussion at the instructor's discretion. Required for the major except that a student in the major program emphasizing Czech, Polish, or Serbo-Croatian may be excused from the corresponding quarter of this course. 140A. Polish literature. Mr. Miłosz (W) 140B. South Slavic literature. Mr. Whyte (F) 140C. Czech and Slovak literature. Mr. Miłosz, Mrs. Przybylska (Sp)

143. Introduction to Modern Slavic Literary Theory. (4)
Three 1-hour meetings per week. Miss Kopan (Sp)

Three 1-hour meetings per week. 150A. To 1800, with emphasis on the Reforma­ tion and Counter-Reformation. Mr. Miłosz (F) 150B. The nineteenth century; romanticism and positivism. Mr. Miłosz, Mrs. Przybylska (W) 150C. The twentieth century. Mr. Miłosz, Mrs. Przybylska (Sp)

155. Polish Romanticism. (3)
Three 1-hour meetings per week. Mr. Miłosz (F)

156. The Polish Theater. (3)
Three 1-hour meetings per week. Mr. Miłosz (Sp)

159. Contemporary Polish Poetry and Fiction. (3)
Three 1-hour meetings per week. Mr. Miłosz (W)

Two 1-hour meetings per week. It is recommended that students majoring in Czech take this course in sequence. 160A. To 1770. Mr. Miłosz (F) 160B. 1770 to 1890. Mr. Whyte (W) 160C. 1890 to the present. Mr. Whyte (Sp)

Two 1-hour meetings per week. It is recommended that students majoring in Serbo-Croatian take this course in sequence. 170A. To 1850. Mr. Mr. Whyte (F) 170B. 1850 to 1918. Mr. Whyte (W) 170C. 1918 to the present. Mr. Whyte (Sp)

187. Russian Poetry. (4)
Three 1-hour lectures per week. Prerequisite or corequisite: course 103B or consent of instructor. Lecture course given in Russian. Course may be repeated without duplication of credit. Mr. Karlinsky (F)

188. Russian Prose. (4)
Three 1-hour lectures per week. Prerequisite or corequisite: course 103A or consent of instructor. Lecture course given in Russian. Course may be repeated without duplication of credit. Mr. Maslenikov (F)
199. Special Study for Advanced Undergraduates. (2–5)
Restricted to honor students.
The Staff (F, W, Sp, Su)

Graduate Courses

210A–210B. Old Church Slavic. (2–2)
Two 1½-hour meetings per week.
Sequence beginning (F), Mr. Whitfield

220. Comparative Slavic Linguistics. (3)
Two 1½-hour meetings per week. Prerequisite: courses 210A–210B.
Mr. Whitfield (Sp)

226. Historical Russian Grammar. (3)
Three 1-hour meetings per week. Prerequisite: courses 210A–210B.
Mr. Maslenikov, Mr. Whitfield (Sp)

230. Old Russian Literature. (3)
Two 1-hour meetings per week. Lectures are in Russian.
Mr. Maslenikov (W)

290. Seminar. (3)
One 2-hour meeting per week. Advanced study in Slavic languages and literatures. Topics will vary from year to year and will be announced at the beginning of each quarter.
The Staff (F, W, Sp, Su)

298. Special Study for Graduate Students. (2–6)
The Staff (F, W, Sp, Su)

299. Directed Research. (2–9)
Normally reserved for students directly engaged upon the doctoral dissertation.
The Staff (F, W, Sp, Su)

H195. Honors Proseminar. (4)
One 2-hour meeting for discussion each week, or individual meetings with the instructor. Advanced literary study for senior honor students. Emphasis on the writing of one or more papers and discussion of them.
The Staff (Sp, Su)

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.
Sequence beginning (W)

Hungarian 118A–118B. Hungarian Reading, Grammar, and Composition. (4–4)
Grammar, and Composition. (4–4)
Four 1-hour meetings per week. Prerequisite: course 28B.
Sequence beginning (W)

Two 1-hour meetings per week.
185A. To 1800. (F)
185B. The nineteenth century. (W)
185C. The twentieth century. (Sp)

Hungarian 290. Seminar. (3)
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. (W, Sp)

SOCIAL SCIENCE

(Department Office, 750 Barrows Hall)

Committee in Charge:
Thomas G. Barnes, D. Phil., Associate Professor of History.
Nelson H. H. Graburn, Ph.D., Assistant Professor of Anthropology.
Allan Pred, Ph.D., Assistant Professor of Geography.
George W. Stocking, Jr., Ph.D., Assistant Professor of History.
Martin A. Trow, Ph.D., Associate Professor of Sociology.
Benjamin N. Ward, Jr., Ph.D., Associate Professor of Economics (Chairman).

The Field Major See the Announcement of the College of Letters and Science.
Letters and Science List: for regulations governing this list, see page 72.

Lower Division Course

1A–1B–1C. Introduction to Social Science. (4–4–4)
Two 1-hour lectures and two 1-hour discussion sections per week. Basic theories, concepts, and findings of the social sciences with reference to questions of policy. Among problems to be considered are class structure, economic stability and growth, racial relations, democratic process, and cultural change among peoples of underdeveloped areas.

Upper Division Course

*100A–100B–100C. The Individual in Organized Society. (5–5–5)
Two 1½-hour lecture and discussion periods each week. Prerequisite: senior status. 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.

SOCIAL WELFARE

(Chairman of the Department).

Milton Chernin, Ph.D., Professor of Social Welfare.
Ernest Greenwood, Ph.D., Professor of Social Welfare.
Henry S. Maas, Ph.D., Professor of Social Welfare.
Davis McEntire, Ph.D., Professor of Social Welfare.
Maurine McKeany, Ph.D., Professor of Social Welfare.
Sheldon Margen, M.D., Professor of Human Nutrition and 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.
Gertrude Wilson, M.A., Professor of Social Welfare, Emeritus.
Joseph S. Briar, D.S.W., Associate Professor of Social Welfare.
James R. W. Leiby, Ph.D., Associate Professor of Social Welfare.
Irving M. Piliavin, D.S.W., Associate Professor of Social Welfare.
Lydia Rapoport, M.S., Associate Professor of Social Welfare.
Margaret S. Schubert, Ph.D., Associate Professor of Social Welfare.
Kermit T. Wiltse, D.S.W., Associate Professor of Social Welfare.
Andrew Billingsley, Ph.D., Assistant Professor of Social Welfare.
Ronald A. Feldman, Ph.D., Assistant Professor of Social Welfare.
Ralph M. Kramer, D.S.W., Assistant Professor of Social Welfare.
Alfred A. Lucco, Ph.D., Assistant Professor of Social Welfare.
Henry Miller, D.S.W., Assistant Professor of Social Welfare.

W. Reed Brockbank, M.D., Lecturer in Social Welfare.
Sally Dewees, M.S., 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.
Irving Kriegsfield, M.S.W., Lecturer in Social Welfare.
Anna Maench, Ph.D., Lecturer in Social Welfare.
Mary D. Monte, M.S.W., Lecturer in Social Welfare and Associate Head, Social Welfare Extension.
Charles O'Shea, M.S.W., Lecturer in Social Welfare.
Ida Oswald, M.S.W., Lecturer in Social Welfare and Field Work Consultant.

‡ In residence winter and spring quarters only, 1966–67.
Genevieve Oxley, M.S., Lecturer in Social Welfare.
Ralph H. Potter, Jr., M.D., Lecturer in Social Welfare.
Marion Sloan, M.S.S.A., Lecturer in Social Welfare.
William T. Smelser, Ph.D., Lecturer in Social Welfare.
Esther Spencer, M.S.S., 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.
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.
Faye Bonetti, M.S.W., Field Work Supervisor in Social Welfare.
Lorna Brangwin, M.S.W., Field Work Consultant 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.
Alice Dailey, M.S.W., Field Work Consultant in Social Welfare.
Mark Ealey, M.S.W., Field Work Supervisor in Social Welfare.
Dorothy Gibson, M.S.S., Field Work Consultant 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.
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.
Katharine Murphy, M.A., Field Work Supervisor in Social Welfare.
Dorothy Pettes, M.A., Field Work Consultant and Coordinator of Field Work in Social Welfare.
Elizabeth E. Pfeiffer, M.S.W., Coordinator of Field Work in Social Welfare.
Arthur Segal, M.S.S.W., Field Work Supervisor in Social Welfare.
Robert A. Wasser, M.S.W., Field Work Consultant 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.

The Department of Social Welfare administers the Undergraduate Group Major in Social Welfare in the College of Letters and Science. The group major in social welfare leads to the degree of Bachelor of Arts and (1) offers a social welfare sequence of general interest to liberal arts students; and (2) prepares undergraduates for (a) graduate professional education in social work, or (b) direct entry upon graduation into certain positions in social service agencies.

Eligible social welfare majors, upon recommendation of their advisers, may enroll in an honors program.
Lower Division  Psychology 1, Psychology 3, Sociology 1, Psychology 5 or Statistics 2.


A list of additional recommended courses for majors is available at the Department Office, 120 Haviland Hall. For information on the School of Social Welfare, see Section I, Chapter V of this catalogue.

