While every effort is made to ensure the accuracy of the information available at the time copy is prepared for this bulletin, the University reserves the right to make changes at any time without prior notice.

Stanford, California
Requests for mailing of bulletins may be made to the above address. Requests can be filled only if zip code is furnished.

Cost for Courses and Degrees is $3 for each bulletin ordered. Add sales tax for mailings inside California. Courses and Degrees is also sold at the Stanford Bookstore.
### UNIVERSITY CALENDAR

#### AUTUMN QUARTER, 1983

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 26-27</td>
<td>Registration</td>
</tr>
<tr>
<td>Sep 28</td>
<td>Instruction begins</td>
</tr>
<tr>
<td>Sep 29</td>
<td>Conferring of degrees - Summer</td>
</tr>
<tr>
<td>Oct 15</td>
<td>Last day for registration</td>
</tr>
<tr>
<td>Nov 24-27</td>
<td>Thanksgiving recess (no classes)</td>
</tr>
<tr>
<td>Dec 1</td>
<td>Last day for filing A.B., B.S., and B.A.S. applications for January (Autumn) conferral</td>
</tr>
<tr>
<td>Dec 9 (Fri)</td>
<td>Last day for filing advanced degree candidacy applications, A.M., M.S., M.F.A., Educational Specialist and Engineer, for April conferral</td>
</tr>
<tr>
<td>Dec 9 (Fri)</td>
<td>Last day for filing A.M., M.S., Engineer theses, and Ph.D. dissertations for Autumn Quarter</td>
</tr>
<tr>
<td>Dec 12-16</td>
<td>End-Quarter examinations</td>
</tr>
</tbody>
</table>

#### WINTER QUARTER, 1984

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 9 (Mon)</td>
<td>Registration</td>
</tr>
<tr>
<td>Jan 12 (Thurs)</td>
<td>Conferring of degrees - Autumn</td>
</tr>
<tr>
<td>Jan 13 (Fri)</td>
<td>Last day for filing graduate fellowship applications</td>
</tr>
<tr>
<td>Jan 30 (Mon)</td>
<td>Last day for registration</td>
</tr>
<tr>
<td>Jan 31 (Tue)</td>
<td>Last day for filing A.B., B.S., and B.A.S. applications for April (Winter) and June (Spring) conferral</td>
</tr>
<tr>
<td>Feb 20 (Mon)</td>
<td>Observance of Presidents' Day (holiday, no classes)</td>
</tr>
<tr>
<td>Mar 11 (Sun)</td>
<td>Observance of Founders’ Day</td>
</tr>
<tr>
<td>Mar 16 (Fri)</td>
<td>Last day for filing A.M., M.S., Engineer theses, and Ph.D. dissertations for Winter Quarter</td>
</tr>
<tr>
<td>Mar 19-23</td>
<td>End-Quarter examinations</td>
</tr>
</tbody>
</table>

#### SPRING QUARTER, 1984

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 2 (Mon)</td>
<td>Registration</td>
</tr>
<tr>
<td>Apr 3 (Tues)</td>
<td>Instruction begins</td>
</tr>
<tr>
<td>Apr 5 (Thurs)</td>
<td>Conferring of degrees - Winter</td>
</tr>
<tr>
<td>Apr 16 (Mon)</td>
<td>Last day for filing undergraduate scholarship applications, matriculated undergraduates</td>
</tr>
<tr>
<td>Apr 23 (Mon)</td>
<td>Last day for registration</td>
</tr>
<tr>
<td>May 28 (Mon)</td>
<td>Observance of Memorial Day (holiday, no classes)</td>
</tr>
<tr>
<td>June 6 (Wed)</td>
<td>Last day for filing advanced degree candidacy applications, A.M., M.S., M.F.A., Educational Specialist and Engineer, for September conferral</td>
</tr>
<tr>
<td>June 6 (Wed)</td>
<td>Last day for filing A.M., M.S., Engineer theses, and Ph.D. dissertations for Spring Quarter</td>
</tr>
<tr>
<td>June 8-13</td>
<td>End-Quarter examinations</td>
</tr>
<tr>
<td>June 16 (Sat)</td>
<td>Senior Class Day</td>
</tr>
<tr>
<td>June 17 (Sun)</td>
<td>Commencement</td>
</tr>
</tbody>
</table>

#### SUMMER QUARTER, 1984

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 25 (Mon)</td>
<td>Registration</td>
</tr>
<tr>
<td>June 26 (Tues)</td>
<td>Instruction begins</td>
</tr>
<tr>
<td>July 4 (Wed)</td>
<td>Independence Day (holiday, no classes)</td>
</tr>
<tr>
<td>Aug 17-18 (Fri-Sat)</td>
<td>Eight-week term examinations</td>
</tr>
<tr>
<td>Aug 18 (Sat)</td>
<td>Eight-week term closes</td>
</tr>
<tr>
<td>Sept 3 (Mon)</td>
<td>Labor Day (Holiday)</td>
</tr>
<tr>
<td>Sept 4 (Tuc)</td>
<td>Quarter closes</td>
</tr>
</tbody>
</table>

#### 1984-85

<table>
<thead>
<tr>
<th>Registration</th>
<th>Autumn</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer (8-week term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last day of Finals</td>
<td>Sept 24-25</td>
<td>Jan 7</td>
<td>April 1</td>
<td>June 24</td>
</tr>
<tr>
<td>Commencement</td>
<td>Dec 14</td>
<td>Mar 22</td>
<td>June 12</td>
<td>Aug 17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>June 16</td>
<td></td>
</tr>
</tbody>
</table>
CONTENTS

HISTORY OF THE UNIVERSITY .............................................. 6

DEGREES ........................................................................... 8
  Undergraduate Degrees ................................................. 8
  Undergraduate Study at Stanford ................................... 9
  Advanced Degrees ......................................................... 14

COURSES OF INSTRUCTION .............................................. 20

GRADUATE SCHOOL OF BUSINESS .................................... 21

SCHOOL OF EARTH SCIENCES ......................................... 22
  Applied Earth Sciences ................................................ 23
  Geology ........................................................................ 33
  Geophysics .................................................................... 44
  Petroleum Engineering ................................................... 49

SCHOOL OF EDUCATION .................................................. 57

SCHOOL OF ENGINEERING ............................................. 86
  Aeronautics and Astronautics ......................................... 102
  Chemical Engineering .................................................... 116
  Civil Engineering .......................................................... 120
  Electrical Engineering ................................................... 134
  Engineering-Economic Systems ..................................... 155
  Industrial Engineering and Engineering Management ..... 164
  Materials Science and Engineering .............................. 170
  Mechanical Engineering ............................................... 176
  Operations Research ....................................................... 197

SCHOOL OF HUMANITIES AND SCIENCES ......................... 204
  Undergraduate Program in African and Afro-American Studies .............................................. 204
  American Studies .......................................................... 208
  Anthropology .................................................................. 212
  Applied Physics ................................................................ 224
  Art ................................................................................. 230
  Asian Languages ............................................................ 243
  Astronomy Course Program .......................................... 251
  Biological Sciences ....................................................... 254
  Division of Marine Biology, Hopkins Marine Station .............................................. 266
  Committee on Black Performing Arts .......................... 269
  Chemistry ....................................................................... 270
  Chicano Fellows Program .............................................. 278
  Classics ........................................................................... 279
  Communication ............................................................... 289
  Comparative Literature .................................................. 299
  Computer Science ........................................................... 307
  Drama .............................................................................. 323
  Center for East Asian Studies ....................................... 330
  Economics ....................................................................... 339
  English .......................................................................... 358
  Program in Feminist Studies ......................................... 374
  Food Research Institute ................................................ 378
  French and Italian .......................................................... 383
  German Studies ............................................................... 395
  History ............................................................................. 409
  Program in the History of Science ............................... 420
  Program in Human Biology .......................................... 421
  Humanities Special Programs ....................................... 430
  Honors Program in Humanities .................................... 430
  Master of Arts Program in Humanities ........................ 432
  Graduate Program in Humanities .................................. 432
  Medieval Studies ............................................................. 433
  International Policy Studies ......................................... 435
  International Relations .................................................. 437
  Language Laboratory ..................................................... 446
  Center for Latin American Studies ................................ 446
  Linguistics ....................................................................... 449
  English as a Foreign Language ..................................... 459
  Literature in Translation ................................................ 460
  Mathematical Sciences ................................................ 461
  Mathematics ................................................................. 462
  Modern Thought and Literature ................................... 471
  Music ............................................................................. 477
  Philosophy ...................................................................... 484
  Physics ........................................................................... 497
  Political Science ............................................................. 507
  Psychology ...................................................................... 519
  Public Policy Program ................................................... 534
  Religious Studies ......................................................... 535
  Center for Russian and East European Studies .............. 541
  Slavic Languages and Literatures ................................ 542
  Sociology ......................................................................... 549
  Center for Space Science and Astrophysics ................ 565
  Spanish and Portuguese ............................................... 567
  Statistics .......................................................................... 578
  The Program in Structured Liberal Education ............... 586
  Western Culture Program ............................................. 586

Special Programs .............................................................. 588
  Program for Individually Designed Majors .................. 588
  Program on Urban Studies ............................................ 589
  Action Research Liaison Office (ARLO) ......................... 593
  Extradepartmental Undergraduate Programs ................ 594
Freshman-Sophomore
Seminar Programs ........................................... 594
Learning Assistance Center (LAC) ......................... 594
Stanford Workshops on Political
and Social Issues (SWOPSI) ................................. 596
Student Center for Innovation in
Research and Education (SCIRE) ......................... 597
Undergraduate Special Program .............................. 598
SCHOOL OF LAW .................................................. 599
SCHOOL OF MEDICINE .......................................... 601
Allied Medical Sciences:
Division of Physical Therapy ................................ 601
Biochemistry ....................................................... 605
Genetics ............................................................. 607
Health Services Research ...................................... 608
Program in Hearing and Speech Sciences ................. 610
Medical Microbiology .......................................... 612
Neurobiology ...................................................... 614
Pathology ......................................................... 615
Pharmacology ..................................................... 617
Physiology ......................................................... 619
Radiology .......................................................... 621
Structural Biology ............................................... 622
DEAN OF GRADUATE STUDIES AND RESEARCH ........... 624
Interdisciplinary Programs and Committees ................. 624
Graduate Division ................................................. 624
Biophysics Program .............................................. 625
Cancer Biology Program ........................................ 626
Medical Information Sciences ............................... 628
Neurosciences Program ........................................ 632
Special Programs ............................................... 636
Center for Teaching and Learning ............................ 636
Independent Laboratories and Institutes ................... 636
Center for Materials Research (CMR) ....................... 636
Center for Research in International Studies (CRIS) .... 637
Inter-University Center for Japanese Studies in Tokyo .... 638
Inter-University Program for Chinese Language Studies in Taipei .................................................. 638
Center for Economic Policy Research .......................... 639
Center for Research on Women (CROW) ...................... 639
Institute for Energy Studies .................................... 640
W. W. Hansen Laboratories of Physics ....................... 640
Institute for Mathematical Studies in Social Sciences .... 640
LOTS Computer Facility ........................................ 641
Northeast Asia-United States Forum on International Policy (NEXUS) .................................... 641
Stanford Center for Chicano Research ........................ 642
Stanford Humanities Center ................................... 642
Stanford Synchrotron Radiation Laboratory (SSRL) ........ 642
LIBRARIES AND INFORMATION SERVICES ................. 643
Hoover Institution on War, Revolution and Peace ........... 643
Libraries ............................................................ 645
Center for Information Technology ............................ 647
OTHER DEPARTMENTS, INSTITUTES AND PROGRAMS ....... 649
Program in Acoustics and Noise ............................... 649
African Studies ................................................... 650
Athletics, Physical Education, and Recreation .............. 656
Stanford Linear Accelerator Center .......................... 667
Stanford Overseas Studies ..................................... 668
Program in Values, Technology, Science and Society ....... 677
UNIVERSITY PUBLICATIONS ....................................... 685
STATEMENT OF NON-DISCRIMINATORY POLICY ............. 684
APPENDIX ......................................................... 687
INDEX .............................................................. 694
HISTORY OF THE UNIVERSITY

On November 14, 1885, Senator and Mrs. Leland Stanford called together at their San Francisco mansion the 24 prominent men who had been chosen as the first trustees of The Leland Stanford Junior University. They handed to the board the Founding Grant of the University, which they had executed three days before. This document, with various amendments, legislative acts, and court decrees, remains as the University's charter. In bold, sweeping language it stipulates that the objectives of the University are "to qualify students for personal success and direct usefulness in life; and to promote the public welfare by exercising an influence in behalf of humanity and civilization, teaching the blessings of liberty regulated by law, and inculcating love and reverence for the great principles of government as derived from the inalienable rights of man to life, liberty, and the pursuit of happiness."

The University bears the name of the Stanford's only child (although it is usually referred to simply as "Stanford University"). Leland Junior died of typhoid fever in Florence, Italy, in 1884 just before his sixteenth birthday. His parents had come to California in 1852 and, although he was schooled as a lawyer, Mr. Stanford entered the mercantile business with his brothers in the gold fields. They established large scale operations in Sacramento, where Mr. Stanford became a leader in business and politics. He was one of the "Big Four" who built the western link of the first transcontinental railroad and was elected Governor of California and later United States Senator. One of the founders of the Republican Party in California, he was an ardent follower of Abraham Lincoln and is credited with keeping California in the Union during the Civil War.

Almost immediately after the death of their son, the Stanfords decided to found a university in his memory on their vast country estate on the San Francisco Peninsula. Although they consulted with several of the presidents of leading institutions, they were not content to model their university after eastern schools. "Of all the young men who come to me with letters of introduction from friends in the East, the most helpless are college young men," the Governor said. But, as the Stanfords' thoughts matured, their ideas of "practical education" enlarged until they arrived at the concept of producing cultured and useful citizens who were especially prepared for personal success in their chosen professions. In a statement of the case for liberal education that was remarkable for its time, Stanford wrote, "I attach great importance to general literature for the enlargement of the mind and for giving business capacity. I think I have noticed that technically educated boys do not make the most successful businessmen. The imagination needs to be cultivated and developed to assure success in life. A man will never construct anything he cannot conceive."

The cornerstone was laid May 14, 1887, and instruction began October 1, 1891. At the dedication ceremony David Starr Jordan, first president, stressed what has been the constant task of the University: to strengthen its students as individuals so that they are better fitted to serve a leading role in a free society. "We hope," Dr. Jordan said on the opening day, "to give our students the priceless legacy of the educated man, the power of knowing what really is. The higher education should . . . help to free them from the dead hands of old traditions and to enable them to form opinions worthy of the new evidence each new day brings before them."

There were 559 in the first student body, many more than had been expected, and the original faculty of 17 was expanded to 29 for the second year. From the beginning, Stanford was coeducational and, like Johns Hopkins and Cornell, followed the German model of providing graduate as well as undergraduate instruction and stressing research along with teaching. Dr. Jordan installed the major subject system at the outset, and English was the only required entrance subject.

By 1916 the 125 Academic Council members were organized into 26 departments, each independent of the others. Ray Lyman Wilbur, who became the University's third president, undertook the arduous, ten-year job of organizing the departments into schools. Several regroupings occurred thereafter, but since 1948 the School organization has been as follows: Earth Sciences, Education, Engineering, Graduate School of Business, Humanities and Sciences, Law, and Medicine.

Within the seven Schools there are approximately 70 departments. In addition there are 30 institutes, centers, programs, and laboratories that are not organized within the schools. Some of the major ones are the Hoover Institution on War, Revolution, and Peace, the Center for Research in International Studies, the W. W. Hansen Laboratories of Physics, and the Stanford Linear Accelerator Center.

Stanford early acquired a reputation as a strong regional institution, especially at the undergraduate level, but it was not until the mid-1950's, during the administration of President J. E. Wallace Sterling, that national and international status as a major teaching and research university was achieved. Geography, demography, and the federal government's recognition of its stake in graduate education,
based on wartime experience, were contributing factors. In 1930 Stanford granted 41 Ph.D. degrees. By 1950 the number was 100, and in 1982 it was 460.

The University does not use any racial, religious, ethnic, geographic or sex-related quotas in admissions. It is committed to the principles of Affirmative Action in the admission of students and in the employment of faculty and staff. Enrollment in 1982-83 totaled 13,075, of whom 6,556 were undergraduates and 6,519 were graduate students. Blacks, Chicanos and Native Americans numbered 971 undergraduates and 363 at the graduate level. Stanford awarded 4,168 degrees in 1982-83, of which 1,675 were baccalaureate and 2,493 were advanced degrees.

Among the 1,269 faculty members who make up the Academic Council there are 10 Nobel laureates, 11 winners of the National Medal of Science, 75 members of the National Academy of Sciences, 114 members of the American Academy of Arts and Sciences, 37 members of the National Academy of Engineering, 9 members of the National Academy of Education, 11 winners of the National Medal of Science, and 3 Pulitzer prize winners.

On October 12, 1980, the University inaugurated Donald Kennedy as its eighth president. Like Stanford's first president, he too is a widely known biologist and an innovator in education. Dr. Kennedy succeeds Richard W. Lyman whose 10 years in office were as troubled as any since Jordan's time; and yet he presided during a period that not only brought Stanford spectacular growth, but its maturity.

Books on Stanford history that are easily obtained in libraries and some bookstores are:

Allen, Stanford: From the Foothills to the Bay, 1980
Clark, Leland Stanford, 1931
Elliott, Stanford University: The First Twenty-five Years, 1937
Mirrielees, Stanford: The Story of a University, 1959
Mitchell, Stanford University, 1916-1941
Nagel, Jane Stanford: Her Life and Letters, 1975
Stockholm Stanford Memorial Church, 1980
Tuterow, Leland Stanford: Man of Many Careers, 1971

Books about Stanford that are out of print or hard to find are available to scholars from the University Archives, Green Library. The Stanford University Archives manuscript and archival collections now number more than 6 million items.
This section describes requirements for degrees which apply to all students at Stanford University. Special departmental or school requirements are described in the section on the school or department itself.

Candidates are graduated in January, April, June, and September, but all diplomas are awarded in June. No degree will be conferred upon any person who has not spent at least three quarters in resident study at the University. No honorary degrees are given.

To supplement information found in Courses and Degrees, readers are referred to Information, the Stanford University Bulletin published each January and available, without charge, from the Office of the Registrar, Old Union Lobby. Information details Stanford University policies and practices regarding such matters as registration, tuition and fees, leaves of absence, academic standing, the Fundamental Standard and Honor Code, and student services.

### UNDERGRADUATE DEGREES

**BACHELOR OF ARTS (A.B.)**  
**BACHELOR OF SCIENCE (B.S.)**  
**BACHELOR OF ARTS AND SCIENCE (B.A.S.)**

The degree of Bachelor of Arts (A.B.) or the degree of Bachelor of Science (B.S.) is conferred upon the candidates recommended by the Subcommittee on Academic Standing, Petitions, and Exceptions who have applied in advance for graduation and fulfilled the following requirements: (See deadlines in Time Schedule calendar.)

1. Completed 180 (quarter) units of University work.
2. Completed Writing, Distribution and Language Requirements.
3. Completed curricular requirements of at least one major department or program and received the recommendation of the department(s). (Curricula and other special requirements are listed under each department in Courses and Degrees.)
4. Completed at least 45 units (including the last 15) at Stanford. (In special cases, students who have obtained at least 135 units in resident work and have completed major and Writing, Distribution and Language requirements may petition for a waiver of the last 15 quarter units work-in-residence requirement.)
5. Completed three quarters of study in residence.

The degree of Bachelor of Arts and Science (B.A.S.) is conferred, upon election by the student, upon candidates recommended by the Subcommittee on Academic Standing, Petitions, and Exceptions who have applied in advance for graduation. Candidates must fulfill requirements (1), (2), (4) and (5) above, and in addition fulfill requirement (3) in two major departments or programs, one leading to a Bachelor of Arts degree and the other leading to a Bachelor of Science degree.

Entering students may be allowed up to 45 units of credit toward graduation for superior work completed in high school. Such advanced credit will be awarded on the basis of scores achieved on College Board Advanced Placement Examinations, subject to University and departmental approval.

A maximum of 90 quarter units of credit for work done elsewhere may be counted toward the bachelor’s degree at Stanford. (See section on Transfer Credit, Information.)

An undergraduate is limited to a total of twelve (12) courses or thirty-six (36) units, whichever is greater, to be counted toward graduation from the following five extradepartmental programs combined: the Learning Assistance Center (LAC), the Student Center for Innovation in Research and Education (SCIRE), Stanford Workshops on Political and Social Issues (SWOPSI), Undergraduate Special Program, and the Program in Urban Studies. Furthermore, not more than twenty-seven (27) units may be from any one of these programs. There is, however, no limit on the number of courses or units which may be taken from these programs in any given quarter.

An undergraduate is also limited to a total of twelve (12) units of Physical Education activity courses and twenty-four (24) units of ensemble Music courses to count toward graduation. There is no limit for either of these per quarter.

A student may formally declare more than one major within a single baccalaureate (A.B. or B.S.) program. The student may do so either at the time of initial major declaration or, as maybe more advisable given the planning required to complete more than one major, by amending the original declaration. Additional information about the option for multiple majors within a single baccalaureate program is available at the Registrar’s Office.

Candidates who fulfill these requirements in the Schools of Earth Sciences and Engineering, or the Departments of Biological Sciences,
DEGREES

SECOND BACHELOR DEGREE

Stanford does not award a second Bachelor of Arts degree to an individual who already holds a Bachelor of Arts, nor a Bachelor of Science degree to an individual who already holds a Bachelor of Science.

The holder of a Bachelor of Arts degree from Stanford may apply to the Subcommittee on Academic Standing, Petitions, and Exceptions for admission to candidacy for a Bachelor of Science degree, and the holder of a Bachelor of Science degree may apply for candidacy for a Bachelor of Arts degree. Application must be filed prior to entry into the Graduate Division, and the recommendation of the major school or department to be entered is required. A student approved for this program may reregister as an undergraduate and will be subject to the usual rules and regulations affecting undergraduates. Specific requirements may be obtained at the Registrar's Office.

COTERMINAL A.B. AND B.S. DEGREE PROGRAMS

A Stanford undergraduate may work simultaneously toward an A.B. and a B.S. degree. A statement of intention should be filed in the Registrar's Office, Academic Standing, Room 139, Old Union, during the student's tenth or eleventh quarter. This statement should be in the form of a petition and should have the favorable recommendation of the appropriate representatives of the two departments in which the student expects to receive degrees.

In order to qualify for both degrees a student must (1) complete the stated University requirements and the departmental requirements for each degree; and (2) complete 15 full-time quarters (225 units), or three full-time quarters (45 units) after completing 180 units.

Students who complete the academic requirements of both degrees without completing the residence requirements for both, may elect to receive either degree in the major for which that degree is granted and have a notation on their transcripts that they have also completed the requirements of the other major. This does not require the completion of more than 180 units.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

The coterminal degree plan permits a Stanford undergraduate to be admitted to a graduate program as early as the eighth quarter (or upon completion of 105 units) and no later than the end of the eleventh quarter and to study for both bachelor's and master's degrees simultaneously in the same or different departments.

The coterminal student must complete 15 full-time quarters or three full-time quarters after completing 180 units. In addition to the 180 units required for the bachelor's degree, the student must complete the number of units shown on the formal application for master's candidacy (not fewer than 36).

Each degree is applied for separately by the deadline given in the University Time Schedules and calendars. The bachelor's degree may not be conferred after the master's.

University graduate fellowships or assistantships are rarely available to students in this program. Most private and federal graduate fellowships require the applicant to have received the baccalaureate degree.

Information and Petitions for Admission to the Coterminal Degree Program are available in the Graduate Program Office or in the department concerned.

Completed petitions should be submitted to the Graduate Program Office, Building 590, Room 104. The student does not apply through the Graduate Admissions Office.

UNDERGRADUATE STUDY AT STANFORD

A Liberal Education

Like all distinguished universities and most undergraduate colleges, Stanford provides the means for its undergraduates to acquire a liberal education: an education which broadens the student's knowledge and awareness in each of the major areas of human knowledge; significantly deepens it in one or two; and prepares him or her for a lifetime of continual learning in the varied and changing application of knowledge to career and personal life. The distinguishing mark of the University is that its faculty
is engaged in discovering and creating knowledge as well as in disseminating it; thus it offers students an unusually rich and varied set of opportunities to gain a liberal education.

The undergraduate curriculum at Stanford allows considerable flexibility. It permits each student to plan an individual program of study that takes into account personal educational goals consistent with particular interests, prior experience, and future aims. In most cases, however, a liberal education is not preparation for a particular career or profession. Rather, a liberal education equips the graduate for pursuing a richer personal and professional life through the enlargement of mind and spirit. It also develops the rigor of mind needed for professional training.

There is no single liberal education, and the purposes served by the study programs pursued by undergraduates are, quite properly, many and diverse. A governing principle, however, is that all programs of study should achieve some balance between depth of knowledge acquired in specialization and breadth of knowledge acquired through exploration. Guidance as to the limits within which that balance ought to be struck is provided by the University's Distribution Requirements and by the requirements set for major fields of study.

These educational goals are achieved through study in individual "courses" which bring together groups of students examining a topic or subject under the supervision of scholars. Courses are assigned credit units. To earn a bachelor's degree, the student must complete at least 180 units and, in so doing, also complete the Writing Requirement, the Distribution Requirements, the Language Requirement, and the requirements set for major fields of study.

These educational goals are achieved through study in individual "courses" which bring together groups of students examining a topic or subject under the supervision of scholars. Courses are assigned credit units. To earn a bachelor's degree, the student must complete at least 180 units and, in so doing, also complete the Writing Requirement, the Distribution Requirements, the Language Requirement, and the requirements set for major fields of study.

The purpose of the Writing Requirement is to promote effective communication by ensuring that every undergraduate can write clear and effective English prose. Words are the vehicles for thought, and clear thinking requires facility in writing and speech.

The Distribution Requirements provide guidance toward the attainment of breadth and stipulate that a significant share of a student's work must lie outside of an area of specialization. These Requirements ensure that every student is exposed to different ideas and different ways of thinking. They enable the student to approach and to understand the important "ways of knowing"—to assess their strengths and limitations, their uniqueness, and, no less importantly, what they have in common.

Depth, the intensive study of one subject or area, is provided through specialization in a major field of study. The major relates more specifically to a student's personal goals and interests than do the general requirements outlined above. Stanford's curriculum provides a wide range of standard majors through its discipline-oriented departments, a number of interdisciplinary majors in addition to departmental offerings, and the opportunity for students to design their own major programs.

Elective courses, which are not taken to satisfy requirements, play a special role in tailoring the student's program to individual needs. For most students, such courses form a large segment of the work offered for a degree. Within the limitations of requirements, students may freely choose any course which previous studies have prepared them to undertake.

The Language Requirement ensures that every student will gain a basic familiarity with a foreign language. Foreign language study extends the student's range of knowledge and expression in significant ways, providing access to materials and cultures that otherwise would be out of reach.

Following are more detailed descriptions of these various Requirements and the rationales upon which they are based.

THE WRITING REQUIREMENT

All instructors expect that students will express themselves effectively in speech and writing. The Writing Requirement is designed to enable students to satisfy that expectation.

All candidates for the bachelor's degree, regardless of the date they matriculated, must complete two quarters of instruction in written composition or an equivalent. Students should fulfill this Requirement in the first year at Stanford so that its benefits may be fully realized during the rest of their formal education. The Requirement is usually met by taking two courses certified to fulfill it; a list of these courses is available at the Academic Information Center and is distributed to entering undergraduates.

Students scoring 4 or 5 on the CEEB Advanced Placement Test in English are exempted from the Writing Requirement. Students demonstrating sufficient skill in writing in the first quarter may be exempted from the second quarter upon certification by the instructor. These exemptions apply only to freshmen; transfer students are individually informed at matriculation of their status vis-à-vis the Requirement.

Courses available to fulfill the Writing Requirement for all students, regardless of the date they matriculated, are designated (DR:W) in this book.
THE DISTRIBUTION REQUIREMENTS

The Distribution Requirements were revised for undergraduates who entered Stanford in September, 1980, and thereafter. Following are a set of general remarks which apply to both the old and the new 1980 Requirements. Then the new and old Requirements are stated separately.

A. INFORMATION APPLICABLE TO BOTH OLD AND NEW DISTRIBUTION REQUIREMENTS

The Distribution Requirements are an integral part of undergraduate education at Stanford. Their purpose is to introduce students to a broad range of fields and areas of study within the humanities, social sciences, natural sciences, applied sciences and technology. Whereas the concentration of courses in the major is expected to provide depth, the Distribution Requirements have the complementary purpose of providing breadth to a student's undergraduate program. Fulfillment of the Distribution Requirements in itself will not provide a student with an adequate general education any more than acquiring the necessary number of units in the major will qualify the student as a specialist in the field. The major and the Distribution Requirements are meant to serve as the nucleus around which the student is expected to build a coherent course of study by drawing on the options available among the required and elective courses.

The Committee on Undergraduate Studies, under the authority of the Senate of the Academic Council, certifies courses which will fulfill the new Distribution Requirements in the required areas of study. Questions regarding specific courses that satisfy the distribution requirements and distribution status are available at the Registrar's Office. Course planning and advising questions related to the distribution requirements should be directed to the Academic Information Center.

It is the responsibility of each student to see that he or she has fulfilled the Requirements by checking with the Registrar's Office. This check should be made at least two or three quarters before graduation. Specific details about course options are available at the AIC and in the Time Schedule; final choices should be made only after reviewing those details.

Students should be extremely careful to note which set of Distribution Requirements apply to them. This is determined by date of matriculation at Stanford. Finally, note that the Requirements are measured in courses, not units.

B. DISTRIBUTION REQUIREMENTS FOR UNDERGRADUATES WHO ENTERED STANFORD IN AUTUMN QUARTER, 1980, AND THEREAFTER

To fulfill the Distribution Requirements undergraduates who entered Stanford in Autumn Quarter, 1980, and thereafter must take ten courses certified for this purpose in eight areas as follows:

Three sequential courses in the Western Culture Program (students may not mix courses from different sequences for this requirement; students are encouraged to satisfy this requirement as early as possible, preferably in the first year);

One course in each of seven other subject areas which together embrace all areas of the undergraduate curriculum (see below for designated Areas numbered Two through Eight);

At least one of the courses in Areas Two through Eight must be designated as concentrating on a non-Western culture.

The subject areas, and corresponding notational symbols, of these Distribution Requirements are as follows:

Area 1: Western Culture (one three-course sequence) (DR:1)
Area 2: Literature and Fine Arts (DR:2)
Area 3: Philosophical, Social, and Religious Thought (DR:3)
Area 4: Human Development, Behavior, and Language (DR:4)
Area 5: Social Processes and Institutions (DR:5)
Area 6: Mathematical Sciences (DR:6)
Area 7: Natural Sciences (DR:7)
Area 8: Technology and Applied Sciences (DR:7)

NOTE: At least one course must be certified as concentrating on a non-Western culture, and will be designated with an asterisk, e.g., (DR:3*).

Courses certified as meeting the 1980 Distribution Requirements carry a minimum of three units of credit. Normally, a single course will be certified as fulfilling only one Distribution Requirement. Exceptionally, a single course whose content is approximately equally divided between two areas of study may be certified as fulfilling either one of two Distribution Requirements. No single course may fulfill more than one Distribution Requirement for a given student.

For students who entered Stanford in Autumn Quarter, 1980, and thereafter, courses which have been certified as satisfying the Dis-
tution Requirements are annotated according to the symbols above to show how they fulfill the Distribution Requirements. A complete list of courses appears as an Appendix at the back of this bulletin.

C. DISTRIBUTION REQUIREMENTS FOR STUDENTS WHO ENTERED STANFORD FROM AUTUMN QUARTER, 1976, THROUGH SUMMER, 1979-1980

Students in this category must complete the Requirements in the following three areas:

1. The Humanities Requirement, consisting of three courses of at least three units each, chosen from those certified and so marked according to the notations listed below. While highly valuable on other grounds, courses in first-year language study, writing courses, and courses in creative and performing arts may not be certified for this requirement.

2. The Social Sciences Requirement, consisting of three courses of at least three units each, chosen from those certified and so marked according to the notations listed below, and chosen from at least two different departments.

3. The Natural Sciences/Mathematics/Technology Requirement, consisting of three courses of at least three units each, one course of which must be chosen from an area other than the mathematical sciences.

Students who entered Stanford from Autumn Quarter, 1976, through Spring Quarter of the academic year 1979-80 may determine which courses may be applied to the Distribution Requirements for their matriculation date by referring to previous Courses and Degrees bulletins, or by inquiring at the Registrar's Office.

THE LANGUAGE REQUIREMENT

Undergraduates who entered Stanford in September 1982 or thereafter are required to complete the third quarter of first year foreign language study at Stanford. Alternatively, students may demonstrate by a Stanford departmental examination competency at a level comparable to the completion of the third quarter of first year foreign language study at Stanford. Students whom the Office of Undergraduate Admissions determines to have completed the third year course of one foreign language in high school will have satisfied this requirement.

The Major

A variety of major fields of study is available, and within most of them there is considerable latitude for students to attain individual goals. Honors programs, permitting individualized study for the qualified student, are offered in a number of departments and cooperatively among several departments. Students whose educational goals cannot be met in an existing degree program may propose an individually designed major (see below). Undergraduates may select a major at any time and must do so by the time they achieve junior status (86 units completed). All undergraduate major programs listed in Courses and Degrees are open to all students except for certain honors degree programs which require application and admission in advance. Students may change their major at any time upon request; in some fields, though, a late change could easily result in extending the period of undergraduate study.

The fields of study for which degrees may be awarded are listed in Courses and Degrees in the section, "Courses of Instruction." Check individual departmental or program listings for the undergraduate degrees offered and for specific major requirements. If no baccalaureate degree is listed for a field of study, it cannot be offered as a regular undergraduate major.

The minimum requirements for each major field of study are set by the faculty teaching in the subject area. Those requirements usually allow latitude for tailoring a major program to a student's specific educational goals. The responsibility for developing a major program within departmental or program requirements lies ultimately with the individual student, working in consultation with his or her major advisor.

The student pursuing a single degree, either the Bachelor of Arts (A.B.) degree or Bachelor of Science (B.S.) degree, formally may declare more than one major within either program. The student may do that either at the time of initial major declaration or, as may be more advisable given the planning required to complete more than one major, by amending the original declaration. If the student's degree is formally to reflect more than a single major:

1. the student must satisfy the requirements of each major;
2. the courses the student proposes to satisfy the requirements of one declared major may not overlap with those of another declared major, unless
   a) overlapping courses constitute introductory skill requirements (e.g., introductory mathematics or foreign language)
b) overlapping courses enable the student to meet not departmental requirements but rather school requirements (e.g., for two majors within the School of Engineering);

3. at the time the student becomes a degree candidate (i.e., files to graduate) the major departments or programs—each cognizant of the courses the student proposes to satisfy the declared majors and of the limitation of number 2 above—must attest to the student's satisfaction of the pertinent major requirements.

Additional information about the option for multiple and co-equal majors within a single baccalaureate program is available at the Academic Information Center. The following paragraphs provide general guidance to the purpose, structure, and limits of the major.

Students electing the Bachelor of Arts and Science (B.A.S.) degree must fulfill without overlapping courses, as defined above, the requirements of one A.B. and one B.S. major.

PURPOSE OF THE MAJOR

A primary purpose of the major is to enable a student to investigate a subject area to considerable depth. This study in depth contrasts with the breadth of study promoted by the Distribution Requirements and, in many cases, by the student's choice of electives. Work in depth permits practice in critical analysis and the solving of problems. Because of its depth, such study also provides a sense of how knowledge grows and evolves, how it is shaped by time and circumstances, and of its complexity and limitations as well as its power.

A second purpose of the major is to provide a considerable mastery of a subject area or group of subjects. The sense of mastery is fullest when work in the major leads to a culminating and synthesizing experience such as a senior seminar, an undergraduate thesis, or a senior project.

STRUCTURE OF THE MAJOR

The structure of a major should be a coherent reflection of the logic of the discipline it represents. Ideally, the student should be introduced to the subject area through a course providing a general overview. Upper-division courses should build upon lower-division courses. The course of study should, if feasible, aim at giving the student the opportunity and responsibility of doing original, creative work in the major subject as a culmination to the program of study.

LIMITS ON REQUIREMENTS FOR MAJORS

In order to achieve the values of study in depth, a well-structured major should occupy no less than approximately one-third of a student's program (55—65 units).

Similarly, it would be difficult to achieve the values of breadth and exploration if that program occupied more than about two-thirds of a student's program (115—125 units).

Finally, to avoid intellectual parochialism, a major program should not require a student to take more than about one-third of his or her courses from within a single department.

Major requirements in cognate subjects which are essential to the structure of a given major should be counted as part of the major program in applying these guidelines. Departmental or school requirements designed to provide extra-disciplinary breadth should not be counted.

The guidelines set forth here are deliberately general. Detailed implementation needs to take into account the specific needs of a student's program and the nature of the discipline or disciplines involved. The exercise of responsibility in achieving the desired educational balance belongs first with the student who has the strongest interest in the value of his or her education. It belongs secondarily to departments and major programs which must set the requirements of competence in the many majors offered.

PROGRAM FOR INDIVIDUALLY DESIGNED MAJORS

This program is intended for students who are interested in pursuing an area of scholarly inquiry which falls outside the purview of an established academic department or program of the university. For details concerning this program refer to the "Individually Designed Major" section of this bulletin.

Undergraduate Academic Advising

The long-range objective of the advising program is to assist the student in assuming maximum responsibility for his or her academic program and in setting and achieving academic and postgraduate goals. The two major components of the program are: (1) the relationship between the student and advisor; and (2) the Academic Information Center. The Center provides and coordinates information and services which will help the student and advisor to work together toward the establishment and accomplishment of the student's goals.

Freshmen are assigned to general academic advisors according to their residence and the primary academic interest which they have indi-
DEGREES

cated. Each residence where freshmen live offers them the services of a group of advisors representing the major academic disciplines. While freshmen are assigned to one specific advisor, they have easy access to all members of the advising group. Each freshman advisor works with advisees each quarter to plan academic programs; the advisor must sign study list cards for each quarter of the student’s freshman year.

Sophomores who are undecided about their major usually continue to work with the advisor with whom they were associated as freshmen, and that advisor continues to sign the student’s study list. By the time junior status is achieved, undergraduates must declare a major, at which time they are assigned to an advisor from the faculty of the major department or program. Sophomores, juniors, and seniors should continue to consult their advisors for planning of programs every quarter.