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. Pilavin (F); Mr. Chernin (W, Sp)

102A–102B. Social Work as a Profession. (3–3)
Two 1½-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’Sheaa, ——— (F, W, Sp)

Two 1½-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.
The Staff (——— in charge) (F); (Mr. Chernin in charge) (W, Sp)

198. Group Study for Advanced Undergraduates. (2–5)
The Staff (Mr. Wiltse in charge) (F); (Mr. Chernin in charge) (W, Sp)

199. Special Study for Advanced Undergraduates. (2–5)
The Staff (Mr. Wiltse in charge) (F); (Mr. Chernin in charge) (W, Sp)

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 1½-hour sessions per week. Physical, psychological, and social development and adaptations of the person, as related to social welfare.
Sequence beginning (F).
Mr. Lucco, Mr. Maas, Mr. Margen, Mr. Potter, Mr. Smelcer, Mr. Zimmerman (F, W)

201A–201B. Social Organization and Social Welfare. (2–3, 2–3)
One 1½-hour session per week for 2 units; an additional 1½ 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.
Sequence beginning (F), Mr. Briar, Mr. Feldman, Mr. Pilavin, Mr. Wolins (F, W)

*202. Development of the Handicapped Child. (2)
One 1½-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. Lucco

203. Development of the Social Deviant. (2)
One 1½-hour sessions 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 1½-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. Brockbank, Mrs. Maench, Mr. Westfall (F, W)

211. Seminars in Human Development and Pathology. (2)
One 1½-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.

* Not to be given, 1966–67.
212. Seminars in Social Organization and Social Welfare. (2)
   One 1½-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. (W, Sp)

   One 1½-hour session per week.
   220A. Income Maintenance.
   Analysis of major issues in the social provision of income for individuals and families through pub-
   lic assistance, social insurance, health and children's allowance, work and training, income sup-
  plementation, and other income maintenance programs. Miss McKeany, Mrs. Taylor (F, W)
   220B. Service Programs.
   Analysis of major issues with reference to socially provided services in the fields of family and child
   welfare, corrections, public health including mental health, rehabilitation, and recreation.
   Miss McKeany, Mrs. Taylor (F, W, Sp)
   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.
   Miss McKeany, Mrs. Taylor (W, Sp)

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. Prerequisite: course 220A and either course 220B or 220C or consent
   of instructor. Intensive study of particular program areas such as child welfare, corrections,
   family welfare, health, medical care, mental health, mental retardation, poverty, rehabilitation, school
   social work, etc. Topics will be announced annually.
   The Staff (W, Sp)

*232. Comparative Welfare Institutions and Practice. (2)
   One 1½-hour session per week. Comparative
   analysis of welfare policies and methods in selected countries in cultural and ideological context.
   Problems of welfare policy in underdeveloped countries.

*233. Seminar in Social Security. (2)
   One 1½-hour session per week.

   One 1½-hour session per week. Primarily for doctoral students. (239A–239B: Theory of organi-
   zation and administration with applications to social welfare; *239C: Selected problems of social
   welfare policy.) Sequence, beginning (F).
   Mr. McEntire (F, W)

240A–240B–240C. Social Casework. (2–2–2)
   One 1½-hour session per week. Basic principles of social work practice with individuals and
   families. Sequence beginning (F).
   The Staff (F, W, Sp)

   One 1½-hour session per week. Beginning analysis of theory and practice of social work with
   groups. Sequence beginning (F).
   Miss Sloan (F, W, Sp)

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.
   Mr. McEntire (Sp)

244. Methods of Social Action. (2)
   One 1½-hour session per week. Principles and methods in developing social action programs in
   social welfare. (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 school social work. The Staff (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.
   The Staff (W, Sp)

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.
   Sequence beginning (W, F).
   Mr. Feldman (F, W)

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. Sequence beginning (F).
   Mr. Kramer (F, W)

254A–254B. Social Welfare Administration. (2–2)
   One 1½-hour session per week. Prerequisite: course 242A–242B or consent of instructor. Admin-
   istrative process and problems in social welfare organizations. Sequence beginning (F).
   Mr. Kriegsfeld (F, W)

   Two 1½-hour sessions per week. Sequence beginning (W, Sp)
   Mrs. Goman (F, W, Sp)

* Not to be given, 1966–67.
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.

Theory. (2–2–2)  
One 1½-hour session per week. Primarily for  
doctoral students. Sequence beginning (F).  
259A, analysis of selected theories of social work  
practice; 259B, analysis of selected social problems  
in the light of theory in social work and the  
social and behavioral sciences; 259C, theories  
of change and their implications for social work  
practice.  
Mr. Britar (F); Mr. Maas (W)

279A–279B–279C. Seminars in History and  
Philosophies of Social Welfare. (2–2–2)  
One 1½-hour session 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.  
Mr. Leiby (F, 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 (F, W, 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, W).  
The Staff (F, W, Sp)

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).  
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

(2–2–2)  
One 1½-hour session per week. Primarily for  
doctoral students. Sequence beginning (W)  
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 selected reference to social welfare  
and social work; 289C, seminar on research design.  
Mr. Greenwood (W, Sp)

297. Individual Study for Graduate Students. (1–9)  
The Staff (Mr. Wiltse in charge) (F);  
(Mr. Chernin in charge) (W, Sp)

298. Group Study for Graduate Students. (1–9)  
The Staff (Mr. Wiltse in charge) (F);  
(Mr. Chernin in charge) (W, Sp)

299. Individual Research. (1–9)  
The Staff (Mr. Wiltse in charge) (F);  
(Mr. Chernin in charge) (W, Sp)

Professional Course

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 prac­
tice in social agencies.  
Miss Pettes, Mrs. Schubert, and Staff (F, W, Sp)

404. Internship in Social Work Practice in Public  
Health. (4–10)  
Four to five days per week during an eleven­
month period. Supervised practice in public health  
departments.  
Mrs. Gorman (F, W, Sp)

SOCIETY

(Department Office, 410 Barrows Hall)

Reinhard Bendix, Ph.D., Professor of Sociology.
Herbert Blumer, Ph.D., Professor of Sociology and Director, Institute of Social Sciences.
John A. Clausen, † Ph.D., Professor of Sociology.
Kingsley Davis, Ph.D., Professor of Sociology.
Wilfrid 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 and Director, Survey Research Center.
Erving Goffman, † Ph.D., Professor of Sociology.
William Kornhauser, Ph.D., Professor of Sociology.
Leo Lowenthal, † Ph.D., Professor of Sociology.
William Petersen, Ph.D., Professor of Sociology.

* Not to be given, 1966–67.
† Absent on leave, 1966–67.
‡ In residence spring quarter only, 1966–67.
H. Franz Schurmann, Ph.D., Professor of Sociology and of History.
Philip Selznick, Ph.D., Professor of Sociology (Chairman of the Department).
Neil J. Smelser, Ph.D., Professor of Sociology (Vice Chairman of the Department).
Harold L. Wilensky, Ph.D., Professor of Sociology.
Margaret T. Hodgson, Ph.D., Professor of Sociology, Emeritus.
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.
Robert Blauner, Ph.D., Assistant Professor of Sociology.
Calvin Goldscheider, Ph.D., Assistant Professor of Sociology.
Jerome H. Skolnick, Ph.D., Assistant Professor of Sociology.
Robert H. Somers, Ph.D., Assistant Professor of Sociology.

- Norman W. Bell, Ph.D., Visiting Professor of Sociology.
- Isadora Ding, M.A., Acting Instructor in Sociology.
- Jan E. Dizard, M.A., Acting Assistant Professor of Sociology.
- Roy A. Hansen, M.A., Acting Assistant Professor of Sociology.
- Philippe Nonet, M.A., Acting Assistant Professor of Sociology.
- Gertrude Jaeger Selznick, Ph.D., Lecturer in Sociology.
- Shirley A. Star (Mrs. Winston Breslin), Ph.D., Visiting Professor of Sociology.

*Departmental Major Adviser: Mr. Dizard.*
*Graduate Adviser: Mr. Trow.*

**The Major**

Sociology 1 or 10 or 20 or 108; 105–106 or 113 and 133; 109, 141, 178, and 20 units from other upper division sociology courses within the department.

**Recommended Lower Division Electives** Anthropology 3; Economics 1; History 4; Psychology 1; Social Science 1A–1B–1C; Statistics 2.

**Honors Program** H194–H195. Majors who enter their senior year with an overall B average are invited to join the department honors program.

**The Graduate Major**

Facilities for graduate study and research in sociology at Berkeley include not only a wide variety of courses and seminars but also research training under individual faculty supervision. Department members are currently engaged in research projects in comparative institutions, demography, educational 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 in 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 the Study of Higher Education, and for Chinese Studies; the International Population and Urban Research project, and various other area institutes of the University.

**Admission to the Program** In addition to the Graduate Division application form, the department requires special forms; it is interested in 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

†† In residence fall and spring quarters only, 1966–67.
†‡ In residence winter and spring quarters only, 1966–67.
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.

Priority will be given to applicants for the fall quarter who apply by December 15, although a small number of applicants who apply by May 15 will be admitted for the fall. No action will be taken on an application until the department has received all the required materials.

An undergraduate major in sociology is not required. The character and quality of the individual's prior education and experience will weigh more heavily than specific course content.

**M.A. Degree Requirements** In the interest of emphasis on the doctoral program and of permitting well-qualified students to proceed to the doctorate expeditiously, 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. A thesis is not required.

**Coursework (36 Required Units)**

1. Sixteen units shall be taken as follows: (a) two required lecture courses, one quarter in methods, one quarter in sociological theory, each to be followed by (b) a required seminar in each of the two fields.