The Academic Information Center (AIC), located on the third floor of the Old Union, is an integral part of the advising program. The AIC is the place where advisors and students will be given an answer—or assistance in finding one—to all questions relating to academic matters. Included in the services and resources available are on-call advisors; announcements of fellowships, assistantships, scholarships, and special study programs available at other schools; a complete collection of graduate and undergraduate catalogs from other institutions in the United States and Canada; information on undergraduate degrees at Stanford; guides to schools; a complete collection of graduate and special study programs available at other institutions; general information on programs every quarter.

The AIC also coordinates a pre-preprofessional advising program to provide guidance for students interested in further study in business, law, medicine or allied health fields.

Location: 306 Old Union
 Hours: Monday through Friday, 8:00—12:00 and 1:00—5:00
 Phone: 497-2426.
 Pre-professional phone: 497-1151.

The Learning Assistance Center (LAC) provides counseling on a wide range of efficient learning techniques, study skills and effective reading strategies. It helps students obtain tutoring in courses where they need individual assistance and trains undergraduates to become effective tutors. The LAC has credit courses in learning skills, reading and writing, and tutoring. It is the accrediting agency for all Stanford peer counseling courses. Further information and course listings are in the Undergraduate Programs section of Courses and Degrees.

ADVANCED DEGREES

GENERAL REQUIREMENTS

RESIDENCE REQUIREMENT

University residence for an advanced degree is the time devoted to graduate study measured in terms of full or partial tuition for Stanford registrations rather than in units of credit. If any of the work done at Stanford is on a part-time registration basis, its equivalence to full-time study is determined by tuition payments. The residence requirement for each advanced degree is stated under the individual requirements for that degree in the following pages and is never less than three full-tuition quarters or the equivalent in partial tuition quarters.

Partial Residence Credit—8, 9 or 10 unit tuition is available to graduate students in schools/departments approving less than full tuition. Unit basis registration (3-10 units) is available only to grade students who are members of the Stanford staff; students eligible for TGR; students who with this work will be able to complete course requirements for a master’s or Ph.D. degree; Honors Cooperative students, or full-time teachers in the area. Credit toward the residence requirement of a degree program is based on the percentage of full tuition paid each quarter.

For each advanced degree there is a minimum of work as a graduate student at Stanford. The minimum is listed under each degree and is not less than 36 quarter units. The last units of a degree program, whether for a course, directed reading, research or thesis, are expected to be completed by the time they are assigned to an advisor from the faculty of the major department or program. The minimum is complete. Such a tuition deficiency is calculated in terms of the percentage of full tuition still lacking. For example, a doctoral student who has met 8.62 quarters of the 9.00 of full tuition required will have a tuition deficiency of .38 of a full quarter’s tuition. The outstanding tuition payment will be calculated at the current year’s tuition rates. Note: In the Summer Quarter when tuition is permitted on a unit basis, 15 units are required for the equivalent of a full tuition quarter. Information on the student’s status with respect to residence may be obtained in the Graduate Program Office.
Specific departmental requirements for advanced degrees are listed in the appropriate sections in this bulletin. Doctoral study involving more than one department is described under Graduate Division Special Programs.

CONTINUOUS REGISTRATION

Candidates for advanced degrees are required to enroll for at least three quarters of each year from the time of matriculation until receipt of the degree—the only exception to that requirement being for officially approved leaves of absence. No university action may be completed while a student is on leave, other than a change of major. All graduate students must be registered in the quarter a degree is conferred, with the following exceptions: A student may apply for a master's degree or submit a thesis or dissertation in the quarter immediately following the last registration. To further expedite progress toward degrees, schools and departments have developed guidelines that enable the student to determine when he or she is making satisfactory progress.

Students should consult their department chairmen or, as appropriate, the school dean, in case the expectations of progress in the degree program are unclear. Students who fail to make satisfactory progress will be so informed by their department chairmen or school deans. Failure to correct deficiencies in a timely manner will be cause for dismissal. “Guidelines for Dismissal of Graduate Students for Academic Reasons” were approved by the Senate of the Academic Council in 1982. For details see current Information Bulletin.

CANDIDACY

Candidacy for A.M., M.S., Ed.S., M.F.A., Engineer, D.M.A., and Ph.D. degrees must be approved by the Committee on Graduate Studies of the Academic Council. Candidacy is valid for five years from date of such approval (if it has not been terminated earlier by the major department because of unsatisfactory progress). Candidacy may be renewed by the approval of a new application, or extended upon the recommendation of the major department. All applications or petitions to the Committee on Graduate Studies must be submitted to the major department for approval before being filed with the Graduate Program Office, Building 590, Room 104, Stanford University, Stanford, California 94305.

Masters' and Engineer candidates are expected to apply for candidacy not later than the last day of class of the quarter preceding the quarter in which they expect their degree. Doctoral candidates are expected to apply for candidacy by the end of their second graduate year at this University.

In addition to conventional registration, three other forms of registration are open to eligible graduate students:

REGISTRATION CATEGORIES

(1) Advanced Graduate Registration (AGR): If the student has been admitted to candidacy, registered for all required courses and satisfied the residence requirement, but has not completed the degree, he or she will register in Advanced Graduate Registration (AGR) status for the equivalent of nine units for each of three quarters.

(2) Terminal Graduate Registration (TGR): Students who have been admitted to candidacy, completed their coursework and residence requirement and fulfilled the three quarters of Advanced Graduate Registration (AGR) or the equivalent in full-time registration, may register in Terminal Graduate Registration (TGR) status.

Students who register TGR in any degree program will enroll in a special course (limited to TGR students) in their departments. The instructor for that course will be the student's advisor.

Work on the thesis or other remaining requirements will be evaluated each quarter by the advisor with an “N” or “N—” mark as a measure of continuing academic progress. A hold will be put on the registration of a student who receives two consecutive “N—” grades.

(3) Unit Basis Registration when only a few units or a fractional amount of tuition remain to complete the student's advanced degree requirements.

Eligibility for these forms of registration can be determined by the student at the Graduate Program Office.

Note “Continuous Registration” in requirements above.

MASTER OF ARTS OR MASTER OF SCIENCE

Upon recommendation to the Senate of the Academic Council by the faculty of the major department and the Committee on Graduate Studies, the degree of Master of Arts (A.M.) or Master of Science (M.S.) is conferred on candidates who have satisfactorily completed at least three quarters of work as a graduate student at the University and fulfilled such other requirements as may be prescribed by the school or department concerned. Note: A longer period will be necessary for students who are inadequately prepared or who do not enroll fulltime. (See Partial Residence Credit under Residence Requirement above).

For a second Stanford master's degree an
additional three quarters of residence (full tuition or the equivalent in partial registrations) and an additional unduplicated program of total units of course work normal to that department will be required.

The University minimum unit requirement for the A.M. or M.S. is 36 quarter units earned at Stanford as a graduate. Most departments require more. At the discretion of a major department, this University minimum requirement of 36 graduate units at Stanford may be reduced to 30 on condition that at least 6 quarter units earned elsewhere as a graduate be validated by the department as the equivalent of specific Stanford courses. Such courses must be reported on the application for candidacy, with the name and number of each Stanford course and the number of units allowed at Stanford for the course. The method of validation should be indicated, e.g., transcript information or examination. However, the minimum residence requirement for the A.M. and M.S. remains unchanged.

For admission to candidacy, see Candidacy under "Advanced Degrees" above.

If a thesis is a degree requirement, three copies, each bearing the approval of the instructor under whose supervision it was prepared, must be submitted to the Graduate Program Office on or before the last day of classes in the final quarter of candidacy. Directions for the preparation and submission of theses are available in the Graduate Program Office, Building 590, Room 104.

**MASTER OF FINE ARTS**

**General Regulations**—Upon recommendation to the Senate of the Academic Council by the faculty of the Art Department and the Committee on Graduate Studies, the degree of Master of Fine Arts (M.F.A.) is conferred on candidates who have satisfactorily completed at least three quarters of graduate work at this University and fulfilled such other requirements as may be prescribed by the Art Department.

Details of additional requirements are available in the Art section of this bulletin. For candidacy, see Candidacy under "Advanced Degrees" above.

**MASTER OF BUSINESS ADMINISTRATION**

Upon recommendation to the Senate of the Academic Council by the faculty of the Graduate School of Business and the Committee on Graduate Studies, the degree of Master of Business Administration (M.B.A.) is conferred on candidates who have satisfied the requirements laid down by the faculty of the Graduate School of Business and the University. (Full particulars concerning these requirements will be found in the Graduate School of Business Bulletin.)

**EDUCATIONAL SPECIALIST**

Upon recommendation to the Senate of the Academic Council by the faculty of the School of Education and the Committee on Graduate Studies, the degree of Educational Specialist (Ed.S.) is conferred on candidates who have satisfactorily completed six quarters and 90 units of approved studies of which at least three quarters and 45 units have been done in residence at Stanford.

**ENGINEER**

**General Regulations**—Upon recommendation to the Senate of the Academic Council by the faculty of the major department and the Committee on Graduate Studies, the degree of Engineer is conferred on candidates who have satisfactorily completed six quarters of approved work as a graduate (of which a minimum of three quarters and 36 quarter units must be in residence at Stanford), presented an acceptable thesis, and fulfilled such other requirements as may be prescribed by the major school or department. A longer period may be necessary for students who are inadequately prepared or who do not enroll full-time.

**Admission to Candidacy**—See Candidacy under "Advanced Degrees" above.

**Thesis**—Three copies of the thesis, bearing the approval of the instructor under whose supervision it was prepared, must be submitted to the Graduate Program Office on or before the last day of classes in the final quarter of candidacy. The candidate will be charged a fee for binding three copies of the thesis. Upon acceptance, two copies are sent to the University Library and one to the major department. Directions for the preparation and submission of theses are available in the Graduate Program Office, Building 590, Room 104.

**MASTER OF LEGAL STUDIES**

Admission to candidacy for the Master of Legal Studies degree (M.L.S.), a nonprofessional degree, is granted to not more than six students a year who hold the Doctor of Philosophy degree (Ph.D.) or other non-law doctoral degree, or who have been admitted to a non-law doctoral program and have completed a program of study amounting to 45 quarter-units or 30 term-units of work toward the doctorate and who meet an admission standard equivalent to...
that required of candidates for the Doctor of Jurisprudence degree.

The degree of Master of Legal Studies is conferred upon applicants so admitted to candidacy who, in not fewer than two academic terms in residence and in not more than two consecutive academic years, successfully complete 30 term-units of work in the School of Law, including three first-year courses in the first Autumn term and at least one course or seminar requiring a research paper. All work shall conform to the rules and regulations of the University and of the School of Law.

MASTER OF JURISPRUDENCE

The Master of Jurisprudence (J.M.) is a non-professional degree. Its requirements include successful completion of the first year of law school plus an additional academic year of full-time law study. The J.M. degree terminates a course of study at the Law School. Candidates may elect to take the degree in the early spring of their second year.

Holders of the J.M. degree who at a later date wish to apply for admission to complete the J.D. program may do so, but readmission is not automatic.

DOCTOR OF EDUCATION

Upon recommendation to the Senate of the Academic Council by the faculty of the School of Education and the Committee on Graduate Studies, the degree of Doctor of Education (Ed.D.) is conferred on candidates who have satisfied the academic requirements of the School of Education and the University residence requirement (see Doctor of Philosophy General Regulations). At the announced time in the quarter at the end of which the degree is to be conferred, the candidate must deposit with the School of Education two copies of the dissertation and two copies of an approved abstract of the dissertation (maximum length 350 words). If extra copies of the bound dissertation are desired, extra copies of the manuscript may be submitted for binding with the required two. The candidate will be charged a fee to cover the cost of microfilming the dissertation, binding the copies, and publishing the abstract. This fee is payable at the Cashier’s office on or before the last day of instruction in the final quarter.

Admission to Candidacy—See Candidacy under “Advanced Degrees” above.

DOCTOR OF JURISPRUDENCE

Upon recommendation to the Senate of the Academic Council by the faculty of the School of Law and the Committee on Graduate Studies, the degree of Doctor of Jurisprudence (J.D.) is conferred on candidates who have received the degree of Bachelor of Arts, or its equivalent, from this University or from some other institution of recognized collegiate rank, and who have satisfactorily completed courses in law aggregating the number of units required under the current Faculty Regulations of the School of Law after devoting not less than three academic years thereto, and who otherwise have satisfied the requirements of the University and of the School of Law.

MASTER OF THE SCIENCE OF LAW

Upon recommendation to the Senate of the Academic Council by the faculty of the School of Law and the Committee on Graduate Studies, the degree of Master of the Science of Law (J.S.M.) is conferred upon candidates who have completed one academic year (26 term units) with distinction in accordance with the rules of the University and the School of Law. To be eligible for candidacy a student must hold the J.D. or its equivalent. The degree is primarily designed for those qualified students who are at the Stanford School of Law for independent reasons (e.g., as teaching fellows) and wish to combine work toward the degree with their principal undertakings. (Full particulars concerning requirements may be found in the bulletin of the Stanford Law School.)
DOCTOR OF THE SCIENCE OF LAW

Upon recommendation to the Senate of the Academic Council by the faculty of the School of Law and the Committee on Graduate Studies, the degree of Doctor of the Science of Law (J.S.D.) is conferred upon candidates who hold a J.D. or its equivalent, complete one academic year in residence, and as a result of independent legal research present a dissertation which is, in the opinion of the faculty of the School of Law, a contribution to knowledge. Such work and dissertation shall conform to the rules of the University and the School of Law.

Candidacy is limited to students of exceptional distinction and promise. (Full particulars concerning requirements may be found in the bulletin of the Stanford Law School.)

DOCTOR OF MEDICINE

Upon recommendation to the Senate of the Academic Council by the faculty of the School of Medicine and the Committee on Graduate Studies, the degree of Doctor of Medicine (M.D.) is conferred on candidates who have satisfactorily completed the required curriculum in medicine. (Full information concerning requirements for the M.D. degree will be found in the School of Medicine Bulletin.)

DOCTOR OF PHILOSOPHY

GENERAL REGULATIONS

Academic Regulations—Upon recommendation to the Senate of the Academic Council by the faculty of the major department and the Committee on Graduate Studies, the degree of Doctor of Philosophy (Ph.D.) is conferred on candidates who have demonstrated substantial scholarship, high attainment in a particular field of knowledge, and ability to do independent investigation and present the results of such research.

Residence Requirements—Each candidate is required to complete three years of graduate residence (9 full tuition quarters or the equivalent in partial tuition quarters).

Acceptable work completed elsewhere as a graduate may be applied to this requirement to a maximum of three quarters. A doctoral program may include master's and/or engineer's courses but must show a minimum of 36 unduplicated units for each such degree.

A Stanford graduate student who has already received three quarters of residence credit under these rules may request as much as three additional residence quarters for work to be done at another institution. This work must have prior approval of the department and the Graduate Division. The amount of credit to be earned must be determined before the student begins the course of study.

ADMISSION TO CANDIDACY

By the end of the doctoral student's second graduate year at Stanford he or she is expected to have completed the major department's qualifying procedures and to apply to the University for candidacy. The department certifies the student's readiness for admission by appropriate signatures on the Application for Candidacy form that is then submitted to the Graduate Program Office. If the student's program includes a minor, the certification of that department is required also. The application form must show at least three units of work taken or to be taken with each of at least four or more Stanford faculty members. Candidacy, when approved by the Committee on Graduate Studies, is valid for five years (if not terminated earlier by the major department because of unsatisfactory progress) and may be renewed only upon recommendation of the major department. Until such a recommendation is made by the department and approved by the University, a hold is placed on further registration.

TEACHING REQUIREMENT

A number of departments have a specific requirement for one or more quarters of teaching for the Ph.D. degree. Detailed information is available in the program descriptions in this bulletin.

FOREIGN LANGUAGE REQUIREMENT

The requirement of a reading knowledge of one or more foreign languages is left to the option of individual departments or schools. Fulfillment of the requirement to the satisfaction of the department is shown by the chairman's signature on the Foreign Language Report form. These forms are submitted to the Graduate Program Office.

UNIVERSITY ORAL EXAMINATION

A University oral examination is a requirement of the Ph.D. and is arranged through the Graduate Program Office after the candidate has been admitted to candidacy, shown special ability and a capacity for independent investigation to the satisfaction of the major school or department. The candidate must be registered the quarter the examination is taken. The examination will not exceed three hours, and will not be held during the first two weeks of any quarter or after the last day of classes in any quarter. The Request for an Oral Examination Form must be submitted to the Graduate Program Office at
least three weeks prior to the date proposed for the examination. The purpose of the examination is to test the candidate’s command of the fields of study and to confirm fitness for scholarly pursuits. The examining committee is to be composed of the chairman, appointed by the Dean of Graduate Studies and Research, presiding, and four or more faculty members appointed by the Dean of Graduate Studies and Research to represent the major and minor departments (upon the departments’ recommendation).

The candidate will be certified as having passed the examination if the Examining Committee casts 4 favorable votes out of 5, 4 votes out of 6, 5 votes out of 7, or 6 votes out of 8. Five members present and voting will constitute a quorum.

In the event the Committee votes to fail a student, the Committee chairman, within five days of the examination, transmits to the candidate’s major department a written evaluation of the student’s performance. Within 30 days, after discussion with the student, advisor and appropriate faculty, the chairman of the student’s major department should send the student a written statement indicating final action of the department. Copies of this document and that of the oral examination’s chairman should also be sent to the Dean of Graduate Studies and Research. Detailed guidelines are available in the file prepared for each examining committee.

Dissertation

Submission of a dissertation that demonstrates the candidate’s capacity for independent advanced research to the satisfaction of the school or department concerned is a requirement of the Ph.D. The dissertation must first be approved on behalf of the major school or department by a reading committee consisting of the candidate’s principal advisor and two other members. At least one member of the committee must be from the major department. (For regulations governing membership on dissertation committees, consult the Graduate Program Office.) In most departments, well before the University Oral Examination, the department chairman will appoint this reading committee, using the Appointment of a Ph.D. Dissertation Reading Committee form. Each member of the reading committee signs the signature page of the final copy of the dissertation when he or she is ready to certify that the work is of acceptable scope and quality.

Theses and dissertations are expected to be in English. Any exceptions will need approval of the Graduate Dean prior to commencement of the work. Exceptions will be made only in most unusual circumstances where there is strong scholarly justification for submitting the dissertation in another language.

One member of the committee will read the dissertation in its final submitted form and so certify on the Certificate of Final Reading of Dissertation.

Three copies of the dissertation must be submitted to the Graduate Program Office on or before the last day of classes in the final quarter of candidacy.

The Graduate Program Office will arrange for the microfilming and binding of the dissertation. A negative microfilm copy of the dissertation will be kept on file by University Microfilms, Ann Arbor, Michigan, from whom positive microfilm copies may be ordered. When bound, two copies are filed in the Stanford University Library, and one copy goes to the major department. Any extra copies may be submitted with the three required.

Directions regarding the preparation of the dissertation and the abstract may be obtained from the Graduate Program Office. The candidate will be charged a fee to cover the cost of microfilming the dissertation, binding three copies of the dissertation, plus any extra copies, and publishing the abstract. This fee is payable at the Cashier’s office on or before the last day of classes in the final quarter.
Note—Unless otherwise specified, courses numbered from 1 to 99 inclusive are primarily for first- and second-year undergraduates; from 100 to 199 inclusive, for third- and fourth-year undergraduates; from 200 to 499 inclusive, for graduate students.

Courses in this bulletin are marked to indicate their availability to fulfill Writing and Distribution Requirements for undergraduates entering from Autumn 1980-81 and thereafter. The complete list of courses fulfilling the requirements for the present Academic year will be found in the "Appendix." Graduate students should ignore the assorted (DR:) markings since such requirements do not apply to them.

Amendments to course offerings announced in Courses and Degrees will be found in the Time Schedule, issued quarterly.

SUMMER SESSION

Summer Session courses are eight weeks in length, except in certain departments that offer ten-week courses.

This bulletin includes, for the Summer Session, only those courses that can be tentatively scheduled at this time by each department. For the complete list of courses and faculty, requests should be made for the special Summer Session Bulletin issued each February.

Dean: Robert K. Jaedicke

Associate Deans: Charles A. Holloway, Eugene J. Webb

Assistant Deans: David S. Gordon, Paul R. Johnson, Carol A. Marchick, Jeffrey H. Moore, Robert W. Simon, Gary G. Williams


Associate Professors: Richard P. Bagozzi, Ben S. Bernanke, Douglas T. Breeden, Jeremy I. Bulow, Robert J. Flanagan, George Foster, Joanne Martin, James M. Patell, Lynn W. Phillips, Jerry I. Porras, Mark A. Wolfson


Senior Lecturers: Steven C. Brandt, George G. C. Parker

Lecturers: John R. Berthold, George A. Blackstone, David L. Bradford, Christopher J. Canellos, Robert E. Decker, Kirk O. Hanson, Robert Hessen, F. Pitcher Johnson, Bruce R. Judd, John McMahan, Jeffrey H. Moore, Mary Munter, Richard T. Pascale, Frank Patitucci, Thomas J. Peters, Dennis M. Rohan, Fred B. Shepheard, Peter H. Webb, David B. Zenoff, Cynthia Zollinger


Courtesy Associate Professor: Myra H. Strober

Courtesy Assistant Professor: Timothy F. Bresnahan

The Graduate School of Business, since its founding in 1925, has provided graduate education for careers in management, research, and teaching.

The two-year Master of Business Administration degree program is designed for the student who seeks preparation for a professional career in management. No specific undergraduate major or courses are required for admission, although prospective applicants are encouraged to include one year of college level mathematics in their undergraduate programs. Possible options within the MBA Program are specialties in Health Services Management and in Public Management, as well as programs leading to the joint JD/MBA degrees, and to the MBA degree and Doctorate in Educational Administration.

The Stanford Sloan Program is an intensive one-year course of study for middle management executives leading to the degree of Master of Science in Management. Participants must be sponsored by their company and have demonstrated superior achievement.

Those interested in college teaching and research are served by the Doctor of Philosophy Program.

For detailed information on programs, curricula and faculty write to the Graduate School of Business, Stanford University, Stanford, California 94305 for the current bulletin.
The School of Earth Sciences includes the departments of Applied Earth Sciences, Geology, Geophysics, and Petroleum Engineering. The aims of the school are: (1) to prepare students for careers in the fields of geology, paleontology, geochemistry, geophysics, petroleum geology, engineering, hydrology, petroleum exploration, and environmental studies; (2) to conduct research in the earth sciences; and (3) to provide opportunities for Stanford undergraduates to learn about our planet’s history, to understand the natural resource base that underlies our economy, and to appreciate the geological and geophysical factors that contribute to the quality of our environment.

To accomplish these objectives the school offers a variety of programs adaptable to the needs of the individual student: a four-year undergraduate program leading to the degree of Bachelor of Science; a five-year program leading to the coterminal Bachelor of Science and Master of Science degrees in the social sciences, physical sciences, or engineering; a coterminal master’s degree in one of the Earth Sciences; and a graduate program offering the degrees of Master of Science, Engineer, and Doctor of Philosophy as described below. Details of individual degree programs will be found in the section for each department.

UNDERGRADUATE PROGRAM

For admission to the School of Earth Sciences there are no special examinations or prerequisite course requirements. Any undergraduate student admitted to the University may declare a major in one of the Earth Science departments by contacting the appropriate department office. The student will be assigned to an academic advisor who is prepared to discuss career opportunities and courses in the earth sciences. Our objectives in advising are (1) to help the student define a career goal and (2) as the latter emerges, to help the student identify courses that will help gain entry into the chosen career. The curriculum is quite broad, and aside from essential basic courses, the selection of individual courses is left to the student and the advisor. Majors in all departments are required to take one or more courses in calculus, physics, and chemistry before graduation. Specific requirements for the Bachelor of Science degree are listed under each department. If the student takes the basic science and mathematics courses in high school or during the first year at Stanford, more time will be available during the student’s senior year for participation in advanced courses, seminars, and research projects.

COTERMINAL BACHELOR’S AND MASTER’S DEGREES

The Stanford coterminal degree plan enables an undergraduate to embark on an integrated program of study leading to the master’s degree before requirements for the bachelor’s degree have been completed. This may result in more expeditious progress toward the advanced degree than would otherwise be possible, making the program especially important to earth scientists because the master’s degree provides an excellent basis for entry into the profession. The coterminal plan permits students to be admitted to a graduate program as early as their eighth quarter at Stanford, or after earning 105 units. Under the plan the student may meet the degree requirements in the more advantageous of the following two ways: by first completing the 180 units required for the B.S. degree and then completing the three quarters required for the M.S. degree; or by completing a total of 15 quarters during which all of the requirements for the two degrees are completed. In either case the student has the option of receiving the B.S. degree upon meeting all the B.S. requirements or of receiving both degrees at the end of the coterminal program. Students are encouraged to discuss the coterminal program with their advisors during their junior year. Petitions for admission to the program are available in the Graduate Program Office and additional information is available in the individual departmental offices.

GRADUATE PROGRAM

Admission to the Graduate Program—A student who wishes to enroll for graduate work in the school must be qualified for graduate standing in the University and in addition must be accepted by the School of Earth Sciences. One requirement for admission is submittal of scores on the verbal and quantitative parts of the Graduate Record Exam. Admission to one department of the school does not guarantee admission to other departments.

Faculty Advisor—Upon entering a graduate program the student should report to the head of his or her department, who will arrange with a member of the faculty to act as the student’s advisor. The student, in consultation with the advisor, then arranges a course of study for the
first quarter, and ultimately a complete plan of study for the degree sought.

Financial Aid—Scholarships, fellowships, and research grants are available to students in the School of Earth Sciences. Detailed information is available from the departments. Applications should be filed by January 15 for awards which become effective in Autumn Quarter for the following year.

APPLIED EARTH SCIENCES

Emeriti: Evan Just, Konrad B. Krauskopf (Affiliated Faculty), Frederick C. Kruger, Charles F. Park, Jr., Norman A.D. Parlee (Professors)

Chairman: Marco T. Einaudi
Associate Chairman: George A. Parks
Associate Professor: Stephan A. Graham*, Andre G. Journel, David C. Pollard
Senior Lecturer: George Mader

OFFERINGS

Undergraduate

The Department of Applied Earth Sciences offers an undergraduate major in Applied Earth Sciences with the following programs:

- Earth Resources
- Environmental Earth Sciences
- Land Resources Planning

Graduate

The Department of Applied Earth Sciences offers a graduate major in Applied Earth Sciences with the following programs and options:

- Applied Geomathematics in Petroleum Exploration and Resource Analysis
- Applied Hydrogeology
- Engineering Geology
- Environmental Earth Sciences
- Geologic Remote Sensing
- Geostatistics for Natural Resources Evaluation
- Ore Deposits and Exploration
- Petroleum Geology
- Special Applied Earth Sciences Program

Any program may be taken under the Management Option described in Graduate Programs.

Programs leading to the B.S., M.S., Engineer, and Ph.D. degrees are available with the "special field" designation of the program on the diploma.

A general degree in Applied Earth Sciences is available for students with specialized objectives consistent with the scope of the department. At the graduate level, the department welcomes applicants from any scientific or engineering discipline who are interested in using their training in Applied Earth Sciences.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

EARTH RESOURCES

Earth Resources is a pre-professional program that deals with the origin and character of raw materials produced from the earth such as minerals and metals, petroleum, and water, as well as the strategies and methods that accompany production. Graduates will be prepared to continue into graduate work in business, management, engineering or earth sciences.

The program consists first of a required core that provides basic geological background, analytical tools and an introduction to the subject. In addition, an individual specialization curriculum containing a minimum of 30 units must be designed to develop background and insight into a particular resource group and its production. All programs will be reviewed and approved by the Committee for Earth Resources (Lyon, Journel, Remson).

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 1</td>
<td>Introduction to Earth Resources</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 100</td>
<td>Earth Resources</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 192</td>
<td>Computing in Geology</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 290</td>
<td>Geostatistics for Exploration</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Chem. 31</td>
<td>Chemical Principles</td>
<td>A,W</td>
<td>4</td>
</tr>
<tr>
<td>Econ. 1</td>
<td>Elementary Economics</td>
<td>A,W,S</td>
<td>5</td>
</tr>
<tr>
<td>Eng. 161</td>
<td>Engineering Economy</td>
<td>A,W,Sum</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 1</td>
<td>Interpreting the Earth</td>
<td>A,W,S,Sum</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 80</td>
<td>Rocks and Minerals</td>
<td>S</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 102</td>
<td>Intro. to Field Geology</td>
<td>Sum</td>
<td>3</td>
</tr>
<tr>
<td>Ind. Engr. 133</td>
<td>Industrial Accounting</td>
<td>A,S</td>
<td>4</td>
</tr>
<tr>
<td>Math. 19-23</td>
<td>Analytic Geometry &amp; Calculus</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>or Math. 40</td>
<td>Series</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>O.R. 150</td>
<td>Models and Applications</td>
<td>W,S</td>
<td>4</td>
</tr>
<tr>
<td>Stat. 110</td>
<td>Stat. Models in Engineering and</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>O.R. in Society</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the Physical Sciences</td>
<td></td>
<td>A,S,Sum</td>
<td>4</td>
</tr>
</tbody>
</table>

Total .................................................. 66
Sample Specialization Curricula

Sample 1: Minerals and Metals

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 145</td>
<td>Mineral Economics</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 146</td>
<td>Intro. to Mining Methods</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 150</td>
<td>Extractive Process Metallurgy</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 110</td>
<td>Structural Geology</td>
<td>S</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 161</td>
<td>Crystal Chemistry</td>
<td>W</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 163</td>
<td>Optical Mineralogy</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>Geol. 181</td>
<td>Igneous Petrology</td>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>A.E.S. 120</td>
<td>Intro. to Ore Deposits</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Sample 2: Petroleum

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geol. 151</td>
<td>Sedimentary Geology and Petrology</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 151L</td>
<td>Lab</td>
<td>W</td>
<td>2</td>
</tr>
<tr>
<td>Geol. 110</td>
<td>Structural Geology</td>
<td>S</td>
<td>5</td>
</tr>
<tr>
<td>Gphys 180</td>
<td>Geologial Int. of Refl. Seisms</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 103</td>
<td>Survey of the Energy Industry</td>
<td>A,S</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 152B</td>
<td>Production Technology</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 251</td>
<td>Oil Field Exploration and Dev.</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 298</td>
<td>Decisions Analysis in Petroleum Exp.</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 253</td>
<td>Petroleum Geol. and Exploration</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

ENVIRONMENTAL EARTH SCIENCES

The undergraduate program of study in Environmental Earth Sciences is designed to be pre-professional. Former students have entered graduate programs of study in the city and regional planning, engineering, landscape architecture, law, and science. A careful choice of electives will enable the student to develop expertise in at least one area of environmental interest.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 130,131,132</td>
<td>Environmental Earth Sciences</td>
<td>A,W,S</td>
<td>15</td>
</tr>
<tr>
<td>A.E.S. 284</td>
<td>Engineering Geology</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>Bio. Sci. 40</td>
<td>Evolutionary Biology</td>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>Chem. 31</td>
<td>Chemical Principles</td>
<td>A,W</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 135</td>
<td>Physical Chemical Principles</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 170</td>
<td>Environmental Science and Technology</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Eng. 171</td>
<td>Environmental Planning</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 105</td>
<td>Introduction to Computing</td>
<td>A,W,S,Sum</td>
<td>4</td>
</tr>
<tr>
<td>Geol. 1</td>
<td>Interpreting the Earth</td>
<td>A,W,S,Sum</td>
<td>4</td>
</tr>
<tr>
<td>Geol. 80</td>
<td>Rocks and Minerals</td>
<td>S</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 102</td>
<td>Introduction to Field Geology</td>
<td>Sum</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 193</td>
<td>Intro. to Probability and Statistics in Geology</td>
<td>Win</td>
<td>3-5</td>
</tr>
<tr>
<td>or Stat. 60</td>
<td>Intro. to Statistical Methods</td>
<td>A,W,S,Sum</td>
<td>4</td>
</tr>
<tr>
<td>Math. 19 or 40 series</td>
<td>Analytic Geometry and Calculus</td>
<td>15 series</td>
<td></td>
</tr>
<tr>
<td>Mech. Engr. 137</td>
<td>Air Pollution or</td>
<td>S</td>
<td>3</td>
</tr>
</tbody>
</table>

Total: 87-90

LAND RESOURCES PLANNING

The undergraduate program of study in Land Resources Planning is designed to prepare students for graduate study in city and regional planning, conservation, landscape architecture, law, resource management and allied programs. It is not designed for students intending to enter graduate study in engineering or science. A careful choice of electives will enable the student to develop expertise in at least one area of environmental interest.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 1</td>
<td>Introduction to Earth Resources</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 130,131,132</td>
<td>Environmental Earth Sciences</td>
<td>A,W,S</td>
<td>15</td>
</tr>
<tr>
<td>A.E.S. 133</td>
<td>Measurement of the Environment—Remote Sensing</td>
<td>A</td>
<td>3</td>
</tr>
</tbody>
</table>

One course from:

Bio. Sci. 40 | Evolutionary Biology | A | 5 |
(Or Human Biology 2A may be substituted)

Chem. 31 | Chemical Principles | A,W | 4 |

Civ. Engr. 133 | Introduction to Urban Planning | A | 3 |

Civ. Eng. 170 | Environmental Science and Technology | A | 3 |

Civ. Eng. 171 | Environmental Planning | W | 3 |

Econ. 1 | Elementary Economics | A,W,S | 4 |

Geol. 1 | Interpreting the Earth | A,W,S,Sum | 5 |

Geol. 80 | Rocks and Minerals | S | 5 |

Geol. 102 | Introduction to Field Geology | Sum | 3 |

Math. 19,20 | Analytic Geometry and Calculus | 6 |

Stat. 60 | Introduction to Statistical Models | A,W,S,Sum | 5 |

Total: 87-90

One course from:

Anthro. 146 | Urban Problems in Anthropological Perspective | W |

Soc. 150 | Urban Sociology | W |

Soc. 151 | Population in the American Economy and Society | A |

Urban Studies 160 | Introduction to Urban Design | W |

Urban Studies 175 | Managing Local Government | 4-5 |

Total: 87-90
GRADUATE PROGRAMS

The Department of Applied Earth Sciences graduate programs prepare students for careers focused on application of the earth sciences in mineral resources, energy resources and environmental management. The programs lead to the degrees Master of Science, Engineer, and Doctor of Philosophy. Diplomas designate the program completed. Typical curricula are described below but individually-tailored, interdisciplinary curricula are encouraged.

The department offers two basic program options for M.S. and Engineer degrees, one emphasizing management and the other emphasizing basic sciences and engineering. The management option includes courses in the Graduate School of Business, the Department of Civil Engineering, and the Department of Industrial Engineering.

Graduate students must maintain a B average in the School of Earth Sciences and equivalent status in other schools.

THE HONORS COOPERATIVE PROGRAM

A number of industrial firms, government laboratories, and other organizations participate in the Honors Cooperative Program (HCP), a plan which permits qualified professional employees to register for Stanford graduate courses on a part-time basis.

MASTER OF SCIENCE

The University's requirements for M.S. degrees and M.S. theses are described in the section "Advanced Degrees" of this bulletin. The student should be guided by the following additional department requirements.

1. At least 45 units of course work are required of which not more than 24 units must represent independent work on a comprehensive project or research program. Not more than 10 of the required 45 units may be undergraduate courses (numbered lower than 200) unless specified in a curriculum.

2. The student must complete one core curriculum. The student then completes the 45-unit degree requirement with additional courses, research or one of the available options.

Special core curricula may be formulated by the student in consultation with his or her research advisor. Special core curricula must be approved by the faculty of the department.

3. Either a written report or a thesis is required for all options.

CURRICULA RECOMMENDED FOR THE MASTER'S DEGREE

APPLIED GEOMATHEMATICS IN PETROLEUM EXPLORATION AND RESOURCE ANALYSIS

This program focuses on the use of mathematics and other tools in exploration for petroleum and in analysis of petroleum resource potential on a regional basis.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 192</td>
<td>Computing in Geology</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 193</td>
<td>Intro. to Probability and Statistics in Geology</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 292</td>
<td>Application of Computers in Geology</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 299</td>
<td>Decision Analysis and Regional Resource Appraisal in Petroleum Exploration</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 251</td>
<td>Oil Field Exploration and Development</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>geophys. 180</td>
<td>Geologic Interpretation of Reflection Seismograms</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Pet.Eng. 150A</td>
<td>Well Log Analysis I</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Pet.Eng. 150B</td>
<td>Well Log Analysis II</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 252</td>
<td>Sedimentary Basins</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 253</td>
<td>Petroleum Geology</td>
<td>S</td>
<td>3</td>
</tr>
</tbody>
</table>

In addition to these core courses, students must receive at least 8 units of credit in courses from the following: Geology 251, 253, 254, 278; Petroleum Engineering 151A, 151B, 250; Geophysics 150, 280, 284; Statistics 110, 116, 119, 120.

APPLIED HYDROGEOLOGY

All students in the Applied Hydrogeology Program are expected to have completed a prior degree in a science or engineering discipline, including courses in elementary chemistry and physics, fluid mechanics, analytic geometry and calculus, computer science, statistics, and geology.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 135</td>
<td>Soil Science</td>
<td>alt. A</td>
<td>4</td>
</tr>
<tr>
<td>A.E.S. 255</td>
<td>Introduction to Solute Transport</td>
<td>alt. A</td>
<td>2</td>
</tr>
<tr>
<td>A.E.S. 258</td>
<td>Role of Fluids in Geologic Processes</td>
<td>S</td>
<td>2</td>
</tr>
<tr>
<td>Civ.Engr. 260</td>
<td>Engineering Hydrology</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Civ.Engr. 261C</td>
<td>Soil Moisture and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geol. 230</td>
<td>Hydrogeology</td>
<td>W</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 232</td>
<td>Numerical Methods in Hydrology</td>
<td>A,W,S</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 193</td>
<td>Intro. to Probability and Statistics</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Oper. Res. 152</td>
<td>Introduction to Operations Research I</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>
Additional course units may be chosen to further particular interests, for example, students interested in groundwater geochemistry should consider a course sequence in water chemistry (see Environmental Geochemistry).

ENGINEERING GEOLOGY

The graduate program in Engineering Geology is a two-year program firmly based on an understanding of fundamental processes and of geotechnical considerations relevant to the field. A master's thesis is required.