2. At least 12 additional units must be taken in the Department of Sociology, of which at least eight units must be in graduate courses or seminars (4 may be in upper division courses).

3. Up to 8 units may be from upper division or graduate courses in other departments, on approval of the personal and graduate advisers.

**Deadlines for Completion**

1. No later than his third quarter of residence, the student must complete the methods and theory requirements, provided that these courses are offered during that period.

2. During his first five quarters of residence the student must complete (a) the methods examination and paper; (b) the theory examination and paper; (c) at least two additional papers on sociological subjects; (d) 36 units as above. The two additional papers may or may not be written as assignments in courses taken. 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. A student may, during his first five quarters of residence, enroll for a 297 or 299 course to extend or revise a paper written as an assignment in a course or seminar, but units so earned will not count toward the 24 required in graduate sociology courses or seminars.

On recommendation of the Graduate Evaluation Committee, the M.A. may be awarded after three quarters of residence if all requirements have been met. All students should aim at completion of the M.A. requirements in three quarters, but the deadline is five quarters.

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 214, Advanced Quantitative Methods, and at least two seminars in addition to those taken to fulfill the requirements for the M.A. degree. A student who takes his master's
degree in this department need not repeat any requirements for the Ph.D. which he has already fulfilled in the course of his work for the M.A.

Before he may take his Ph.D. oral examination, the student must pass examinations in two of the following languages (one of which must be French, German, or Russian): Chinese, French, German, Hebrew, Italian, Japanese, Russian, Spanish. Instead of two languages, the student may elect on approval of the Graduate Division to take a single intensive examination in French, German, or Russian.

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.

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 72.

Lower Division Courses

1. Introduction to Sociology: Selected Themes. (4)
Two 1-hour lectures, two 1-hour discussion sections, and two consultation hours per week. Prerequisite: not open 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. Hurn (F); Mr. Blauner, Miss Ding (W); Mr. Dizard, Mr. Matza (Sp); ———— (Su)

10. Introduction to Sociology: Group Tutorial. (4)
Approximately three hours per week of tutorial sessions, lectures, and discussions to be arranged. Prerequisite: not open to students who have taken course 1. Emphasis is on guided reading and discussions.
Mr. Smelser (W); ———— (Su)

20. Population and Society. (4)
Two 1-hour lectures, two 1-hour discussion sections, and two consultation hours per week. Introduction to sociological analysis using demographic data and concepts.
Mr. Goldscheider (F, Sp); ———— (Su)

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.

*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, Tegart, Sorokin, Weber, and others.

105. Introduction to Methods of Sociological Study. (5)
Two 1½-hour lectures, two 1-hour laboratory sections, and one consultation hour per week. Prerequisite: course 40 and 8 additional units in sociology, or equivalent. Methodological problems and technical procedures in defining problems to investigate and in selecting, describing, classifying, and analyzing data.
Mr. Hirschi (F); Mr. Trow (W); ———— (Su)

* Not to be given, 1966–67.

107. Deviance and Social Control. (5)
Two 1½-hour lectures and two consultation hours per week. A consideration of forms, causes and controls of deviant behavior.
——— (F); Mr. Hirschi (Sp); ———— (Su)

108. Principles of Sociology. (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.
Mr. Nonet (F, Sp); ———— (Su)

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. Smelser (F); Mr. Nonet (Sp); ———— (Su)

110. Race and Ethnic Relations. (5)
Three lecture hours and two consultation hours per week. Prerequisite: course 1 or 10 or consent of instructor. Significance of identification, multi-ethnic status systems, minority groups and movements, inter-ethnic tensions, race ideology and public policy.
Mr. Dizard (F); Mr. Marx (Sp); ———— (Su)

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. Matza (F); ———— (Su)

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. Dizard (W); ———— (Su)

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. Zablocki (F, Sp); ———— (Su)

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. Nonet (W); ——— (Su)

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. Petersen (W)

124. Sociology of Education. (5)
Three lecture hours and two consultation hours per week. The role of formal education in modern societies. Educational systems in relation to the religious, cultural, economic, and political forces shaping their character.

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.

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.

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. Bell (F); ——— (Su)

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. Hirschi (F); Mr. Kaplan (W)

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 and similar data, their uses and limitations, and how the data are statistically analyzed. Fertility, mortality, population composition and distribution, are included.

Mr. Goldscheider (Sp)

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. Hansen (Sp); ——— (Su)

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.

——— (F); ——— (Su)

141. Social Organization of Modern Western Societies. (5)
Three lecture hours and two consultation hours per week.

Mr. Hurn, (F, Sp); Mr. Schurmann (W); ——— (Su)

142. Comparative Institutions. (5)
Three lecture hours and two consultation hours per week. Comparison of selected social institutions; their relation to ideas and social change.

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. Glock (W)

147. Religious Doctrines and Social Conduct. (5)
Three lecture hours and two consultation hours per week. Comparable elements in various religious doctrines; direct and indirect effects on human behavior.

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.

——— (Su)

149. Social Movements and Public Action. (5)
Three lecture hours and two consultation hours per week. Social movements, the formation and play of public opinion, and the behavior of interest groups.

Mr. Zablocki (W); ——— (Su)

150. Human Migration. (5)
Three lecture hours and two consultation hours per week. History of international migration and analysis of its types, causes, and consequences. Study of internal migration in the United States and in selected foreign countries. Statistical, social and demographic problems connected with migration.

Mr. Goldscheider (W)

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

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)
Three 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. Mr. Lowenthal (Sp)

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. Miss Ding (F, 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 (F, W); ——— (Su)

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. ——— (Sp)

H194. Senior Honors Seminar, (5)
Two lecture-seminar hours and four consultation hours per week. Prerequisite: open only to seniors who are seeking an A.B. degree with honors. Intensive study of individual topic to provide background for honors thesis. Mr. Kornhauser (W)

H195. Honors Thesis. (5)
Two lecture-seminar hours and four consultation hours per week. Prerequisite: course H194 with grade of A or B. Group and individual conferences. Mr. Kornhauser (Sp)

199. Special Study for Advanced Undergraduates.
(1-5)
Prerequisite: restricted to senior honors students. The Staff (F, W, Sp, Su)

Graduate Courses

201. Methods of Sociological Research. (4)
One 2-hour meeting and two consultation hours per week. Miss Star (F, W)

202. Research Methods: Special Topics. (4)
One 2-hour seminar and two consultation hours per week. Prerequisite: course 201 or equivalent. 202A. Survey research methods. Mr. Somers (W); Miss Star (Sp) 202B. Field methods. Mr. Matza (W) 202C. Demographic methods. Mr. Davis, Mr. Keyfitz (W) 202D. Historical and comparative methods. Mr. Bendix (Sp)

*204. Social Contacts. (3)
One 2-hour meeting and two consultation hours per week. Social units and dynamics of face-to-face interaction in natural settings; communication aspects of public order.

* Not to be given, 1966-67.

206. Socialization and Personality. (3)
One 2-hour meeting 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. Bell (F)

207. Analysis of Social Action. (3)
One 2-hour meeting 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. Kornhauser (Sp)

210. Racial and Ethnic Minorities. (3)
One 2-hour meeting 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. Blau (W); ——— (Su)

212. Deviance and Social Control. (3)
One 2-hour meeting and two consultation hours per week. Deviance and social system analysis; ethnography of deviant communities. Mr. Matza (F); ——— (Su)

214. Advanced Quantitative Methods. (4)
One 2-hour meeting and two consultation hours per week. Prerequisite: course 113 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. Somers (Sp)

219. Sociology of Law. (3)
One 2-hour meeting 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); ——— (Su)

222. Sociology of Education. (3)
One 2-hour meeting 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 (F)

224. Social Change. (3)
One 2-hour meeting and two consultation hours per week. Stresses the rise and spread of industrialism to underdeveloped countries. ——— (F); ——— (Su)

227. Basic Issues in Sociological Theory. (4)
One 2-hour meeting and two consultation hours per week. Mr. Selznick (W)

228. Seminars in Sociological Theory. (4)
One 2-hour seminar and two consultation hours per week. Prerequisite: course 227 or equivalent. Mr. Blau (Sp); Mr. Lowenthal (Sp); Mrs. Selznick (Sp); Mr. Smelser (Sp)

229. Sociology of Work. (3)
One 2-hour meeting 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.

230. Population. (3)
One 2-hour meeting 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. Davis (F)

231. Sociology of Marriage, Family, and Kinship. (3)
One 2-hour meeting and two consultation hours per week. Family structure and behavior, including kinship, marriage, divorce, reproduction, and parental relations; interrelations between family and stratification, economy, law, religion.
Mr. Davis (Sp)

232. Social Stratification. (3)
One 2-hour meeting and two consultation hours per week. Theoretical and methodological problems in the field, with special emphasis on comparative materials.
Mr. Bendix (W); ———— (Su)

241. Organizations and Institutions. (3)
One 2-hour meeting and two consultation hours per week.
Mr. Hansen (Sp)

242. Comparative Social Structure. (3)
One 2-hour lecture and one consultation hour per week.
Mr. Eberhard (W)

*246. Sociology of Religion. (3)
One 2-hour meeting and two consultation hours per week. Prerequisite: course 146, or consent of instructor. Interplay between theory and research; the interrelaton of religious ideas and institutions with the economic, political, and social order.