All students in the Engineering Geology Program are generally expected to have taken courses approximately equivalent to those of the Stanford undergraduate core sequence in Geology, as well as an introductory geomorphology course, general geophysics (Geophys. 190), and Applied Mechanics: Stress Analysis (Engr. 11).

The following courses must be taken for credit:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 280</td>
<td>Physical Processes in Geology</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>A.E.S. 281</td>
<td>Rock Fracture</td>
<td>S</td>
<td>4</td>
</tr>
<tr>
<td>A.E.S. 284</td>
<td>Engineering Geology</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>A.E.S. 286</td>
<td>Engineering Geologic Mapping</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 386A,B,C</td>
<td>Seminars: Engineering Geology</td>
<td>A,W,S</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 221</td>
<td>Photogeology</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 230</td>
<td>Hydrogeology</td>
<td>W</td>
<td>5</td>
</tr>
<tr>
<td>Civ. Engr. 190</td>
<td>Geotechnical Engineering</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 290</td>
<td>Soil Mechanics</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 191</td>
<td>Geophysical Field Techniques</td>
<td>S</td>
<td>4</td>
</tr>
<tr>
<td>Civ. Engr. 282B</td>
<td>Earthquake Engineering II</td>
<td>S</td>
<td>3</td>
</tr>
</tbody>
</table>

Total units required: 40

Students are urged to take or audit additional relevant courses either in the Earth Sciences or in Civil Engineering. The following courses are particularly well suited for engineering geologists:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 135</td>
<td>Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>Civ. Engr. 291</td>
<td>Foundation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 292</td>
<td>Earth Structures</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 293</td>
<td>Experimental Soil Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>Geol. 182</td>
<td>Igneous and Metamorphic Rocks</td>
<td>4</td>
</tr>
<tr>
<td>Geol. 253</td>
<td>Sedimentary Petrology</td>
<td>4</td>
</tr>
<tr>
<td>Geophys. 274</td>
<td>Seismology</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 276A</td>
<td>Seismic Waves: Sources and Propagation</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 264</td>
<td>Sedimentation Problems</td>
<td>3</td>
</tr>
</tbody>
</table>

ENVIRONMENTAL EARTH SCIENCES

All students in the Environmental Earth Sciences Program are expected to have completed a prior degree in science or engineering, including courses in elementary biology, chemistry, physics, calculus, computer science, probability and statistics, geology and field geology.

Requirements for all students in Environmental Earth Sciences:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 130, 131, 132</td>
<td>Environmental Earth Sciences</td>
<td>A,W,S</td>
<td>9</td>
</tr>
<tr>
<td>A.E.S. 233</td>
<td>Measurement of the Environment-Remote Sensing</td>
<td>W</td>
<td>4</td>
</tr>
<tr>
<td>Geol. 221</td>
<td>Photogeology</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

A program comprising 29 additional units of graduate-level courses may be used to design a substantive, coherent program to meet individual interests and career objectives. Typical programs involve additional course work in Applied Hydrogeology, Engineering Geology, Geostatistics for Natural Resources Evaluation, and Remote Sensing.

ENVIRONMENTAL GEOCHEMISTRY

Courses and research opportunities in theoretical and experimental low temperature aqueous chemistry and environmental geochemistry are available in the Departments of Applied Earth Sciences, Civil Engineering, and Geology. Students in any of the A.E.S. core programs, such as Applied Hydrogeology or Ore Deposits and Exploration can take advantage of these opportunities to broaden their program. Students who wish to specialize in aqueous geochemistry still further can do so by arranging an Applied Earth Sciences Special Program tailored specifically to their own interests. Advance correspondence or consultation with the faculty is suggested.

GEOLOGIC REMOTE SENSING

Remote sensing covers a wide range of interactive topics, best understood when studied with a strong geologic background. Specializations may be taken in the following application areas, each with its own set of further requirements: Geobotany, Exploration/Ore Deposits, Exploration/Petroleum, Geomathematics, Hydrogeology, or Environmental Geoscience. Students with non-geologic undergraduate degrees will be expected to correct their deficiencies.

The following courses constitute a core sequence:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 192</td>
<td>Computing in Geology</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 233</td>
<td>Measurement of the Environment</td>
<td>W</td>
<td>4</td>
</tr>
<tr>
<td>A.E.S. 296</td>
<td>Airborne Exploration-Structure</td>
<td>Alt.</td>
<td>S 4</td>
</tr>
<tr>
<td>A.E.S. 297</td>
<td>Airborne Exploration-Lithology</td>
<td>Alt.</td>
<td>S 4</td>
</tr>
</tbody>
</table>
GEOSTATISTICS FOR NATURAL RESOURCES EVALUATION

All applicants to this program are expected to have an undergraduate background in Geology, Mining or Geophysics; or a B.S. in Mathematics or Statistics with interest focused towards applications.

The following courses constitute the core sequence:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus. 200-01</td>
<td>Economic Analysis and Policy</td>
<td>I, II</td>
<td>4-8</td>
</tr>
<tr>
<td>Bus. 210-11</td>
<td>Accounting I, II or I.E. 133. Industrial Accounting</td>
<td></td>
<td>4-8</td>
</tr>
<tr>
<td>Bus. 220</td>
<td>Business Finance</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Bus. 261-62</td>
<td>Decision Sciences I, II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus. 270</td>
<td>Organizational Behavior or I.E. 100. Theory and Management</td>
<td></td>
<td>4-6</td>
</tr>
<tr>
<td>Bus. 301</td>
<td>International Economics and Policy</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Civ. Engr. 145</td>
<td>Construction Equipment and Methods</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Engr. Econ. Sys. 231</td>
<td>Decision Analysis</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Engr. 161</td>
<td>Engineering Economy</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 234</td>
<td>Research and Development Management</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

ORE DEPOSITS AND EXPLORATION

This program is flexible, and students who wish to make substitution for core requirements may petition the faculty with a statement of the justifications.

All students in the program leading to the M.S. (including coterminal) and Ph.D. degrees are required to complete the following core course sequence.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mat. Sci. 181</td>
<td>Thermodynamics and Phase Equilibria or Geol. 275. Solution-Mineral Equilibria</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>A.E.S. 277.</td>
<td>Field Mapping of Mineral Deposits</td>
<td>Spr. vac &amp; Spr. qtr.</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 220.</td>
<td>Advanced Ore Deposits</td>
<td>W</td>
<td>5</td>
</tr>
<tr>
<td>A.E.S. 290.</td>
<td>Geostatistics for Exploration and Development</td>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>Geophys. 191.</td>
<td>Geophysical Field Techniques</td>
<td>S</td>
<td>4</td>
</tr>
</tbody>
</table>

Total | 21 |

In addition to these core courses, the degree candidate will be expected to have taken the following courses (or their equivalents); core courses assume the student has the knowledge provided by this background, and the equivalent of a summer field mapping course.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geol. 163</td>
<td>Optical Mineralogy</td>
<td>W</td>
<td>4</td>
</tr>
<tr>
<td>Geol. 171</td>
<td>Introduction to Geochemistry</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 120.</td>
<td>Introduction to Ore Deposits</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>A.E.S. 192.</td>
<td>Computing in Geology or Comp. Sci. 106. Introduction to Computing</td>
<td>A</td>
<td>3-4</td>
</tr>
<tr>
<td>Geophys. 190.</td>
<td>General Geophysics</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>Geol. 151.</td>
<td>Sedimentary Geology and Petrology</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 181.</td>
<td>Igneous Petrology</td>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 182.</td>
<td>Metamorphic Petrology</td>
<td>S</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 193.</td>
<td>Introduction to Probability and Statistics in Geology</td>
<td>W</td>
<td>3</td>
</tr>
</tbody>
</table>
PETROLEUM GEOLOGY

Petroleum Geology is a broad subject embracing aspects of many subdisciplines of the earth sciences. Students entering the Petroleum Geology M.S. Program will have diverse backgrounds and career interests, and the program is intended to provide flexibility to accommodate these differences. At the same time, the program includes required courses chosen to equip students with concepts and tools fundamental to petroleum geology and exploration.

In addition, each student must have adequate background (usually from a prior degree) in stratigraphy (e.g. Geol. 152), sedimentation (e.g. Geol. 151), structural geology (e.g. Geol. 110), and basic field geology (e.g. Geol. 102). A thesis is required for the M.S. degree.

REQUIRED CORE COURSES

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 251</td>
<td>Oil Field Exploration and Development or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.E. 267</td>
<td>Engineering Valuation and Appraisal of Oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.E.S. 252</td>
<td>Sedimentary Basins</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 253</td>
<td>Petroleum Geology</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 258</td>
<td>Role of Fluids in Geologic Processes</td>
<td>W</td>
<td>2</td>
</tr>
<tr>
<td>Geol. 251</td>
<td>Continental Margins</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 254</td>
<td>Sedimentary Processes, Facies and</td>
<td>alt.</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Depositional Systems</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Geol. 278</td>
<td>Organic Geochemistry</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 190</td>
<td>Geologic Interpretation of Reflection</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Seismograms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pet.Engr. 150A</td>
<td>Well Log Analysis I</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Pet.Engr. 150B</td>
<td>Well Log Analysis II</td>
<td>W</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

In addition to these core courses, the following elective courses offer students the opportunity to further cultivate special interests. Students must take for credit three courses from these electives: Geology 221, 230, 241, 242, 243, 244, 253; Geophysics 150, 262, 280, 284; Applied Earth Sciences 284, 290, 292, 296, 297, 298; Petroleum Engineering 103, 151A, 151B, 152A, 250, 267.

SPECIAL APPLIED EARTH SCIENCES PROGRAM

A program with 45 units of courses approved by the department faculty.

ENGINEER DEGREE

A minimum of two years (six quarters) of graduate study is required. At least one of these years, ordinarily the last, must be spent as a registered student at Stanford. The candidate must complete 90 units of course work, no more than 10 of which may be applied to overcoming deficiencies in undergraduate training. The student must prepare a thesis meeting the approval of the supervising instructor and the University Committee on Graduate Studies.

DOCTOR OF PHILOSOPHY

Objectives—The degree of Doctor of Philosophy is conferred upon candidates who have demonstrated substantial scholarship, high attainment in a particular field of knowledge, and ability to do independent investigation.

Requirements—The University's requirements are described in the section "Advanced Degrees" in this bulletin. A brief summary of additional departmental requirements follows. A complete statement of requirements may be obtained from the office of Applied Earth Sciences.

Graduate students are admitted with a degree goal: M.S., Engineer, or Ph.D. An approved petition is required to change goals. Those with a Ph.D. goal initiate qualifying procedures after earning faculty recommendation, at the end of the first year. After completion of the qualifying procedures, the department may recommend that the student apply to the University for Ph.D. candidacy. Passing of the University Oral Examination and acceptance of a dissertation by the Graduate Division of the University complete the academic requirements for the degree.

The department qualifying procedures involve four steps: completion of core course sequence, faculty recommendation, departmental oral examination and proposal of research project. The first three steps must be completed within the first eighteen months after initial registration.

Courses—The student must pass the M.S. core courses required for his or her option with an average grade of "B" or higher, or demonstrate that he or she has done the equivalent elsewhere. In addition, the student must take a series of courses approved by his or her Program Committee.

Departmental Oral Examination—The student must pass the department oral examination, which is a test of mastery of the major option and at least one related area, by the end of the sixth quarter of graduate work. Mastery is expected at levels of breadth and sophistication sufficient to support Ph.D. work.

Research Proposal Seminar—Before the end of the second year of graduate work, the student must present a short, written, dissertation research proposal and present a seminar to members of his or her faculty Research Advisory Group. The seminar will be followed by a question period. After completion the student should file his Ph.D. candidacy application.

University Oral Examination—After a student has been admitted to candidacy, shown
special ability in his or her field of study and proven capacity for independent investigation to the satisfaction of his or her Research Advisory Group, the student may arrange through the Graduate Program Office for the University oral examination. The examination is a defense of the dissertation, based on a complete manuscript, and administered by a representative of the Graduate Division of the University and four or more faculty members representing the major and minor departments.

Scheduling—Detailed scheduling of all events is left to the student. Normally, a maximum of 4 years of graduate study is allowed and a further year is allowed only if the Department Curriculum Committee is satisfied that the work can be completed in that time.

UNDERGRADUATE COURSES

1. Earth Resources—An introduction to the occurrence and economics of earth resources. Topics include geologic and economic background, fossil fuels, nuclear energy, metals, and non-metallic minerals.

   3 units, Win (Staff) TTh 1:15-2:45

100. Advanced Earth Resources—The economics and management of natural resource projects, including public environmental goods and private mineral fuel recovery operations. Topics include project evaluation, operating strategy, and the effect of governmental policy upon these projects.

   3 units, Spr (Evans) MWF 2 plus lab by arrangement

105. Extractive Process Metallurgy—Introduction to the thermodynamics and fundamentals of metal production processes. Unit processes are dealt with under the following major headings: (a) concentration of minerals, (b) preparation for reduction, (c) reduction to the metal, (d) refining and alloying, and (e) casting. The course also surveys integrated processes, flowsheets, and the general industrial field as applied to important metals. Pre-requisite: Basic chemistry. A term project is required for 3 units credit.

   2-3 units, Aut (Parke) MWF 2:15

120. Introduction to Ore Deposits—A survey course emphasizing the geological environment of ore deposits. Topics include evolution through geologic time: petro-tectonic setting; morphology and structure; mineral associations. Laboratory study includes hand lens inspection of rock suites and discussions with some sessions on interrelationship of plans and cross sections in visualizing three dimensional aspects of ore bodies, alteration patterns and structure. Pre-requisite: Geology 161 or equivalent.

   4 units, Aut (Einaudi) MWF 10
   lab M 1:15-4:05

130. Environmental Earth Sciences I—First of three-course sequence investigating relationship of environmental earth sciences to city and regional planning. Major field project throughout sequence involves preparation of a land-use plan for a selected location. Topics include: environmental data, introduction to city and regional planning, land use determinants, analysis for urban planning, land capability systems, optimization, and weather and climate. No pre-requisites.

   5 units undergraduates, 3 units graduates,
   Aut (Mader, Remson), MWF 11; labs, seminars, and field trips by arrangement

131. Environmental Earth Sciences II—See course sequence description under 130. Topics include: geologic constraints to development, stream and air pollution, environmental systems analysis, responses to landslides, general plan preparation, climatic water balance. Laboratories include computer storage of environmental data, optimization of planning decisions, use of multiple maps in regional planning, and stream pollution. Prerequisite: 130 or consent of instructor.

   5 units undergraduates, 3 units graduates;
   Win (Mader, Remson) MWF 11; labs,
   seminars, and field trips by arrangement

132. Environmental Earth Sciences III—See course sequence description under 130, 131. Topics include: environmental impact studies, waste disposal and sanitary landfill, non-renewable resources and geologic hazards, planning responses to earthquakes, new towns and visionary planners. Laboratories include use of air photos in planning, economics of mineral resources, and site selection for a new community. Prerequisite: 131 or consent of instructor.

   5 units undergraduates, 3 units graduates;
   Aut (Mader, Remson) MWF 11; labs,
   seminars, and field trips by arrangement

133. Measurement of the Environment—Remote Sensing—Survey course covering the methods of rapid reconnaissance of the environment stressing those techniques suited to change-detection. Emphasis on detection of vegetation as an indication of various types of pollution of water and air, potential landslide areas, and evaluating coastal wetland. "Hands-on" use of computer to analyze LANDSAT satellite coverage of campus. Introductory physics recommended. (Graduate students register for A.E.S. 233)

   3 units, Win (Lyon) TTh 2:15
   plus lab 3:15-5:05
135. Soil Science—A survey of principal soil properties and processes, including properties of soil interfaces; physical chemical and microbiological processes; soil genesis and classification. The course is designed for seniors and graduate students majoring in earth sciences and engineering. Prerequisites: freshman calculus, chemistry and physics.

4 units, Aut (Rubin) TTh 3:15-5:05 alternate years, given 1983-84

145. Mineral Economics—Lectures and discussions on the relationship between minerals and the economy and decision making in the mineral industry. Included in the course are elements of commodity analysis, economic feasibility studies and the influence of government policies, national and international, on these evaluations. Case studies methods for minerals, metals and the fossil fuels will be used.

3 units, Win (Staff) by arrangement

146. Mining Methods—An introduction to underground and surface mining methods, mining and materials handling cycle. Ancillary mining problems of water, ventilation, safety and environmental impact will also be discussed. Process of mine feasibility will also be included.

2 units, Aut (Mousset-Jones) 3 hrs. per week by arrangement

192. Computing in Geology—Introduction to computing with stress on geological applications. Topics include FORTRAN programming, file handling, matrix algebra, surface fitting, contour mapping, numerical analysis, and simulation of dynamic systems. Wide variety of applications including petroleum geology, ore deposits, hydrology, and geomorphology.

3 units, Aut (Harbaugh) MWF 10

192A. Computing in Geology—For those well-versed in FORTRAN programming. Same course material as 192 with exception of FORTRAN fundamentals. See time schedule for first class meeting. Prerequisite: thorough facility in FORTRAN.

2 units, Aut (Harbaugh) MWF 10

194. Numerical Methods for Geologists—A course intended for students in all fields of the earth sciences. Topics covered include an introduction to finite differences, finite elements, linear programming and matrix methods in earth sciences. The emphasis is on application to mathematical models. Prerequisite: Introductory calculus.

3 units, Spr (Remson) MWF 9

199. Special Problems in Applied Earth Sciences for Undergraduates—Guided research or reading on special problems.

any quarter (Staff) by arrangement

146. Computing in Geology—Introduction to computing with stress on geological applications. Topics include FORTRAN programming, file handling, matrix algebra, surface fitting, contour mapping, numerical analysis, and simulation of dynamic systems. Wide variety of applications including petroleum geology, ore deposits, hydrology, and geomorphology. 

3 units, Win (Staff) by arrangement

192. Computing in Geology—Introduction to computing with stress on geological applications. Topics include FORTRAN programming, file handling, matrix algebra, surface fitting, contour mapping, numerical analysis, and simulation of dynamic systems. Wide variety of applications including petroleum geology, ore deposits, hydrology, and geomorphology. 

3 units, Aut (Harbaugh) MWF 10

192A. Computing in Geology—For those well-versed in FORTRAN programming. Same course material as 192 with exception of FORTRAN fundamentals. See time schedule for first class meeting. Prerequisite: thorough facility in FORTRAN.

2 units, Aut (Harbaugh) MWF 10

194. Numerical Methods for Geologists—A course intended for students in all fields of the earth sciences. Topics covered include an introduction to finite differences, finite elements, linear programming and matrix methods in earth sciences. The emphasis is on application to mathematical models. Prerequisite: Introductory calculus.

3 units, Spr (Remson) MWF 9

199. Special Problems in Applied Earth Sciences for Undergraduates—Guided research or reading on special problems.

any quarter (Staff) by arrangement

207. Metal Refining and the Nature of Liquid Metals—Metal refining processes and the physical chemistry underlying them. A systematic treatment of unit processes based on types of impurity phases; deals effectively with the fundamentals of such widely different methods as the zone refining of semiconductors, the industrial refining of copper, steelmaking, and the vacuum refining of high temperature alloys. Structures and properties of liquid metals.

3 units, Win (Parlee) MWF 2:15 alternate years, given 1983-84

220. Advanced Ore Deposits—Lectures are designed to integrate field, theoretical, and laboratory data on the origin of ore deposits and application to exploration concepts. Laboratory consists of an introduction to the reflected light microscope, followed by advanced study of rock suites from district collections by hand lens, polished thin section microscopy, X-ray diffraction, electron microprobe and fluid inclusion techniques. Individual projects. Prerequisites: 120, Geology 163, 171.

5 units, Win (Einaudi) MWF 11 plus one lab by arrangement

224. Low Temperature Aqueous Geochemistry—A systematic study of ideas and principles needed for solving quantitative problems in aqueous geochemistry at temperatures near 25°C and atmospheric pressure. The use of thermodynamics in predicting the feasibility and extent of chemical processes such as dissolution and precipitation, hydrolysis and complexation, oxidation and reduction. Emphasis on resolution of general questions into tractable problems and on problem solving and graphic representation of results. Course is based on lectures, problem sets, and discussion of problem solutions. Prerequisites: Geology 171 or equivalent experience with thermodynamics.

3 units, Aut (Leckie) TTh 11, F 2:15

225. Surfaces and Interfaces—Detailed study of the influence of surfaces and interfaces on chemical equilibria in water systems, emphasizing particle size effects on solubility, and adsorption on solids. Useful in geochemistry, water chemistry, hydrology, chemical oceanography, water pollution abatement, etc. Purpose is to provide background necessary for interpretation of observed phenomena and, where possible, for quantitative prediction of effects.

3 units, Spr (Parks) by arrangement

227A. Problems in Applied Aqueous Thermodynamics—A systematic, self-study review of principles and strategies needed for solving quantitative problems in low temperature aquatic thermodynamics and an introduction to the use of computer methods using the
MINEQL family of programs. Course requires completion of a set of homework problems, guided by a small number of lectures and a weekly diagnostic workshop. Prerequisite: 224 or equivalent.

2 units, Win (Parks) by arrangement

227B. Low Temperature Aqueous Thermodynamics—Lectures, student seminars, and a term project on selected subjects in low temperature aqueous thermodynamics. Topics include non-ideality models and correction methods, sources, evaluation and estimation of thermodynamic data, trends in metal complex stabilities, and student-suggested topics submitted the preceding quarter. Prerequisites: 227A and Material Science 181 or equivalent.

3 units, Win (Parks) TTh 9, plus one hour by arrangement


4 units, Win (Lyon) TTh 2:15 Lab 3:15-5:05

251. Oil Field Exploration and Development—Objective is to analyze an actual oil exploration venture and prepare a comprehensive analysis and recommendation that includes interpretation of the geology, well engineering specifications, lease acquisitions, and a financial forecast.

3 units, Spr (Harbaugh, Kourt) W 2:15-4:40

252. Sedimentary Basins—Analysis of the depositional framework and tectonic evolution of sedimentary basins. Topics covered include tectonic and environmental controls on facies relations, synthesis of basin development through time in terms of depositional systems and tectonic settings. Weekend field trip required. Prerequisites: Geology 110, 151; 154 recommended.

3 units, Aut (Graham) TTh 12-1:15

253. Petroleum Geology and Exploration—Course covers basics of petroleum geology origin and occurrence of hydrocarbons and exploration for hydrocarbons. Subjects considered include thermal maturation history in hydrocarbon generation, significance of sedimentary and tectonic setting, principles of accumulation, geological and geophysical exploration techniques, economic considerations, and unconventional hydrocarbon resources. Prerequisites: Geology 110, 151; Geophysics 180 recommended.

3 units, Spr (Graham) TTh 1:15-3:05

255. Introduction to Solute Transport—Processes influencing transport of solutes through porous media; mathematical equations describing transport of reacting solutes and numerical methods for their solution. Course is designed for earth scientists and for engineers interested in water and environmental problems. Prerequisites: freshman chemistry, either Geology 232 or Civil Engineering 201.

2 units, Aut (Rubin) Th 3:15-5:05 alternate years, given 1984-85

258. Role of Fluids in Geologic Processes—An introduction to principles which govern a number of geologic processes in which fluids (groundwater) play an important role. Processes include: regional flow of groundwater, especially in sedimentary basins; movement and entrapment of petroleum; development of anomalous fluid pressures, both high and low; role of fluid in tectonic movements, particularly in controlling friction; hydraulic fracturing as a measure of in-situ stress; transport of chemical constituents by groundwater; and transport of heat by groundwater. Prerequisites: elementary calculus.

2 units, Win (Bredehoeft) Th 3:15

259. Seminar: Ground-Water Investigations—A ground-water investigation and analysis of an undeveloped ground water basin. Objective will be to structure an investigation leading to description and analysis of the system. Each participant will "bid the job" just as if he or she is a consultant, designing a cost effective investigation to provide data to understand the system and design an optimal development.

2 units, Spr (Bredehoeft) by arrangement

276. Seminar: Sedimentary Geology—Discussion of current topics in sedimentary geology.

2 units, Aut (Graham) by arrangement

277. Field Mapping of Mineral Deposits—A seven-day field trip to a specific mineral district in California or Nevada, emphasizing detailed mapping of outcrops, adits and (where possible) underground workings. Students (in Spring Quarter) will prepare the maps and produce a report suitable for presentation to management or for publication. Prerequisite: 120.

3 units, Spr vacation (Einaudi); register Spring Qtr

280. Physical Processes in Geology—A survey of physical processes in geology with special attention to bending, buckling, fracture, and flow of rock. The basic tools of a continuum mechanical approach to these phenomena will be introduced including stress and strain analysis, constitutive properties of rock, elastic deformation, plasticity, viscous flow, and heat transport. Each subject will be developed with problems from engineering and structural geology for which elementary solutions are available from the literature of continuum mechanics.
Emphasis will be on a physical understanding of the fundamental equations of each subject and applications to geological problems. Prerequisites: Calculus.

4 units, Aut (Pollard) MWF 9

281. Rock Fracture—Survey of the nature, origin, and physical behavior of joints, faults, and other fractures in rock. Field observations, principles of fracture mechanics, and the elastic theory of cracks are developed to form a basis for interpreting fractures in outcrop and on maps. The important roles of fractures in rock deformation, fluid motion, and heat transportation in the Earth are considered. Potential applications include earthquake and volcanic hazard assessment, nuclear waste isolation, geothermal energy and oil recovery, structural and tectonic analysis. This course is designed for students of engineering geology and structural geology. Prerequisites: 280, Introductory Calculus.

4 units, Spr (Pollard) MWF 10

284. Engineering Geology—Application of geologic and hydrologic factors in location, design, and construction of engineering works. Emphasis on solution of real problems through effective interaction among geoscientists and engineers. Lectures, seminars, and field trips.

4 units, Aut (Jahns) TTh 10; field trips and seminars by arrangement

285B. Engineering Geology of Quaternary Sediments—Analysis of several geologic settings or sites, varying from Mexico City, to the Lower Mississippi Valley, to the High Sierra, in which fluvial, lacustrine, or glacial sediments have had a major and well documented influence on the planning, engineering, and performance of civil works such as buildings, tunnels, land fills, and dams.

3 units, Win (Staff, Rich) TTh 9; not given 1983-84

286. Engineering Geologic Mapping—Detailed field work and preparation of an engineering-geologic map and a stability-analysis map of one of the many fascinating areas of ground instability near Stanford. Mostly independent work, requiring about 8 hours of field time per week. Some prior field experience is desirable but soils engineers without field experience are welcome.

3 units, Spr (Jahns) by arrangement


5 units, Aut (Journel) TTh 10-12; plus lab by arrangement

291. Practice of Geostatistics on Simulated Deposits—The course is based on a numerical model of a deposit. Teams of students receive a budget for drillholes and the same geological information. The deposit is studied through maps, variograms, kriging. Economic feasibility is performed from the estimates of recoverable reserves. All results are checked against underlying reality. Prerequisites: 290, Fortran programming.

5 units, Win (Journel) by arrangement

292. Research in Geological Computing—Extension topics introduced in 192 with opportunity for extended individual research. Course may be repeated for credit. Prerequisite: 192.

3 units, Win (Harbaugh) TTh 10

293B,C. Topics in Advanced Geostatistics—Topics chosen from the following: Conditional expectations and non-linear kriging as projections in Hilbert spaces; Parametric vs. non-parametric estimation of spatial distributions; Conditional simulations of deposits and reservoirs; Convex analysis for production optimization with quality control. Course may be repeated for credit. Prerequisites: 290, Advanced calculus.

3 units, Win, Spr (Journel) by arrangement

295A,B,C. Seminar: Remote Sensing in Exploration—Weekly two-hour for discussion of recent advances covering all aspects of remote sensing, especially those which may be applied to mineral exploration. Open to all interested participants, who will be expected to cover some pertinent aspect of the field for review and presentation. No prerequisites. Pass-Fail grading. Sequence may be repeated.

1 unit, Aut, Win, Spr (Lyon) F 12-2

296. Airborne Exploration: Structural Mapping—Advanced interpretation of photographic and radar images of large-area features, for regional reconnaissance. The effect of varying sun angles and radar look-directions, of flight altitudes, scales and seasons will be evaluated. Includes laboratory analysis of imagery (satellite and aircraft) designed to extract the maximum of structural information from an area. Field analysis. Prerequisite: 133, Geology 221, or equivalent.

4 units, Spr (Lyon) TTh 2:15 and lab TTh 3:15-5:05

alternate years, given 1984-85

297. Airborne Exploration: Lithologic Mapping—An advanced course covering the multi-
spectral and multitemporal response of terrain (rock, soil, vegetation and water) from ultraviolet to infrared and microwave energy, principally for use as an exploration tool. Spectral and temporal signatures will be stressed as means of determining rock lithologies directly. Geobotanical and biogeobotanical aspects will be covered. Labs supported by field measurements, and data analysis. Prerequisite: 133, Geology 221, or equivalent.

4 units, Spr (Lyon) TTh 2:15 and lab TTh 3:15-5:05 alternate years, given 1983-84


3 units, Win (Harbaugh) MWF 11

299. Special Problems in Applied Earth Sciences—Individual research or guided reading on special problems. any quarter (Staff) by arrangement

300. Advanced Work in Applied Earth Sciences—Individual work on a dissertation, thesis, or master's report. any quarter (Staff) by arrangement

320A,B. Seminar and Field Trip: Ore Genesis—Research aimed at understanding the features and processes related to a particular class of mineral deposits. Topics will be selected on basis of participant interest and timeliness. Field trip planning and guidebook prepared in Winter. Field trip (1-2 weeks) Win or Spr. Students prepare papers and make oral presentations. Prerequisite: 220 or may be taken concurrently.

2 units, Win, Spr (Einaudi)

386A,B,C. Seminars: Engineering Geology—Selected topics. Course may be repeated for credit.

1-2 units, Aut (Jahns)

Win (Pollard)

Spr (Jahns)

390A,B,C. Seminar: Geostatistics—Discussion of classic and current research in geostatistics. Topics selected on basis of interest and timeliness. May be repeated for credit.

1 unit, Aut, Win, Spr (Journel) by arrangement
maximum of 64-67 units. Letter grades are required in geology core courses and in chemistry, physics, and mathematics. All undergraduate geology majors are expected to complete the core course sequence, regardless of their intended subsequent specialization in geology. The core course sequence is as follows:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Qtr</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sophomore Year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geol. 1.</td>
<td>Interpreting the Earth</td>
<td>W, S</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 2.</td>
<td>Earth History</td>
<td>W</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 80.</td>
<td>Rocks and Minerals</td>
<td>S</td>
<td>5</td>
</tr>
<tr>
<td>Geol. 102.</td>
<td>Introduction to Field Geology</td>
<td>Sum</td>
<td>3</td>
</tr>
</tbody>
</table>

(Required basic science and mathematics courses, if not completed earlier, can be taken during this year.)

Junior Year

<table>
<thead>
<tr>
<th>Subject</th>
<th>Qtr</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geol. 161.</td>
<td>Crystal Chemistry and Mineralogy</td>
<td>A</td>
</tr>
<tr>
<td>Geol. 163.</td>
<td>Optical Mineralogy</td>
<td>W</td>
</tr>
<tr>
<td>Geol. 151.</td>
<td>Sedimentary Geology and Petrology</td>
<td>W</td>
</tr>
<tr>
<td>Geol. 151L.</td>
<td>Introduction to Sedimentary Petrography</td>
<td>W</td>
</tr>
<tr>
<td>Geol. 110.</td>
<td>Structural Geology</td>
<td>S</td>
</tr>
<tr>
<td>Geol. 152.</td>
<td>Stratigraphy and Paleocoeology</td>
<td>S</td>
</tr>
<tr>
<td>Geol. 103A, B.</td>
<td>Advanced Field Geology</td>
<td>Sum</td>
</tr>
</tbody>
</table>

(Room available for electives from list of choices below during this year. Room available for electives from list of choices below during this year.)

Senior Year

<table>
<thead>
<tr>
<th>Subject</th>
<th>Qtr</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geol. 181.</td>
<td>Igneous Petrology</td>
<td>A</td>
</tr>
<tr>
<td>Geol. 143.</td>
<td>Principles of Paleontology</td>
<td>W</td>
</tr>
<tr>
<td>Geol. 171.</td>
<td>Introduction to Geochemistry</td>
<td>A</td>
</tr>
<tr>
<td>Geol. 182.</td>
<td>Metamorphic Petrology</td>
<td>S</td>
</tr>
<tr>
<td>Geol. 193.</td>
<td>Statistics in Geology</td>
<td>W</td>
</tr>
<tr>
<td>A.E.S. 120.</td>
<td>Introduction to Ore Deposits</td>
<td>A</td>
</tr>
<tr>
<td>Geophys. 150.</td>
<td>Plate Tectonics</td>
<td>W</td>
</tr>
<tr>
<td>Geophys. 190.</td>
<td>General Geophysics</td>
<td>A</td>
</tr>
<tr>
<td>Geophys. 180.</td>
<td>Geologic Interpretation of Seismic Reflection Records</td>
<td>W</td>
</tr>
</tbody>
</table>

This schedule assumes entrance in the geology program no later than the Winter Quarter of the sophomore year. Later entrance is possible but may result in scheduling difficulties. Students intending to declare a geology major later than the Winter Quarter of their sophomore year should first consult their geology advisor regarding the proper schedule. If the student enters in his or her junior year, it is imperative that all requirements in mathematics, physics, and chemistry have been completed as well as courses equivalent to Geology 1 and Geology 2 to avoid delay in obtaining the bachelor's degree.

The minimum number of required courses in mathematics, physics, and chemistry for the Bachelor of Science in Geology varies with a student's high school preparation in the three subjects, general quantitative ability, and the speed at which he or she desires proficiency. Students with interests in analytical aspects of geology should plan on completing mathematics courses through differential equations. The following course sequences describe alternative ways of meeting the minimum requirements:

Mathematics

1. For students who wish to complete the requirements for calculus and analytic geometry in three quarters: Mathematics 41, 42, 43

2. For students who wish to cover the same subjects in five quarters: Mathematics 19, 20, 21, 22, 23

Physics

1. For students with average interest and ability in physics and with mathematical preparation through Mathematics 20 or 41 and concurrent registration in Mathematics 21 or 42: Physics 51 (Mechanics), 53 (Electricity), and 55 (Light and Heat)

2. For students with exceptional ability and interest in physics, advanced placement in mathematics, and concurrent registration in Mathematics 44: Physics 61, 62 and 13 (Advanced Freshman Physics)

Chemistry

1. For the majority of students majoring in geology: Chemistry 31 (Chemical Principles) and Chemistry 135 (Physical Chemical Principles)

2. In some instances the following sequence may be substituted for Chemistry 31 and 135 with consent of the advisor: Chemistry 31 (Chemical Principles) and Chemistry 33 (Structure and Reactivity; organic chemistry)

Maximum possible required units in mathematics, physics, and chemistry 35

Minimum possible required units in mathematics, physics and chemistry 30

ELECTIVES

A student entering Stanford with credit in high school algebra, trigonometry, and natural
science normally will have units of free electives in addition to the core curriculum in geology and requirements of the University. These elective units afford an opportunity to acquire substantial strength in one or more of the many subdisciplines in geology and allied earth sciences at the undergraduate level. Alternatively, elective units can be utilized to complete requirements for a teaching credential or to acquire depth in a discipline outside the earth sciences such as civil engineering or marine biology. Appropriate electives, which are in accord with the interests of a student, can be selected in conference with the advisor. There are no constraints on elective courses, and they may be taken in the Department of Geology or any other department of the University.

All courses numbered in the 100's and 200's are open to qualified undergraduate students. The number of courses offered within a given subdiscipline of Geology commonly exceeds the number of elective units available to a student. Appropriate electives, which are in accord with the interests of a student, can be selected in conference with the advisor. There are no constraints on elective courses, and they may be taken in the Department of Geology or any other department of the University.

COTERMINAL B.S. AND M.S. PROGRAM

A Stanford undergraduate majoring in Geology may be admitted to the University Division for the purpose of working simultaneously toward bachelor's and master's degrees provided:

1. The student applies after the beginning of the 8th quarter of undergraduate work and before the end of the 11th quarter.
2. Admission is recommended by the school or department in which the student seeks a master's degree, that department applying the same standards for admission that it would to an applicant for the Graduate Division.

Both degrees may be granted simultaneously, provided:

1. The student completes 15 full-time quarters or the equivalent (or 3 full quarters after completing 180 units). (Partial tuition registration is possible after the completion of 12 full quarters.)
2. The student applies for each degree at the appropriate time and to the appropriate agency.
3. The student completes all the requirements for the baccalaureate degree and is recommended for the degree by the Subcommit- tee on Graduation.
4. The student completes all the requirements for the master's degree and is recommended for that degree by the University Committee on Graduate Studies.

GRADUATE PROGRAMS

Graduate studies in the Geology Department involve academic coursework and independent research. A broad range of opportunities for research is offered by the varied interests of the faculty in the department and in other departments of the School of Earth Sciences. Stanford University is situated in a region that invites geologic field research during all seasons of the year. The California Coast Ranges, Sierra Nevada, Cascade Mountains, Colorado Plateau, Columbia Plateau, and the Basin and Range Province are all within easy reach, and their geology offers many unsolved problems in all branches of the science. Marine geological research is pursued by several faculty and their students in a global context with special emphasis on the Pacific. Laboratories and analytical facilities are available for research in various branches of geology, including paleontology and micropaleontology, palynology, mineralogy, metamorphic petrology, igneous petrology, volcanology, mineral deposits, geochemistry, geological archeology, groundwater geology, marine geology, petroleum geology, photogeology, rock mechanics, sedimentology, stratigraphy, and structural geology.

Course programs in the areas of faculty interest can be tailored to the student's needs and interests with the aid of his or her academic and thesis advisors. Students are encouraged to include in their program courses offered in other departments of the School of Earth Sciences as well as in other parts of the University. Graduate programs in the areas of engineering geology, environmental earth science, mineral deposits, and petroleum exploration are listed in this bulletin under the Department of Applied Earth Sciences.

For the typical well-qualified student with a background equivalent to that of a Stanford geology undergraduate, completion of the requirements for the M.S. normally takes six full-time quarters, and for the Ph.D. twelve full-time quarters including both course work and thesis research. Departmental financial assistance, if awarded, is limited to these terms.

Admission—For admission to graduate work in the department, the applicant must have taken the Aptitude Tests (Verbal, Quantitative and Analytical) of the Graduate Record Examination; the Advanced Test is not required. Previously admitted students who wish to change their degree objective from an M.S. to a Ph.D. must petition the Admissions and Awards Committee.

MASTER OF SCIENCE

Objectives—It is the purpose of the master's program in geology to continue a student's train-
ing in geology and to prepare the student for a professional geological career.

**Procedures**—During registration, students will be given a counseling test on material covered in those courses required of undergraduate geology majors at Stanford. The results will be used in the design of the student’s course program. The Graduate Committee of the department will appoint a tentative academic advisor during registration with appropriate consideration of the student’s background, interests, and professional goals. In consultation with his or her academic advisor, the student will plan a program of coursework for the first year. The student should select a thesis advisor within the first year of residence and submit to his advisor a proposal for thesis research as soon as possible. The academic advisor supervises completion of the departmental requirements for the M.S. program (as outlined below), until the research proposal has been accepted, when this responsibility passes to the thesis advisor. The student may change either thesis or academic advisors by mutual agreement and with a notice to the Graduate Committee.

**Requirements**—The University’s requirements for the Master of Science degree are stated in the section “Advanced Degrees” of this bulletin. The student must also be guided by the following departmental requirements.

1. The student must complete (for a grade) any remedial coursework required by the department on the basis of a counseling test (administered in the first quarter of residency) and recommendation of the student’s advisor.
2. The student must complete a minimum of 45 units of coursework.
   a) Not more than 15 units of the 45 may comprise research and special problems courses.
   b) The courses must be junior, senior, or graduate level courses (courses numbered 100 or higher).
   c) The course list is selected by the student with his or her academic advisor.
3. The student must serve as a Teaching Assistant for at least one course.
4. The student must file for candidacy by the last day in the quarter preceding the degree quarter.
5. The student must complete a thesis describing his or her research. Thesis research should begin during the first year at Stanford and the thesis should be completed before the end of the sixth quarter here.
6. Early during the thesis research period, and after consultation with the student, the thesis advisor will appoint a second reader for the thesis, the thesis advisor being the first reader. The two readers will determine jointly whether the thesis is acceptable for the M.S. degree in the department.
7. Once the thesis has been approved, the student will make a public presentation of his or her results at an appropriate forum, preferably at a meeting of a national geological society.

**Schedule**—The calendar of events of a typical M.S. program is as follows:

<table>
<thead>
<tr>
<th>Quarter Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2-3</td>
</tr>
<tr>
<td>3-5</td>
</tr>
<tr>
<td>5-6</td>
</tr>
</tbody>
</table>

**DOCTOR OF PHILOSOPHY**

**Objectives**—To develop the skills needed to conduct original geological investigations, to interpret the results, and to present the data and conclusions in a clear and concise manner.

**Procedures**—During registration, students will be given a counseling test on material covered in those courses required of undergraduate geology majors at Stanford. The results will be used in the design of the student’s course program. A tentative academic advisor will be appointed by the Graduate Committee of the department during registration with appropriate consideration of the student’s background, interests, and professional goals. In consultation with his or her academic advisor the student will plan a program of coursework for the first year. The student should choose a thesis advisor within the first year of residence. The academic advisor supervises completion of the departmental requirements for the Ph.D. program (as outlined below), until the student passes the Research Examination, when this responsibility passes to the thesis advisor. The student may change either research or academic advisors by mutual agreement and with a notice to the Graduate Committee.

**Requirements**—The University’s requirements for the Ph.D. are stated in the section “Advanced Degrees” of this bulletin. The stu-
dent must also be guided by the following department requirements:

1. In the Winter Quarter of the first year, the student will take the Departmental Written Examination. A student who fails the examination may repeat it the following Winter Quarter, but must pass it the second time to remain in the Ph.D. program. Failure of one or more parts of the examination may result in the requirement of remedial coursework.

2. The student must successfully complete the courses that form his or her individualized academic program. The requirements include a minimum of four courses of at least three units each from four different faculty members in the School of Earth Sciences at Stanford. University rules require a minimum of 36 unduplicated units for the degree.

3. The student must serve as a Teaching Assistant for at least one course.

4. The student must qualify for Ph.D. Candidacy. The department procedure involves four steps: passing the Departmental Written Examination, preparing a Research Proposal, passing the Research Examination, and establishing a Research Advisory Committee. By University regulation, these four steps must be completed before the end of the student's sixth quarter at Stanford. If the student is unable to meet this requirement, an explanatory petition requesting an extension, endorsed by the thesis advisor and the department chairman, must be filed with the Dean of the Graduate Division.

Research Proposal—Each student must prepare a research proposal, not to exceed ten double-spaced pages, describing the scientific goals of the intended Ph.D. research, the relevant literature, and the investigative approach. The proposal is normally expected to be completed before the student's fifth quarter at Stanford and must be approved by the thesis advisor before the Research Examination may be scheduled.

Research Examination—During the Research Examination the student will defend his or her proposal and answer general questions in his or her field of specialization in an Oral Examination. The Examining Committee will consist of at least five members of whom a minimum of four must be professors in the School of Earth Sciences. The Examining Committee will be appointed by the Graduate Committee in consultation with the student and the student's potential thesis advisor. The examination must be passed by the end of the student's second year.

Research Advisory Committee—Once the student has passed the Research Examination, a Research Advisory Committee is to be selected in consultation with the thesis advisor. The Committee shall consist of three to five members, at least two of whom, including the thesis advisor, must be geology faculty. The primary responsibility of the Research Advisory Committee is to aid the student in accomplishing his or her research program.

Upon the satisfactory completion of the Research Examination and assembling of a Research Advisory Committee, the department will certify to the University Committee on Graduate Studies that the student has successfully fulfilled the departmental requirements for candidacy for the Ph.D. degree. Students must file for candidacy by the end of their second year.

Doctoral Dissertation—Under the supervision of the Research Advisory Committee the candidate must prepare a doctoral dissertation which is a contribution to knowledge and is the result of independent research. The dissertation must be concise and the student is strongly urged to prepare it in a format directly suitable for publication either in parts or as a whole.

Schedule—The calendar of events in the Ph.D. program is normally as follows:

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complete counseling test; plan coursework for first year with academic advisor.</td>
</tr>
<tr>
<td>2</td>
<td>Departmental Written Examination.</td>
</tr>
<tr>
<td>2-6</td>
<td>Preparation of research proposal; Research Examination; certification and petition for Ph.D. Candidacy; admission to candidacy for the Ph.D.</td>
</tr>
<tr>
<td>2-12</td>
<td>Ph.D. research; University Ph.D. Oral defense; complete dissertation.</td>
</tr>
</tbody>
</table>

COURSES

Note—Courses in the 300 to 400 series ordinarily are not open to undergraduates. Courses in the Summer Quarter are offered for a ten-week period unless otherwise noted.

The student is urged to examine the course offerings listed by other departments. Of particular importance are those in: Applied Earth Sciences, Geophysics, Petroleum Engineering, Chemistry, Physics, Materials Science, Mathematics, and Statistics.

1. Interpreting the Earth—Presentation and discussion of some Earth studies, especially those relating the Earth's present-day processes to its materials and internal constitution. The basis of observations and measurements will be introduced by field trips and labs, and the logic of actual investigations will be examined. Impli-
cations for human activities will be evident. Lectures, one three-hour laboratory period per week, and one or two field trips required. A transportation fee will be charged for field trips. High school chemistry and physics strongly recommended. (DR:7)

5 units, Win (Rich) MWF 8; lab and field trips by arrangement
Spr (Mahood) MWF 8; lab and field trips by arrangement
Sum (Staff) MWF 9; lab and field trips by arrangement

2. Earth History—Evolution of the major features of the earth, including plate tectonics, the surface environment of the earth and the evolution of life. Topics include the history of oceans, continents and mountain belts as they relate to current theories of continental drift and plate tectonics; the evolution and role of life on earth as related to the physical, chemical, climatic and oceanographic history of the earth; earth resources and earth history; directions of current research in the history of the earth. Lectures and laboratory sessions. Geology 1 recommended as preparation. (DR:7)

5 units, Win (van Andel) MWF 11; lab by arrangement

80. Rocks and Minerals—Identification, classification, and interpretation of igneous, sedimentary, and metamorphic rocks, based on their minerals, textures, and primary structures, and on present day observable processes. Laboratory work will emphasize use of a hand lens in making observations, and field trips will demonstrate rock structures and genetic associations. Prerequisite: 1, with introductory chemistry strongly recommended.

5 units, Spr (Coleman) MWF 8; lab MW or TTh 1:15-4; and field trips by arrangement

102. Introduction to Field Geology—Instruction and practice in the basic methods of geologic investigation and recording in the field. Primary emphasis is placed upon techniques of systematic observation on the outcrop and the construction of geologic maps and sections from the data obtained. The field area studied may vary from year to year, but each site used will be selected to display a variety of rock types and landforms related to clearly defined structures. The course is conducted from a tent camp during the two-week interval preceding the beginning of the Autumn Quarter. Details of the schedule each year are given in the Summer Sessions Bulletin. Prerequisite: 1, and 80, or consent of instructor.

3 units, Sum (Ruetz) Sept. 10-24

103A,B. Advanced Field Geology — This course provides an opportunity of junior- and senior-level students to become involved in a substantial field investigation of professional scope and assumes familiarity with elementary techniques of field mapping and a proficiency in basic geologic concepts. The aim of the course is to provide an in-depth exposure to independent analysis of relatively complex geologic problems in the field and the presentation of research results in the form of a professional geologic report. The course is conducted from a tent camp at one or more localities in the western states and involves a coordinated field study of mapping, description, and interpretation of a relatively unknown field area. Emphasis in the field is placed on observation of lithologic and structural features, measurement of stratigraphic and structural sections, application of various survey methods, and plotting of geologic data on topographic maps and aerial photographs. Graduate students must obtain the permission of the instructor(s) to enroll. Prerequisites: 1, 2, 80, 102, 110, and 151; or consent of instructor(s).

103A. Introduction to advanced field techniques; detailed stratigraphic and structural mapping; description and interpretation of lithologic features; conducted from a field camp in California or Nevada. Credit for 103A requires completion of 103B.

8 units (Miller) June 17-August 8

103B. Preparation of comprehensive geologic report on field areas studied during 103A; work done in the field or on campus. Credit for 103B requires completion of 103A.

4 units (Miller) August 8-Sept 1st

105. Geologic Problems—Supervised reading, field and/or laboratory work, written reports thereon.

1-10 units, any quarter (Staff) by arrangement

110. Structural Geology—Introduction to how and why rocks deform and mountains are built. Emphasis is on the geometry, style, and mechanisms of folding and faulting and the stereographic projection and analysis of structural data. Some lab sessions involve the study of faults and folds in the field (all day Thursday or Saturday) others are at Stanford (Thursday afternoon or evening). One week-end long field trip, if offered, is required. Prerequisite: 1 and 102 or consent of instructor.

5 units, Spr (Miller) MWF 9 plus field lab Th or Sat

119. Human Settlement and Landscape in the Aegean—(Same as Classics 119.) Lectures, seminars, and readings on the relations between civilization and landscape from the Old
151. Introduction to Sedimentary Facies—Inquiry into depositional systems. Topics explored include grain size analysis, origin of bedding and sedimentary structures, origin of sedimentary facies. Siliciclastic depositional systems and environments studies include alluvial, fluvial, eolian, deltaic, nearshore, shelf, deepsea. Summary of carbonate deposition: reef models, tidal flats and shelves, evaporites and deep-sea. Three field trips, one with write-up, are required. Students desiring a more complete understanding of sedimentary geology are urged to take 151L concurrently. Prerequisites: 1, 2.

3 units, Win (Larue) MWF 9
field trips by arrangement

151L. Introduction to Sedimentary Petrography—Lecture and lab concentrate on origin and evolution of siliciclastic and carbonate rocks. Lectures and labs in 151L coordinate with lectures of 151. Descriptions of sedimentary particles, introduction to point counting, tectonics and sandstone composition, cementation and diagenesis, thermal maturation. Prerequisites: 151, 163.

2 units, Win (Larue) M 12
plus lab M or W 1:15-4:05

152. Stratigraphic Geology—Rudiments of interpreting sedimentary rocks with emphasis placed on the utility of integrating paleontologic and sedimentologic evidence to reconstruct depositional environments. Characteristic variations of modern and ancient biofacies and lithofacies are traced in time and space. Concepts of biostratigraphy, stratigraphic techniques and correlation are interwoven with discussions of the dynamics of the marine ecosystem, basin analysis, and paleoceanography. An investigation of a stratigraphic problem serves as a basis for a required term paper. Lectures and discussions are supplemented by extensive reading from classic and current scientific literature. Prerequisites: 1, 2, 102, and 151.

4 units, Spr (Ingle) MWF 10; two required
field trips; research conferences
by arrangement

161. Crystal Chemistry and Mineralogy—Introduction to the crystallographic groups and the theory of x-ray diffraction. Principles of crystal chemistry. Factors affecting the stability of minerals and the solid contaminants of our environment. Systematic examination of the structures, chemistry, physical properties and paragenesis of the major rock-forming minerals with emphasis on silicates. Introduction to the principles of optical mineralogy. Laboratories will be concerned with determinative mineral-
ogy including hand specimen, optical and x-ray methods. One field trip. Prerequisites: 1, 80, 102 and Chemistry 31 (may be taken concurrently).

5 units, Aut (Brown) MWF 10
lab MW 1:15-4:05

163. Optical Mineralogy—A course to provide familiarity with polarizing microscope to study rocks and minerals. It covers fundamental principles of optical properties and systematic study of common rock-forming minerals. Prerequisites: 161.

4 units, Win (Liou) TTh 9 and
lab TTh 1:15-4:05 or MW 1:15-4:05

171. Introduction to Geochemistry—An introduction to the application of chemical principles and concepts to geologic systems. The course concentrates on (1) developing an understanding of the chemical behavior of fluids, minerals, and gases and (2) using simple equilibrium approaches to modeling the geochemical consequences of diagenetic, hydrothermal, metamorphic, and igneous processes. Topics include: reversible thermodynamics, solution chemistry, mineral-solution equilibria, stable and radiogenic isotopes and the distribution and transport of elements by geologic processes. Prerequisites: 102, 161, and Chemistry 135.

4 units, Aut (Bird) MWF 9

175. Solution-Mineral Equilibria: Theory—This course will develop procedures for calculating and evaluating the thermodynamic properties of reversible reactions among rock-forming minerals and aqueous solutions in geologic systems. A review of the concepts and principles of chemical thermodynamics relevant to geochemical processes is followed by a systematic investigation of the thermodynamic behavior of minerals, H2O, CO2 and electrolyte solutions at high temperatures and pressures. Emphasis is placed on the generation and utility of phase diagrams depicting solution-mineral equilibria relevant to 1.) phase relations associated with diagenetic, hydrothermal and metamorphic processes, and 2.) the prediction of temperature, pressure, and the chemical potential of thermodynamic components compatible with observed mineralogic phase relations in geologic outcrops. Individual research projects. Prerequisite: 171.

3 units, Spr (Mahood) MWF 11

181. Igneous Petrology—Origin of igneous rocks, emphasizing magmatic differentiation processes displayed in the chemistry of volcanic rocks. Subjects covered will include the physical properties of magmas, role of volatile components, applications of trace elements and isotopes to petrogenesis, modelling of crystal fractionation and partial melting, relevant experimental data and phase diagrams, relation of magma types to tectonic setting, and classification schemes. Course is designed for seniors and new graduate students. May be taken without the lab for 3 units by students who are not undergraduate geology majors. Prerequisites: 161 for lecture portion; 163 for lab.

3-5 units, Aut (Mahood) TTh 11
lab TTh or MW 1:15-4:05

182. Metamorphic Petrology—Genesis of metamorphic rocks and the imposed physicochemical conditions for their formation. Topics covered will include textures and structures of metamorphic rocks, chemistry, paragenesis and phase relations of metamorphic minerals, metamorphic reactions, role of oxygen fugacity and mixed volatiles in metamorphic recrystallization, metamorphic belts, ocean-floor and subduction zone metamorphism. Laboratory exercises include petrographic study of common metamorphic rocks. Prerequisite: 181.

5 units, Spr (Liou) TTh 11 and
lab TTh 1:15-4:05

185. Volcanology—Types of eruptions; eruptive mechanisms; models of emplacement of pyroclastic flows and characteristics of resulting deposits; classification of volcanic landforms and their relation to the composition and physical properties of the magma; characteristics of magma chambers; volcanic gases; eruptive histories of volcanic centers. To obtain the full benefit of this course, it is recommended that Geology 185L be taken concurrently. One four-day field trip is required. Prerequisite: 80 or its equivalent.

3 units, Spr (Mahood) MWF 11

185L. Volcanology Laboratory—Hand sample and petrographic microscope examination of volcanic rocks. Labs are keyed to lectures in Geology 185 Volcanology, which must be taken concurrently. Prerequisites: 163 is required; 181 is helpful but not required.

1 unit, Spr (Mahood) W 1:15-4:05

193. Introduction to Probability and Statistics in Geology—Discrete and continuous probability theory; applications of probability to model-building; the role of probability in sampling and experimentation; statistical techniques in the analysis of sample data; statistical verification of models and statistical estimation of model parameters; introduction to stochastic processes and correlation analysis. Prerequisite: Introductory calculus.

3 units, Win (Journel and Switzer) TTh 11-12:15

3 units, Spr (Larue, Miller)
M 2-4, W 2-3
alternate years, given 1984-85

215. Topics in Regional Geology and Tectonics—Seminar.
2 units, Win (Miller)

221. Photogeology—Introduction to principles and practices of obtaining geologic data from air photographs. Particular emphasis is placed on the geologic interpretation of air photos for use in stratigraphic, structural and environmental analysis. Characteristics of the various films and filters in common use and the geometry of the resultant imagery are evaluated. Simple photogrammetric equipment is employed to obtain quantitative data from photos. Prerequisite: knowledge of geomorphology and structural geology, or consent of instructor.

4 units, Auth (Rich) TTh 1:15-4:05

230. Hydrogeology—Theory of underground water, analysis of field data and pumping tests, geologic groundwater environments, solution of field problems, groundwater modeling. Prerequisites: elementary calculus.

5 units, Win (Remson) MWF 9; seminar
M 2:15-4:05; lab by arrangement


3 units, any quarter (Remson)
by arrangement

241. Introduction to Micropaleontology—Study of microscopic marine fossils including diatoms, ostracods, and radiolarians with emphasis on foraminifera. Detailed study of principles of classification, evolutionary trends, common genera, and ecology of foraminifera. Application of planktonic and benthonic foraminifera to problems of paleoecology, paleoceanography, and correlation of marine sediments. An original and quantitative investigation of a fossil or a modern foraminiferal fauna serves as a basis for required term paper. Instruction in laboratory and field techniques. Prerequisite: 152, with 143 highly recommended.

5 units, Aut (Ingle) MWF 11; two lab discussion periods by arrangement, alternate years, given 1983-84

242. Introduction to Palynology—Study of microfossils smaller than 200 micrometers, especially spores, pollen, dinoflagellates, and acritarchs. Techniques of recovery and microscopy, morphology and classification, geologic distribution, application to stratigraphic problems. Prerequisite: 143 or consent of instructor.

5 units, Spr (Evitt)
3 lecs, 2 labs, by arrangement
alternate years, given 1983-84

243. Stratigraphic Palynology—Detailed laboratory study of assemblages of microfossils smaller than 200 micra, from Cambrian and younger strata, supplemented with lectures and discussions. Prerequisite: 242.

Aut (Evitt) units and hours
by arrangement

244. Advanced Micropaleontology—Discussion and practice in use of marine microfossils (mainly benthonic and planktonic foraminifera) to solve fundamental geologic and oceanographic problems of geochronology, correlation, paleoecology, and paleoceanography. Individual analyses of a series of unknown samples provide an intensive laboratory experience in applying basic concepts of biostratigraphy and paleoenvironmental analysis to interpretation of Paleozoic, Mesozoic, and Cenozoic microfossil assemblages. Lectures focus on classic and current examples of research in this field. One week field trip. Prerequisite: 241.

3 units, Win (Ingle) T11
lab TTh 1:15-4:05 or by arrangement
alternate years, given 1983-84

250. Ocean Basins—Physiography, tectonics and sedimentation of the modern and ancient ocean. Survey of the field with emphasis on familiarization with the current marine geological literature and with directions of advanced research in marine geology and marine geophysics. Topics include the morphology, tectonics and volcanism of the deep-sea, processes of deep-sea sedimentation, the carbonate and silica cycles, sedimentary history of the deep ocean, Cenozoic and Mesozoic paleoceanography. Course restricted to the geology of the deep-sea; the geology of the ocean margins is treated in Geology 251. Prerequisites: 1, 150, or consent of the instructor.

4 units, Aut (van Andel) MWF 9
alternate years, given 1984-85

251. Continental Margins—An overview of the current knowledge of continental margins past and present. Emphasis is on the structure and the sedimentary history and facies of the margins of the world, and present nearshore and shelf sedimentation processes are treated
only in this light. Topics include morphology and structure, sediment facies patterns and sediment petrology of coastal, shelf and slope sediments; origin of passive and active continental margins; casus and effects and the role of transgressions and regressions in geological history problems in the utilization of continental margins; politics and management of continental margin research, exploration and exploitation. Seismic reflection studies on the continental margin. A term project is required. Pre-requisites: 1, 150, 151 or consent of the instructor.

4 units, Aut (van Andel) MWF 9
alternate years, given 1983-84

253. Sedimentary Petrology—Examination and interpretation of sediments and sedimentary rocks. Aspects of provenance, texture, composition, diagenesis, and incipient metamorphism are treated. Laboratory stresses work with the petrographic microscope but includes sieving and settling procedures, sectioning and staining techniques, separation and mounting of heavy minerals, and modal point-counting. Emphasis is placed on sandstones of all kinds including calcarenites, but limited study of volcaniclastic rocks, lutites and cherts, phosphorites, ironstones, evaporites, and carbonate rocks is included. Prerequisites: 163, 161 and 180.

4 units, Spr (Larue, Graham) TTh 9
plus lab TTh 1:15-4:04
optional field trips by arrangement


3 units, Aut (Larue) MWF 2:15
3 field trips by arrangement
alternate years, given 1984-85

261. Rock Forming Minerals—Systematic examination of the structures, chemistry, physical properties, and paragenesis of the major rock forming silicates and related mineral groups. Review of the properties and structures of silicate melts and glasses with an introduction to crystal growth from the melt. Discussion of mineral geothermometry and geobarometry. Laboratories will be concerned with crystal chemical principles and current theories of chemical bonding as applied to minerals, with measurement of basic physical properties, and characterization of minerals by powder x-ray diffraction and infrared techniques. Several labs will also be devoted to basic hand specimen identification.

4 units, Win (Brown) TTh 10
lab by arrangement
alternate years, given 1984-85

273. Chemistry and Physics of Magma-Hydrothermal System—Lecture seminar course on the transport of energy, mass, and momentum associated with the intrusion of magmas into the upper portions of the Earth's crust. Transport theory for porous media and irreversible thermodynamics of fluid-mineral interactions are developed and are used to evaluate geologic observations in both active and fossil magmatic-hydrothermal systems. Seminar topics will be selected based on the students' interests. Prerequisites: 171 Recommended: 175 or 275, A.E.S. 120, 220.

2 units, Spr (Bird) TTh 11

275. Solution-Mineral Equilibria: Research Applications—Individual research projects associated with thermodynamic analysis of phase relations in experimental and/or geological systems with emphasis on reactions among aqueous solutions and minerals. To be taken concurrently with 175.

1-2 units, Win (Bird) MW 2-3:30

278. Organic Geochemistry—Course unites aspects of geology and chemistry in study of origin and occurrence and fate or organic materials in geological environments. Principles of organic geochemistry are applied to sedimentology, paleontology, petroleum geology, and environmental science. There are no formal pre-requisites although introductory courses in geochemistry and organic chemistry are helpful.

2 units, Win (Kvenvolden) TTh 4:15
given 1984-85

280. Rock Sampling Preparation—A practical introduction to the use of rock-crushing and mineral separation equipment and technique; sampling and safety precautions. Designed for graduate students and advanced undergraduate students who will be using these techniques for their research.

1 unit, Win (Mahood and Parks)
F 1:15-4:05
alternate years, given 1984-85

289. Teaching Experience.
0-3 units, Aut, Win, Sum (Staff)
by arrangement

293. Applications of Probability and Statistics in Geology—A variety of techniques will be presented along with their applications to geological problems. Students will then be expected to offer critical reviews of selected published research papers with respect to the appropriateness and correctness of statistical usage. Prerequisite: 193 or consent of instructor.

3 units, Spr (Switzer) TTh 11-12:15;
alternate years, given 1983-84
317. Advanced Field Mapping—Ten to fourteen days mapping in structurally complex region. Emphasis is on collected detailed microscopic structural data as well as stratigraphic and sedimentologic data. Goal is to help to solve a topical problem in either regional and/or local geology. Prerequisite: consent of instructor(s).

3 units, Aut (Miller)

by arrangement

318. Seminar in Structural Geology.
1 unit, Aut, Win, Spr (Larue)
by arrangement

327. Seminar in Quaternary Geology—Analysis of current problems, concepts and research in Quaternary Geology. Topics for discussion are selected on the basis of interests of participants.

2 units, Spr (Rich) by arrangement alternate years, given 1983-84

351. Seminar in Marine Geology and Geophysics—Advanced level discussion of current research problems in the geophysics, tectonics, sedimentation and history of the ocean basins. Emphasis will be on new data or unsolved problems; occasionally, data sets may be available that have not yet been used and that permit original research in a tectonic or sedimentary problem. Topics for discussion will be selected where possible with the advice of prospective participants.

2 units, Aut (van Andel) by arrangement given 1983-84

358. Seminar in Sedimentary Geology—
1 unit, Aut, Win, Spr (Larue)
by arrangement

361. Seminar in Mineralogy.
1 unit, Win (Staff) by arrangement

371. Seminar in Geochemistry.
1 unit, Aut (Staff) by arrangement

381. Seminar in Igneous Petrology.
1-3 units, Aut, Win, Spr, (Mahood)
by arrangement

382. Seminar in Metamorphic Petrology—Discussion of selected topics in the area of tectonic and metamorphic processes, research problems and methods of study of metamorphic rocks on their origin and relationships in time and space. Prerequisite: consent of instructor.

2 units, Spr (Liou and Coleman)
by arrangement
alternate years, given 1984-85

Problems in Various Fields of Geology—Units, quarter, and time by arrangement (Staff). All courses.

309. Problems in General Geology.

319. Problems in Structural Geology.
GEOPHYSICS

Chairman: George A. Thompson
Professors: Jon F. Claerbout, Allan V. Cox, Robert L. Kovach, Amos M. Nur, George A. Thompson. Affiliated: Tjeerd H. van Andel
Associate Professor: Norman H. Sleep
Assistant Professor: Robert J. Geller, Michael O. McWilliams
Professor (Research): Zvi Ben-Avraham
Consulting Professors: Cecil Green, William Ostrander
Consulting Associate Professor: David M. Boore
Research Associate: Michel Prevot

OFFERINGS AND FACILITIES

Geophysics is the branch of earth science concerned with exploration of the earth and its history by physical measurements. The undergraduate and graduate programs are designed to provide (1) a background of fundamentals in science and (2) courses in geophysics to coordinate the fundamentals with principles of geophysics. The program leading to the Bachelor of Science in Geophysics permits many electives and a high degree of flexibility for each individual student. Graduate programs give specialized training for professional work in exploration, research, and education. The Department of Geophysics is housed in the Ruth Wattis Mitchell Earth Sciences Building and the Salvatori Laboratory of Geophysics. The department has a number of research facilities among which are a rock-magnetism laboratory, several large scale minicomputers, a high pressure and temperature rock deformation laboratory, and various instruments for field measurements. Current research activities in the department include earthquake mechanics, studies of geothermal areas, application of seismology to study of present-day tectonics, near field seismology, geophysical monitoring of the San Andreas fault, paleomagnetic investigations of regional tectonics, behavior of the geomagnetic field, free oscillation and surface wave studies, and major research programs in reflection seismology and experimental and theoretical rock physics. Graduate programs lead to the degree of Master of Science and Doctor of Philosophy.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

Objectives—To provide a solid background in the essentials of physics and geology, while at the same time providing knowledge about the entire spectrum of geophysics (ranging from exploration geophysics to earthquake seismology and plate tectonics). Students will be prepared for either an immediate professional career in the resources industry or graduate study.

The following course requirements for the degree of Bachelor of Science in Geophysics are in addition to the University requirements in general studies. A written report on original research is also required. Normally, this will be undertaken as part of the student’s participation in three quarters of Research Seminar (Geophysics 185, Section A, B, C, D, E, F, G, H, J) during the senior year. Seniors in Geophysics who expect to do graduate work are urged to take the Graduate Record Examination as early as is convenient in their final undergraduate year.

CURRICULUM

Course No. Subject
Chem. 31. Chemical Principles
Chem. 135. Physical Chemical Principles, or Physics 170, 171, Thermodynamics
Electrical Eng. 141. Electromagnetic Fundamentals or Physics 120. Electricity and Magnetism
Geol. 1. Interpreting the Earth
Geol. 80. Rocks and Minerals
Geol. 102. Introduction to Field Geo.
Geol. 110. Structural Geology
Geophy. 185 (A, B, C, D, E, F, G, H, J) Research Seminar
9 units of Geophysics chosen from the list below.
Math. 10, 11, 21, 22, 23 and 44, or 41, 42, 43 and 44. Analytical Geometry and Calculus
Math. 130. Ordinary Differential Equations
Physics 51, 53, 54, 55 and 56.
Elementary Physics
Physics 110, 111. Mechanics

The following geophysics electives are particularly recommended to fill the 9 unit requirement: 102, 180, 195, 252, 276, 280 and 284. Elective courses which do not fill the 9 unit requirement, but are recommended are: C.S.105 or C.S.106, Geology 103A and B. Geology 181, Physics 57, 58, 100, 101, 120, 121, 122, 210, 211, or Electrical Engineering 142; Mathematics 101, 106, 113, 114, 131, 132, Engineering 44, and Chemical Engineering 140, 150.

GRADUATE PROGRAMS

MASTER OF SCIENCE

Objectives—To round out the student’s training for professional work in geophysics through the completion of fundamental courses, both in the major field and in related sciences, and by obtaining a start on independent work and specialization.

Requirements for the Degree—The candidate must fulfill the following requirements:
1. Be registered in the graduate school for at least three quarters.

2. Complete 45 units with at least a B average. At least 6 of these units must be independent work on a research problem, resulting in a written report accepted by the candidate's faculty advisor. Normally this research will be undertaken as part of the candidate's participation in three quarters of Research Seminar (Geophysics 385, Sections A, B, C, D, E, F, G, H, J).

3. Make up deficiencies in previous training. Not more than 10 units of such work may be counted as part of the minimum total of 45 units. Background in field geology should be at the level of Geology 103A and 103B.

Students who do not meet the standard course requirements (see undergraduate curriculum) but who have unusual competence in other areas, such as environmental geophysics or space physics, may petition the geophysics faculty to arrange individual programs.

**MASTER OF SCIENCE IN EXPLORATION**

**Objectives**—To provide the theoretical background needed for a career in exploration geophysics. Emphasis is placed on petroleum exploration. The program normally takes four quarters, beginning and ending in the Autumn Quarter, and in addition includes a 2-week field geology course given just before registration in the Autumn for students entering without an equivalent course. A summer internship working in industry or in a government laboratory is an integral part of the program. Although a formal M.S. thesis is not required, the student will present an oral and written report based on the summer internship in the Geophysics 380 seminar in the final Autumn Quarter.

The prerequisites for students entering the program begin with a B.S. degree either in geophysics, geology, physics, engineering, or mathematics. A sequence of courses in mathematics at least through ordinary differential equations and at least one course in introductory geology are required for admission to the program. The following additional undergraduate courses are recommended: linear algebra, computer science, complex variables, and intermediate to advanced geology.

**Requirements for the Degree**—The normal course load is 12 to 15 units per quarter. The required courses for the degree are listed in the following model schedule. Students who have already taken the equivalent of some of the required courses are encouraged to take additional electives in geophysics, electrical engineering, geology, mathematics, or business administration, depending on whether their career objectives are directed toward data processing, interpretation, or management.

### First Year

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn</td>
<td></td>
</tr>
<tr>
<td>Geophys. 190. General Geophysics</td>
<td>4</td>
</tr>
<tr>
<td>Electrical Engr. 261. Fourier Transform and its Application</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 174. Seismology</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 350A. Seminar: Exploration Geophysics</td>
<td>1</td>
</tr>
<tr>
<td>Geophys. 397. Contemporary Geophysics Seminar</td>
<td>1</td>
</tr>
<tr>
<td>Pet. Engr. 150A. Introductory Well Log Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td></td>
</tr>
<tr>
<td>Geol. 151. Sedimentary Geology</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 180. Geologic Interpretation of Reflection Seismograms</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 180A. Seismic Data Processing lab</td>
<td>1</td>
</tr>
<tr>
<td>Geophys. 262. Rock Physics</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 397. Contemporary Geophysics Seminar</td>
<td>1</td>
</tr>
<tr>
<td>One of following 3 courses:</td>
<td></td>
</tr>
<tr>
<td>A.E.S. 298. Decision Analysis in Petroleum Exploration</td>
<td>3</td>
</tr>
<tr>
<td>Electrical Engr. 263. Digital Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 150. Plate Tectonics</td>
<td>3</td>
</tr>
<tr>
<td>FORTRAN Short Course</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

**Spring Quarter**

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geol. 80. Rocks and Minerals</td>
</tr>
<tr>
<td>Geol. 110. Structural Geology</td>
</tr>
<tr>
<td>Geophys. 290. Reflection Seismology in 1-D</td>
</tr>
<tr>
<td>14 or 16</td>
</tr>
</tbody>
</table>

### Second Year

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn</td>
<td></td>
</tr>
<tr>
<td>A.E.S. 252. Sedimentary Basins</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 191A. Geophysical Field Techniques</td>
<td>4</td>
</tr>
<tr>
<td>Geophys. 284. Reflection Seismology in 3-D</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 380B. Seminar: Exploration Geophysics</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>

Normal course loads of 12-15 units will include additional elective courses in related fields, such as Petroleum Engineering, Geology, Applied Earth Sciences, Mathematics, Physics, Computer Science, Industrial Engineering, Accounting, and Management.

**DOCTOR OF PHILOSOPHY**

**Objectives**—The degree of Doctor of Philosophy is conferred upon evidence of high attainment in Geophysics, and ability to conduct an independent investigation and to present the results of such research.
Requirements for the Degree—A minimum of three years (nine quarters) of university graduate study must be satisfactorily completed. At least one of these years, ordinarily the last, must be spent as a registered student at Stanford. During their first year, candidates will take three quarters of Research Seminar (Geophysics 385, Sections A, B, C, D, E, G, H, J). Ph.D. candidates in Geophysics are required to complete Physics 121 or Electrical Engineering 142, Electrical Engineering 261, and Physics 210, 211, or Mathematics 220A, 220B. Additional advanced courses are to be selected from the following topics: Applied Physics, Astrophysics, Atomic and Nuclear Physics, Communications Theory, Computer Sciences, Electromagnetic Theory, Civil Engineering, Chemical Engineering, Engineering Mechanics, Geology, Geophysics, Materials Science, Physics of Solids, Thermodynamics. Students who wish to waive any of the required courses must petition the department in writing prior to their admission to candidacy. Petitions must state a well-reasoned plan for the substitute requirements. Students without practical electronics experience are strongly encouraged to take a laboratory course such as Engineering 41A, 42A, or 44. The candidate’s record must indicate outstanding scholarship, and deficiencies in previous training must be removed. Experience as a teaching assistant (quarter-time for at least one academic quarter) is required for the Ph.D. degree. The student must pass the departmental written qualifying examination which is given annually in January, by his or her second year; pass the Departmental Oral Exam by presenting and defending a written research paper or proposal by the end of the second year; fulfill the requirements of the minor department, if a minor is elected; and prepare under faculty supervision a dissertation which is a contribution to knowledge and the result of independent work expressed in satisfactory form and pass the University oral examination, which is essentially a defense of the dissertation.

The Ph.D. dissertation must be submitted in its final form within five calendar years from the date of admission to candidacy by the University Committee on Graduate Studies. Candidates for the degree who fail to meet this deadline will be required to reapply for admission to candidacy and retake the departmental and the University Oral Examinations. They will be given one additional year in which to submit their dissertations.

University requirements regarding the M.S. and Ph.D. are described in the “Degrees” section of this bulletin.

**COURSES**

3. Earthquakes and Man—Earthquakes occur daily in California with the prospect that a large, destructive earthquake could occur during our lifetime. This introductory course provides insight into why and where earthquakes occur, the nature of earthquake ground motions and their effects on onshore and offshore structures (such as buildings and offshore oil platforms), earthquake risk, protective measures, earthquake prediction and modification. Lectures, demonstrations and one Saturday field trip. (DR:8)

3 units, Spr (Kovach) TTh 10, field trip by arrangement

102. Paleomagnetism—An introduction to the application of paleomagnetic methods to problems in tectonics, structural geology and stratigraphy. Topics covered include: origin and spherical harmonic analysis of the geomagnetic field, origin of thermal, chemical and depositional remanent magnetization in geological materials, techniques of measurement, data reduction and analysis, apparent polar wandering and plate motion, analysis of terrane displacement. A 3-5 day field trip is conducted to learn techniques of sample collection and orientation. Students conduct a small-scale paleomagnetic study as a research project. Prerequisites: Geology 1 or 2; Recommended: Geophysics 150, Geology 110 and Physics 53.

3 units, Spr (McWilliams) by arrangement alternate years, given 1984-85

150. Plate Tectonics—Measurement, description and evolution of movements between lithospheric plates as determined from geologic and geophysical data. Topics include: determination of relative velocities between plates; analysis of magnetic anomalies to determine age of sea floor; interpretation of paleomagnetic data; seismicity at plate boundaries; geologic processes at rises, trenches, and transforms; causes of plate motions; development of plate tectonics as a unifying concept in earth science including the relationship of plate tectonic processes to the geology of California. Prerequisites: knowledge of plane geometry, vectors, Geology 1 or 2, or consent of instructor.

3 units, Win (McWilliams, Sleep) MWF 11 lab by arrangement

174. Seismology—Introduction to earthquakes and seismic wave propagation. Topics to be discussed include: principles of seismographs, seismicity, earthquake magnitude and energy, construction of travel-time tables, general theory of elastic waves, interpretation of seismograms, determination of earthquake source mechanisms, seismicity and its relation to tectonics and engineering seismology. Prerequisites: Math 130, Physics 55 or equivalent and
180. Geologic Interpretation of Reflection Seismograms—Elementary principles of reflection seismology, seismic data processing, and field operations, including field trip to an operating crew (if available). Integration of seismic and other exploration data into exploration programs. Workshops and lectures in stratigraphic and structural interpretation of seismic sections and well logs, utilizing data from various oceans and continents.