248. Collective Behavior. (3)
One 2-hour meeting and two consultation hours per week. Studies in mass behavior, social movements, and political action.
Mr. Smelser (W)

*253. Sociology of Culture. (3)
One 2-hour meeting 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.

254. Sociology of Health and Medicine. (3)
One 2-hour meeting 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. Bell (W)

255. Sociology of Mental Health. (3)
One 2-hour meeting and two consultation hours per week. Social and cultural aspects of mental illness: etiology, symptomatology, and duration; social and organizational responses.
——— (F)

260. Political Sociology. (3)
One 2-hour meeting and two consultation hours per week. Contributions of sociology to theory and research in politics. Analysis of structure and ideology of organized groups.
——— (F)

262. Urbanization. (3)
One 2-hour meeting 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. Petersen (W)

290. Seminar. (3)
One 2-hour seminar and two consultation hours per week. Advanced study in modern sociology. The specific topics will be announced at the beginning of each quarter.
Mr. Eberhard, Mr. Petersen, ———— (F); Mr. Trow (W); Mr. Bell, Mr. Selznick, Mr. Clock, Miss Star (Sp); ———— (Su)

297. Special Study. (1–6)
Special study intended to provide opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. The Staff (F, W, Sp, Su)

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 (F, W, Sp, Su)

* Not to be given, 1966–67.
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., Associate 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 B. Stout, Ph.D., Professor of Soil Science, Davis.
Albert Ulrich, Ph.D., Lecturer in Soils and Plant Nutrition.
D. Emeron Williams, Ph.D., Lecturer in Soils and Plant Nutrition.
Paul J. Zinke, Ph.D., Associate Professor of Forestry.

Undergraduate Major Adviser: Mr. Waldron.
Graduate Adviser for Soil Science: Mr. Birkeland.
Graduate Adviser for Plant Physiology: Mr. Broyer.

The Department of Soils and Plant Nutrition in the College of Agriculture offers a major in soils and plant nutrition under the Agricultural Sciences Curriculum (see page 130). The student may select soil science or plant nutrition as a field or emphasis. Both have basic principles and similar requirements in the physical and biological sciences. Students electing the soil science option will take additional geology and soil science courses, while those choosing the plant nutrition option will take biochemistry, plant pathology, and additional plant nutrition courses to satisfy the requirements.

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, 56 units as follows: chemistry, including physical chemistry (30); geology (4); physics (12); analytic geometry and calculus (6); statistics (4).

Biological and Agricultural Sciences, 23 units as follows: biology (15); plant physiology (5); plant ecology (3).

Major Field, 44 units as follows: options—select one of the following fields of emphasis: A. Soil science: additional geology (9); plant nutrition (3); soil science including summer field course (32). B. Plant nutrition: biochemistry (4); plant nutrition (6); plant pathology (4); soil science (30).

Additional courses, 39 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.

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 throughout doctorate study.

For further details, please 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. — (Sp)

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: Chemistry 1A–1B and 8A; Physics 2A–2B–2C; Geology 5A or 10. Introduction to physical, chemical, and biological properties of soil. Mr. Day (F)

101. Development and Morphology of Soils. (4)

Three 1-hour lectures per week. Prerequisite: Geology 10, Chemistry 1A. Recommended: course 100. Climate, vegetation, geology, topography, and time as factors in development and chemistry of great world soil groups. (Sp)

101F. Development and Morphology of Soils. (1)

Field trips. Prerequisite: course 101 should be taken concurrently. Saturday excursions in connection with course 101. Mr. Arkley, Mr. Birkeland (Sp)

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 3-hour laboratory 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, Mr. Birkeland (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 (Extraclass)

110. The Soil as a Medium for Plant Growth. (5)

Four 1-hour lectures per week; one hour conference per week. Prerequisite: Chemistry 1A–1B–1C and 14. Recommended: Geology 10. 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 1½-hour lectures per week; laboratory, eight hours per week. Prerequisite: Biology 1A–1B–1C; Chemistry 5 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)

**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 analysis and plant growth methods; use of fertilizers; soil physical properties related to management problems.

Mr. Ulrich, Mr. Arkley (Sp)

* Not to be offered, 1966–67.
203. Soil Resource Evaluation. (3)
One 2-hour lecture per week; field work. Prerequisite: course 101 or 105; Geology 5A; or consent of instructor. Pedological 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. Birkeland (F)

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. Pedological 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 and in the rhizosphere; mineral nutrition of soil microorganisms and the fate of agricultural chemicals in soil. Origin, nature, and properties of soil organic matter. Mr. McLaren (F)

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)

220. Soil Physics. (5)
Five 1-hour lectures per week. Prerequisite: course 102; Mathematics 1A–18–1C; 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)

297. Individual Study. (1-6)
Prerequisite: consent of instructor. Individual study while preparing for qualifying examinations. The Staff (W)

299. Research in Soil Science. (1-14)
Prerequisite: graduate standing and consent of instructor. The Staff (F, W, Sp, Su)

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 (F, W, Sp, Su)

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 (F, W, Sp)

*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)

280. Advanced Plant Nutrition. (3)
Prerequisite: course 117; Biochemistry 102. Recent advances in knowledge of mechanisms of plant growth; methods of research. ——— (Sp)

297. Individual Study. (1-6)
Prerequisite: consent of instructor. Individual study while preparing for qualifying examinations. The Staff (F, W, Sp, Su)

299. Research in Plant Nutrition. (1-14)
Prerequisite: graduate standing and consent of the instructor. The Staff (F, W, Sp, Su)

Staff Seminar in Plant Nutrition. (No credit)
The Staff (F, W, Sp)

* Not to be offered, 1966–67.
SPANISH AND PORTUGUESE

(Department Office, 4321 Dwinelle Hall)

R. Fernando Alegria, Ph.D., Professor of Spanish.
G. Arnold Chapman, Ph.D., Professor of Spanish (Vice-Chairman of the Department).
Luis Monguió, Licenciado en Derecho, LL.D., Professor of Spanish (Chairman of the Department).
Edwin S. Morby, Ph.D., Professor of Spanish.
Antonio Rodríguez-Monino, Doctor en Filosofía y Letras, Professor of Spanish.
Dorothy C. Shadi, Ph.D., Professor of Spanish.
Charles E. Kany, Ph.D., Professor of Spanish, Emeritus.
José F. Montesinos, Licenciado en Filosofía y Letras, 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.
Rafael Pérez de la Dehesa, Ph.D., Assistant Professor of Spanish.
Michael J. Ruggerio, Ph.D., Assistant Professor of Spanish.

Donald R. Larson, M.A., Acting Assistant Professor of Spanish.
George A. Shipley, Jr., M.A., Lecturer in Spanish.

Departmental Major Advisers: Mr. Kany, Mr. Alegria, Mr. Pérez de la Dehesa, Mr. Ruggerio.

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 (unless course 4 is passed with a grade of A); 25A–25B–25C. 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, 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 (see course listing below) for 107A–107B–107C will be waived for students in the honors program. Students passing an examination in lieu of any of the required courses will be deemed to have satisfied the corresponding requirement for the major, though without obtaining unit credit.

Students shall qualify for honors at graduation by completing with a grade of at least B the special honors course or a three-quarter graduate course. The special honors course (H198A–H198B–H198C) shall be given each quarter. This course shall consist of independent study and the writing of a thesis under the direction of an appropriate member of the department. Each student shall choose his own area of study, subject to the approval of his adviser and of the faculty member who is to direct the study.

Students in the honors program may enroll in one graduate course related to their area of study, provided they obtain the approval of their adviser and of the faculty member teaching the course.

Students failing to maintain a general average of 3.0 and an average of 3.0 in the upper division courses in Spanish shall not be allowed to continue in the honors program.

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 Literatures requires a reading knowledge of Latin, German, French, and Italian, besides Spanish.

Students (other than Berkeley A.B. Spanish majors) applying for admission to graduate work 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 literatures at Berkeley requires an A.B. degree, with a major in Spanish, Italian, or French, equivalent to the respective majors in the University of California, Berkeley, and a reading knowledge of Latin, German, French, Italian, and Spanish, tested by written examinations (as soon as possible after admission to graduate study at Berkeley). While there are no specific course requirements in the doctoral program, students are expected to follow a program of work approved by the graduate adviser. The qualifying examination, success-
ful passing of which is a prerequisite for advancement to candidacy, is a means of ascertaining the student's preparation. Students whose principal interest is literary, and whose emphasis is on Spanish, must have a detailed knowledge of Spanish (including Spanish-American) literature, and an adequate knowledge of French and Italian literature, and of Romance philology. Students whose principal interest is philological should see the statement under Romance Philology. After advancement to candidacy the student must write a doctoral dissertation embodying the results of original research, and pass a final examination concerned with the dissertation and related subjects.

For further details on the requirements for the M.A. degree in Spanish and the Ph.D. degree in Romance languages and literatures see Chapter III of this catalogue, and consult the Graduate Adviser in Spanish, 4321 Dwinelle Hall.

Letters and Science List: for regulations governing this list, see page 72.