3 units, Win (Graham, Ostrander and Thompson)
TTh 11 and lab W 1:15-4

180A. Seismic Data Processing Lab—Workshop experience in computer enhancement of reflection data. Prerequisites: Electrical Engineering 261, concurrent or previous registration in 180.

1 unit, Win (Staff) by arrangement

185A,B,C,D,E,G,H,J. Research Seminars—The research seminar provides the undergraduate an opportunity to participate directly in one of the ongoing research projects in the Geophysics department. Participation will consist of helping with experimental and computational work; joining in reading and study groups; giving seminar papers; and doing original research for the undergraduate thesis. Enrollment limited to Geophysics undergraduates and coterminus master candidates. Prerequisite: consent of instructor.

185A. Research Seminar: Reflection Seismology—Departmental research in reflection seismology and petroleum prospecting.
2 units, Aut, Win, Spr (Claerbout)
by arrangement

185B. Research Seminar: Geomagnetism—Current research in paleomagnetism, geomagnetism, and plate tectonics.
2 units, Aut, Win, Spr (Cox)
by arrangement

2 units, Aut, Win, Spr (Kovach)
by arrangement

185D. Research Seminar: Tectonophysics—Research in areas of current interest in rock mechanics, tectonophysics, and related problems. Content varies from quarter to quarter.
2 units, Aut, Win, Spr (Nur)
by arrangement

185E. Research Seminar: Tectonics—Research topics on the origin, major structures, and tectonic processes of the earth's crust. Emphasis on use of deep seismic reflection data including COCORP data.
2 units, Aut, Win, Spr (Thompson)
by arrangement

2 units, Aut, Win, Spr (Geller and Sleep)
by arrangement

185J. Research Seminar: Paleomagnetism and Tectonics—Current research in paleomagnetism, rock magnetism, global and regional tectonics.
2 units, Aut, Win, Spr (McWilliams)
by arrangement


4 units, Aut (Sleep) MWF 11 lab by arrangement

191. Geophysical Field Techniques—Geophysical field investigations in a region of geologic and economic interest using seismic refraction, gravity, magnetic, electromagnetic, and electrical field techniques. Basic introduction to techniques of geophysical prospecting (excluding seismic reflection). A 5 day fieldtrip immediately precedes the Autumn quarter, for data collection. Students engage in all phases of program, interpret the data, and prepare a final report. Prerequisite: 190 suggested.

3 units, Aut (McWilliams) TTh 10-11.30 given 1984-85

191A. Geophysical Field Techniques—Field investigations as in Geophysics 191 supplemented with lectures and classroom exercises on the quantitative interpretation and inversion of electrical and electromagnetic prospecting data. Prerequisite: Geophysics 190 and Physics 120 or Electrical Engineering 141.

4 units, Aut (McWilliams) TTh 10-11.30 given 1984-85

195. Physics of Planetary Interiors—A study of the available data of seismology, volcanology, geodesy, heat flow, high pressure laboratory
work and solid state physics for developing up-to-date understanding of the properties and processes of the interiors of the terrestrial planets. Emphasis is placed on current unresolved problems, including the formation of the planets and their thermal histories.

3 units, Spr (Sleep) TTh 10-11:30 alternate years, given 1983-84

262. Rock Physics—Properties of and processes in rocks as related to geophysical exploration, crustal studies and tectonic processes. Emphasis on wave velocities and attenuation, hydraulic permeability; and electrical resistivity in rocks. Application to in situ problems, using laboratory data and theoretical results.

3 units, Win (Nur) MWF 10

276A,B. Advanced Seismology—Basic results for body waves, surface waves, free oscillations and earthquake source theory studied theoretically and applied to data. Topics covered include dispersion and excitation of free oscillations, use of free oscillations and surface waves to determine earthquake source parameters, inversion of dispersion data to determine earth structure, physical dispersion due to anelasticity, Cagniard-de Hoop and reflectivity methods for body-wave synthesis and crack theory models of the earthquake source. Prerequisites: Geophysics 174; Math 131 and Physics 111 and 120 or equivalent; Scientific programming experience.

276A. 3 units, Win (Geller) by arrangement

276B. 3 units, Spr (Geller) by arrangement


3 units, Spr (Claerbout) MWF 10


3 units, Aut (Claerbout) MWF 10

301. Problems in Geophysics.

any quarter (Staff) by arrangement

380A,B. Seminar: Exploration Geophysics—This seminar gives master's candidates an opportunity to frame and pursue their thesis research. Second year students in the Exploration Program report on summer jobs and develop their independent research projects, culminating in a written report and oral presentation to the department. First year students register in 380A. Second year in 380B.

380A. 1 unit, Aut (Cox) by arrangement

380B. 1 or 3 units, Aut (Cox) by arrangement

385A,B,C,D,E,G,H,J. Research Seminars—The research seminar serves several purposes for the graduate student. It gives the master's candidate an opportunity to frame and pursue his thesis research within the context of one of the ongoing research projects in the department. It gives the first-year Ph.D. candidate a chance to participate directly in advanced research prior to making his or her final commitment concerning a thesis subject, which he or she normally does during his second year. It gives the advanced graduate student a regular opportunity to present progress reports on his or her thesis research before a critical audience. Prerequisite: consent of the instructor.

385A. Research Seminar: Reflection Seismology—Departmental research in reflection seismology and petroleum prospecting.

2 units, Aut, Win, Spr (Claerbout) by arrangement

385B. Research Seminar: Geomagnetism—Current research in paleomagnetism, geomagnetism, and plate tectonics.

2 units, Aut, Win, Spr (Cox) by arrangement

385C. Research Seminar: Seismology—Current research in seismology, seismicity, and earthquake source mechanisms.

2 units, Aut, Win, Spr (Kovach) by arrangement

385D. Research Seminar: Tectonophysics—Research in areas of current interest in rock mechanics, tectonophysics, and related problems. Content varies from quarter to quarter.

2 units, Aut, Win, Spr (Nur) by arrangement

385E. Research Seminar: Tectonics—Research topics on the origin, major structures, and tectonic processes of the earth's crust. Emphasis on use of deep seismic reflection data including COCORP data.

2 units, Aut, Win (Thompson) by arrangement
2 units, Aut, Win, Spr (Celler and Sleep) by arrangement

2 units, Aut, Win, Spr (McWilliams) by arrangement

397. Introduction to Contemporary Geophysics—Seminar on current topics of interest in geophysics with particular emphasis on active research both within the department and at other institutions. Required of all first year graduate students.
1 unit, Aut, Win, Spr (Staff, Geller in charge) F 3:15

398. Seminar—See Geology 351 for details.
2 units, Aut (van Andel) by arrangement

399. Teaching Experience in Geophysics—The purpose of this course is to provide on-the-job training in the teaching of geophysics. The student will have an opportunity to develop problem sets and laboratory exercises, grade papers, and give occasional lectures under the supervision of the regular instructor of a geophysics course. Regular conferences with the instructor and with students in the class will provide the student-teacher with feedback about his or her effectiveness in teaching.
2-4 units, any quarter (Staff) by arrangement

400. Research in Geophysics.
any quarter (Staff) by arrangement

PETROLEUM ENGINEERING

Emeritus: Frank G. Miller (Professor), Marshall B. Standing (Consulting Professor)
Chairman: Henry J. Ramey, Jr.
Associate Chairman: William E. Brigham
Professors: Khalid Aziz, William E. Brigham, George M. Homay (by courtesy), Sullivan S. Marsden, Jr., Henry J. Ramey, Jr.
Assistant Professor: Roland N. Horne
Acting Associate Professor: Jon S. Guimondson
Consulting Associate Professor: Robert G. Lindblom
Visiting Scholar: Zhao-Xin Lang

OFFERINGS

The study programs of the Department of Petroleum Engineering are designed to train graduates competent in the engineering technology of petroleum, mineral fluids, energy and water production from the earth. The broad scientific base involved in this field qualifies graduates for wide-ranging professional assignments in areas such as:
Drilling Technology
Production Technology
Well and Property Valuation
Pressure Transient Analysis
Reservoir Engineering
Well Test Analysis
Reservoir Simulation
Well Logging and Log Analysis
Improved Oil Production
Natural Gas Engineering
Geothermal Energy Production
Mineral Fluid Economics
Water Production and Reclamation
Pipeline Transportation
Environmental Engineering
Mineral Fluid Production Research

Scientific disciplines involved include geology, geophysics, chemistry, mathematics, physics, and computer science. Breadth in engineering disciplines is also encouraged. The rapidly evolving energy and fluid production industries require professionals of unusual versatility interested in wide-ranging technological, sociological, and geographical subjects. Qualified students are encouraged to take graduate study
because typical assignments often lead to responsible positions in industrial management and research.

Graduate research is conducted in specialties such as geothermal engineering, improved oil recovery, well log analysis, well bore heat and fluid flow, pressure transient analysis, flow of non-Newtonian fluids, in-situ shale gasification, solution mining, natural gas engineering, mineral resource management and development, and mathematical simulation of these systems. Undergraduate participation in both research and industrial practice is encouraged and aided.

The main objective of this program is to produce mature engineers of broad scientific base qualified to grow in the evolving fields of energy resource production and environmental and social responsibility of technology. Because of the international nature of this field, special opportunities exist for those persons interested in language, culture, and travel. Participation in the Stanford Overseas Centers is encouraged, and summertime employment in the energy industries is required for at least one summer prior to the baccalaureate and for certain graduate students. Industrial summertime employment is usually plentiful for petroleum engineering students and the salary schedules are high. Permanent employment opportunities are extraordinary at all degree levels. For the past eight years, baccalaureate degree recipients have commanded the highest starting salaries of all baccalaureate and master's degrees. Graduate programs lead to the degrees of Master of Science, Engineer, Engineer (Management Option), and Doctor of Philosophy.

LABORATORY FACILITIES

The department occupies portions of the Mitchell Earth Sciences Building, the Henry Salvatori Building, and the Lloyd Noble Laboratory of Petroleum Engineering. The Lloyd Noble Building contains six laboratories for high temperature fluid flow and geothermal energy research, oil recovery research, adsorption studies, a classroom, a machine shop, an analytical laboratory, the main office for the Stanford University Petroleum Research Institute (SUPRI), faculty offices, a computer room, and office study space for graduate students. Other faculty and departmental offices are in the Mitchell Earth Sciences Building, and the Salvatori Building. Laboratories and additional student study rooms and research laboratories are also located in the Mitchell Building. Research is conducted in all three buildings.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The four-year program leading to the B.S. degree provides a foundation for a career in many facets of the energy industry. The Petroleum Engineering curriculum is fully accredited by the Accreditation Board for Engineering Development (ABET). The department undergoes accreditation inspections with the School of Engineering and further information may be found in the School of Engineering portion of this bulletin. Basic sciences and engineering are stressed to provide depth sufficient for the wide spectrum of careers possible in this field. Breadth is provided through courses in social sciences and humanities.

COURSE PROGRAM FOR UNDERGRADUATES

The requirements for the B.S. degree in Petroleum Engineering are essentially the same as those described for any engineering degree in the School of Engineering portion of this bulletin. In brief the credit and subject requirements are:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>6</td>
</tr>
<tr>
<td>Social science</td>
<td>9</td>
</tr>
<tr>
<td>Humanities</td>
<td>9</td>
</tr>
<tr>
<td>Mathematics</td>
<td>21 (min)</td>
</tr>
<tr>
<td>Science</td>
<td>24 (min)</td>
</tr>
<tr>
<td>Engineering breadth</td>
<td>36 (min)</td>
</tr>
<tr>
<td>Engineering depth</td>
<td>36 (min)</td>
</tr>
<tr>
<td>Free electives</td>
<td>39</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>180</strong></td>
</tr>
</tbody>
</table>

Although there is ample opportunity to modify a particular program to meet special objectives such as pre-law, a typical course of study would include the following:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pet. E. 103</td>
<td>Survey of the energy industries</td>
<td>3</td>
</tr>
<tr>
<td>150A</td>
<td>Well log analysis -I</td>
<td>3</td>
</tr>
<tr>
<td>150B</td>
<td>Well log analysis-II</td>
<td>3</td>
</tr>
<tr>
<td>151A</td>
<td>Earth fluids</td>
<td>3</td>
</tr>
<tr>
<td>151B</td>
<td>Fluid flow in porous media</td>
<td>3</td>
</tr>
<tr>
<td>151D</td>
<td>Reservoir fluids laboratory</td>
<td>3</td>
</tr>
<tr>
<td>151E</td>
<td>Core analysis laboratory</td>
<td>3</td>
</tr>
<tr>
<td>152A</td>
<td>Drilling technology</td>
<td>5</td>
</tr>
<tr>
<td>152B</td>
<td>Production technology</td>
<td>3</td>
</tr>
<tr>
<td>152C</td>
<td>Drilling fluids</td>
<td>3</td>
</tr>
<tr>
<td>160</td>
<td>Report on energy industry training</td>
<td>1</td>
</tr>
<tr>
<td>170</td>
<td>Elements of reservoir engineering</td>
<td>3</td>
</tr>
<tr>
<td>171</td>
<td>Reservoir simulation fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>172</td>
<td>Gas engineering</td>
<td>3</td>
</tr>
<tr>
<td>Math 19, 20, 21, 22, 23, 44, and 130</td>
<td>Calculus and differential equations</td>
<td>3 ea.</td>
</tr>
<tr>
<td>Chem 31, 33, and 171</td>
<td>Chemical principles reactions, and physical chemistry</td>
<td>11</td>
</tr>
<tr>
<td>Physics 51 and 53-Mechanics, Electricity and Magnetism</td>
<td>4 ea.</td>
<td></td>
</tr>
</tbody>
</table>
Selected courses often taken as electives are: Applied Earth Sciences 251 and 253; Geol. 102 and 193; Geophys. 180; Engr. 44, 50, 102, 103; Physics 110, 111; Pet. Engr. 173, 180, 190, 267; Stat. 110; Mech. Engr. 103 (Aut) and 250; Math 113, 131, 132; Comp. Sci. 135; and Chem. Engr. 110, 140, 150, and 160.

Sample programs showing courses by year and quarter are available in the Petroleum Engineering Office, room 360, Mitchell Earth Sciences Building. It is important to start mathematics courses in the first year and engineering and geology early in the second year.

Several other requirements are: (1) one summer’s work experience and a one unit report (Pet. E. 160) is required, (2) engineering breadth and depth courses should be taken for letter grades, and (3) ABET accreditation requires engineering students to have one half year (22½ credits) of engineering design. The latter requirement will normally be met on completion of engineering depth and breadth requirements.

The general university requirements for writing, western culture, and foreign language must also be completed within the 180 unit minimum requirement for the Bachelor of Science in Petroleum Engineering.

COTERMINAL B.S. AND M.S. PROGRAM

A Stanford undergraduate majoring in engineering or earth sciences may be admitted to the University Division for the purpose of working simultaneously toward both bachelor’s and master’s degrees under terms indicated in the introductory material for the School of Earth Sciences.

The applicant’s petition must provide strong evidence of academic performance as a graduate student. The petition will be evaluated and acted upon by the graduate admissions committee of the department. Typically, at least a 3.25 grade point average in engineering, science and mathematics is expected. Applicants must take the Graduate Record Examination (GRE) before action will be taken on the application. Students seeking a Bachelor of Science in an engineering field other than petroleum engineering and a Master of Science in Petroleum Engineering, should plan to take petroleum engineering and geology undergraduate requirements as a portion of the School of Engineering breadth requirement for their undergraduate degree.

GRADUATE PROGRAMS

The energy industries are interested in engaging petroleum engineers having advanced training. A balanced master’s degree curriculum covering both professional engineering and research requires a minimum of one academic year beyond the baccalaureate. The demand for people with this background far exceeds the supply. As a result, there are many attractive employment opportunities.

The degree of Engineer requires a comprehensive two-year program of graduate study. This degree permits more extensive course work than the master’s degree with an emphasis on professional practice.

The degree of Engineer (Management Option) requires two years of graduate study, combining engineering and business administration. This program is conducted in cooperation with the Graduate School of Business.

The degree of Doctor of Philosophy is awarded primarily on the basis of accomplishment in research. A minimum of both extensive course work and two years of graduate work beyond the master’s degree is required for the degree.

MASTER OF SCIENCE

The objective is to prepare the student for professional work in petroleum engineering through the completion of fundamental courses, both in the major field and in related sciences, and by obtaining a start on independent work and specialization.

The candidate must fulfill the following requirements:

1. Be registered in the graduate school for at least three quarters.
2. Complete 45 units with at least a B average; at least 6 and no more than 9 of these units must be independent work on a research problem.
3. Make up deficiencies in previous training; not more than 10 units of such work may be counted as part of the minimum total of 45 units.

In making up deficiencies, some of the following courses may be considered as mezzanine courses: Pet. E. 150A, 150B, 170, 171, and 172. That is, they may apply as either undergraduate or graduate credit. The 10 unit limitation applies to other deficiencies such as geology and other undergraduate petroleum engineering courses.

4. Demonstrate a knowledge of basic principles and research methods in the general field of study by preparing a report, to be submitted to a faculty member.

Usual research subjects include oil and gas recovery, reservoir engineering, transient well-test analysis, flow of non-Newtonian fluids, geothermal energy, well log analysis, natural
gas engineering, energy industry management, pipeline transportation, and certain groundwater hydrology and environmental problems.

**COURSES SUGGESTED FOR THE MASTER'S DEGREE**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering 200A. Mathematical Methods in Mechanical Engineering*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineering 200B. Mathematical Methods in Mechanical Engineering*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pet.E. 270A. Advanced Reservoir Engineering</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pet.E. 270B. Advanced Reservoir Engineering</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pet.E. 271A. Reservoir Simulation Theory</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pet.E. 271B. Advanced Reservoir Simulation</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pet.E. 274. Introduction to Research Methods</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pet.E. 275. Fundamentals of Well Test Analysis</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Electives†</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>


† Electives are to be selected with the approval of the student’s advisor.

The above course listing is typical, but other specific course listings are available in the department for students interested in concentrating on improved oil recovery, geothermal energy, environmental engineering, hydrology, oil transportation.

Students wishing to concentrate on numerical reservoir simulation may take the petroleum engineering course sequence 171, 271A, and 271B. This sequence provides fundamental background in preparation and operation of numerical reservoir simulators.

**ENGINEER**

**ENGINEER (MANAGEMENT OPTION)**

The objective is to broaden the student’s training in professional engineering and to provide a background in business administration.

A minimum of two years (six quarters) of graduate study is required. At least one of these years, ordinarily the last, must be spent as a registered student at Stanford. The candidate must complete 90 units of course work, including credit for research (Petroleum Engineering 360), and including all the course requirements of the department’s master’s degree except the research. If the candidate has received unit credit for such research, this credit ordinarily would be transferable to the Engineer degree. No more than 10 of the required 90 units may be applied to overcoming deficiencies in undergraduate training. In making up deficiencies, some of the following may be considered as mezzanine courses: 150A, 150B, 170, 171, and 172. That is, they may apply as either undergraduate or graduate credit. The 10 unit limitation applies to the other deficiencies such as geology and other petroleum engineering courses. The candidate is required to take a minimum of 36 units in Industrial Engineering and the Graduate School of Business. The following courses are suggested (other courses may be selected with advisor approval):

- **Bus. 200-201. Economic Analysis and Policy I and II**
- **Bus. 210-211. Accounting I and II**
- **Bus. 220. Business Finance I**
- **Bus. 261. Decision Making under Uncertainty**
- **Bus. 270. Organizational Behavior**
- **Bus. 290. Strategic Management**
- **Bus. 321. Investment Management**
- **Bus. 351. Negotiation and Intervention**
- **Bus. 352 Small Business Management**
- **Bus. 354. Energy-Business Issues**
- **I.E. 272. Managing Technical Companies**
- **Bus. 397. Business and the Law**

Additional units needed to make up the required 90 may be electives. The student must secure at least “Pass” grades in Graduate School of Business courses. In all other courses the student must maintain a “B” average. The student must prepare a thesis on a combined engineering and economic study representing 15 units of research. It is to have the approval of the supervising instructor and the University Committee for Graduate Studies.
mittee on Graduate Studies. Engineering theses are to be signed by two faculty members.

DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy is conferred upon evidence of high attainment involving the ability to conduct an independent investigation and to present the results of such research.

A minimum of three years (nine quarters) of graduate study must be satisfactorily completed. At least two of these years, ordinarily the last, should be spent as a registered student at Stanford. Ordinarily the student is expected to take at least 90 units of course work including credit for research (Petroleum Engineering 360) beyond the 45 units required for the master’s degree. Approximately 65 units are generally required, exclusive of research units. The 65 units in question should represent graduate courses in petroleum engineering offered at Stanford, plus courses picked from the following list, and other courses approved by the department.

MATH AND APPLIED MATH

Math. 106. Introduction to Theory of Functions of a Complex Variable 3
Math. 113. Linear Algebra and Matrix Theory 3
Math. 114. Linear Algebra and Matrix Theory 3
Math. 115. Fundamental Concepts of Analysis 3
Math. 131. Partial Differential Equations—I 3
Math. 132. Partial Differential Equations—II 3
Mechanical Engineering 201. Applications of Complex Variables 3
Stat. 110. Statistical Methods in Engineering and Physical Sciences 4
Stat. 111. Theory of Probability 4
Comp. Sci. 106. Introduction to Computing 3
Comp. Sci. 135. Numerical Methods 3
Comp. Sci. 234. Numerical Methods of Optimization 3
Aero. & Astro. 192. Vector Analysis and Cartesian Tensors 3
Aero. & Astro. 291A and B. Linear Transforms and Their Applications to Engineering Problems I and II 3 ea.

SCIENCE

App. Earth Sci. 225. Surfaces and Interfaces 3
App. Earth Sci. 251. Oil Field Exploration and Development 3
App. Earth Sci. 255. Introduction to Solute Transport 2
App. Earth Sci. 257. Hydrogeology in Engineering Practice 2

PETROLEUM ENGINEERING

Chem.Eng. 140. Fluid Mechanics 3
Engr. 287. Methods and Experiences in Engineering Education 3
Engr. 299. Seminar in Fluid Mechanics 1
Ind. Engr. 232. Advanced Engineering Economy 3
Mech. Engr. 250. Heat Transfer 4
Mech. Engr. 252A. Convective Heat and Mass Transfer 3

The Ph.D. program is normally a 4-year program. Except in unusual circumstances, the first year is consumed in fulfilling the requirements for the M.S. degree. During the second and third years, the student acquires the foregoing minimum of 65 units of credit in courses approved by the departmental faculty. Experience as a teaching assistant (quarter-time for at least one academic quarter) is required for the Ph.D. degree. During the second and third years, the student also completes a minimum of 25 units of research. The student begins the research work by making a literature survey and by formalizing research objectives. The fourth year the student spends full time completing research and writing the dissertation before the end of the academic year.

The departmental qualifying examinations usually are taken at the beginning of the year of graduate study, or at any time mutually agreed upon by the student and the faculty. The qualifying examinations extend over a period of about ten days and consist of a written part and an oral part. The written part consists of three or four two-hour examinations on different subjects. The oral part is a two-hour examination in which the student is questioned by members of the departmental faculty.

The student’s record must indicate outstanding scholarship. The student must pass the departmental qualifying examination; fulfill the requirements of the minor department, if a minor is elected; and pass the University oral examination, which is essentially a defense of the dissertation problem. The student must prepare a dissertation which is a significant
contribution to knowledge and the result of independent work.

The Ph.D. dissertation must be submitted in its final form within five calendar years from the date of admission to candidacy by the University Committee on Graduate Studies. Candidates for the degree who fail to meet this deadline will be required to reapply for admission to candidacy and retake the departmental qualifying and University oral examinations. They will be given one additional year in which to submit their dissertations.

COURSES

103. Survey of the Energy Industries—Arranged to give the students a comprehensive view of organization and operation of energy industries. Exploration; drilling and offshore drilling; development and production methods; transportation and storage; refining and petrochemicals; marketing; geothermal energy; oil shales; tar sands; coal; and solar energy. (DR: 8)
3 units, Aut (Horn) MWF 9 and 11
Spr (Horn) MWF 9 and 11

150A. Well Log Analysis I—An interdisciplinary course for all earth scientists and engineers. The main objective is development of a practical understanding of the interpretation of well logs by use of real field examples. Lectures, problems. Methods for evaluating commercial significance of rock formations penetrated in exploratory drilling. This is the first part of a two-part course and concentrates on the fundamentals of all types of logs including electric and nonelectric logs.
3 units, Aut (Sanyal) T 2:15-5:05

150B. Well Log Analysis II—This is the second part of the two-part course. Concentrates on quantitative, interpretive techniques of all types of logs.
3 units, Win (Sanyal) T 1:15-4:05

151A. Earth Fluids—Lectures, problems. Chemical, physical, and thermodynamic properties of underground earth fluids. Gas laws, behavior of liquids, phase equilibria, viscosities of hydrocarbons; properties of subsurface waters and steam. Prerequisite: 103.
3 units, Win (Horne) T 10-12, Th 11

3 units, Win (Aziz) by arrangement

151D. Reservoir Fluids Laboratory—Physical properties of petroleum and its products, distillation, gravity, viscosity, surface tension, etc. Prerequisite: 151A (may be taken concurrently).
3 units, Win (Gudmundsson) M 2:15
lab WF 2:15-5:05

151E. Core Analysis Laboratory—Porosity, permeability, capillary pressure, irreducible saturations, formation resistivity factor of porous media. Prerequisites: 151B and 151D (may be taken concurrently).
3 units, Win (Horne) T 1:15
lab TTh 2:15-5:05

152A. Drilling Technology—A course designed to provide a comprehensive picture of modern drilling operations, practices, and equipment both onshore and offshore. Lectures, field trips, problems.
5 units, Win (Horn) TTh 10-11:50

152B. Production Technology—Course designed to provide a survey of production operations, practices, and equipment. Lectures, demonstrations, field trips.
3 units, Spr (Harrington) T 10-12, Th 11

3 units, Aut (Castanier) MW 2:15
lab MW 2:15-5:05

1 unit, any quarter (Staff) by arrangement

3 units, Spr (Brigham) MWF 9

3 units, Aut (Aziz) T 9, Th 9-10:50

inated geothermal steam reservoirs. Design of well tests and gas gathering.

3 units, Aut (Ramey) MWF 10


any quarter (Staff) by arrangement

180. Undergraduate Teaching Experience—Leading field trips, preparing lecture notes, quizzes under supervision of the instructor.

1-3 units, any quarter (Staff) by arrangement

190. Undergraduate research problems—Original or guided research problems with comprehensive report.

1-3 units, any quarter (Staff) by arrangement

250. Advanced Formation Evaluation—Lectures, problems. Advanced logging systems, planning and computer aided interpretation. Proper combinations of wellbore logs with computer analysis of digitized data provide an optimum inspection of formations. Prerequisites: 150A and 150B or consent of instructor.

3 units, Spr (Staff) by arrangement

267. Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties—Seminar, problems. Appraisal of development and remedial work on oil and gas wells; appraisal of producing properties; estimation of productive capacity, reserves; operating costs, depletion and depreciation; value of future profits, tax returns, fair market value. Prerequisite: consent of instructor.

3 units, Spr (Kourt, Voss) S 9-12, or by arrangement


1 unit, any quarter (Staff)

by arrangement

269. Geothermal Reservoir Engineering—Steam well deliverability measurement, forecasting, and steam reservoir determination and forecasting. Interpretation of downhole pressure and temperature profiles. Vapor and liquid-dominated systems. Wellbore heat transmission, static and flowing pressures in wells, flow metering. Field problems and examples.

3 units, Spr (Gudmudsson) MWF 11


3 units, Auth (Brigham) MWF 9


3 units, Win (Bigham) MWF 10

270C. Advanced Reservoir Engineering—Continuation of 270B. Lectures and problems.

3 units, Spr (Staff) by arrangement


3 units, Spr (Horne) by arrangement

271B. Advanced Reservoir Simulation—Lectures and problems. Various methods of solving coupled system of partial differential equations arising in reservoir simulation. Discussion of coning, compositional and thermal models. Special topics of current interest to industry. Prerequisites: 171, 270A, 270B and 271A (may be taken concurrently) or consent of instructor.

3 units Spr (Aziz) alternate years, given 1984-85

272. Advanced Gas Engineering—Lectures, problems. Transient flow of real gas in reservoirs, testing of gas wells. Gas reservoir material balances, water-drive (recharge) gas reservoirs, production matching and forecasting, reserve estimation, gas storage reservoirs. Real gas potential. Prerequisite: 172, 275, or consent of instructor.

3 units, Spr (Ramey) MWF 10


any quarter (Staff)

by arrangement

274. Introduction to Research Methods — Lectures, demonstrations, preparation and presentation of research proposals. Theoretical and experimental methods. Literature surveying and compiling. Prerequisite: Graduate standing.

3 units, Aut (Marsden) MWF 10


4 units, Win (Ramey) by arrangement
280A. Improved Recovery Methods—Lectures, problems. Chromatographic transport of mass and heat through porous media, specific applications to immiscible and miscible displacement of oil. Includes water flooding, gas injection, miscible displacement, thermal oil recovery methods, and other modern fluid injection methods. Prerequisite: 270A (may be taken concurrently).

3 units, Aut (Staff) by arrangement

280B. Modern Fluid Injection—Continuation of 280A.

3 units, Win (Staff) by arrangement


3 units, Spr (Horne) given 1984-85


3 units, Spr (Marsden) alternate years, given 1984-85

284. Non-Newtonian Fluids in Petroleum Production Engineering—Properties and applications of non-Newtonian fluids in both drilling, completing, cementing, fracturing, improving production of wells; transportation and recovery. Prerequisite: Graduate standing.

3 units, Spr (Marsden) MWF 9 alternate years, given 1983-84

285A,B,C,D. Research Seminars—The research seminar serves the purpose of pursuing special, focused study in areas of research within the department. All graduate degree program students may use this opportunity to participate in advanced work in areas of particular interest prior to making a final decision on a thesis subject. Prerequisite: consent of instructor.

285A. Research Seminar—Special drilling, production, or reservoir engineering subjects.

1 unit, Aut, Win, Spr (Staff) by arrangement


1 unit, Aut, Win, Spr (Brigham) by arrangement


1 unit, Aut, Win, Spr (Gudmundsson, Horne, Kruger, Ramey) by arrangement


1 unit, Win, Spr (Staff) by arrangement

359. Teaching Experience in Petroleum Engineering—On the job training in teaching petroleum engineering. The student will prepare and present several lectures, problem sets, grade problems, and prepare laboratory experiments under the supervision of a regular course instructor. Performance will be evaluated by both students and the regular instructor.

1-3 units, any quarter (Staff) by arrangement

360. Advanced Work in Petroleum Engineering—Graduate level work in either experimental, computational, or theoretical research Advanced technical report writing.

Any quarter (Aziz, Brigham, Cinco-L, Dykstra, Gudmundsson, Homsy, Horn, Horne, Marsden, Miller, Ramey, Sanyal) by arrangement
Emeriti: Robert N. Bush, Oliver E. Byrd, Lee J. Cronbach, Edith M. Dowley, Alfred H. Grommon, Paul DeH. Hurd, William J. Iverson, Wolfgang E. Kuhn, James D. MacConnell, Quinn McNemar, John E. Nixon, Wilbur Schramm, Pauline S. Sears, Fannie R. Shaftel, Rosedith Sitgreaves, George D. Spindler, Lawrence G. Thomas, H. Donald Winbigler (Professors); Margaret Barr, Luell Guthrie, Marian S. Ruch (Associate Professors); Guy H. Browning (Lecturer)

Dean: J. Myron Atkin

Associate Deans: Arturo Pacheco (Academic and Student Affairs), Jack Thomas (Research and Administration)

Assistant Dean: Eleanor Worden (Admissions and Financial Aid)

Professors: Paul Brest (by courtesy), Edwin M. Bridges, Robert C. Calfee, Martin Carnoy, Elizabeth G. Cohen, Arthur Coladarci, Sanford M. Dornbusch (by courtesy), Elliot W. Eisner, Nathaniel L. Gage, Richard E. Gross, Robert D. Hess, Alex Inkeles (by courtesy), Michael W. Kirst, John D. Kumboltz (on leave), Henry M. Levin (on leave), James G. March (by courtesy), Lewis B. Mayhew, John W. Meyer (by courtesy), Ingram Olkin, Denis C. Phillips, Robert L. Politzer, Helen W. Schrader (by courtesy), W. Richard Scott (by courtesy), Lee S. Shulman, Alberta E. Siegel (by courtesy), Richard E. Snow (on leave), Herbert Solomon (by courtesy), Patrick C. Suppes (by courtesy), Robert B. Textor, Carl E. Thoresen, David B. Tyack (on leave), Hans N. Weiler

Associate Professors: Arthur Applebee, Michael Bratman (by courtesy), Larry Cuban, Edmundo Fuenzalida, Shirley Heath, Milbrey McLaughlin, Wesley K. Ruff, Joel Samoff, Pamela L. Strathairn (by courtesy), Myra H. Strober, Decker F. Walker

Assistant Professors: Beatriz Arias, Martin Ford, Michael Garet, Edward Haertel, Susan Krantz, Nel Noddings, Arturo Pacheco, David Rogosa, Joan E. Talbert (on leave)

Lecturers: Ray Bacchetti, Patrick Brady, Fred Hargadon, Ronald B. Herring, Robert P. Huff, James W. Lyons, Douglas P. Murray, Joel Smith, Carolyn P. Walker

Acting Assistant Professor: David Grossman

Visiting Professor: Bruno Bettelheim

OFFERINGS

The School of Education is responsible for the preparation of scholars investigating educational processes, and of teachers, supervisors, guidance workers, administrators, and other educational specialists. Five degrees with specialization in education are granted by the University: Master of Arts, Master of Arts in Teaching, Educational Specialist, Doctor of Education, and Doctor of Philosophy. For experienced teachers the Master of Arts in Teaching degree is offered jointly with several academic departments. Teaching and educational service credentials are issued by state departments of education upon verification by the School of Education that properly accredited work has been completed by the student. The school recommends to the California Commission on Credentialing that credentials be granted to those students completing one of the Commission-approved credential programs.

Students who qualify for a preliminary teaching credential in California, but need a fifth year of study and a University recommendation for the clear California teaching credential, may satisfy this state requirement in one of the University's degree programs. Students requiring this University recommendation must contact the Degree Program Office in the School of Education during their first quarter of study.

Acceptance of Work Done Elsewhere—Students transferring with advanced or graduate standing from other universities may have some equivalent training accepted in lieu of the courses required at this University for degree programs.

The University offers no correspondence or extension courses.

SUMMER SESSION

The full Summer Session in the School of Education is for eight weeks. In addition, several one-, two-, three-, and four-week workshops and institutes are offered which make it possible for students to earn credit in shorter periods of time. However, those who pursue a full program of study (15 units) for eight weeks may earn a quarter of residence toward degree and credential programs. The number of units for which a student may register in the Summer Session may not exceed 16, unless part of the registration is for thesis or dissertation.

The Summer Session Bulletin, issued each year in February, contains more definite information about summer offerings.
UNDERGRADUATE PROGRAM
COTERMINAL A.B./A.M.
PROGRAM IN EDUCATION

The school of education admits students from undergraduate departments within the University into a Coterminal A.B. and A.M. program. Students in such a program receive an A.B. in their undergraduate major and an A.M. in Education. Approval of the student's undergraduate department and the School of Education is required. Applications may be made upon completion of 105 units, but no later than the end of the eleventh quarter of undergraduate work. Students study for both the bachelor's and master's degrees simultaneously and must complete fifteen full-time quarters, or three full-time quarters after completing 180 units toward the undergraduate degree. The number of units required for the A.M. degree depends upon the program requirements within the School of Education; the minimum number is 36.

Applicants may obtain Petitions for Admission to the coterminal degree program from the School of Education or the Graduate Program Office. They must submit a statement of purpose, a transcript, two letters of recommendation from members of their undergraduate department, and yearly program sheets.

GRADUATE PROGRAMS

The information about programs of study reported below is in relation to degrees and credentials. Many students entering the School of Education are seeking both degrees and credentials. In that case, both applicable sections should be consulted. Below are listed degrees offered by the School of Education with which credentials may be associated. (There is no necessary association between degrees and credentials. Requirements for degrees and credentials differ.)

Students who wish to be candidates for graduate degrees are urged to write to the Admissions Office, School of Education, Stanford University, Stanford, CA 94305 for full information and application forms. The sections below summarize the requirements for the degrees but do not describe the programs in detail. The details are supplied upon request by the School of Education. The Graduate Record Examination (Aptitude Test) is required for all graduate admissions.

Admission to graduate standing by the University does not in itself constitute admission to candidacy for a graduate degree in the School of Education. Students who have been admitted to graduate standing at Stanford University should inquire, during their first quarter in residence, about degree application procedures.

Students working toward graduate degrees should follow the suggestions outlined for each degree. Students applying for the master's or doctoral degree will present a preliminary program of study which represents the work to be completed in earning the degree. They will also consult their advisors with regard to organizing their graduate programs within the limits described in this bulletin.

Students who are candidates for a master's or doctoral degree should consult also the University's general requirements described in the "Degrees" section in this bulletin, noting in particular, registration and residence requirements.

MASTER OF ARTS

The degree of Master of Arts (A.M.) in Education is offered in the following fields:

Administration and Policy Analysis
Curriculum and Teacher Education (with specialization in the following areas):
- Art Education
- Bilingual/Bicultural Education
- Design and Evaluation of Educational Programs (General Curriculum, Curriculum Evaluation, Educational Film and Television, Elementary Education, Teacher Education)
- Mathematics Education
- Physical Education
- Physical Education with Specialization in Dance
- Second Language Education
- Writing, Reading and Language (English as a First Language)
- Interactive Educational Technology
- International Development Education
- International Educational Administration and Policy Analysis
- Mathematical Methods in Educational Research
- Social Sciences in Education
- Gender Studies
- Stanford Teacher Education Program*

Other program areas may be arranged for individual graduate applicants when approved by the relevant administrative committee. Ordinarily candidates for the master's degree in the Curriculum and Teacher Education area will have completed student teaching or another practicum, or have one year or more of teaching experience before entering the master's program.

More detailed information about the Master of Arts programs and requirements in specific areas may be obtained from the Degree Program Office, School of Education.
A minimum of 36 quarter units of graduate work is required, although some A.M. programs in the School of Education have course and residence requirements which exceed the minimum requirements. At least 30 units must be completed at Stanford. A minimum of 12 of these must be taken for a letter grade and the candidate must achieve at least a "B" average. Eighteen (18) units of the program must be in the School of Education. In no case will the degree be granted unless the student has been registered at Stanford for three quarters after the conferring of the bachelor's degree. University residence requirements must be met. The minimum residence requirement for the master's degree is registration at Stanford as a graduate during at least three quarters and the payment of the equivalent of at least three full quarters' tuition at Stanford as a graduate. Only one quarter of nonmatriculated study may be counted toward the residency requirement for this degree.

The degree of Master of Arts is conferred by the University, on recommendation of the faculty of the School of Education and the University Committee on Graduate Studies. No thesis is required.

Information on program requirements and the order of procedure for applying for candidacy for the master's degree should be obtained from the Degree Program Office, School of Education, during registration in the first quarter of residence.

NOTE: Application for candidacy for the of A.M. degree must be filed with the Degree Program Office no later than two weeks before the last day of class of the quarter preceding the quarter in which degree conferral is expected.

MASTER OF ARTS,
TEACHING (SUBJECT)†

The degree of Master of Arts, (Subject) in Teaching is offered jointly by the School of Education and the following academic departments: Art, Classics, English, French and Italian, German, History, Latin American Studies, Mathematics, Political Science, Slavic Languages and Literature, and Sociology. In addition to these fields, it is possible for candidates to work out special programs in areas such as the social sciences.

General requirements for the degree are as follows:

1. The applicant must have completed a bachelor's degree with an acceptable grade point average to qualify for graduate study. The department of the major teaching field determines the adequacy of this preparation. The School of Education determines the adequacy of the candidate's background in professional education. The candidate must be admitted to the program both by the department of the teaching major and the School of Education.
2. The applicant must have teaching experience.
3. Three quarters of full-time residence (or equivalent). This may be satisfied in many cases by the candidate's attending a series of Summer Quarters when appropriate courses are available.
4. A minimum of 45 quarter units of graduate study. At least 36 of these units must be completed at Stanford. University residence requirements must be met. The minimum residence requirement for the master's degree is registration at Stanford as a graduate during at least three quarters and the payment of the equivalent of at least three full quarters' tuition at Stanford as a graduate. Only one quarter of nonmatriculated study may be counted toward the residency requirement for this degree.
5. A minimum of 25 units of the courses taken for the A.M.T. degree must be in the teaching field of concentration.
6. At least 12 units of the A.M.T. degree requirements shall consist of graduate courses in the School of Education at Stanford. Certain courses cross-listed in two departments may be used to satisfy requirements in either the academic department or the School of Education, but the same course may not be used to meet requirements in both departments. Requirements for the School of Education consist of courses in the following areas to supplement the candidate's preparation:
   a) Methods in the candidate's teaching field.
   b) A course in curriculum.
   c) Recent work in Psychological or Social Foundations. (If both have been completed elsewhere, other work in the foundation fields—History, Philosophy, Comparative Education, etc.—must be

† The degree of Master of Arts, in Teaching (Subject) is reserved for experienced teachers or for individuals who have previously completed a program of teacher preparation. Candidates seeking their initial preparation for teaching by way of a teaching internship may prepare for the degree of Master of Arts in Education as well as for a credential. See "Credentials for Public School Service" for pertinent details.

* A program for candidates who are seeking initial preparation for the Single Subject Teaching Credential (Secondary) as well as for the master's degree. See "Credentials for Public School Service" for pertinent information.
selected in consultation with the advisor in the School of Education.)

7. Requirements in the major teaching field are determined by the major department, and the program of professional courses by the School of Education. Both the preliminary plan of study and the final application for the degree must be signed by a representative of the academic department and of the School of Education.

8. The candidate must achieve at least a “B” average in approved Stanford courses in the teaching subject and in professional education, or grades in these courses equivalent to those required for the academic department’s Master of Arts degree.

9. Approved general background courses outside of the teaching field and professional education may be used to satisfy some of the unit requirements for the degree.

10. Specific course requirements in both the teaching field and professional education will be determined in part by the candidate’s previous program of studies.

NOTE: Application for candidacy for the A.M.T. degree must be filed with the Degree Program Office, School of Education, no later than two weeks before the last day of class of the quarter preceding the quarter in which degree conferral is expected.

EDUCATIONAL SPECIALIST IN EVALUATION

The degree of Educational Specialist (Ed.S.) is offered in the field of Evaluation for those students admitted to the School of Education’s Evaluation Training Program. General requirements for the degree are given below; a statement about the design of the program follows.

General requirements—The Educational Specialist degree can be completed with a minimum of three quarters of coursework beyond the master’s (or its equivalent) and an accumulation of 45 quarter units; in addition, field-based projects are required. The minimum residence requirement for the degree is registration at Stanford as a graduate student during at least three quarters and the payment of at least three full quarters tuition at Stanford as a graduate.

EVALUATION TRAINING PROGRAM

Evaluation of educational and social programs is a relatively new specialization. Evaluators are, in effect, doing educational work; they attempt to help society to learn in its programmatic attempt to solve pressing problems. To carry out this function, evaluators need to be conversant with a variety of disciplines, and to have expertise in at least one that is pertinent. In addition, in order to be effective, evaluators need to understand the political, social, and organizational settings in which programs are carried out and in which decisions about progress are made.

There are three general ways in which the Ed.S. degree in Evaluation can be earned:

1. By applicants with professional experience who hold an A.M. degree and whose professional advancement would be enhanced by the Ed.S. degree as a terminal qualification.

2. By applicants who are taking another course of study within Stanford (e.g., a doctorate in Education or Communication) and who wish to take the Ed.S. degree concurrently.

3. By applicants who hold a doctorate but who wish to qualify themselves in evaluation by taking the Ed.S. degree in a post-doctoral year.

Students in the Evaluation Training Program (ETP) will be required to take courses examining evaluation problems from both “technical” and “practical” perspectives, and courses which place evaluation in political and social contexts. Participation in practicum activities is also required. However, within this framework, students will be able to meet the program requirements by tailoring their courses to satisfy their individual interests.

Further information about the Evaluation Training Program and the Educational Specialist degree can be obtained from the School of Education Admissions Office, or from the Director of the ETP.

NOTE: Application for candidacy for the Ed.S. degree must be filed with the Degree Program Office, School of Education, no later than two weeks before the last day of class of the quarter preceding the quarter in which degree conferral is expected.

DOCTORAL DEGREES

Students admitted to study for advanced degrees in education should plan to specialize in the field of their professional interest, preparing for some line of professional activity and at the same time securing mastery of an organized body of knowledge. The choice should be made in light of the professional objectives of the student. The course of study for the various program areas is somewhat flexible, allowing a student, in consultation with the advisor, to emphasize certain aspects of the work, depending on particular interests and objectives. A faculty advisor from the student’s program area
will assist in planning a program of study and in projecting research plans for the dissertation. Other members of the faculty of the School of Education may also be consulted with regard to the particular area chosen by the student.

The program areas for the doctorate are listed below.

Administration and Policy Analysis
Curriculum and Teacher Education, with concentrations in any of the following fields:
- Art
- Bilingual (Bidialectal)/Bicultural Education
- Design and Evaluation of Educational Programs (General Curriculum, Curriculum Evaluation, Elementary Education, Teacher Education)
- Second Language Education
- Social Studies
- Writing, Reading and Language (English as a First Language)

International Development Education
* Mathematical Methods in Educational Research
* Psychological Studies in Education, with concentrations in:
  - Child Development and Early Education
  - Counseling Psychology
  - Counseling Psychology (Health Psychology)
  - Educational Psychology

* Social Sciences in Education, with concentrations in:
  - Anthropology of Education
  - Economic Studies in Education
  - History of Education
  - Philosophy of Education
  - Political Studies in Education
  - Sociology of Education
  - Social Sciences in Education (interdisciplinary)

For each of the six general program areas there is a corresponding Area Committee. A timetable for the student’s expected progress toward the Ed. D. or Ph. D. degree is available for each program area. In general the timetable is as follows:

**First year**—Selection of program area and advisor; development of program plan; course work; preliminary review (qualifying examination in some areas).

**Second year**—Continuation of course work; qualifying examination or review; admission to candidacy; dissertation planning and proposal; oral examination (proposal option).

**Third year**—Work on dissertation; completion of course work.

**Fourth year**—Completion of dissertation; oral examination (defense of dissertation).

* Ph.D. degree only.

---

**DOCTOR OF EDUCATION**

The degree of Doctor of Education (Ed. D.) is a professional degree conferred by the University upon recommendation by the faculty of the School of Education and the University Committee on Graduate Studies. This degree is intended to meet the needs of (a) those who seek a comprehensive professional understanding of and competence in dealing with educational problems met by administrators, supervisors, guidance workers, and curriculum specialists; or (b) those who aspire to a scholarly preparation for teaching Education in colleges or universities.

**Residence**—Nine full tuition quarters of graduate registration (or the equivalent in partial tuition quarters) are required for the doctorate. Acceptable graduate work completed at other institutions may be included in the fulfillment of this requirement to a maximum of three quarters. See sections on “Advanced Degrees” and on “Nonmatriculated Graduate Study” under “Dean of Graduate Studies and Research” in this bulletin. In such cases, candidates for the degree will be expected during the course of work to register at Stanford for a minimum of two academic years (six full quarters or the equivalent in partial registrations). A minimum of two of these quarters must be in consecutive full-time residence. Admission to candidacy is granted by the School of Education and expires five years from the end of the quarter in which the candidacy is established.

**Units**—A minimum of 108 quarter units must be completed. Unit requirements are evaluated on the basis of graduate units taken beyond the baccalaureate degree, including relevant and acceptable work taken elsewhere up to a maximum of 36 quarter units.

Graduate course work taken seven or more years ago ordinarily will not be included in the doctoral program.

**Organization of Program**—The student will organize a program in conference with an advisor relevant to the selected field of concentration. This advisor will also make recommendations to the Area Committee concerning the student’s application for candidacy for the degree and will usually function as advisor on research for the dissertation. The advisor will be aided by other members of the faculty in the direction of the research program. All programs require the approval of the relevant School of Education Area Committee and the administrative committee.

Information about requirements in specific program areas may be obtained from the Ad-
missions Office, School of Education, or from the secretary to the relevant Area Committee.

**DOCTOR OF PHILOSOPHY**

The degree of Doctor of Philosophy (Ph. D.) is conferred by the University upon recommendation by the faculty of the School of Education and the University Committee on Graduate Studies. Students working toward this degree in the School of Education are ordinarily preparing to direct research work in public school systems or in specialized institutions, or to conduct research as faculty members of colleges or universities.

*Residence*—Nine full tuition quarters of graduate registration (or the equivalent in partial tuition quarters) are required for the doctorate. Acceptable graduate work completed at other institutions may be included in the fulfillment of this requirement to a maximum of three quarters. (See sections on “Advanced Degrees” and on “Nonmatriculated Graduate Study” in this bulletin.) In such cases, candidates for the degree will be expected during the course of work to register at Stanford for a minimum of two academic years (six full quarters or the equivalent in partial registrations). A minimum of two of these quarters must be in consecutive full-time residence.

Application for formal admission to candidacy for the Ph.D. degree should be made no later than the sixth quarter of graduate study at Stanford. Admission to candidacy is granted by the University Committee on Graduate Studies and expires five years from the end of the quarter in which the candidacy is established.

*Units*—A minimum of 108 quarter units must be completed. A minor field of study must be included if the candidate does not hold an acceptable master's degree outside the field of education. Unit requirements are evaluated on the basis of graduate units taken beyond the baccalaureate degree, including relevant and acceptable work taken elsewhere up to a maximum of 36 quarter units. Graduate course work taken seven or more years ago ordinarily will not be included in the doctoral program.

*Organization of Program*—Considerable flexibility is allowed in projecting a program for the Ph.D. degree. The candidate will be expected to organize a program of work for the degree in conference with advisors relevant to the field of concentration. All programs require the approval of the relevant School of Education Area Committee and administrative committee, and the University Committee on Graduate Studies. Information about requirements in specific program areas may be obtained from

---

**CREDENTIALS FOR PUBLIC SCHOOL SERVICE**

The University is authorized to recommend the granting of certain credentials for service in the public schools of California. The course work and teaching experience required for California credentials will in many instances meet the credential requirements of other states.

**ADMINISTRATIVE SERVICES CREDENTIAL**

The Stanford School of Education is authorized to recommend students for the Service Credential with Specialization in Administrative Services. Students must be admitted to a degree program in the School of Education as well as to the Administrative Services Credential Program. Applications for the Credential Program are available from the Degree Program Office in the School of Education and should be filed by the second quarter of study. Students must hold a valid California teaching credential based on a baccalaureate degree or a pupil personnel services credential; have three years of successful, full-time experience (either teaching or in the field of pupil personnel services); and complete Stanford's approved program. Information about programs of study, and application procedures should be obtained from the Degree Program Office in the School of Education on or shortly after registration day in the first quarter of residence.

The Service Credential with specialization in Administrative Services authorizes the holder to serve as superintendent, associate superintendent, deputy superintendent, principal, assistant principal, supervisor, consultant, coordinator, or in an equivalent or intermediate level administration position.

**TEACHING CREDENTIALS**

The School of Education is authorized to recommend those students who complete the
Stanford Teacher Education Program (see below) for the California Single Subject Teaching Credential. Programs of study and order of procedure should be obtained from the Degree Program Office in the School of Education on registration day in the first quarter of residence.

Students who have completed a program of professional preparation elsewhere, qualified for a preliminary teaching credential in California (either multiple subject or single subject), and need a fifth year of study and a university recommendation for a clear credential should contact the Degree Program Office at the beginning of their first quarter of study at Stanford in order to plan for the completion of credential requirements concurrently with the fifth-year program requirements.

STANFORD TEACHER EDUCATION PROGRAM (INTERNSHIP)

The Stanford Teacher Education Program (STEP) is a twelve-month, fifth-year program which leads to a California Single Subject Teaching Credential and the Master of Arts degree in Education. It begins in June with a Summer Quarter of intensive preparation in the process of teaching and experiences in summer programs in nearby schools. During the academic year, students take courses in their academic fields and in professional education; they also teach part time in local schools. Stanford offers training for the credential in the following areas only: Art, English, a Foreign Language (French, German, Spanish), Mathematics, Music, Physical Education, a Science (Biology, Chemistry, Physics), and Social Science.

Eligibility—Graduates in the humanities and sciences from colleges and universities of recognized standing are eligible to be considered as candidates for admission to the Stanford Teacher Education Program, if they have maintained at least a B- academic average in undergraduate and graduate courses. Applicants must have acceptable preparation in one of the teaching majors listed above. Previous course work in professional education at the graduate level will not be counted toward the master's degree. Persons who have been out of college for some time but now seek to prepare to teach, as well as recent graduates, are encouraged to apply. The number of candidates who can be admitted to prepare in a particular subject area is limited by the facilities of the University and by the number of school assignments available in that subject field.

Closing date for filing applications—Completed applications (available from the Admissions Office, School of Education) should be filed no later than March 1.

The Graduate Record Examination (Aptitude Test)—Required for admission.

Teaching practicum—Each candidate must successfully complete a year of teaching at a local cooperating school under the supervision of a Stanford supervisor and a resident supervising teacher. The candidate normally spends a half day in school, including teaching two classes. Some candidates receive a small salary, but many complete the requirement of the program through holding non-salaried student teaching positions.

Every effort is made to secure placement for a candidate that reflects the student's preference and that provides an income. However, no guarantee is made that a salaried internship position can be provided.

Requirements—To qualify for the clear California Single Subject Teaching Credential, the candidate must satisfy the following requirements:

1. A baccalaureate or higher degree from an approved institution (except in professional education).
2. A teaching major consisting of a minimum of 36 quarter units (24 semester units) of upper division or graduate courses.
3. The approved fifth year of study program of professional preparation which includes work in the academic area, in professional education, and in practical teaching experiences. A minimum of 45 units of graduate study is required, and at least 36 of these units must be completed at Stanford.
4. Fulfillment of the U.S. Constitution requirement either by taking satisfactory course work or by passing an examination.
5. The course in reading instruction.
6. The course in health education.
7. The course in special education.
8. Verification of knowledge of subject matter in order to establish a teaching authorization in the student's area of admission. This must be done by one of the following two methods:
   a) Passage of an examination on the subject matter (currently one of the Specialty Area tests of the National Teacher Examinations) or,
   b. Completion of a Commission approved subject matter waiver program in a California institution.

An intern teacher must be credentialed during the STEP training year. Therefore, the teaching authorization should be verified by
one of the above methods before the start of an internship in September.

How the Program is Organized

Summer Quarter—Full-time residence at Stanford University. Courses in the teaching major and in professional education: foundations of education, curriculum and instruction in the teaching major, introduction to secondary education, and health and adolescence.

Academic Year—Part-time teaching responsibilities. Additional course work in the academic major; course work in education to include additional work in the foundations of education, reading, special education, curriculum and instruction and teaching internship.

In light of continuing program development these requirements are subject to revision.

COURSES IN OTHER DIVISIONS OF THE UNIVERSITY

Teachers, administrators, and specialists in other areas of education are expected to have a substantial knowledge of a variety of academic fields outside the areas encompassed by professional education. Students are therefore urged to consider the courses offered in other divisions of the University in planning their programs.

COURSES IN EDUCATION

The School of Education is primarily a professional graduate school. However, undergraduates are welcome in many courses numbered 100–299.

Course descriptions are arranged in numerical order and indexed by professional program areas.

"X" suffix denotes an Experimental Course which is offered only once or twice. With faculty approval it can then be offered as a regular course in the School of Education.

"S" suffix denotes a Special Course, given only once, by the School of Education. It is not included as a regular offering. This designation is intended particularly for courses taught by visiting faculty and those dealing with important but transitory subjects.

100. UPSE Practicum in Education — For undergraduates who want to teach, tutor, or coach in local schools and educational programs. Opportunities for first-hand experience exist at all age levels and in a wide variety of subjects. Sponsorship and supervision through the Undergraduate Program in the School of Education. (UPSE)

2-3 units, Aut, Win, Spr (Staff) by arrangement

100A. UPSE Seminar — Designed for undergraduates who had or are having first-hand experience as teachers, tutors, or coaches. Emphasizes contemporary educational issues and the common concerns of beginning teachers. Particular focus of seminar may vary from quarter to quarter. Sponsored by Undergraduate Program in the School of Education. (UPSE)

1-2 units, Aut, Win, Spr (Staff)

T 7-9 p.m.

105. American Education and Public Policy — (Same as History 158B.) Drawing on history and political science, this course treats policy issues in education. Who influences schooling and how? How have American schools responded to human diversity? What consequences does schooling have? What are the prospects for reform in public education? Issues analyzed in lectures and in small group discussions. (SSE) (DR:5)

3 units, Aut (Tyack and Kirst) alternate years, given 1984-85

130. Counseling and Therapy: An Introduction — (Same as Psychology 144.) Some major approaches to counseling and psychotherapy. Primary emphasis on social learning strategies as to key concepts, and clinical techniques. Study number of case studies on variety of personal, social, academic problems. Psychology 1 recommended as prerequisite. (PSE)

3 units, Spr (J. Krumboltz) alternate years, given 1984-85

132S. Seminar in Cross-Cultural Counseling — (Same as Psychology 131.) An examination of how the New World experience has affected the adaptive strategies, acculturation patterns, family structure, predominant stresses, and support systems of Afro-Americans, American Indians, Asian Americans and Hispanic Americans. Intensive analysis of the theory and practice of cross-cultural counseling, cultural adaptation of existing counseling interventions, and present mental health service delivery models with special emphasis on cultural appropriateness, bicultural competence, and clinical efficacy with ethnic minority groups. (PSE)

3 units, Aut (LaFromboise) TTh 11-12:30

134. Counseling for Career Planning — Methods for helping other people learn career decision-making procedures; alternative theories of career choice; information sources for generating alternatives and estimating probable outcomes. (PSE)

3 units, Aut (J. Krumboltz) alternate years, given 1984-85

136. Behavior Modification: Introduction — (Same as Psychology 139.) Examines how principles of learning are used to help people change their behavior. Contrasts alternative
154. Psychology of Reading — (Same as Psychology 143.) Survey of literature on the reading process, and acquisition of reading. Review of experiments on reading and reading instruction. (PSE)

3 units, Win (Krantz) MW 1:15-2:45
and by arrangement

161. Introduction to Teaching and Learning in Asia—Preparation for transcultural living and teaching experiences. Emphasis on knowledge of (1) Asian history and culture; (2) skills required for living in an Asian community; and (3) role played by American culture in shaping one's own attitudes, values and behavior. Prerequisite: consent of instructor. (IDE)

4-5 units, Spr (Herring) by arrangement

170. Sex and Education—(Same as Sociology 112.) Examines gender as a critical variable in educational institutions and labor markets. Interdisciplinary approach to issues such as the distribution of power in schools, the determinants of occupational choice, the relative payoff of schooling for women and men, the causes of differential behavior and treatment between the sexes in schools and in the work force, and the legal redress of inequalities. Readings, lectures and discussions on theoretical, empirical and policy materials. Coordinated with the Center of Research on Women's (CROW) Wednesday noon lecture series. The three primary disciplines in the course will be economics, history and sociology, but professors of psychology and the law will also take part in the analysis. (SSE)

3-4 units, Spr (Cohen, Strober and Tyack) alternate years given, 1984-85

172. Status Attainment: Education and Work — (Same as Sociology 137.) Introduction to sociological research on educational, occupational and economic attainment processes. Special attention is focused on gender differences in work careers over the life cycle and on organizational and institutional structuring of careers. The U.S. status-attainment research tradition contrasted with alternative theoretical and empirical perspectives on educational and work-career process. (SSE)

3-5 units, Spr (Heath) TTh 2:15-4:05

174X. Exploring the Educational Potential of Microcomputers—A seminar in which various uses of computers in education will be consid-
200. History of Education — Foundational course in educational history meeting advanced degree requirements. Survey; emphasis upon European backgrounds, educators, schools, covering period from “Golden Age” of Greece to twentieth century. (SSE)
3-4 units, Win (Gross) TTh 1:15-3:05

201. History of Education in the United States — (Same as History 158.) Analysis of selected turning points in education in relation to such topics as religion, political socialization, race relations, immigration, and urbanization. (SSE)
3 units, Spr (Tyack)
alternate years, given 1984-85

202. Social Science: Teachers and Schools—This course is designed for the beginning secondary school teacher. Readings, lectures and class activities will involve the application of concepts and analytical techniques from the social sciences problems of the beginning teacher. The approach will be interdisciplinary and will involve a team of two faculty members with differencing social science specialties. (SSE)
4-6 units, Spr (Cohen and Arias)
MW 4:15-6:05

203. Models of the Child in Contemporary Educational Thought—Introductory course intended to focus critical attention on a number of influential views of the child that have been formulated by psychologists, political theorists and philosophers, and to place them in historical and philosophical perspective. (SSE)
4 units, Sum (Phillips) TTh 2-4

204. Introduction to Philosophy of Education: Curriculum Focus—Aims at introducing current approaches and techniques in philosophy of education, but material has been selected also for its general relevance to students of education; the introductory philosophical material will be presented in the context of issues concerning the curriculum. (SSE)
4 units, Aut (Staff)
alternate years, given 1984-85

205. Ideology and Education—Philosophical analysis of the concept of “ideology” as it has been developed in critical social theories from Marx to the present; in particular, the course will focus in class lectures and discussions on the claim that all education is ideological, and will raise the question of whether or not there is any non-ideological way of setting and evaluating educational goals. The second half of the course will focus on a comparative analysis of ideology and education in several distinct national contexts: U.S.A., Cuba, Tanzania. (IDE, SSE)
4 units, Aut (Pacheco) MW 10-12

206A. Introduction to the Study of International Development Education—Introduction to the theoretical orientations and the research agenda in International Development Education, and to resources for study and research at Stanford. Required for all first-year students in SIDEC: others by consent of instructor. (IDE)
2-3 units, Aut (Weiler and staff)
M 12-2 and by arrangement

206B. Project Workshop in International Development Education—This course concludes the 4-quarter A.M. program in SIDEC, and is required of all A.M. students. It is organized around the students’ “Master Project”, and will provide in-depth reviews of draft project reports. The final version of the report is due at the end of the course. (IDE)
4 units, Sum (Fuenzalida) MW 2:15-4:05

207X. International Cooperation in Education Development — Critical review of current policies, priorities, and practices an international cooperation in education, with special attention to the role of international organizations (World Bank, Unesco, OECD), and of national development assistance agencies. (IDE, SSE)
4 units, Spr (Weiler) M 1:15-3:05
and by arrangement

208A. Introduction to Curriculum—An introduction to curriculum theory and the history of curriculum as a field of study. Aims and objectives; pre-active and interactive views; explicit and implicit curricula; introduction to problems of program evaluation. (CTE)
4 units, Aut (D. Walker) MW 3:15-5:05

208B. Introduction to Curriculum—Builds upon the ideas, theories and issues encountered in Education 208A which is a prerequisite. In depth study of conceptual work pertaining to the planning of school programs, offering opportunity to apply those concepts to case study materials. The major aim of the course, in addi-
tion to deepening students' understanding of existing concepts is to facilitate the formation of new concepts and approaches to the planning of school programs where existing ones are found wanting. (CTE)

4 units, Win (Eisner) MW 7-9 p.m.

200X. Implementing Educational Reform—Examination of efforts to devise and implement educational reform policies in a single Third World country, focusing on: (1) the problem(s) the new policies are expected to address (and thus the policial economy of the country studied); (2) the formation and articulation of alternative policies, emphasizing the social location of ideas and values; and (3) the policy making process and the implementation of the new policies, especially organizational characteristics, bureaucratic imperatives, political mobilization, and external influences. Organized as a seminar; each participants will study intensively a particular reform policy. No formal prerequisites; previous Third World course work and/or professional experience and familiarity with Education 306A-D topics helpful. (IDE)

4 units, Win (Samoff) MW 1:15-3:05 and by arrangement

210. Sociology of Education—(Same as Sociology 210.) Introduction to sociological approaches to educational phenomena. Topics include school organization and environment, the relationship of education to adult roles, the impact of social class and ethnicity on classroom learning and the social structure of the classroom. Course work includes reading and evaluating social science research. Features short written assignments and individual feedback. Course 210 will meet with course 310. (SSE)

4 units, Win (Cohen) TTh 1:15-3:05

211. Introduction to Philosophy of Social Science—(Same as Philosophy 166.) Intended for upper division undergraduates who are majoring in one of the social sciences, and for beginning graduate students in related areas such as education. The course will begin by focusing upon the differences various writers have noted between the natural and social sciences, and will then move on to several topics of importance in the social sciences: explaining human action, the functional explanation of social phenomena, and holistic versus reductionist orientations. Examples from contemporary social science research literature. (SSE)

4 units, Win (Phillips) MW 1:15-3:05

212. Practicum in Ethnographic Futures Research—(Same as Anthropology 269.) Instruc-tion in the rationale, and guidance in the practice, of Ethnographic Futures Research (EFR), a non-directive, semi-structured, open-ended technique for eliciting from a sample of inter-
viewees their middle-range perceived and preferred alternative cultural scenarios for a given social group. EFR is (1) an auxiliary technique for research on sociocultural change; (2) a means of augmenting conventional planning and policy-making approaches; and (3) an educational technique for both interviewer and interviewee. Instruction will include ways of combining EFR with conventional ethnography and other research methodologies. No prerequisites, but 287 is recommended. (IDE, SSE)

5 units, Spr (Textor)

alternate years, given 1984-85

213. Aesthetic Foundations of Education—Examines the aesthetic foundations of education. Addresses questions such as what is meant by "the art" of teaching. Examines several major conceptions of art and their contribution to cognitive development, to human understanding and to the role that the arts can play in education. (CTE)

4 units, Aut (Eisner) MW 7-9 p.m.

214. Evaluation Research Methods—(Same as Communications 253.) Nature of evaluation and evaluation design, problems of field work, construction of instruments. Prerequisites: basic statistics, Communications 204 (or equivalents), Communications 251. (IDE)

3-5 units, Spr (Chaffee) TTh 10-12

and by arrangement

215. Psychological Foundations of Education—(Same as Psychology 145.) Introductory course in application of psychological principles to educational practices. Prerequisite: Psychology 1 or equivalent. (CTE, PSE)

4 units, Sum (Gage) MW 1:15-3:05

216X. Cognitive Behavior Modification—(Same as Psychology 361.) Examines assumptions and issues of cognitive behavioral interventions. Discusses methods such as problem solving, cognitive restructuring, self-instructional training, and self control in counseling and educational settings. (PSE)

3 units, Spr (Krantz) M 1:15-3:05

and by arrangement

217S. Teaching a Global Perspective: Cross-Cultural Approaches — An overview of current research and practice in the field of global education in American schools. Emphasis will be on cross-cultural approaches utilizing materials from Asia, Africa and Latin America. Models and promising practices will be critically reviewed, especially the work of the Stanford Program on International and Cross-Cultural Education (SPICE). Designed primarily for SPICE staff and research assistants. Consent of instructor. (CTE, IDE)

4 units, Spr (Grossman) MW 3:15-5:05
219. Artistic Development of the Child—Designed to introduce students to research in the behavioral sciences having relevance for understanding of the child's artistic development. (CTE)

4 units, Win (Eisner)
alternate years, given 1984-85

220A,B,C. The Social Sciences and Educational Analysis—Relationships among economics, political science, and sociology and their applications to education in the United States. Required of students in the program in Administration and Policy Analysis and open to all students. Each quarter emphasizes the contribution of a particular social science, but also stresses the interrelationships among the social sciences.

220A. The Social Sciences and Educational Analysis: Introduction to the Economics of Education—Overview of the relationship between education and economic analysis—investment and consumption theories of education—financing of education. Topics include effects of education on economic growth and distribution of income—taxation for educational purposes. Students who lack training in elementary economics required to enroll in a parallel course in economic analysis for one additional unit of credit. (APA, SSE)

4-5 units, Aut (Strober) MW 1:15-3:05 and by arrangement

220B. The Social Sciences and Educational Analysis: Introduction to the Politics of Education—Overview of the political analysis and policy formulation in education; focus on alternative models of the political process, the nature of interest groups, political strategies, community power, the external environment of organizations and the implementations of policy. Applications to educational settings and problems emphasized. (APA, SSE)

4 units, Win (Kirst) MW 11-12:30; and by arrangement

220C. The Social Sciences and Educational Analysis: Introduction to the Sociology of Education—Effects of schools and schooling on individuals, the stratification system, and society. Education as socializing individuals and as legitimizing social institutions—social and individual factors affecting the expansion of schooling, individual educational attainment, organizational structure of the schools. (APA, SSE)

5 units, Spr (Meyer) MWF 9

221A,B,C. Administration and Organization of Educational Institutions in Context—Con-
sign and evaluation of decision experience. Marginal analysis, cost-benefit accounting, constrained maximization, mathematical modeling, program evaluation. Introduction to linear models for large-scale data analysis provided. Particular attention paid to sensitivity of implications to model assumptions. (APA, SSE)

4-5 units, Win (Strober) MW 1:15-3:05

222C. Decision Analysis in Education III—Application of simple quantitative models to administrative problems through structured computer-based simulations of educational processes, procedures, and institutions. Introduces Markov models, queuing theory, and elementary difference equations. Participants will work briefly with existing simulation models and then spend much of the quarter constructing programming, and testing small-scale computer simulators. No previous computer experience is necessary, but Education 222A and 222B or their equivalents are prerequisite. (APA, SSE)

5 units, Spr (Garet) MWF 10:30-12 and by arrangement

223. Effective Schools: Research, Policy, and Practice — The course offers a critical examination of the recent studies of schools that exceed the expectations of school officials and citizens in producing high student achievement. Research methodologies, results of the studies, and efforts to implement these results and improve schooling are examined. The various components of effective schools are looked at: effective teaching, principal leadership, organizational processes in the school, parent involvement, and the role of the superintendent. A project is required that involves a study of a school and a determination of its effectiveness. (APA)

3 units, Win (Cuban) WF 10-11:30

226X. Special Topics in Educational Administration—This seminar will review the major conceptual and methodological issues involved in studying topics of relevance to educational administration. Topics change from year to year. In 1984-85, the seminar will focus on the dynamics of organizational exit, with particular emphasis being placed on dismissal. (APA)

3 units, Win (Bridges) alternate years, given 1984-85

227. The Assessment of Culturally Diverse Populations — A review of the major assessment issues in bilingual education including language proficiency testing program entry-exit or reclassification criteria, and program formative and summative evaluations. Problems related to the design and aggregation of data will be examined through an in-depth study of longitudinal and cross-sectional program evaluations. (CTE)

4 units, Spr (Arias) alternate years, given 1984-85

229. The Development of Social Competence: Theory, Research and Practice—Critically examines theory and research on social competence from a developmental perspective. Emphasizes two major themes: socialization influences and the psychological attributes of socially competent children and adolescents. In addition, selected educational approaches and projects designed to enhance social competence will be reviewed and analyzed. (PSE)

3 units, Aut (Ford) T 9-10 and Th 9-11

231. Social Structure of World Society—(Same as Sociology 152; Values, Technology, Science and Society 155.) Sociological analysis of society on a world-wide basis, i.e., all the people inhabiting the earth and the institutions through which their lives are organized, are treated as participants in one global social system. Competing models of the emerging world order will be reviewed and compared. Among the topics to be covered will be the worldwide population dynamics, the nature of the world economy, communication of persons on a global scale, socio-economic stratification of the world population and education, science and technology as global systems. Mixed lecture-discussion format, with Thursdays from 10-11 set aside for discussion only. (IDE, SSE)

5 units, Aut (Inkeles) TTh 10-12 and by arrangement

232. Science and Research in Counseling Health Psychology—(Same as Psychology 253.) Examines assumptions of empirical-experimental research in applied human sciences. Critical analysis of relationship between theoretical rationales, research questions, designs, data analyses and conclusions. Major emphasis on improving writing skills. Enrollment limited. (PSE)

4 units, Aut (Thoresen) MW 9-11

234. Individual Counseling Psychology Methods — (Same as Psychology 250.) Techniques for helping individual clients learn successful procedures for coping with problems such as shyness, depression, anxiety, obesity and aggression. (PSE)

3 units, Aut (J. Krumboltz) alternate years, given 1985-86

235. Chronic Stress: Theory, Research, and Clinical Practice — (Same as Psychology 160.) Introduction to conceptual models of chronic stress in home, work, and community environments. Particular attention to methods and pro-
grams to assess as well as to alter chronic stress. Using a cognitive social learning model, psychosocial factors will be emphasized in considering the ethiology, maintenance, and modification of stress, along with biochemical-physiological processes. The “Type A” Behavior Pattern will be examined as one perspective of chronic stress in humans. Intended for students (upper division undergraduates or graduates) interested in psychosocial as well physiological factors in health-related problems, especially intervention methods. (PSE)

4 units, Win (Thoresen) TTh 2:15-4:05
and by arrangement

236X. The Education of the Exceptional Child—Purpose: The central aim of the course is to 1) provide comprehensive insights into the strengths and weaknesses of the exceptional child; 2) enhance awareness of formal and informal means of assessing cognitive, affective, and perceptual strengths and weaknesses; 3) foster the planning and implementation of educational strategies to satisfy the assessed needs of the student; and 4) introduce relevant legislation and the implications it holds for management of the exceptional child. (CTE)
2 units, Spr (Staff) by arrangement

238A,B,C.* Counseling Psychology: Supervised Applications—Supervised counseling interventions at Stanford Counseling Institute and in selected field settings. Sequence must begin in Autumn Quarter. (Counseling Psychology majors only.) Consent of instructor. (PSE)

238A. 4 units, Aut (Krantz and Thoresen)
(Krantz) Th 1:15-3:05
(Thoresen) by arrangement

238B. 4 units, Win (Krantz and Thoresen)
(Krantz) Th 1:15-3:05
(Thoresen) by arrangement

238C. 4 units, Spr (Krantz and Thoresen)
(Krantz) Th 1:15-3:05
(Thoresen) by arrangement

239A,B,C. Observation and Directed Teaching of Study Skills and Developmental Reading in College—Practicum offering opportunity to participate as observer, tutor-counselor or group instructor in reading and study skills. Weekly seminar and/or conferences with instructor. Prerequisite: consent of instructor. (CTE)

2-4 units, Aut, Win, Spr (C. Walker)
by arrangement

240. Health and Adolescence—An orientation to the American Secondary School. (CTE)
1 unit, Sum (Staff) by arrangement

242X. Recent History of American Higher Education—A detailed examination of the events of four decades, 1940-1980, in the context of another important four decades, 1870-1910. (APA)
3 units, Win (Mayhew) T 1:15-4:05

244X. Education and the International Context of Development—The course reviews the transformation of the international context of development during the decade of the 1960’s, emphasizing the new importance acquired by research, the social sciences and planning techniques as development tools. It then analyzes how the governments of the peripheral countries reacted to this new international context and how they strived to acquire their own scientific and technological establishments. Finally, the consequences of the acquisition of modern scientific and technological institutions for the peripheral countries are discussed. The course relies basically on Latin American materials, in particular on studies conducted by the instructor and his collaborators on Chile and on Venezuela. (IDE)
3 units, Sum (Fuenzalida) W 10-12

245. Introduction to Secondary Education—An overview of secondary education today and yesterday with focus on secondary education since World War II, and much of the emphasis on current issues like accountability, unionization, the role of private schools, certification, access, curriculum, education vouchers, and the role of government agencies in shaping the profession and the nature of schooling. (CTE)
2 units, Sum (Atkin and Kirst)
by arrangement

246A,B,C,D. Secondary School Teaching Practicum—Training and practice in specific skills in schools. Taken during each quarter of STEP year. Includes regular meetings with STEP staff. (16 units required for graduation from the program). (CTE)

246A. 1-13 units, Sum (Staff)
by arrangement

246B. 1-13 units, Aut (Staff)
by arrangement

246C. 1-13 units, Win (Staff)
by arrangement

246D. 1-13 units, Spr (Staff)
by arrangement

247. Affective Education—The educational and philosophical foundations of programs in Affective Education. Topics will be selected from the following: relatedness, receptivity, self-concept, moral education, spiritual education, educating the senses, emotion and feeling. May be used to satisfy Normative Requirement. (CTE, SSE)
4 units, Aut (Noddings) TTh 4:15-6:05

* This course requirement may be waived at the discretion of the instructor.
248. Language Planning and Public Policy—
(Same as Linguistics 262.) Overview of language planning theories and implementation strategies and impacts on public policies. Among topics to be covered are: sociolinguistics surveys; information resources in language planning; approaches of the social sciences to language planning; and language law and its relation to constitutional law and state systems. Cross-national and historical dimensions of issues in language policy-making provide comparative perspective for in-depth examination of language situations within the United States. (SSE, APA, IDE)

5 units, Spr (Heath) MW 1:15-3:05
and by arrangement

250A. Statistical Analysis in Educational Research I—This two-quarter sequence follows the prerequisite Statistics 160 and is designed for graduate students who expect to use statistical methods in their research. Analysis of variance covariance; correlation and regression; analysis of categorical data. Proficiency with statistical computer packages. Prerequisite: Statistics 160. (MME)

250A. 4 units, Win, (Rogosa) MWF 11-12:30
250B. 4 units, Spr, (Rogosa) MWF 11-12:30


4 units, Aut (Rogosa) MWF 11-12:30

250D. Statistical Analysis in Educational Research II: Experimental Design—This course deals with advanced analysis of variance and design of experiments. Topics include factorial, blocked and fractional designs, linear contrasts, and repeated-measures designs; applications of BMD and SPSS computer packages will be covered. (MME)

4 units, Sum (Calfee) MW 1:15-3:05

251. Experimental Methods in Educational Research—Introduction to psychological methods of experimentation as applied to problems in education. Research topics will include process areas (perception, memory, verbal and concept learning, cognition) with examples from selected content areas (e.g., reading, mathematics). For graduate students with little or no background in Psychological Studies. Enrollment limited to 20, with preference given to first- and second-year students. (PSE)

3 units, Aut (Calfee) MWF 9

252. Introduction to Test Theory—(Same as Psychology 248.) Concepts of reliability and validity; derivation and use of test scales and norms; mathematical models and procedures for test validation, scoring, and interpretation. Prerequisites: Statistics 60 or Psychology 60 or equivalent (PSE).