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 (F, W, Sp, Su)

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 (F, W, Sp, Su)

3. Intermediate Spanish (Continuation of 2). (5)
   Five 1-hour class meetings per week; laboratory periods to be arranged. Prerequisite: course 2 or equivalent or a satisfactory score on the placement test.
   Mr. Shipley in charge (F, W, Sp, Su)

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. Pérez de la Dehesa in charge (F, W, Sp, Su)

9A–9B. Intermediate Spanish. (4–4)
   Four 1-hour class meetings per week. Prerequisite: course 4 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 (F, W, Sp, Su)

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 (F, W, Sp, Su)

   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. Murillo in charge (F, W, Sp, Su)

39. Spanish and Spanish-American Literature in English Translation. (3)
   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. (3) Mr. Ruggerio, Mr. Shipley (F, Sp)
   39B. Spain: Neo-Classical Period to Present Day. (3) Mr. Ruggerio, Mr. Shipley (W, Su)
   39C. Spanish America: To the End of the Nineteenth Century. (3) Mr. Askins, Mr. Chapman (F, Sp)
   39D. Spanish America: Modernism and the Contemporary Period. (3) Mr. Askins, Mr. Chapman (W, Su)

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.
   *(F)

102. American-Spanish Divergencies from Standard Castilian. (3)
   Three class hours per week.
   *(W)

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. Polt, Mr. Rodriguez-Molina

103C. Study of a Prose Genre of the Nineteenth Century. (4)
   Three class hours per week. Mr. Polt (Sp)
   *(Not to be given, 1966–67.)
Three class hours per week. Required of majors.
Mr. Alegria, Mr. Chapman, Mr. Monguíó, Mr. Torres-Rioseco (F, W, Sp)

105. Modern Peninsular Drama: From the Romantic Movement to the Present. (4)
Three class hours per week. Mrs. Shadi (F)

*106. Spanish Literature of the Eighteenth Century. (4)
Three class hours per week. Mr. Polt (Sp)

107A–107B–107C. History of Spanish Literature to 1700. (3–3–3)
Three class hours per week. Prerequisite: 14 units of upper division literature courses in Spanish. Required of majors.
Sequence beginning (F), Mr. Morby, Mr. Murillo, Mr. Rodríguez-Moñino (F)

108. Introduction to the Ballad. (4)
Three class hours per week. Mr. Askins (Sp)

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. Pérez de la Dehesa

113. Studies in Latin-American Culture. (4)
Three class hours per week.
Mr. Torres-Rioseco (W)

Three class hours per week.
Sequence beginning (F), Mr. Alegria

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. Larson, Mr. Pérez de la Dehesa, Mr. Ruggerio, Mr. Shipley (F, W, Sp, Su)

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

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 (F, W, Sp, Su)

Graduate Courses
(Concerning conditions for admission to graduate courses, see page 125.)
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. 1966–1967: Spanish-American Romanticism.
Sequence beginning (F), Mr. Monguíó

203A–203B–203C. Techniques of Literary Scholarship. (2–2–2)
One 2-hour meeting per week. Sequence beginning (F), Mr. Rodríguez-Moñino

*204A–204B–204C. The Spanish-American Novel. (2–2–2)
One 2-hour meeting per week.
Sequence beginning (F), Mr. Torres-Rioseco

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. Alegria

*208A–208B–208C. The Ballad. (2–2–2)
One 2-hour meeting per week.
Sequence beginning (F), Mr. Montesinos

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),

One 2-hour meeting per week.
Sequence beginning (F), Mr. Montesinos

* Not to be given, 1966–67.
*214A–214B–214C. Modernism in Hispanic–American. (2–2–2)
One 2-hour meeting per week.
Sequence beginning (F), Mr. Torres-Rioseco

*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)

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.
Sequence beginning (F), Mr. Chapman

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. Chapman, Mr. Morby (F, W, Sp, Su)

16. Beginning Spanish for Graduate Students.
(No credit)
Three 1-hour meetings per week. Preparation for the graduate reading examinations.
——— (F, W, Sp)

Portuguese

Lower Division Courses

Duplication of Credit. A student will not be allowed unit credit for that part of Portuguese 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 Portuguese is 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 Portuguese (Beginner’s Course). (4)
Five 1-hour class meetings per week.
Mr. Askins, Mr. Woodbridge (F)

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, Mr. Woodbridge (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, Mr. Woodbridge (Sp)

4. Intermediate Portuguese (Continuation of 3). (5)
Five 1-hour class meetings per week. Prerequisite: course 3 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. Askins, Mr. Woodbridge (F, Sp)

39C–39D. Brazilian Literature in English Translation. (3–3)
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

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 125.)

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)

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)

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)

* Not to be given, 1966–67.
(Department Office, 2125 Dwinelle Hall)

Edward N. Barnhart, Ph.D., Professor of Speech and Lecturer in Psychology.
Robert L. Beloof, Ph.D., Professor of Speech (Chairman of the Department).
Don Geiger,† Ph.D., Professor of Speech.
Richard Hagopian, M.F.A., Professor of Speech.
Lee S. Hultzén, Ph.D., Visiting Professor of Speech.
Gerald E. Marsh, M.A., Professor of Speech.
Anthony Ostroff, M.S., Professor of Speech.
Garff B. Wilson, Ph.D., Professor of Speech and Professor of Dramatic Art.
Edward Z. Rowell, Ph.D., Associate Professor of Speech, Emeritus.
Arnold Perstein, Ph.M., 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.
William F. Shepard, Ph.D., Associate Professor of Speech.
Robert L. Oswalt, Ph.D., Assistant Professor of Speech.
Janette L. Richardson, Ph.D., Assistant Professor of Speech.
Todd G. Willy, Ph.D., Assistant Professor of Speech.

Richard L. Chesney, J.D., Acting Assistant Professor of Speech.
Molly Minehan, M.A., Acting Assistant Professor of Speech.
Rachmael benAvram, M.A., Lecturer in Speech.
Elizabeth F. Russell, Ph.D., Lecturer in Speech.
Fred S. Stripp, Th.D., Lecturer in Speech.

Departmental Major Advisers: Mr. Beloof, Mr. Brandt, Mr. Willy.
Graduate Adviser: Mr. Willy.

The Major


The major shall consist of a total of eight of these 5-unit courses totaling 40 quarter units. Five of these units shall be taken from Group (1), 15 units from Group (2), and 5 units from Group (3). The distribution of the remaining 15 units will be optional under the advice and approval of a departmental major adviser.

Letters and Science List: for regulations governing this list, see page 72.

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 prosegal students will usually be offered each quarter. Sequence beginning each quarter. The Staff (F, W, Sp, Su)

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.

Mr. Wilson, Mr. benAvram, Mr. Hagopian, Miss Minehan, Mr. Chatman (F, W, Sp, Su)

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.

Mr. Chesney (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 (W)

15. Fundamentals of Speech Behavior. (5)
An introduction to the scientific study of speech.

Mr. Hultzen, 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 oral style.

Mr. Stipp, Mr. Tabler, Mr. Wilson (F, W, Sp, Su)

English for Foreign Students
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.

24. Elementary Oral 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 (F, W, Sp, Su)

624A–624B. Elementary Oral English for Foreign Graduate Students. (5)
A reduced course for foreign graduate students to be offered in the fall and winter quarters only. Not open to undergraduates. Sequence course.

The Staff (F, W)

Required of foreign students whose grades on the diagnostic examination indicate need for further instruction in English for University work.

The Staff (F, W, Sp, Su)

28. Advanced Oral English for Foreign Students. (5)
Required of foreign students whose grades on the diagnostic examination indicate need for further instruction in English for University work.

The Staff (F, W, Sp, Su)

40. English Composition for Foreign Students. (5)
Elective course for foreign students with advanced ability in English.

The Staff (F, W, Sp, Su)

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 (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 (F, W, Sp, Su)

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 (Sp)

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 lyric voices in the major American and English literary periods.

Mr. Hagopian, Oral Interpretation Staff (F, Sp)

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.

Mr. Wilson (F, W)

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.

Mr. Wilson, Mr. benAvram
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 reasoning applied to discussion of sociopolitical and related problems. Training in research, systematic discernment and evaluation of issues, in preparation and organization of materials, outlines and briefs, for presentation in oral and written form.

Mr. Beloff (W)

132A-132B. The Art of Argument. (5-5)

Principles of and intensive practice in oral argumentation, in group discussion and in cross-examination. Of special value to those intending to teach Speech. Sequence course.

Mr. Marsh (F, W)

134. Freedom of Speech. (5)

Critical and historical analysis of the main theories and justifications of freedom of expression developed in England and the United States, and of the factors and tests determining its scope and practical exercise.

Mr. Chesney (Sp)

135. British Public Address of the Eighteenth and Nineteenth Centuries. (5)

Critical analysis of the major speakers and agitators in the British Parliament, press, and popular journals, from Lord Belhaven to Joseph Chamberlain.

Mr. Willy (W)

137. American Public Address of the Eighteenth and Nineteenth Centuries. (5)

Critical analysis of the rhetorical practice in the United States from the late colonial period until the Reconstruction. Special emphasis on political and religious agitation.

Miss Minehan (Sp)

*139. Modern Spokesmen. (5)

Writings and speeches of modern spokesmen for major contemporary movements; problems of ideology and ideological conflict, with a special emphasis on the comparison of intellectual perspectives from the realms of politics, social science, and culture.

Miss Minehan (Sp)

140. Rhetorical Theory to 400 A.D. (5)

Mr. Willy (Sp)

141. Rhetorical Theory, 400 to 1700 A.D. (5)

Miss Richardson (Sp)

*142. Rhetorical Theory, 1700 to the Present. (5)

Miss Minehan (Sp)

144. Textual Rhetoric and Argumentation. (5)

An examination of the construction of meaning in speeches and essays by the manipulation of figures and logical devices.

Mr. Brandt (F)

145. Textual Rhetoric and Drama. (5)

A consideration of the way character is created in drama by repetitive rhetorical patterns and the way themes are defined by the manipulation of such patterns.

Mr. Brandt (W)

146. Textual Rhetoric and Poetry. (5)

A consideration of the relationship between the texture of poetic discourse largely defined by figures of speech and overall poetic structures.

Miss Richardson (Sp)

Speech Sciences

150. General Phonetics. (5)

Physical, anatomical, and physiological factors in speech; classical articulatory phonetic theory: modern acoustic phonetics.

Mr. Hultzen (F)

152. Empirical Bases of Literary Interpretation. (5)

The scientific analysis of expressive vocal features beyond simple message-conveyance and their semantic implications in a general framework of literary meaning and explicatory process.

Mr. Chatman (W)

155. Contrastive Language Analysis: English as a Second Language. (5)

Prerequisite: an elementary course in linguistics and one in psychology; preparation in anthropology will be useful, but not mandatory. A native command of English or its equivalent is necessary. Phonological, grammatical and semantic problems in learning English; language learning theory; construction and validation of materials; evaluation of competence; cross-cultural and cross-linguistic comparisons.

Mrs. Ervin-Tripp (Sp)

*160A-160B. Meaning and Communication. (5-5)

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.

--- (F, W)

164A-164B. Speech and Society. (5-5)

Survey of types of speech and discourse; their effects on interpersonal relations, personality development, and social integration; their influence on development and character of social institutions, mores and beliefs; the reciprocal influence of social institutions and speech. Sequence course.

Mrs. Ervin-Tripp (W, Sp)

*165. Cultural Patterns of Discourse. (5)

Cultural factors of communication. Case studies from contemporary societies, literate and nonliterate.

--- (W)

* Not to be given, 1966-67.
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 (F, W, Sp)

H195A–H195B. Honors Course. (5-5)
Prerequisite: Speech majors, senior standing, and on the honors list. A special program which may be substituted for the communication with the approval of the major adviser. Sequence course. 
The Staff (Mr. Brandt in charge) (W, Sp)

H197A–H197B. 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 (W, Sp)

198. Directed Group Studies for Upper Division Students. (1–5)
The Staff (Mr. Beloof in charge) (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (1–5)
Restricted to senior honor students.
The Staff (Mr. Beloof in charge) (F, W, Sp, Su)

Graduate Courses
A prerequisite for all graduate courses is graduate status and approval of the graduate adviser.

*201. Research Problems in Speech. (5)
Selected problems involving the interrelations of the speech arts and sciences. Topics vary from year to year. Open only to students with the M.A. degree in Speech or its equivalent.
The Staff (Sp)

*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 twentieth 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 poetry, 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.
——— (W)

*240. Rhetorical Invention. (5)
Problems in the scope, applications, and divergencies of western theory and practice of rhetorical invention; ethical and aesthetic criteria of invention theory.
Mr. Willy (Sp)

*241. Analytic Techniques for Rhetorical Documents. (5)
Problems and techniques in the analysis of individual modes and general modal patterns of rhetorical practice; emphasis on methodology for research with historical documents in the English language.
Mr. Willy (F)

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 (Sp)

*246. Legal and Constitutional Rhetoric. (5)
Examination of doctrinal changes in such jurisprudential concepts as "right," "motive," "intent," "action," and "freedom," as seen from the interrelated approaches of historical, logical and rhetorical analysis, concentrating on rhetorical form and its relation to logical content in Supreme Court decisions construing constitutional principles.
Mr. Bendich (F)

250. Metrics. (5)
Rhythm as physical fact and psychological perception; the linguistic features available for rhythm; phonological backgrounds—"stress," accent, length,

* Not to be given 1966–67.
juncture in phonetic and phonemic terms; the distinction between meter and recitation; scansion and recitational analysis, semantic aspects of meter.

Mr. Chatman (Sp)

*252. Stylistics. (5)

The linguistic specification of literary style; segmental and suprasegmental phonostylistics of poetic "schemes" and meter; stylistic choice in grammar—morphostylistics, syntactostylistics, stylistic choice in vocabulary—diction, "tropes," and related semantic phenomena.

Mr. Chatman (W)

*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, Mr. Chatman (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.

Mrs. Ervin-Tripp (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 (Mr. Beloof in charge) (F, W, Sp)

297. Individual Study. (1–5)

In consultation with graduate adviser, intended to provide opportunity for qualified students to prepare themselves for the various examinations required for the Ph.D. The Staff (Mr. Beloof in charge) (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.
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.
Roy Radner, Ph.D., Professor of Economics and of Statistics.
Henry Scheffé, Ph.D., Professor of Statistics (Chairman of the Department).
Elizabeth L. Scott, Ph.D., Professor of Statistics.
Aram J. Thomasian, Ph.D., Professor of Statistics and of Electrical Engineering.
Jerzy Neyman, ‡‡ Ph.D., D.Sc.(hon.), LL.D.(hon.), Ph.D.(hon.), Professor of Statistics, Emeritus, and Director of the Statistical Laboratory.
Lester E. Dubins, Ph.D., Associate Professor of Statistics and of Mathematics.
David A. Freedman, Ph.D., Associate Professor of Statistics.
Peter J. Bickel, Ph.D., Assistant Professor of Statistics.
Lawrence D. Brown, Ph.D., Assistant Professor of Statistics.
Gus W. Haggstrom, Ph.D., Assistant Professor of Statistics.
Roger A. Purves, Ph.D., Assistant Professor of Statistics.
Volker Strassen, Ph.D., Assistant Professor of Statistics.

Robert H. Berk, Ph.D., Visiting Assistant Professor of Statistics.
Dennis C. Gilliland, M.S., Lecturer in Statistics.
Gideon E. Schwarz, Ph.D., Visiting Assistant Professor of Statistics.

Departmental Major Adviser: Mr. Barankin.

The Department of Statistics offers the undergraduate a thorough introduction to

* Not to be given, 1966–67.
†† Recalled to active service.
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 195 given to recent developments.

The Major

Lower Division Courses Mathematics 1A–1B–1C, 2A–2B–2C (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.

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), 168, and 169. At least two courses from Mathematics 104A, 104B, 105, 113A, 125A, 128A, 135, and 185. The remaining courses of the 36 upper division units required for the major must be selected in consultation with 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 231).

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. Blackwell, 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 Mr. LeCam.

**Letters and Science List**: for regulations governing this list, see page 72.

**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, W)

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. (W, 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. Blackwell, Mr. Purves (F, W); Mr. Blackwell, Mr. Berk (Sp, Su)

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. Mr. Purves (Sp)

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. Brown (F); Mr. Berk (W); Mr. Freedman (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. Freedman, Mr. Bickel (F); Mr. Barankin, Mr. Hodges (W); Mr. Purves, Mr. Schwarz (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 testing of hypotheses. Probability densities including the normal, \( t \), \( \chi^2 \), and \( F \). 100B, Mr. Friedman (W); Mr. Hodges (Sp) 100C; Mr. Freedman (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 applicational aspects are treated carefully, the more difficult theorems are stated without proof. Useful also for students taking only one quarter. Sequence beginning (F). 130A, (F); Miss Scott (Sp); 130B, (W); 130C, (Sp)

131. **Statistical Inference for Social Scientists.** (4)

Four 1-hour lectures per week. **Prerequisite**: a mathematics course such as Mathematics 190, and a lower division statistics course. 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. Kuznets, (F); Mr. Freedman, (W); Mr. Bickel, (Sp); Mr. Hodges, (Su)

131L. **Laboratory Course in Statistical Inference**

for Social Scientists. (1)

One 2-hour laboratory per week. May be taken only in conjunction with Statistics 131. Mr. Kuznets, (F); Mr. Freedman, (W); Mr. Bickel, (Sp); Mr. Hodges, (Su)
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. Kuznets (W); ——— (Su)

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 (W); ——— (Su)

133. Elementary Probability Theory. (3)
Three 1-hour lectures per week. Prerequisite: Mathematics 2A or consent of the instructor. A brief treatment of the topics in Statistics 134, sufficient for Statistics 135A. Mr. Haggstrom (F)

134. Methods of Probability Theory. (5)
Sec. 1: Five 1-hour lectures per week; Sec. 2: Three 1¼-hour lectures per week; Sec. 3: Two 1-hour lectures and one 1-hour discussion groups meeting plus individual work per week. Prerequisite: Mathematics 2A or consent of instructor. 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. Berk, ——— (F); Sec. 1 and 2: Mr. Purves, Mr. Haggstrom; Sec. 3: Mr. Thomasian (W); Mr. Bickel, ——— (Sp); ——— (Su)

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 credit by students having completed Statistics 130B or 132. 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. Sequence beginning (W).
Mr. Haggstrom (W, 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 132 or 135B. Common nonparametric tests such as the sign test, Wilcoxon test and rank correlation tests. Null distributions and their approximations. Efficiency properties. Estimates based on these statistics.
Mr. Hodges (F)

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. Hodges (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, Hoteling’s T-test, multivariate analysis of variance.
Mr. Hodges (Sp)