3-4 units, Aut (Haertel) MW 3:15-5:05

253X. Finance of Higher Education: Financial Aid—Explores through readings and discussions the nature, sources and purposes of student financial aid as the means of financing higher education. Students will be expected to investigate and report on a topic relating to subject matter. (APA)

3 units, Aut (Huff) Th 3:15-5:05

254A. Ethnographic Monitoring of Rapid Change I—(Same as Anthropology 192A.) Seminar-practicum on the anthropological and empirical study of processes of rapid or sudden change, such as tele-microelectronic, biotechnical, or other technological innovation, an ecological system break, or a fundamental shift in political or managerial control where such change is judged likely in turn to produce profound sociocultural change. The student, working alone or with a team, will select a problem, formulate it in social science terms, and receive training and systematic guidance in using appropriately adapted ethnographic techniques to carry out a fieldwork project in a local community or institution. The resulting paper will assess implications of findings for theory, policy, and education. Previous interviewing or social science background helpful but not essential. Open to graduate students, seniors, and juniors. Enrollment limited to 20. (SSE, IDE)

3-5 units, Win (Textor) TTh 7-10 p.m.
and by arrangement

254B. Ethnographic Monitoring of Rapid Change II—(Same as Anthropology 192B.) Continuation of Education 254A (Anthropology 192A) for the student requiring additional time, training, or guidance to complete a paper, prepare it for publication, develop it into a dissertation proposal, etc. (SSE, IDE)

3-5 units, Spr (Textor) W 7-10 p.m.
and by arrangement

255. Human Abilities—(Same as Psychology 155.) The nature, development and measurement of intellectual abilities. Prerequisites: Psychology 1 and Statistics 60 or Psychology 60, or equivalent. (PSE)

3 units, Spr (Haertel) MWF 10

256. Methods of Teaching Writing—Rationale and methods for using writing in school subjects, including English and other content areas. Discussion of how to structure writing
assignments, how to respond to students' writing, and how to evaluate performance. (CTE)

and by arrangement

259. Family Influences on Cognitive Functioning and Educational Achievement—(Same as Psychology 360.) Analysis of the influence of family background, structure, and interaction on cognitive development and school achievement. Attention is given both to direct and indirect effects (motivation, cognitive style, problem-solving strategies). (PSE)

3 units, Win (Hess) T 9 Th 9-10:50

262A,B. Curriculum and Instruction in English—Approaches to teaching English in the secondary school, including goals for instruction, teaching techniques, and methods of evaluation. (CTE)

262A. 2-3 units, Sum (Applebee) MW 3:15-5:05
262B. 2 units, Aut (Applebee) T 3:15-5:05

263A,B. Curriculum and Instruction in Mathematics—Purposes and programs of mathematics in the secondary curriculum; teaching materials, methods. (CTE)

263A. 3 units, Sum (Noddings) MW 3:15-5:05
263B. 2 units, Aut (Noddings) T 4:15-6:05

264A,B. Curriculum and Instruction in Foreign Languages—Methods, techniques of foreign language teaching, testing. Materials of foreign language teaching. (CTE)

264A. 3 units, Sum (Staff) TTh 3:15-5:05
264B. 2 units, Aut (R. Politzer) Th 4:15-6:05

266A,B. Curriculum and Instruction in Physical Education—Major emphasis on knowledge of the activities basic to school physical education and athletic programs. Also involves teaching techniques, curricular materials, and evaluation. Theoretical and practical training. (CTE)

266A. 3 units, Sum (Garcia) MW 3:15-5:05
266B. 2 units, Aut (Garcia) T 8-9:50

267A,B. Curriculum and Instruction in Science—Examination of possible objectives of secondary science teaching and related methods: selection and organization of content and instructional materials; laboratory and demonstration techniques; evaluation, tests; curricular changes; ties with other subject areas. (CTE)

267A. 3 units, Sum (Staff) TTh 3:15-5:05
267B. 2 units, Aut (Staff) T 4:15-6:05

268A,B. Curriculum and Instruction in Social Studies—Emphasis on the methodology of social studies instruction: review of curriculum trends; survey of teaching materials; opportunities to develop teaching and resource units. (CTE)

268A. 2-3 units, Sum (Gross) TTh 3:15-5:05
268B. 2 units, Aut (Gross) T 4:15-6:05

269X. Foundations of Learning for Teaching—Overview of the psychology of instruction and the epistemology of school as related to the planning and implementation of teaching, the analysis of curriculum and the evaluation of performance and understanding. Course readings and activities are coordinated with internship and student teaching activities of participants. Limited to candidates for teaching credential. (CTE)

4 units, Win (Shulman and Phillips)

MW 5:15-6:30

271. Systems, Issues and Problems in Educational Research—The course examines ways in which educational research is pursued in the context of educational practice and policy, the social sciences, and science broadly conceived. Examines the roots of current research and programmatic emphasis in education from several methodological perspectives. Areas of research examined include learning and individual differences, teaching in classrooms and policy research on school effectiveness. (CTE, PSE)

4 units, Aut (Shulman and McLaughlin)

MW 10-12

273. Education as a Social Science—Intended only for first year doctoral students in the Social Sciences in Education. The students will meet with faculty members of the Area Committee. Provides orientation to the wide range of intellectual and research strategies represented by the social science faculty. Students will have the opportunity to interview faculty and to plan with them the topic of discussion for the evening of their course session. Each session will be planned with relevant readings. In addition, this course will assist the student in course planning and in strategies for developing a problem question for the doctoral thesis. The class will have the opportunity to develop sessions to meet orientation and adjustment needs, as they arise. (SSE)

1 unit, Aut (Cohen) T 4:15-6:05

274A,B,C. Ethics of Development in a Global Environment (EDGE)—(Same as Anthropology 133A,B,C; Engineering 297A,B,C; Political Science 140A,B,C.) The EDGE seminars present a series of speakers on current development issues with emphasis on the problems of the poorer nations. Autumn Quarter speakers discuss basic world resources—energy, food,
housing, population and environment—and the political development and dependencies of developing regions. Winter Quarter speakers address the international institutions and their roles: international banking, international businesses, U.S. and foreign universities, East-West political policies, and organizations of developing countries. Spring Quarter speakers address the roles of individuals in national and international institutions dealing with the problems of developing countries.

The speakers present a wide range of political, professional, and national backgrounds and present candid and often differing points of view. The series gives students working in developing countries of institutions dealing with developing countries a better knowledge of the challenges they face and the issues they must deal with. (IDE, SIDEC)

One unit credit for attendance of the speaker series; three units additional credit for optional workshops treating selected issues in more depth. (Sequential registration not required.)

1 unit (lecture only) or 4 units
plus workshop) Aut, Win, Spr (Fagen, Fuenzalida, Lusignan, McWhorter, Siegel, Textor) Lectures
M 7:30-9:30 p.m.
workshops by arrangement

276X. Education in the People's Republic of China—Course will investigate the problems of educational reform and planning in a post-revolutionary socialist society. Probe the problems of introducing an educational system congruent with the development of "socialist man." Focus on the post-1949 transformation of the educational system, but education in pre-revolutionary China will be introduced for comparative purposes. In this context, the relationship between education and social, economic and political structures will be raised. (IDE)

4 units, Win (Grossman) MW 3:15-5:05

277X. Education and Work—Examine action of traditional models of socio-economic structure and educational changes, concentrating on the relationship between education and work. Emphasis will be put on functionalist and dialectical models. The literature covered by the course will include work done in the U.S., Europe and the Third World. Specific case studies will be used to illustrate the models. Open to students from all areas. (IDE)

5 units, Win (Carnoy) M 7-9 p.m.

278. Introduction to Issues in Evaluation—An introduction to the basic literature and major theoretical and practical issues facing the emerging evaluation profession. Topics to be covered are evaluation as a branch of experimental science; models of evaluation; quantitative and qualitative approaches to evaluation; evaluation as related to decision-making and the political process; and professional standards of evaluation. (SSE)

4 units, Aut (Phillips) TTh 12-2:05

279X. Managing in Higher Education: The Roles of Principles, Ideas and Skills—How the strands of principles, ideas and skills come together in the practical tasks of managing. Organized around topics (problem diagnosis, planning and budgeting, decision-making); draws on case studies, examples, and experiences to examine how theory and practice inform and influence one another. The main frame of reference will be universities, although much of what is covered will apply to all colleges as well. The main objective is to study managing—what it is and how one does it effectively in higher education. (APA)

3 units, Spr (Bacchetti) M 3:15-5:30

280. Training Seminar: Ethnography of Schooling—(Same as Anthropology 214.) Focuses on ethnographic approaches to the study of schooling emerging from recent anthropological work. The development of such approaches in educational anthropology, and the emerging criteria of good ethnography in schools, will be explored. Problems of ethnographic "evaluation," ethics and ethnography, and the potential relevance of school ethnography to educational policy will be considered. The main focus of the seminar, however, will be upon training participants to observe and record behavior, develop skills in the elicitation of cultural knowledge, and to develop an internally consistent conceptual structure that will orient observation and elicitation productively. Selected techniques of ethnographic research applicable to the study of schooling will be demonstrated. Students will be asked to apply such techniques in modest field research projects that can be carried out in settings accessible to them and write one research report or proposal for research. (SSE)

3-4 units, Sum (George and Louise Spindler)
W 1:15-4:05

282. Linguistics and the Teaching of English as a Foreign/Second Language—(Same as Linguistics 292.) Linguistic aspects of the problems of teaching English to speakers of other languages, and standard English to speakers of other dialects. Prerequisite: introductory course in linguistics or consent of instructor. (CTE)

4-5 units, Aut (F. Politzer) MW 1:15-3:05

285X. Education, Contemporary Crises, and the World System—This course is concerned with the settings in which education and educators operate; it is intended as a complement to other courses in International Development
Education and Social Sciences in Education. The notion of crisis has become a major feature in discussion of the contemporary situation, yet rarely is that notion used systematically. One focus in this course will be on crisis as an analytic tool for understanding contemporary society, and particularly with the argument that crises are endemic, generated not by deviations from a stable equilibrium, but rather by structural features of the world in which we live. A second focus will be on the conceptualization of world system as an analytic tool. Clearly, global interactions are increasingly a matter of necessity rather than choice. What happens in one place can, and often does, have rapid and powerful consequences throughout the world system. Recurrent crises and the structure of the world system are settings within which education must operate. A third focus, then, will be on understanding educational outcomes in terms of crises and world system. (IDE)

3 units, Spr (Samoff) alternate years, given 1984-85

287. Cultural Approaches to Alternative Futures—(Same as Anthropology 148.) Seminar exploring alternative middle-range futures — of a community, a society, or the world — from an anthropological perspective. Stresses developing ability to read the futures literature critically, using explicit models and systematic data, while at the same time developing imaginative scenario-building skills. Emphasizes the change-driving power of the tele-microelectronic and biotechnical revolutions. Considers global ecological and energy constraints and sociopolitical imperatives. Examines particular Western and non-Western cultures in terms of their adaptive capacity or vulnerability. Addresses implications for the policy-maker, planner, and educator. (IDE, SSE) (DR:5)
3-5 units, Win (Textor) WF 3:15-4:45 and by arrangement

291. Methods of Teaching German—(Same as German Studies 302.) (CTE)
2 units, Win (Lohnes)

292. Methods of Teaching Spanish—(Same as Spanish 301.) A practical guide to the teaching of language. Analysis and discussion of classroom practices and instructional material. (CTE)
3-5 units, Spr (Haro) MWF 12

293. Methods of Teaching French—(Same as French 293.) Second language acquisition with specific references to French: theory and practice, including frequent observations of a demonstration class at 10 a.m. (CTE)
4 units, Aut (Hester) W 11

297. Overview of Reading Instruction for the Public Schools—General survey of elementary school reading instruction, including phonics as an approach to word identification. Introduction to reading in secondary school subjects and to remedial reading. (Limited to teaching credential candidates.) (CTE)
3 units, Win (Calfee) MW 3:15-5:05 and by arrangement

301. Colloquium on the Historiography of American Education—(Same as History 301.) Analysis of the literature of American education history, designed for students who wish to do further work in the field. In addition to weekly colloquium discussions, students will have an opportunity to pursue specialized topics in small group tutorial sessions. (SSE)
4-5 units, Aut (Tyack) alternate years, given 1984-85

305. Philosophy and Empirical Research—Problems of relevance to the researcher will be explored from the point of view of philosophers of science such as Karl Popper and Carl Hempel, but much of the material dealt with will have been written by researchers themselves. (SSE)
4 units, Aut (Phillips) Th 7-10 p.m.

306A. Education and Economic Development—An introduction into the analysis of the role of education in economic growth and development. Case material will consider development problems both in the U.S. and abroad. Discussion sections will deal with special economic aspects of educational development. (IDE, SSE)
5 units, Aut (Carnoy) TTh 2:15-4:05 and by arrangement

306B. Education and Political Change—(Same as Political Science 221.) Introduction to the analysis of the relations between education and politics from a comparative perspective. Special attention will be given to: different theoretical approaches to the study of education and politics, questions of legitimacy in educational policy, international factors in educational development, the politics of educational planning and reform, processes and conditions of political learning. (IDE, SSE)
5 units, Win (Weiler) TTh 2:15-4:05 and by arrangement

306C. Education and Sociocultural Change—(Same as Anthropology 238.) (Undergraduates register for Anthropology 138.) Utilizes a variety of theories and models to examine processes of sociocultural change worldwide, especially processes of modernization and development. Examines the effectiveness, or lack thereof, of educational inputs in promoting sociocultural change. Considers such factors as demographic shifts, ecological system breaks,
mineral and energy constraints, pollution and congestion, the potential of the tele-microelectronic and biotechnical revolutions, dependency and exploitation, and culturally engendered value conflicts. Seeks to promote a non-ethnocentric, culturally sensitive, ethically aware understanding of the needs of non-Western peoples whom development and educational programs are intended to benefit. (IDE, SSE)

3-5 units, Spr (Textor) TTh 2:15-4:05

and by arrangement

306D. Sociology of Development and Education—This course offers a systematic comparison between modernization and dependence approaches to development, emphasizing the different treatment education receives in each of them, and the consequent different approach toward educational reforms in developing countries. (IDE, SSE)

5 units, Aut (Fuenzalida) MW 3:15-5:05

307X. Knowledge and Legitimation: The Politics of Educational Research—(Same as Political Science 328.) Within the theoretical framework of legitimation theory, the course develops the notion of “compensatory legitimation” for the analysis of the national and international politics of educational research. Case studies review the work of agencies for research support, cooperation, and dissemination. Research seminar for doctoral students; consent of instructor required. (IDE, SSE)

5 units, Win (Weiler), M 3:15-5:05

310. Sociology of Education—(Same as Sociology 310.) For doctoral and master’s students. Meets with Education 210 (see course description). Emphasis on conceptualizing and analyzing applied sociological research in education. Features short written assignments, individual feedback and work with actual research data. (SSE)

4-6 units, Win (Cohen) TTh 1:15-3:05

312B. Interaction Processes in Education: Design and Evaluation—(Same as Sociology 242B.) Educational applications of sociological/social psychological theory and research to classroom processes, staff relations, teams and task forces. Course will cover principles for design and evaluations of group work for students and teamwork for teaching staff. Topics include social processes of influence, role differentiation and evaluation. Methods for systematic evaluation and observation are included; students will receive practical experience in using these methods. (SSE)

4 units, Aut (Cohen) MW 2:15-4:05

313A,B. Economics of Education—Major attention devoted to the “production,” distribution, and financing of education; contribution of education to economic growth; education and the distribution of income; role of educational characteristics in labor markets. Prerequisites: economic theory and quantitative methods and consent of instructor (SSE)

313A. 3 units, Win (Staff) M 7:30-9:30 by arrangement

313B. 5 units, Spr (Carnoy) M 7-9 p.m. and by arrangement

314. Seminar in Citizenship Education—A seminar for experienced teachers, administrators, curriculum workers, and other school personnel. Includes a topical consideration of projects and research related to the problems of educating responsible citizens for a free society. (CTE)

2-4 units, Aut (Gross) alternate years, given 1984-85

315. Cultural Transmission—(Same as Anthropology 266.) The transmission and communication of explicit and implicit cultural assumptions in a variety of formal and informal educational contexts. The patterning of education in a cross-cultural perspective, sequence of culturally constructed experiences in life careers, cultural analysis and sensitization. Attention to education in the U.S.A. and other complex societies, as well as in non-literate cultures.

3-5 units, Win (George and Louise Spindler) T 7-10 p.m. and by arrangement


3 units, Aut (Calfee) MWF 10

317. Psychological Research on Teaching—Introduction to theory, methodology, and substantive findings of research on teaching and teacher education. (PSE)

4 units, Win (Gage) alternate years, given 1984-85

320X. Research Seminar: Using Computers for Empirical Research—This course will help students develop their computer skills in preparation for undertaking an empirical-based dissertation. Students will apply their statistical background to the analysis of large-scale data sets using the facilities of CIT. They will use statistical packages (SPSS and SAS), write and store programs in WYLBUR, and learn data management techniques. Cost-effective techniques will be stressed. The course is open to all advanced
graduate students. Prerequisites: completion of CIT mini-courses in WYLBUR, SPSS, and SAS; or equivalent experience. (APA)

3-5 units, Spr (Rumberger) T 2:15-4:05

321A,B. Quantitative Methods in Qualitative Research—A two quarter sequence designed to introduce doctoral students to the role of quantitative analysis in qualitative research. Students enrolling will be expected to complete one mini-project each quarter, involving the collection and analysis of qualitative data. Students wishing to enroll must have completed Education 222A,B,C, or an introductory statistics course, (Statistics 160 or equivalent). (APA)

321A. Quantitative Methods in Qualitative Research—An introduction to statistical inference in qualitative research. Topics include the logic of inference in experimental and quasi-experimental designs, parametric and non-parametric statistical methods for the analysis of qualitative data, and problems of statistical inference in non-experimental qualitative research.

5 units, Win (Caret)

321B. Quantitative Methods in Qualitative Research—Issues of sample selection, data collection and data analysis in a variety of qualitative research designs, including community studies, two-case comparisons, regional variation models, and intensive, intracultural analysis. The role of statistical and non-statistical inference in qualitative research.

5 units, Spr (Caret and Heath)

322. Implementation of Policy Decisions on Local Schools—This course offers students a working knowledge of how local, state and federal decisions are implemented at the local school. In addition to knowledge, the course offers the chance for students to strengthen analytic skills in anticipating and diagnosing implementation problems. A project is required that involves a study of a school that is about to, or already has, implemented a local, state, or federal policy decision. (APA)

3 units, Win (Cuban)

alternate years, given 1984-85

323A. Educational Evaluation and Federal Education Policy—(Same as Political Science 288K.) The formulation and administration of federal education policy. Includes federal/state delivery systems and policy evaluation as well as the key actors of coalitions. (APA)

3 units, Spr (Kirst) TTh 3:15-5:05

and by arrangement.

323B. School Governance and School Community Relations—Analyzes the local and state governance of public education with particular stress on community politics, teacher bargaining, and state control.

3 units, Win (Kirst)

alternate years, given 1984-85

327. Research Practicum: Social Sciences in Education—Seminar designed to assist students in developing their dissertation proposals. Intended for doctoral students who have identified a dissertation problem area and are prepared to begin work on a proposal draft. Issues relevant to stages of research design are addressed: conceptualizing a research problem and developing hypotheses, choosing a research strategy, identifying and selecting cases, measuring variables and producing data, and strategies for analyzing the data. Course structure facilitates the decision-making process and the writing of the proposal and provides feedback to individuals at each stage of the proposal’s development. (SSE)

4 units, Sum (Talbert)

alternate years, given 1985-86

332. Curricular Response to Educational Equity—A review of curricular programs which have been developed as a result of legislative intervention in the classroom. A critical review of the research on domestic bilingual, desegregation and multicultural programs will be followed by identification of the variables related to successful program implementation. For doctoral students interested in curricular issues related to national origin minority students. (CTE)

4 units, Aut (Arias) TTh 5:15-7:05

337. Ethnography of Communication: Research Methods—(Same as Anthropology 167.) A research seminar designed to provide intensive preparation in ethnographic field methods for the study of communication. Following a review of earlier efforts in ethnography of communication, current research problems (determining unit of study, defining speech community, choosing among transcription systems, and analyzing and comparing cross-language data) will be examined. Case studies include: (1) selected speech events for interpreting value orientation to language and social roles, (2) oral-literate continuum models, and (3) use of cognitive style theories for understanding cross-cultural dimensions of first/language acquisition. (IDE, SSE)

4-5 units, Win (Heath) MW 1:15-3:05

338A,B,C. Internship in Counseling Psychology—Intensive supervised field experience in local schools or social agencies. (For Counseling Psychology majors only.) (PSE)

338A. 1-6 units, Aut (Krantz and Thoresen) by arrangement
338B. 1-6 units, Win
(Krantz and Thoresen)
by arrangement

338C. 1-6 units, Spr
(Krantz and Thoresen)
by arrangement

342A, B. Curriculum Construction—A practical in design of curriculum materials. Each year an interdisciplinary area is chosen and materials developed for teaching it. The topic and age level change from year to year. All phases of curriculum planning and evaluation are covered. Prerequisite: Education 340, consent of Instructor. (CTE)

342A, 3 units, Aut (D. Walker) M 7-10 p.m.
342B, 3 units, Win (D. Walker) M 7-10 p.m.

343. Motivational Processes in Education—The course is intended primarily for psychological studies students, interested in problems of motivation and perception in achievement-related situations. Course content includes the study of traditional theories of motivation and related research, an in-depth examination of recent reconceptualizations of traditional theories of motivation in information processing terms, motivational development in children, including home and school influences, and educational outcomes. Particular attention is given to implications for classroom instruction, teacher training, and curriculum development. (PSE)

3 units, Spr (Ford) TTh 2:15-4:05

347. Problems of Teacher Education—Designed to enable students to formulate researchable problems and promising methods for the study of teacher education. Compares teacher education with education in other professions. It will also examine other issues in the preservice and inservice education of teacher professionals. (CTE)

4 units, Spr (Shulman) MW 3:15-5:05

348. Educational Connoisseurship and Educational Criticism—This course introduces students to literature dealing with forms of educational evaluation employing artistic and qualitative rather than scientific and quantitative procedures. It provides students with opportunities to develop high levels of educational connoisseurship. It fosters the development of writing skills in a critical mode. It is expected that students will write, present, and compare educational criticism. (CTE)

4 units, Spr (Eisner) M 7-10 p.m.

349. Professional Education of Teachers—The course is intended to provide for students of teacher education and teaching (a) an historical overview of American teacher education from 1960 to the present, which leads to (b) a systematic framework for teacher training (particularly in-service) based on an adaptive conception of the teaching-learning process, and (c) exemplary training content material for use within the framework. Developed at the Center for Educational Research at Stanford, the "Systematic Teacher Training Model" represents a set of recommendations for research and practice. Students will learn the theoretical and research bases of the model, experiment with various content material at each stage, and apply the model to specific training needs in actual or hypothetical training situations. (CTE)

4 units, Spr (Gage) alternate years, given 1984-85


0-3 units, Aut (Calfee) by arrangement

351B. Advanced Statistical Analysis in Educational Research—Analysis of longitudinal data. Growth models; measurement of change; repeated measures designs; analysis of quasi-experiments; structural regression models; analysis of reciprocal effects. Prerequisite: 250C or equivalent. (MME)

3 units, Spr (Rogosa) MW 3:15-5:05

353. Problems in Measurement—(Same as Psychology 249.) Survey of alternative mathematical models used in test construction, analysis, and equating. The course emphasizes applications of item response theory ("latent trait theory") to measurement problems including estimation of item parameters and person abilities, test construction and scoring, tailored testing, mastery testing, vertical and horizontal test equating, and detection of item bias. Prerequisites: 250B and 252, or Psychology 152 and 248, or equivalent. (PSE)

3 units, Win (Haertel and Rogosa) alternate years, given 1984-85

356. Seminar in Physical Education Research—Critique of selected recent literature and research. (CTE)

3 units, Aut (Garcia) M 8-9:50, W 8-8:50

357. Seminar in Physical Education Curriculum—Research in physical education curriculum and instruction. (CTE)

3 units, Spr (Garcia) M 8-9:50, W 8-8:50

359. Seminar in Physical Education (Motor Learning)—Review of research concerning movement behavior, motor skills, motor learning, motor educability, and perceptual-motor acts related to sport, dance, designed exercises, and movement exploration in the physical education curriculum. (CTE)

3 units, Win (Staff) MW 8
366. Literacy: Social and Historical Perspectives—(Same as Linguistics 259.) Historical examination of writing systems, the impact of print, and links between social mobility and literacy will be used to identify norms and practices which affect the teaching and learning of reading and writing today. Emphasis will be on the social functions of literacy in work, home, and school settings. Myths regarding literacy's consequences for cognition, socioeconomic mobility, and the predictability of citizen behaviors will be examined with respect to recent social historical and other social science research. (SSE, CTE, IDE)

4-5 units, Aut (Heath) MW 1:15-3:05

368. Student Affairs, Administration Practices and Issues—A discussion of cases, issues and principles of student affairs administration in institutions of higher education. (APA)

3 units, Aut (Lyons) Th 1:15-4:05

369. Personnel Administration — Covers a range of personnel matters including selection and appraisal of personnel, collective bargaining, work-related stress, and dismissal. Treats the legal, social science, and educational aspects of these topics.

3 units, Sum (Bridges) TTh 10:05-11:30

370. Legal Basis for Education—This seminar examines the legal context of elementary and secondary education, landmark court decisions and federal legislation affecting education, and the legal problems involved in administering local school districts. Fulfills the law requirement for the California Administrative Services Credential. (APA)

3 units, Sum (Bridges) TTh 10:05-11:30

373. Higher Education Institutions in Developing Countries—This course analyses the extent to which present higher education institutions in developing countries contribute to self-centered development or to socio-cultural incorporation of these countries into the world economic system, at a general-theoretical level and with emphasis on familiarization with current literature. (IDE)

3 units, (Win) (Fuenzalida) W 3:15-5:05

376X. Education and the Theories of the State—This course will explore the assumption that the basis for public education is the public good by reviewing theories of the state and their implications for the provision of public education. (IDE)

5 units, Spr (Carnoy)

alternate years, given 1984-85

380. Curriculum Development in the Visual Arts—Devoted to the application of curriculum theory to the construction of visual and verbal materials designed to increase students' ability to perceive, respond to and create visually expressive form. Students will work individually and in teams to develop curriculum material focused on particular aspects of artistic learning. (CTE)

4 units, Spr (Eisner)

alternate years, given 1984-85

382. Practicum in Cultural Pluralism—An intensive review of the curricular strategies which schools have utilized to address the cultural diversity of their student bodies. Visits to local schools for observation of desegregation, bilingual and multicultural programs will be arranged. Each student will prepare a critical review of these programs as a class project. Of particular interest for 1983-84 is a review of culturally appropriate microcomputer courseware.

3-6 units, Sum (Staff)

alternate years, given 1984-85

383. Recent Developments in Foreign Language Education—Second Language Teaching in the context of Bilingual Education and Cultural Pluralism. Concerns with student variables and problems of individualization of instruction. Description and evaluation of linguistic and cultural objectives. (CTE)

4 units, Spr (R. Politzer)

alternate years, given 1984-85

385. The Role of Non-Standard Dialects in Education—Differences between standard and non-standard dialects with special reference to social dialects and Black English. Instruction in a second dialect, non-standard dialects and literacy. Prerequisite: an introductory course in linguistics and/or a course in Methodology of Teaching Language. (CTE)

4 units, Win (R. Politzer) TTh 4:15-6:05

386. Linguistic Theories of Language Acquisition and Language Teaching—Theories of language acquisition, psycholinguistics, contrastive analysis and error analysis and their relation to the teaching of a second language. Prerequisite: at least one graduate course in linguistics theory and/or psycholinguistics (CTE)

4 units, Win (R. Politzer) MW 4:15-6:05


4 units, Aut (R. Politzer) TTh 1:15-3:05

389. Language and Mental Development: Implications for Schooling—An exploration of language use and language development as they relate to general issues in teaching and learning.
Ways in which such fields as linguistics, philosophy, and psychology approach a shared problem-area are examined through study of major works in a variety of disciplines. (CTE)

3-4 units, Aut (Applebee) M 3:15-6:05
and by arrangement

395. Education and Radical Change: African Experiences—(Same as Political Science 221S.) Focuses on two dimensions of education and radical change: 1) schools as the targets of protest and 2) education as a core element in development strategy. Begins with an examination of the education system in South Africa, where access and quality are limited by race. Proceeds to an exploration of the efforts of South African students—most visible since the uprising of June, 1976—a focus on the educational system as a mechanism for organizing for broader changes. The second dimension will be concerned with efforts of educators in those African states that have achieved majority rule. The experiences of Tanzania and Guine-Bissau will offer comparative insight and through student research presentations insight will be gained of Angola, Mozambique and Zimbabwe. (IDE)

5 units, Spr (Samoff) TTh 12-2:05
and by arrangement


2-4 units, Aut (Gross) W 3:15-5:05

404. Advanced Seminar in Philosophy of Education—The seminar intended primarily for specialists in philosophy of education, will focus on current controversies in the field, and on the work of leading analytic philosophers of education (Scheffler, Peters, Hirst and others). (SSE)

3 units, Win (Phillips)
alternate years, given 1984-85

408A,B,C. Research Workshop in International Development Education—Continuing research workshop for the review of (a) key issue in the methodology and epistemology of social research in education, and (b) research proposals and findings by students and faculty. Prerequisite: 306A-D or equivalent. Limited enrollment; priority given to advanced doctoral students in SIDEC and SSE. (IDE, SSE)

408A. Research Workshop in IDE I
2-5 units, Aut (Samoff and Carnoy)
MW 1:15-3:05 and by arrangement

408B. Research Workshop in IDE II
2-5 units, Win (Samoff and Fuenzalida)
Th 12:15-2:05 and by arrangement

408C. Research Workshop in IDE III
2-5 units, Spr (Samoff and Weiler)
MW 3:15-5:05 and by arrangement

411. Research Seminar in Child Development and Early Education—(Same as Psychology 362.) Oriented toward current research in child development and early education. Ongoing projects, dissertation proposals, results of recently completed studies and trends in research will be the focus of discussion. (PSE)

0-3 units, Aut, Win, Spr (Hess and Ford)
TTh 12-1:15 and by arrangement

415. Seminar in the Psychology of Reading—Topics seminar for advanced students. Admission by consent of instructor. (PSE)

2-4 units, Win (Calfee)
alternate years, given 1984-85

416. Seminar on Aptitude—Study of individual differences in learning, cognitive, and motivational processes related to education. Limited to advanced doctoral students in educational research. Prerequisites: Education 250A, B Education 255, or equivalent, and consent of instructor. (PSE)

3 units, Win (Snow)
alternate years, given 1985-86

419. Seminar in Research on Teaching—A critical examination of research on teacher behaviors and characteristics considered as either dependent or independent variables. Prerequisite: 317. (PSE)

4 units, Win (Shulman) MW 9-11

422C,D. Internship in Educational Administration—A seminar especially designed for students in educational administration program holding field internships. Involves reading the theoretical discussions on administration; lectures by practicing administrators. (APA)

422C,D. 1-5 units, Spr, Sum
(Bridges) by arrangement

423A,B,C. Research on Educational Administration and Policy Analysis—This is a sequence of three courses designed for advanced doctoral students to help increase their research skills and develop sound dissertation proposals. Students in administration and policy analysis are urged to take two and possibly three of these courses including the "A" Sequence. (APA)

423A. Research on Educational Administration and Policy Analysis: The Dissertation Proposal—An elaboration of the problems of developing doctoral research plans and ways of solving those. Will include such matters as choosing an advisor and committee, review or relevant literature and the nature of evidence and scholarly citations.

3-5 units

423B. Research on Educational Administration and Policy Analysis: Research in Higher
Education Administration and Policy Analysis—A review of research strategies for the study of higher education, preparation of research proposals and research design, culminating in preparation of proposals for a doctoral dissertation. Especially designed for second-year doctoral students trying to develop a dissertation problem and proposal.

3 units, by arrangement

423C. Research on Educational Administration and Policy Analysis: Planning Policy Oriented Research—Working seminar for doctoral students who plan to carry out policy studies. Emphasizes the careful translation of policy concerns into researchable questions. Topics include the use of existing literature and of peer reviews to guide research design; the choice of research procedures, the susceptibility of designs and procedures to overt and inadvertent biases, and the ethical and substantive criteria which should guide policy research. Emphasizes and provides exercise in clear, cogent writing and persuasive argument. Students will prepare, exchange, criticize, defend and revise research proposals, which will in turn underlie much of the substantive discussion. Intended for students who have identified a dissertation problem area and are prepared to begin work on a proposal draft. Consent of the instructor is required.

3-5 units, Spr (Arias) T 1:05-3:05 and by arrangement

448X. Experimental Design for Evaluation—Advanced course on the application of experimental design concepts to field-based evaluation of educational and social programs. The student will gain experience in applying the concepts to actual problems. Stress will be on comprehensive and efficient designs for sample selection, curriculum development, and instrumentation. Prerequisites: 250D or equivalent.

3 units, Sum (Calfee) MW 3:15-4:30

450. Seminar on Ethical Concerns in Research and Evaluation — Consideration of ethical obligations, issues and dilemmas in planning, conducting, disseminating and applying educational research, with particular attention to research involving interventions. Codes of ethics developed by relevant scientific and professional organizations are examined and evaluated.

3 units, Win (Coladarci) Th 10-12 and by arrangement

453. Doctoral Dissertation. (All Areas) any quarter (Staff) by arrangement

459. Seminar in Physical Education Issues—Selected issues and problems in physical education.

3 units, Win (Staff) MW 9-10

460X. Advanced Seminar in Evaluation: Learning and Control—Seminar will examine the incentives, variables and institutional processes associated with evaluation's two broad purposes — learning and control. Consider issues of evaluation validity, reliability and utility in light of factors associated with organizational change and maintenance, school effectiveness, organizational decision-making and learning. Focus on (1) the extent to which traditional evaluation purposes and strategies are compatible with school settings and (2) ways in which evaluation can be more useful to people working in education.

3 units, Spr (McLaughlin) M 7-10 p.m.
Students will assume a major responsibility in the selection of the content for the seminar and for the ways in which the content is examined. Open to doctoral students in the School of Education who have a serious interest in understanding the role of the arts in education. Consent of the instructor is required. (CTE)

2-5 units, Aut (Eisner) alternate years, given 1984-85

465. Research Seminar on the Writing Process and Writing Instruction—State-of-the-art review of the contributions of various disciplines to the understanding of writing processes. Critical analysis of assumptions, methodologies, and results as they relate both to teaching practice and to an understanding of cognitive and linguistic development. Studies examined will be drawn from such fields as rhetoric, linguistics, anthropology, psychology, and education. (CTE)

4 units, Win (Applebee) M 3:15-6:05 and by arrangement

466. Doctoral Seminar in the Design and Evaluation of Educational Programs (DEEP)—Required of all doctoral students in DEEP. Intended to give students in DEEP the opportunity to become acquainted with research in this field. Students will be able to learn in a relatively intimate setting about research activities in which they are engaged and the kinds of problems that they believe to be important in the field. Intended to introduce doctoral students to research and scholarship related to the DEEP program at Stanford. All DEEP faculty participate, along with other Stanford faculty and outside speakers. Upon completing the seminar, students should be acquainted with the major problems addressed in this field and different ways these are addressed by current investigators. (CTE)

3-5 units, Win (DEEP faculty) T 7-10 p.m.