165. Introduction to Continuous Probability. (4)
Mr. Barankin (Sp)

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 1½-hour lectures per week. Prerequisite: Mathematics 2B. General theory of zero-sum, two-person games, illustrated by detailed study of examples.
Mr. Blackwell (W)

169. Dynamic Programming. (4)
Two 1½-hour lectures per week. Prerequisite: course 100A or 133 or 134. General theory of dynamic programming, illustrated by detailed study of examples.
Mr. Radner (Sp)

195. Special Topics in Probability and Statistics. (3)
Three 1-hour lectures per week. Prerequisite: consent of instructor. Recent developments of special interest to the instructor exposted as a senior level course.
The Staff (F, W, Sp)

H197. Special Study for Honors Candidates. (1–7)
The Staff (F, W, Sp, Su)

199. Special Study for Advanced Undergraduates. (1–5)
Investigation of special problems under the direction of members of the department. Restricted to senior honors students.
The Staff (F, W, Sp, Su)

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)  
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: Discrete 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.  
Mr. Strassen, Mr. Schwarz, Mr. Berk (F).  
200B–200C. 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. Berk, Mr. Schwarz (W); 200C, Mr. Bickel (F); Mr. Schwarz (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.  
Mr. Strassen, Mr. Schwarz, Mr. Berk (F).  
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. Berk, Mr. Schwarz (W); 200N: Mr. Bickel (F); Mr. Schwarz (Sp)  
201. Mathematical Bases of Probability Theory. (4)  
Three 1-hour lectures per week. Prerequisite: Mathematics 105 or consent of instructor. Probability space, Random variables, Types of convergence, Expectation. Conditional probability and conditional expectation, Danielli-Kolmogorov consistency theorem, Tulcea theorem.  
Mr. Loève (F, Su)  
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. General theory will be developed as needed.  
Sequence beginning (F), Mr. Dubins  
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. Stationarity, ergodic theorems. Elementary Markov chains. Sequence beginning (W), Mr. Loève (W, 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. Brown  
210M. Laboratory for Statistics 210B. (2)  
Two 2-hour laboratories per week. Mr. Brown (W)  
210N. Laboratory for Statistics 210C. (2)  
Two 2-hour laboratories per week. Mr. Brown (Sp)  
216A–216B. Theory of Nonparametric Inference. (3–3)  
Three 1-hour lectures per week. Prerequisite: a year of upper division probability and statistics. Nonparametric and robust methods for problems such as the one- and two-sample problems, the hypotheses of randomness and independence, and problems of testing and estimation occurring in linear models. Asymptotic null distributions, power and efficiency.  
Sequence beginning (W), Mr. Bickel  
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 χ² test, likelihood ratio tests and asymptotically similar tests.  
Sequence beginning (F), Mr. LeCam  
218. Theory of Statistical Decision Functions. (4)  
Mr. LeCam (F)  
230A–230B. Analysis of Variance. (4–4)  
Sequence beginning (F), Mr. Schefé, Mr. Gilliland (F).  
230B, Mr. Schefé, Mr. Gilliland (W)
232. Experimental Design. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 230B. Randomization models. Blocking, confounding, and fractional replication in a× experiments. Response surface exploration.
Mr. Gilliland (Sp)

236A–236B, Analysis of Discrete Observations. (3–3)
Mr. Gilliland

238. Sequential Experimentation. (3)
Two 1-hour lectures and one 2-hour laboratory per week. Prerequisite: one of course 100C, 130B, 132, 135A, 200C. Wald probability-ratio tests. Truncated sequential tests. Sequential design. Industrial inspection. Sequential estimation. Two-stage procedures.
Mr. Haggstrom (Sp)

240. Nonparametric Analysis. (4)
Two 1-hour lectures and two 2-hour laboratories per week. Prerequisite: one of course 100C, 130B, 132, 135A, 200C. Standard nonparametric tests. Emphasis on interpretation rather than proofs. Includes weighted rank tests, normal score tests, Permutation tests. Comparison of tests. Nonparametric estimation.
Mr. Haggstrom (Sp)

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. Mr. Brown (Sp)

248. Inference in Time Series. (4)
Three 1-hour lectures and one 2-hour laboratory per week. Prerequisite: course 230A. 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. LeCam (W)

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. LeCam (W)

257. Probability Models in Biology and Problems of Health. (3)
Three 1-hour lectures per week. Prerequisite: familiarity with concepts of probability and consent of instructor. Clustering of organisms over a habitat. Population dynamics. Competition of species. Epidemiology: with homogeneous exposure and with variable exposure and variable dispersal of infected.
Mr. LeCam (W)

258. Statistical Problems in Modern Research in Astronomy. (3)
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 statistics. Recommended: course 210C or 230A and 236A. Introduction to studies conducted at the Statistical Laboratory, predominantly in biology, health, and astronomy. Material will include novel problems of design, testing, and estimation, frequently unpublished and occasionally unsolved. As need arises, particular sections of statistical theory will be reviewed.
Mr. Neyman (Sp)

261. 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. Schwarz (F)

262. Information Theory. (4)
Three 1-hour lectures per week. Prerequisite: course 203A or 205A. Topics in the Shannon theory of information such as: entropy rate, channel capacity, coding theorems, error bounds, algebraic coding, sequential decoding.
Mr. Thomasian (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. Strassen (W)

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. Strassen (Sp)

273. Topics in the Theory of Second Order Processes. (4)
Mr. Barankin (F)

295. Current Topics 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.
Mr. Freedman (F); — (W); — (Sp)

287. 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. Course to be taken on the satisfactory or unsatisfactory basis. The Staff (F, W, Sp, Su)

298. Seminars.
298A. Current Literature. (3)
Supervised presentation, by students, of current literature. (F); (W); (Sp); (Su)
298B. Special Seminars. (2–6)
Special topics, by means of lectures and informal conferences. Mr. Neyman (F, W); (Sp); (Su)

299. Individual Research Leading to Higher Degrees. (2–6)
The Staff (F, W, Sp, Su)

Colloquium in Probability and Statistics. (No credit)
Meeting for the presentation of original work by members of the staff, visitors, and graduate students. (F, W, Sp, Su)

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. For example, work on astronomy is conducted in cooperation with astronomers at Lick Observatory.

Essentially, every faculty member of the Department of Statistics can use the facilities of the Statistical Laboratory. Its paid personnel consists of a substantial number of research assistants and secretarial help, mostly paid from project funds.

SUBJECT A

(Department Office, 216 Dwinelle Hall Annex)

Committee in Charge:
William S. Anderson, Ph.D., Associate Professor of Latin.
Wallace I. Matson, Ph.D., Professor of Philosophy.

E. James Knapton, M.A., Supervisor of Subject A.

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 25. Training in the principles of composition, sentence structure, grammar, punctuation, and spelling. Weekly compositions and frequent exercises. Sections limited to thirty students.

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.
Jonas E. Gullberg, A.B., Professor of Metrology.
Cadet H. Hand, Jr., Ph.D., Professor of Zoology and Director of the Bodega Marine Laboratory.
The Department of Zoology presents a broad coverage of animal biology, ranging from the more classical disciplines of vertebrate and invertebrate zoology to the more modern and experimental aspects seen in studies of 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) vertebrate anatomy or development (105 or 106), (2) genetics (150 or 151 or Genetics 100), (3) cell physiology (104), and (4) natural history, either vertebrate (107A-B) or invertebrate (108A-B). 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; Math 16A and 16B or equivalent; Physics 2A, 2B, and 2C. Recommended: German, French, additional mathematics, statistics, additional chemistry, biochemistry, and basic courses in other biological sciences. (2) Thirty-six units of upper division courses in Zoology, including (a) 105 or 106, (b) 104, (c) 107A–107B or 108A–108B, (d) 150 or 151 or Genetics 100, (e) additional upper division units to bring total to 36, and including 6 units of laboratory work. For 8 of the additional upper division units (e), substitutions may be made by permission of the major adviser from courses in other natural sciences. (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 proseninar (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 proseninar (Zoology 198) and prepare a thesis (Zoology H196).

Credit Allowance for Lower Division Courses
If Biology 11A-11B is taken after the completion of Botany 10 or Zoology 10, credit is allowed for only half of the sequence, such credit to be withheld until the entire sequence has been completed and then allowed for the last course completed. No credit is allowed for Biology 11A-11B if it is taken after Botany 10 and Zoology 10 have been completed. Biology 1A-1B-1C may be taken for credit after the completion of all or part of Biology 11A-11B or Botany 10 or Zoology 10. No credit is allowed for Botany 10 or Zoology 10 if all or part of Biology 11A-11B or Biology 1A-1B-1C has been completed.

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 (chosen from German, French, or Russian), required for the M.A. A reading knowledge of two of these 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, a course in statistics, and a course at a marine laboratory. All candidates for the Ph.D. must pass an oral examination covering several fields within zoology or related disciplines. 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 communicate the results. 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 72.

Lower Division Course

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. See above for credit allowance in relation to other lower division courses. An outline of the main facts and principles of biology, with special reference to the bearing of biology upon human life.
Mr. Licht (F); Mr. Eakin (W); Mr. Pearson (Sp); ———— (Su)

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. (5)
Two 1½-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. Eakin (F); ———— (Su)

106. Comparative Anatomy of the Vertebrates. (6)
Two 1½-hour lectures, three 3-hour laboratories per week. Prerequisite: Biology 1 or equivalent. Functional and evolutionary significance of the structures of the vertebrate body.
Mr. Quay (W); ———— (Su)

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)

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. Simmons (W); Mr. Hand (Sp)
110A—110B. Cytology (3—3)
Two 1-hour lectures per week. Sequence beginning (F). Both quarters must be completed for credit. Prerequisite: Biology 1ABC or Biology 11AB and Chemistry 1A, 1B. 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 180, working knowledge of microtechnique.
Mr. Alfert (F, W)

111. Experimental Embryology. (4)
Three 1-hour lectures per week. Prerequisite: course 105.
Mr. Berg (W)

111L. Experimental Embryology Laboratory. (4)
Two 4-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)

112. Physiological Embryology. (4)
Three 1-hour lectures per week. Prerequisite: course 105. Recommended: course 111. Reading of research literature and term paper required.
Mr. Berg (F)

*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 (Sp)

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 201A—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.
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. Prerequisite: course 131 or concurrent enrollment therein.
Mr. Licht (Sp)

135. Animal Behavior. (4)
Three 1-hour lectures per week. Prerequisite: Biology 1 or consent of instructor. An introduction to comparative animal behavior and behavioral physiology.
Mr. Barlow (F)

*136. Laboratory Studies of Animal Behavior. (3)
Two 3-hour laboratories per week. Prerequisite: course 135 and consent of instructor. Limited to ten students.

140. Animal Ecology. (4)
Three 1-hour lectures per week. Prerequisite: three quarters of upper division work in biology, 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. (5)
Four 1-hour lectures and one conference per week. Prerequisite: one quarter of biology. Introduction to general genetics.
Mr. Stern (F); ——— (Su)

*150L. Genetics Laboratory. (3)
Two 3-hour laboratories per week. Prerequisite: course 150 (may be taken concurrently). Limited to 24 students.
(Variable)

*151. Human Genetics. (5)
Four 1-hour lectures 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.
Mr. Stern (W); ——— (Su)

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; genetic 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 (F)

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. Natural History of Marine Invertebrates. (8)
Full-time study at Bodega Marine Laboratory in first half of summer quarter, including lectures, laboratory, field work and special problems. Prerequisite: Biology 1, or Biology 11A—11B. Recommended: Zoology 108A—108B. Mr. Hand, Mr. Smith (Su)

* Not to be given, 1966—67.

Zoology 150 and 151 will be alternated, and will not be given concurrently in any quarter.
163. Mammalogy. (4)

Two 1-hour lectures and discussion periods and one 3-hour laboratory per week, plus two weekend field trips. Prerequisite: course 107A–107B. Recommended: course 106. Classification, survey of mammalian orders, field methods of collection.

Mr. Benson (F)

164. Ornithology. (4)

Two 1-hour lectures and two 2-hour laboratories per week, plus field work and papers to be arranged. Prerequisite: course 107A–107B. Anatomy and function in birds from the standpoint of adaptations and systematics. Ordinal and familial groups of the world.

Mr. Ames (W)

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. (4)

Two 1-hour lectures and two 3-hour laboratories per week. Prerequisite: three quarters of upper division work in zoology. Recommended: course 106.

Mr. Barlow (Sp)

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 (F)

173. Field Course in Wildlife and Fisheries. (6)

Approximately 6 hours per day weekdays, including lectures, laboratory and field work. Prerequisite: consent of instructor. Given at Sagehen Creek Field Station, near Truckee, California.

Mr. Leopold (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. Leopold (Sp)

180. Comparative Histology. (4)

Two 1½-hour lectures per week, plus conferences and term paper. Prerequisite: Biology 1 or equivalent. Recommended: 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)

One or two 1-hour lectures, three 3-hour laboratories per week. Prerequisite: course 180 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)

Three 1-hour lectures per week, plus individual conferences. Prerequisite: consent of instructor. Lectures, assigned reading, and individual reports on biological aspects of neoplasia.

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 exercises emphasizing recognition of neoplasms and the laboratory methods appropriate to research on biology of neoplasia.

Mr. DeOme, Mr. Nandi (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. Gullberg (F, W, Sp)

H196. Thesis Course. (3)

Prerequisite: senior standing with an over-all B average, and at least a B average in the major. Restricted to candidates for honors with the A.B. degree. Individual study and research on a special problem to be chosen in consultation with a member of the staff. Preparation of a thesis on broader aspects of this work.

The Staff (Mr. DeOme in charge)

(F, W, Sp, Su)

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. Smith (F); Mr. Licht (W)

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

Prerequisite: background courses in chosen subjects. Restricted to senior honors students.

The Staff (F, W, Sp, Su)

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 work.

201. Molecular and Cellular Aspects of Development. (4)

Three 1½-hour lectures per week. Prerequisite: courses 104, 165, and 150 or equivalent. Advanced treatment of cellular developmental biology. Regulation of cell biosynthesis and differentiation.

Mr. Wilt (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. Allert (Sp)

* Not to be given, 1966–67.
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 (Sp)

*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. Prerequisite: courses 104 and 212, or consent of the instructor. Seminar discussion of recent literature.
Mr. Mazia (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: a course in cytology or histology, or consent of the instructor. Reports and discussion of recent and current studies in ultrastructure research.
Mr. Eakin (Sp)

*219. Seminar in Developmental Biology. (2)
One 2-hour meeting per week. Prerequisite: course 105 or equivalent and course 111, or 112, or 113. Mr. Birky, Mr. Eakin, Mr. Harris, 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.
Mr. Bern (W)

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, osmoregulation, and related processes in invertebrates.
Mr. Smith (W, Sp)

224B. Comparative physiology of nervous and hormonal coordination, activity, sensory physiology, and behavior of invertebrates.

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.

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.

227. Seminar in Comparative Functional Biology of Invertebrates. (2)
One 2-hour meeting per week. Prerequisite: course 224, or consent of instructor. Mr. Smith (F)

231. Seminar in Physiological Ecology. (2)
One 2-hour lecture per week. Prerequisite: consent of instructor.
Mr. Licht (W)

*235. Social Behavior. (3)
Two 1-hour lectures per week. Prerequisite: course 135. Comparative aspects of behavioral interactions and social organization.

237. Seminar in Animal Behavior. (2)
One 2-hour meeting per week. Prerequisite: course 135 or Psychology 150A and consent of the instructor.

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 survey of major communities in California.
Sequence beginning (W) Mr. Paris, Mr. Petelka (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. Petelka (F)

244. Seminar in Animal Ecology. (2)
One 2-hour meeting per week. Prerequisite: course 140 or equivalent, and consent of instructor.

248. Genetic Ecology. (2)
One 2-hour meeting 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. Stern (variable)

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)

* Not to be given, 1966–67.
256. Seminar in Protozoology. (2)
One 2-hour meeting per week, plus outside preparation of papers. Prerequisite: 155 or 255, or consent of instructor.
Mr. Balamuth (Sp)

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. 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, Mr. Smith (W)

260. Chordate Neurology. (4)
Two 1-hour and 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)

267. Seminar on Speciation in Vertebrates. (2)
One 1 1/2-hour meeting per week. Prerequisite: course 259. Emphasis on current literature.
Mr. Benson, Mr. Johnson (F)

267A. Seminar on Speciation in Vertebrates. (2)
One 2-hour meeting per week. Prerequisite: consent of instructor. Biology of major invertebrate groups, topics to vary from year to year. May be repeated.
Mr. Benson, Mr. J. Johnson (F)

269. Vertebrate Review. (2)
One 1-hour and one 2-hour meeting per week. Review of current literature on problems in vertebrate evolution and isolation mechanisms in vertebrates, with emphasis on current literature.
Mr. Benson, Mr. Johnson (F)

270. Vertebrate Review. (2)
One 2-hour meeting per week. Review of current literature on ecology and evolution of higher vertebrates. May be repeated for credit.
Mr. Benson, Mr. Lidicker (W)

275. Seminar in Wildlife Ecology and Population Dynamics. (2)
One 2-hour meeting per week. Prerequisite: course 173 or equivalent.
Mr. Leopold (Sp)

284. Seminar in Biology of Neoplasia. (2)
One 2-hour meeting per week. Prerequisite: courses 181 and 181L, and consent of instructor. Presentation and discussion of current research in biology of neoplasia.
Mr. DeOme, Mr. Nandi, Mr. Bern, Mr. Weiss, Mr. Harris (Sp)

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. Enrollment limited. Theory and critical use of electrical instrumentation.
Mr. Gullberg (variable)

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. Handi, Mr. Bern, Mr. Weiss (Su)

295B. Advanced Marine Invertebrate Natural History. (8 or 16)
Full-time study at Bodega Marine Laboratory for first and/or second half of the summer quarter. Prerequisite: course 108 or 157. Semi-independent investigations of marine invertebrates.
Mr. Hand (Su)

296. Research. (1-12)
Credit awarded according to work planned and accomplished.
The Staff (F, W, Sp, Su)

299. Special Study for Graduate Students. (1-4)
Reading or other advanced study by arrangement with a staff member.
The Staff (F, W, Sp, Su)

Zoology Seminar. (No credit)
Meetings for the presentation of original work by the faculty, visiting lecturers, and graduate students.

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.

* Not to be given, 1966-67.
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 A. Starker Leopold, Acting Director of the Museum, 2593 Life Sciences Building; or 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 A. Starker Leopold, Acting Director of the Museum of Vertebrate Zoology.
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