467. Research Seminar on Literary Understanding and the Teaching of Literature—Review of the contribution of various disciplines to the understanding of literary representation and response to literature. Critical analysis of assumptions, methodologies, and results. Studies examined will be drawn from the field of literary criticism, psychology, anthropology, linguistics and education. (CTE)

4 units, Win (Applebee) alternate years, given 1984-85

470. Practicum—For advanced graduate students. (All Areas) by Arrangement

470E. Practicum in Evaluation—Topics of current interest in the area of educational evaluation will be discussed. Restricted to student members of the Evaluation Consortium. (All Areas)

Aut, Win (Staff) by arrangement
Spr (Kirst) by arrangement

477. Organization and Style in Research Reports—Some major considerations in preparing formal reports of scholarship and inquiry, including theses and dissertations. Emphasis on organization; the achievement of clarity, technical, ethical and legal considerations; alternative conventions; general stylistic practices. (All Areas)

3-5 units, Aut, Spr (Coladarci) Th 10-12 and by arrangement

480. Directed Reading—For advanced graduate students. (All Areas) by arrangement


4 units, Spr (R. Politizer) alternate years, given 1984-85

490. Directed Research—For advanced graduate students. (All Areas) by arrangement

493A. Seminar on Methodological Problems in Educational Research—Discussion of topics of current methodological interest. Practicum in consulting on actual projects being carried out by faculty and students. (MME) 0-3 units, Aut, Win,(Rogosa) Th 11-1 and by arrangement

0-3 units, Spr (Öklin and Rogosa) Th 11-1 and by arrangement

496. Seminar in Social Studies Education—Seminar in social studies education for advanced degree candidates. Comprehensive analysis of social studies education for the purpose of identifying researchable problems. (CTE)

2-4 units, Win (Gross) W 1:15-3:05

ADMINISTRATION AND POLICY ANALYSIS (APA)

Basic and advanced courses are offered in the administration and organization of pre-collegiate educational institutions and other educationally related organizations and bureaucracies. These courses will meet requirements for administration credentials in California.

105. American Education and Public Policy
220A. The Social Sciences and Educational Analysis: Introduction to the Economics of Education
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>220B</td>
<td>The Social Sciences and Educational Analysis: Introduction to the Politics of Education (Same as Political Science 187.)</td>
</tr>
<tr>
<td>220C</td>
<td>The Social Sciences and Educational Analysis: Introduction to the Sociology of Education</td>
</tr>
<tr>
<td>221A</td>
<td>Administration and Organization of Educational Institutions in Context: Administration of Complex Organizations</td>
</tr>
<tr>
<td>221B</td>
<td>Administration and Organization of Educational Institutions in Context: Administration and Organization of Post-Secondary Institutions</td>
</tr>
<tr>
<td>221C</td>
<td>Administration and Organization of Educational Institutions in Context: American Educational Institutions</td>
</tr>
<tr>
<td>222A</td>
<td>Decision Analysis in Education I</td>
</tr>
<tr>
<td>222B</td>
<td>Decision Analysis in Education II</td>
</tr>
<tr>
<td>222C</td>
<td>Decision Analysis in Education III</td>
</tr>
<tr>
<td>223</td>
<td>Effective Schools: Research, Policy and Practice</td>
</tr>
<tr>
<td>226X</td>
<td>Special Topics in Educational Administration</td>
</tr>
<tr>
<td>242X</td>
<td>Recent History of American Higher Education</td>
</tr>
<tr>
<td>248</td>
<td>Language Planning and Public Policy (Same as Linguistics 262.)</td>
</tr>
<tr>
<td>253X</td>
<td>Finance of Higher Education: Financial Aid</td>
</tr>
<tr>
<td>279X</td>
<td>Managing in Higher Education</td>
</tr>
<tr>
<td>320X</td>
<td>Research Seminar: Using Computers for Empirical Research</td>
</tr>
<tr>
<td>321</td>
<td>Quantitative Methods in Qualitative Research</td>
</tr>
<tr>
<td>322</td>
<td>Implementation of Policy Decisions in Local Schools</td>
</tr>
<tr>
<td>332A</td>
<td>Education and Public Policy: Federal Education Policy and Administration (Same as Political Science 228K)</td>
</tr>
<tr>
<td>332B</td>
<td>School Governance and School Community Relations</td>
</tr>
<tr>
<td>365</td>
<td>Seminar: Planning Policy-Oriented Research</td>
</tr>
<tr>
<td>369</td>
<td>Personnel Administration</td>
</tr>
<tr>
<td>370</td>
<td>Legal Basis for Education</td>
</tr>
<tr>
<td>422A,B,C,D</td>
<td>Internship in Educational Administration</td>
</tr>
<tr>
<td>423A,B,C</td>
<td>Research on Educational Administration and Policy Analysis</td>
</tr>
<tr>
<td>424</td>
<td>Structure and Functioning of Institutions of Higher Education</td>
</tr>
<tr>
<td>450</td>
<td>Seminar on Ethical Concerns in Research and Evaluation</td>
</tr>
<tr>
<td>470E</td>
<td>Practicum in Evaluation (See Psychological Studies in Education.)</td>
</tr>
<tr>
<td>477</td>
<td>Organization and Style in Research Reports</td>
</tr>
</tbody>
</table>

**CURRICULUM AND TEACHER EDUCATION (CTE)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>142</td>
<td>Practical Inquiry in Education</td>
</tr>
<tr>
<td>174X</td>
<td>Exploring the Educational Potential of Microcomputers</td>
</tr>
<tr>
<td>177</td>
<td>Physiology of Exercise</td>
</tr>
<tr>
<td>208A,B</td>
<td>Introduction to Curriculum</td>
</tr>
<tr>
<td>213</td>
<td>Foundations of Aesthetic Education</td>
</tr>
<tr>
<td>215</td>
<td>Psychological Foundations of Education (Same as Psychology 145.)</td>
</tr>
<tr>
<td>217S</td>
<td>Teaching a Global Perspective: Cross-Cultural Approaches</td>
</tr>
<tr>
<td>219</td>
<td>Artistic Development of the Child</td>
</tr>
</tbody>
</table>

227. The Assessment of Culturally Diverse Populations
236X. The Education of the Exceptional Child
239A,B,C. Observation and Directed Teaching of Study Skills and Developmental Reading in College
240. Health and Adolescence
243. Student Behavior and School Discipline: Problems, Perspectives and Proposals
245. Introduction to Secondary Education
246A,B,C,D. Secondary School Teaching Practicum
247. Affective Education
256. Methods of Teaching Writing
263A,B. Curriculum and Instruction in English
263A,B. Curriculum and Instruction in Mathematics
264A,B. Curriculum and Instruction in Foreign Language
266A,B. Curriculum and Instruction in Physical Education
267A,B. Curriculum and Instruction in Science
268A,B. Curriculum and Instruction in Social Studies
269X. Foundations of Learning for Teaching
278. Classroom Observation
285. Linguistics and the Teaching of English as a Foreign/Second Language (Same as Linguistics 292.)
289. Methods of Teaching German (Same as German Studies 302.)
292. Methods of Teaching Spanish (Same as Spanish 301.)
293. Methods of Teaching French (Same as French 293)
297. Overview of Reading Instruction for the Public Schools
314. Seminar in Citizenship Education
332. Curricular Response to Educational Equity
340. Curriculum Theories and Curriculum Change
342A,B. Curriculum Construction
347. Problems of Teacher Education
348. Educational Connoisseurship and Educational Criticism
349. Professional Education of Teachers
356. Seminar in Physical Education Research
357. Seminar in Physical Education Curriculum
359. Seminar in Physical Education (Motor Learning)
366. Literacy: Social and Historical Perspectives (Same as Linguistics 259.)
380. Curriculum Development in the Visual Arts
382. Practicum in Cultural Pluralism
383. Recent Developments in Foreign Language Education
385. The Role of Non-Standard Dialects in Education
386. Linguistic Theories of Language Acquisition and Language Teaching
388. Foreign Language Education and Bilingual Education in the Elementary School
389. Language and Mental Development: Implications for Schooling
396. Recent Developments in Secondary School Social Studies
438. Culture in the Curriculum
450. Seminar on Ethical Concerns in Research and Evaluation
459. Seminar on Physical Education Issues
INTERNATIONAL DEVELOPMENT EDUCATION (IDE) (SIDEC)

161. Introduction to Teaching and Learning in Asia
192. The Anthropology of Play (Same as Anthropology 154.)
195. Introduction to Africa Through Film: Terrs, and Liberation
205. Ideology and Education
206A. Introduction to the Study of International Development Education
206B. Project Workshop in International Development Education
207X. International Cooperation in Educational Development
208. Personality and Social Structure (Same as Sociology 123)
209X. Implementing Educational Reform
212. Practicum in Ethnographic Futures Research (Same as Anthropology 269.)
214. Evaluation on Research Methods (Same as Communications 253.)
217S. Teaching a Global Perspective: Cross Cultural Approaches
231. Social Structure of World Society (Same as Sociology 152.)
244X. Education and the International Context of Development
248. Language Planning and Public Policy (Same as Linguistics 262.)
250A,B. Statistical Analysis in Education Research I
250C. Statistical Analysis in Educational Research II
250D. Statistical Analysis in Educational Research II: Experimental Design
251. Experimental Methods in Educational Research
351B. Advanced Statistical Analysis in Educational Research (Same as Education 353.)
353. Problems in Measurement (Same as Psychology 249.)
357. Cultural Approaches to Alternative Futures (Same as Anthropology 269.)
368A. Education and Economic Development
368B. Education and Political Development (Same as Political Science 221.)
366C. Education and Sociocultural Change (Same as Anthropology 233.)
366D. Sociology of Development and Education
377X. Education and Work
278. Education, Contemporary Crises, and the World System
293X. Education: Contemporary Crises, and the World System
215. Psychological Foundations of Education (Same as Psychology 145.)
216X. Cognitive Behavior Modification (Same as Psychology 361.)
229. The Development of Social Competence: Theory, Research and Practice
232. Science and Research in Counseling Psychology (Same as Psychology 253.)
234. Individual Counseling Psychology (Same as Psychology 250.)

PSYCHOLOGICAL STUDIES IN EDUCATION (PSE)

130. Counseling and Therapy: An Introduction (Same as Psychology 144.)
132S. Seminar in Cross-Cultural Counseling (Same as Psychology 131.)
134. Counseling for Career Planning
136. Behavior Modification: An Introduction (Same as Psychology 139.)
154. Psychology of Reading (Same as Psychology 143.)
194S. Undergraduate Seminar: American Indian Counseling and Mental Health (Same as Psychology 193.)
215. Psychological Foundations of Education (Same as Psychology 145.)
216X. Cognitive Behavior Modification (Same as Psychology 361.)
229. The Development of Social Competence: Theory, Research and Practice
232. Science and Research in Counseling Psychology (Same as Psychology 253.)
234. Individual Counseling Psychology (Same as Psychology 250.)
235. Chronic Stress: Theory, Research, and Clinical Practice (Same as Psychology 160.)
238A, B, C. Counseling Psychology: Supervised Applications
251. Experimental Methods in Educational Research
252. Introduction to Test Theory (Same as Psychology 248.)
255. Human Abilities (Same as Psychology 155.)
259. Family Influences on Cognitive Functioning and Educational Achievement (Same as Psychology 360.)
316. Cognitive Psychology of Education
317. Introduction to Research on Teaching
339A, B, C. Internship in Counseling Psychology
343. Motivational Processes in Education
350A, B. Psychological Studies in Education
353. Problems in Measurement (Same as Psychology 249.)
411. Research Seminar in Child Development and Early Education (Same as Psychology 362.)
415. Seminar in the Psychology of Reading
416. Seminar on Aptitude
419. Seminar in Research on Teaching
426. Theory and Practice in Criterion-References Test Interpretations
431. Doctoral Seminar in Counseling Psychology
448X. Experimental Design for Evaluation
450. Seminar on Ethical Concerns in Research and Evaluation
470E. Practicum in Evaluation
477. Organization and Style in Research Reports

COMMITTEE ON SOCIAL SCIENCES IN EDUCATION (SSE)

105. American Education and Public Policy (Same as History 195B.)
106. Sex and Education (Same as Sociology 112.)
171. Women's Self-Directed Re-Education
122. Status Attainment: Education and Work (Same as Sociology 147.)
192. The Anthropology of Play (Same as Anthropology 154.)
200. History of Education (Same as History 103.)
201. History of Education in the United States (Same as History 158.)
202. Social Science: Teachers and Schools
203. Models of the Child in Contemporary Educational Thought
204. Introduction to Philosophy of Education
205. Ideology and Education
208. Personality and Social Structure (Same as Sociology 123.)
209X. Implementing Educational Reforms
210. Sociology of Education (Same as Sociology 210.)
211. Introduction to Philosophy of Social Science (Same as Philosophy 166.)
212. Practicum in Ethnographic Futures Research (Same as Anthropology 269.)
216. Cultural Pluralism and American Educational Policy
220A. The Social Sciences and Educational Analysis: Introduction to the Economics of Education
220B. The Social Sciences and Educational Analysis: Introduction to the Politics of Education
220C. The Social Sciences and Educational Analysis: Introduction to the Sociology of Education (Same as Sociology 143.)
221A. Administration and Organization of Educational Institutions in Context: Administration of Complex Organizations
221B. Administration and Organization of Educational Institutions in Context: Administration and Organization of Post-Secondary Institutions
221C. Administration and Organization of Educational Institutions in Context: American Educational Institutions
222A. Decision Analysis in Education I
222B. Decision Analysis in Education II
222C. Decision Analysis in Education III
247. Affective Education
248. Language Planning and Public Policy (Same as Linguistics 262.)
254A. Ethnographic Monitoring of Rapid Change I (Same as Anthropology 192A.)
254B. Ethnographic Monitoring of Rapid Change II (Same as Anthropology 192B.)
273. Education as a Social Science
278. Introduction to Issues in Evaluation
280. Training Seminar: The Ethnography of Schooling (Same as Anthropology 214.)
287. Cultural Approaches to Alternative Futures (Same as Anthropology 148.)
301. Colloquium on the Historiography of American Education (Same as History 301.)
302. Colloquium on the History of American Urban Education (Same as History 302.)
305. Philosophy and Empirical Research
306A. Education and Economic Development
306B. Education and Political Change (Same as Political Science 221.)
306C. Education and Sociocultural Change (Same as Anthropology 238.)
306D. Sociology of Development and Education
307X. Knowledge and Legitimation: The Politics of Educational Research (Same as Political Science 328.)
310. Sociology of Education (Same as Sociology 310.)
312B. Interaction Processes in Education (Same as Sociology 242B.)
313A, B. Economics of Education
315. Cultural Transmission (Same as Anthropology 206.)
327. Research Practicum: Social Science in Education (Same as Sociology 368.)
337. Ethnography of Communication: Research Methods (Same as Anthropology 167.)
366. Literacy: Social and Historical Perspectives (Same as Linguistics 259.)
382. Practicum in Cultural Pluralism
404. Advanced Seminar in Philosophy of Education
408A, B, C. Research Workshop in International Development Education
450. Seminar on Ethical Concerns in Research and Evaluation
460X. Advanced Seminar in Evaluation: Learning and Control
470E. Practicum in Evaluation (See Psychological Studies in Education.)
477. Organization and Style in Research Reports
180. Directed Reading in Education—Master's degree students. Any Quarter (Staff) by arrangement

190. Directed Research in Education—Master's degree students. Any Quarter (Staff) by arrangement

453. Doctoral Dissertation. Any Quarter (Staff) by arrangement

470. Practicum—For advanced graduate students. Not for STEP students. By arrangement

480. Directed Reading—For advanced graduate students. By arrangement

490. Directed Research—For advanced graduate students. By arrangement
SCHOOL OF ENGINEERING

Dean: William M. Kays
Associate Deans: James L. Adams (Academic Affairs), Kenneth S. Down (Business Affairs), Robert L. Street (Research), Gilbert Masters (Student Relations)
Assistant Deans: Mary Lou Allen, Anthony A. Macias, Loretta J. Rendall, Beverly Scott
Consulting Professor of Engineering: Hans M. Mark, Chauncey Starr

OFFERINGS

The School of Engineering offers four-year undergraduate programs leading to the degree of Bachelor of Science; five-year programs leading to both Bachelor of Science and Master of Science degrees; others leading to a Bachelor of Science with a Bachelor of Arts in a field of humanities or social science; dual degree programs with certain other colleges; and graduate curricula leading to the degrees of Master of Science, Engineer, and Doctor of Philosophy.

The school includes nine academic departments: Aeronautics and Astronautics, Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering-Economic Systems, Industrial Engineering and Engineering Management, Materials Science and Engineering, Mechanical Engineering, and Operations Research. These departments are responsible for graduate curricula, research activities, and the departmental components of the undergraduate curricula. In research, where faculty interest and competence embraces both engineering and the supporting sciences, there are not only numerous programs within the school, but also there are several inter-school activities, including the Microwave Laboratory, the Center for Materials Research, the Institute for Plasma Research, the Radio Astronomy Institute, the Joint Institute for Aeroacoustics, the Institute for Electronics in Medicine, the Institute for Energy Studies, and the program in Product Design. Petroleum Engineering is offered through the School of Earth Sciences.

Instruction in engineering is offered during the Autumn, Winter, and Spring Quarters of the regular academic year. During the Summer Quarter a few undergraduate and graduate courses are offered.

UNDERGRADUATE ADMISSION

Students admitted to the University may declare a major in the School of Engineering if they elect to do so; there are no additional procedures, course requirements, or examinations for admission to the school.

PREPARATION RECOMMENDED FOR FRESHMEN

Students who plan to enter as freshmen intending to major in engineering should take mathematics in high school to as high a level as is offered. (See Mathematics department, School of Humanities and Sciences, for information on advanced placement in mathematics.) High school courses in physics and chemistry are strongly recommended but not required. Additional elective course work in English is also recommended.

PREPARATION RECOMMENDED FOR TRANSFER STUDENTS

Students who do the early part of their college work elsewhere and then transfer to Stanford to complete their engineering programs should follow an engineering or pre-engineering program at the first school, selecting insofar as possible courses applicable to the requirements of the School of Engineering, i.e., courses comparable to those discussed under "Undergraduate Programs of Study." In addition, students would be well advised to complete the equivalent of Stanford's foreign language requirement as well as many of the University's distribution requirements as possible before transferring. Some transfer students may require more than four years to obtain the B.S. degree. However, Stanford affords great flexibility in planning and scheduling individual programs, which makes it possible for transfer students, having wide variations in preparation, to plan full programs for each quarter and to progress toward graduation without undue delay.

Transfer credit will be given for courses taken elsewhere whenever the courses are equivalent or substantially similar to Stanford courses. The policy of the School of Engineering is to study each transfer student's preparation and make a reasonable evaluation of the courses taken prior to transfer. Inquiries may be addressed to the Dean of Engineering at Stanford.

UNDERGRADUATE PROGRAMS

The principal objective of the undergraduate engineering curriculum is to provide opportunity for personal maturity and intellectual growth, for the attainment of professional competence, and for the development of social responsibility. The curriculum is quite flexible and decisions on individual courses, in general, are left to the student and the advisor. For a student with a well-defined educational goal, there is a great deal of latitude.
For further information please refer to the Undergraduate Handbook, obtainable in the Dean's Office, School of Engineering.

### CURRICULUM COMPONENTS

As an aid in program planning, the curriculum is described in terms of 8 components: Writing, University Distribution, Foreign Language, Mathematics and Science, Engineering Breadth, Engineering Depth, Free Electives, and the requirement of "Functional Balance" (see part 7 of this section). By planning these components carefully and taking full advantage of the available advising services, a student can arrange a strong program to meet any one of a wide variety of educational objectives. Engineering majors are offered in three categories: Departmental Majors, Interdisciplinary Majors, and Innovative Majors.

Engineering students are subject to the University distribution requirements outlined in the first pages of this bulletin. (The requirement in the areas of mathematics, natural sciences, and technology will be satisfied automatically by most engineering programs.) Students who qualify for advance placement will receive credit toward fulfillment of the Engineering mathematics and science requirement.

### POLICY ON PASS/NO CREDIT GRADING

The Undergraduate Council has established the following policy with regard to pass/no credit grading:

Courses taken in satisfaction of the area requirements of the School of Engineering in Mathematics, Science, Engineering Breadth, and Engineering Depth must be taken for a letter grade.

### UNIVERSITY REQUIREMENTS

The University requirements in Writing, Distribution and Foreign Language are described in the "Degrees" section of this bulletin.

### MATHEMATICS AND SCIENCE

(45 units minimum with at least 21 units of each)

Engineering students need a solid foundation in the calculus of continuous functions, an introduction to discrete mathematics, and an understanding of statistics or probability theory. The minimum preparation should normally include work to the level of Mathematics 43. Knowledge of ordinary differential equations and matrices is important in many areas of engineering, and students are encouraged to select additional courses in these topics. A list of courses appropriate for satisfying the Engineering mathematics requirement is available in the office of the Dean of Engineering.

A strong background in the basic concepts and principles of physical science such as physics, chemistry and biology is essential for engineering. The basic physics sequence beginning with Physics 51 normally is chosen by engineering students. These courses are aimed at giving the student contact with engineering during the first year. A list of courses appropriate for satisfying the Engineering science requirement is available in the office of the Dean of Engineering.

### ENGINEERING BREADTH

(36 units minimum)

Every undergraduate engineering program includes coursework selected from a variety of engineering disciplines.

Accordingly, each student chooses a minimum of 36 units of courses from at least six of the nine categories listed below. No more than 10 units in any one category can be counted toward satisfaction of the breadth requirement. On recommendation from his or her advisor, a student may request substitutions to this list by submitting a petition to the Special Programs Committee of the Engineering Undergraduate Council. For example, certain petroleum engineering, geology, geophysics, and applied earth sciences courses can be petitioned in several breadth categories.

1. **MECHANICS OF SOLIDS AND FLUIDS**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aero. &amp; Astro. 100.</td>
<td>Intro. to Aero &amp; Astro.</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 3.</td>
<td>Applied Mechanics: Statics</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 11.</td>
<td>Applied Mechanics: Stress Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 21.</td>
<td>Mechanics of Fluids</td>
<td>4</td>
</tr>
<tr>
<td>Chem. Engr. 140</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 33.</td>
<td>Introductory Fluids</td>
<td>3</td>
</tr>
<tr>
<td>Physics 110.</td>
<td>Intermediate Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engr. 107.</td>
<td>Mechanics of Fluids</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engr. 114.</td>
<td>Mechanics of Materials</td>
<td>4</td>
</tr>
<tr>
<td>Mech. Engr. 131B.</td>
<td>Thermosciences</td>
<td>5</td>
</tr>
<tr>
<td>Physics 111.</td>
<td>Intermediate Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

2. **ELECTROMAGNETISM, ELECTRIC CIRCUITS, AND DEVICES**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. 41.</td>
<td>Circuits</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 42.</td>
<td>Electronics</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 43.</td>
<td>Electromechanics</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 44.</td>
<td>Basic Electronics</td>
<td>5</td>
</tr>
<tr>
<td>Elec. Engr. 101.</td>
<td>Circuits I</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 111.</td>
<td>Electronics</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 141.</td>
<td>Electromagnetic Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>Physics 120.</td>
<td>Intermediate Electricity and Magnetism</td>
<td>3</td>
</tr>
</tbody>
</table>

3. **THERMODYNAMICS**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. 32.</td>
<td>Introduction to the Thermosciences</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 135.</td>
<td>Physical Chemical Principles</td>
<td>3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Chem. 171</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Mat. Sci. 181</td>
<td>Thermodynamics and Phase Equilibria</td>
<td>4</td>
</tr>
<tr>
<td>Physics 170</td>
<td>Thermodynamics, Kinetic Theory, and Statistical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 110</td>
<td>Equilibrium in Thermodynamic Systems</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 131C</td>
<td>Thermosciences</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 50</td>
<td>Introductory Science of Materials</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 170</td>
<td>An Introduction to Polymeric Materials</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 51</td>
<td>Materials Technology for Structural Applications</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 52</td>
<td>Electronic Properties of Materials</td>
<td>3</td>
</tr>
<tr>
<td>Mat. Sci. 180</td>
<td>Atomic Arrangements in Solids</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 111</td>
<td>Stress, Strain, Strength</td>
<td>3</td>
</tr>
<tr>
<td>Phil. 57</td>
<td>Introduction to Logic</td>
<td>5</td>
</tr>
<tr>
<td>Phil. 160A,B</td>
<td>Symbolic Logic</td>
<td>3,3</td>
</tr>
<tr>
<td>Comp. Sci. 103</td>
<td>Programming in Fortran</td>
<td>1</td>
</tr>
<tr>
<td>Comp. Sci. 104</td>
<td>Programming in Algol W</td>
<td>1</td>
</tr>
<tr>
<td>Comp. Sci. 106</td>
<td>Introduction to Computing</td>
<td>4</td>
</tr>
<tr>
<td>Comp. Sci. 107</td>
<td>Programming Methods</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 111</td>
<td>Introduction to Computer Organization, Machine and Assembly Languages</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 156</td>
<td>Introduction to Mathematical Theory of Computation</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 206</td>
<td>Computing with Symbolic Expressions</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 181</td>
<td>Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 182</td>
<td>Digital Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 141</td>
<td>Utilization of Computers</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 144</td>
<td>Simulation</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 12</td>
<td>Intermediate Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 104</td>
<td>Dynamic Response</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 105</td>
<td>Control System Analysis and Design</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 155</td>
<td>Process Analysis &amp; Control</td>
<td>3</td>
</tr>
</tbody>
</table>

**More Advanced Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. 206</td>
<td>Control Systems Design and Simulation</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 207</td>
<td>Digital Control I</td>
<td>4</td>
</tr>
<tr>
<td>Engr.-Econ. Sys. 201A,B</td>
<td>Dynamic Systems</td>
<td>4, 4</td>
</tr>
<tr>
<td>Chem. Engr. 120</td>
<td>Separations Processes</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 150</td>
<td>Energy and Mass Transport</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 293</td>
<td>Energy Processes</td>
<td>3</td>
</tr>
<tr>
<td>Mat. Sci. 182</td>
<td>Rate Processes in Materials</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 131A</td>
<td>Thermosciences</td>
<td>5</td>
</tr>
<tr>
<td>Chem. Engr. 160</td>
<td>Chem Plant Design</td>
<td>4</td>
</tr>
<tr>
<td>Civil Engr. 176</td>
<td>Small Scale</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 161</td>
<td>Engineering Economy</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 100</td>
<td>Organizations: Theory &amp; Management</td>
<td>4</td>
</tr>
<tr>
<td>Indus. Engr. 133</td>
<td>Industrial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>Mech. Engr. 101</td>
<td>Visual Thinking</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 102</td>
<td>Design Communication</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 103</td>
<td>Manufacturing Technology</td>
<td>3</td>
</tr>
<tr>
<td>Oper. Res. 50</td>
<td>Models and Applications of Operations Research in Society</td>
<td>3</td>
</tr>
<tr>
<td>Oper. Res. 151</td>
<td>Introduction to Operations Research I</td>
<td>3</td>
</tr>
<tr>
<td>Oper. Res. 152</td>
<td>Introduction to Operations Research I</td>
<td>3</td>
</tr>
<tr>
<td>Oper. Res. 153</td>
<td>Introduction to Operations Research II</td>
<td>4</td>
</tr>
<tr>
<td>More Advanced Courses</td>
<td>Control Systems Design and Simulation</td>
<td>4</td>
</tr>
<tr>
<td>More Advanced Courses</td>
<td>Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 260</td>
<td>Analysis of Production Systems</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 164</td>
<td>Production Engineering Problems</td>
<td>3</td>
</tr>
<tr>
<td>Mech Engr. 115A</td>
<td>Introduction to Product Design</td>
<td>3</td>
</tr>
<tr>
<td>Oper. Res. 190</td>
<td>Applications of Operations Research</td>
<td>3</td>
</tr>
<tr>
<td>More Advanced Courses</td>
<td>Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>More Advanced Courses</td>
<td>Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engr. 133</td>
<td>Introduction to Urban Planning</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engr. 170</td>
<td>Enviromental Science and Technology</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 30</td>
<td>Social Aspects of Nuclear Power</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 115A</td>
<td>Human Values in Design</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 138</td>
<td>Noise Pollution</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 180</td>
<td>Energy and Society</td>
<td>3</td>
</tr>
<tr>
<td>Pet. Engr. 103</td>
<td>Survey of Energy Industries</td>
<td>3</td>
</tr>
<tr>
<td>Poli. Sci. 138A</td>
<td>Arms Control &amp; Disarmament</td>
<td>5</td>
</tr>
<tr>
<td>VTSS 101</td>
<td>Contemporary Technological Society</td>
<td>4</td>
</tr>
<tr>
<td>VTSS 105</td>
<td>Ethics and Human Values in Technological Society</td>
<td>4</td>
</tr>
<tr>
<td>VTSS 106</td>
<td>The Nature of Technology in Modern Society</td>
<td>4</td>
</tr>
</tbody>
</table>

**More Advanced Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meier Engr. 110</td>
<td>Equilibrium in Thermodynamic Systems</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 131C</td>
<td>Thermosciences</td>
<td>4</td>
</tr>
<tr>
<td>Chem. Engr. 170</td>
<td>An Introduction to Polymeric Materials</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 51</td>
<td>Materials Technology for Structural Applications</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 52</td>
<td>Electronic Properties of Materials</td>
<td>3</td>
</tr>
<tr>
<td>Mat. Sci. 180</td>
<td>Atomic Arrangements in Solids</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 111</td>
<td>Stress, Strain, Strength</td>
<td>3</td>
</tr>
<tr>
<td>Phil. 57</td>
<td>Introduction to Logic</td>
<td>5</td>
</tr>
<tr>
<td>Phil. 160A,B</td>
<td>Symbolic Logic</td>
<td>3,3</td>
</tr>
<tr>
<td>Comp. Sci. 103</td>
<td>Programming in Fortran</td>
<td>1</td>
</tr>
<tr>
<td>Comp. Sci. 104</td>
<td>Programming in Algol W</td>
<td>1</td>
</tr>
<tr>
<td>Comp. Sci. 106</td>
<td>Introduction to Computing</td>
<td>4</td>
</tr>
<tr>
<td>Comp. Sci. 107</td>
<td>Programming Methods</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 111</td>
<td>Introduction to Computer Organization, Machine and Assembly Languages</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 156</td>
<td>Introduction to Mathematical Theory of Computation</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 206</td>
<td>Computing with Symbolic Expressions</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 181</td>
<td>Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 182</td>
<td>Digital Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 141</td>
<td>Utilization of Computers</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 144</td>
<td>Simulation</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 12</td>
<td>Intermediate Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 104</td>
<td>Dynamic Response</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 105</td>
<td>Control System Analysis and Design</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 155</td>
<td>Process Analysis &amp; Control</td>
<td>3</td>
</tr>
</tbody>
</table>

**More Advanced Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr.-Econ. Sys. 231</td>
<td>Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 260</td>
<td>Analysis of Production Systems</td>
<td>3</td>
</tr>
<tr>
<td>Indus. Engr. 164</td>
<td>Production Engineering Problems</td>
<td>3</td>
</tr>
<tr>
<td>Mech Engr. 115A</td>
<td>Introduction to Product Design</td>
<td>3</td>
</tr>
<tr>
<td>Oper. Res. 190</td>
<td>Applications of Operations Research</td>
<td>3</td>
</tr>
<tr>
<td>More Advanced Courses</td>
<td>Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>More Advanced Courses</td>
<td>Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engr. 133</td>
<td>Introduction to Urban Planning</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engr. 170</td>
<td>Enviromental Science and Technology</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 30</td>
<td>Social Aspects of Nuclear Power</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 115A</td>
<td>Human Values in Design</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 138</td>
<td>Noise Pollution</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 180</td>
<td>Energy and Society</td>
<td>3</td>
</tr>
<tr>
<td>Pet. Engr. 103</td>
<td>Survey of Energy Industries</td>
<td>3</td>
</tr>
<tr>
<td>Poli. Sci. 138A</td>
<td>Arms Control &amp; Disarmament</td>
<td>5</td>
</tr>
<tr>
<td>VTSS 101</td>
<td>Contemporary Technological Society</td>
<td>4</td>
</tr>
<tr>
<td>VTSS 105</td>
<td>Ethics and Human Values in Technological Society</td>
<td>4</td>
</tr>
<tr>
<td>VTSS 106</td>
<td>The Nature of Technology in Modern Society</td>
<td>4</td>
</tr>
</tbody>
</table>
ENGINEERING DEPTH
(36 units minimum)

The depth requirement is satisfied in one of three ways.

Departmental Majors — The student completes the sequence of courses recommended by one of the engineering departments (Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering and Engineering Management, Materials Science and Engineering, and Mechanical Engineering.)

Interdisciplinary Majors (General Engineering) — The student completes the sequence of courses recommended for one of the following programs: Aeronautics and Astronautics, Environmental Engineering, or Product Design.

Innovative Majors (General Engineering) — Any student, aided by an advisor, may propose a unique curriculum to attain particular career goals.

These three possibilities are described later in more detail under the heading “Engineering Majors.” Not all of these curricula are accredited. All programs must, of course, meet the school and University requirements as outlined in the components described herein.

FREE ELECTIVES

Enough additional courses to bring the total to 180 units or more, typically between 30 and 40 units, are required.

FUNCTIONAL BALANCE

Every engineering student should obtain experience in analysis, synthesis and experimentation. Analysis is concerned with the formulation and solving of mathematical models, primarily by use of deductive reasoning, and optimization. Synthesis emphasizes problem definition, ideation, and inductive reasoning. Experimentation involves the innovative applications of experimental equipment and techniques to discover relations and to answer questions. These skills are essential in the successful practice of engineering.

The Engineering Breadth and Depth components of the curriculum will usually ensure adequate experiences in analysis. To round out the program, each student is expected to include the equivalent of at least 9 units of synthesis and 8 units of experimentation. It is not expected that this will require additional course work; instead, each student should keep in mind the necessity for functional balance while selecting courses in the Science, Engineering Breadth, Engineering Depth, and Elective components of his or her curriculum. A list of courses and their unit content of synthesis and/or experimentation is available from the office of the Dean of Engineering.

ACCREDITATION

The Accreditation Board for Engineering and Technology (ABET) accredits college engineering programs on a nationwide basis. Accreditation is important in many areas of the engineering profession; students wishing more information about accreditation should consult their departmental office or the office of the Dean of Engineering.

The following undergraduate curricula are accredited: Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering and Engineering Management, Mechanical Engineering, and Petroleum Engineering (School of Earth Sciences). The Aeronautics and Astronautics curriculum is accredited at the master’s degree level.

ENGINEERING MAJORS

DEPARTMENTAL MAJORS

Satisfaction of the engineering depth requirement by completion of one of the departmental course sequences constitutes a major in that branch of engineering. A student wishing to deviate slightly from one of the departmental depth programs may submit his or her proposed program to the department for approval. Modified programs recommended by a department will normally be approved by the Undergraduate Council. Sample programs for departmental majors are available from the office of the Dean of Engineering.

CHEMICAL ENGINEERING

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 173</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 175</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 110</td>
<td>Equilibrium in Thermodynamic Systems</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 120</td>
<td>Separations Processes</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 130</td>
<td>Chemical Kinetics: Theory with Applications for Reactor Design</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 140</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 150</td>
<td>Energy and Mass Transport</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 160</td>
<td>Chemical Engineering Plant Design</td>
<td>3</td>
</tr>
</tbody>
</table>
### CIVIL ENGINEERING

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.E. 107</td>
<td>Mechanics of Fluids</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 114</td>
<td>Mechanics of Materials</td>
<td>4</td>
</tr>
<tr>
<td>C.E. 130</td>
<td>Transportation</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 143</td>
<td>Specifications and Contracts</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 160</td>
<td>Water-Resources Engineering</td>
<td>4</td>
</tr>
<tr>
<td>C.E. 170</td>
<td>Man and His Environment</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 180</td>
<td>Elementary Structural Analysis</td>
<td>4</td>
</tr>
<tr>
<td>C.E. 180</td>
<td>Geotechnical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>C.E. 188</td>
<td>Senior Report</td>
<td>1</td>
</tr>
</tbody>
</table>

Plus two other C.E. courses, one of which must be a design or planning course (i.e., C.E. 133, C.E. 144, C.E. 171, C.E. 176, C.E. 181, or C.E. 182). Graduate C.E. design or planning courses are also acceptable with advisor's approval.

**Special Requirement:**
Any student who has not had exposure to drafting, either in high school or through work experience, should include M.E. 102 in his or her program.

### ELECTRICAL ENGINEERING

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.E. 101, 102, and 103 or 104</td>
<td>Circuits and Networks</td>
<td>9</td>
</tr>
<tr>
<td>E.E. 111, 112, 113</td>
<td>Electronics</td>
<td>9</td>
</tr>
<tr>
<td>E.E. 121, 122</td>
<td>Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>E.E. 141</td>
<td>Electromagnetic Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 181 or 181S</td>
<td>Computer Organizations</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 139 or 274</td>
<td>Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 102E</td>
<td>Writing</td>
<td>1</td>
</tr>
<tr>
<td>Restricted Electives (any E.E. courses)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

### ELECTRICAL ENGINEERING-COMPUTERS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.E. 101, 102, 104</td>
<td>Circuits and Networks</td>
<td>9</td>
</tr>
<tr>
<td>E.E. 111, 112, 113</td>
<td>Electronics</td>
<td>9</td>
</tr>
<tr>
<td>E.E. 121, 122</td>
<td>Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>E.E. 180, 181, 182</td>
<td>Computers</td>
<td>9</td>
</tr>
<tr>
<td>E102E</td>
<td>Writing</td>
<td>1</td>
</tr>
<tr>
<td>E.E. 183 or E.E. 274</td>
<td>Laboratory</td>
<td>3</td>
</tr>
</tbody>
</table>

### INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. 44</td>
<td>Basic Electronics</td>
<td>5</td>
</tr>
<tr>
<td>Engr. 161</td>
<td>Engineering Economy</td>
<td>3</td>
</tr>
<tr>
<td>I.E. 100</td>
<td>Organizations: Theory and Management</td>
<td>4</td>
</tr>
<tr>
<td>I.E. 121</td>
<td>Statistics and Quality</td>
<td>4</td>
</tr>
</tbody>
</table>

I.E. 125. Work Design and Measurement        4
I.E. 133. Industrial Accounting              3
I.E. 144. Simulation                         3
I.E. 235. Introduction to Financial Decisions 3
I.E. 260. Analysis of Production Systems I   3
I.E. 180. Senior Project—Organizations, or I.E. 183. Senior Project—Financial Analysis, or
I.E. 186. Senior Project—Production          4
Engr. 161. Engineering Economy               3

### MATERIALS SCIENCE AND ENGINEERING

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S. &amp; E. 150</td>
<td>Atomic Arrangements in Solids</td>
<td>5</td>
</tr>
<tr>
<td>M.S. &amp; E. 151</td>
<td>Thermodynamics and Phase Equilibria</td>
<td>5</td>
</tr>
<tr>
<td>M.S. &amp; E. 152</td>
<td>Rate Processes in Materials</td>
<td>4</td>
</tr>
<tr>
<td>M.S. &amp; E. 155</td>
<td>Mechanical Behavior of Solids</td>
<td>4</td>
</tr>
<tr>
<td>M.S. &amp; E. 158</td>
<td>Electrical, Optical and Magnetic Properties of Materials</td>
<td>5</td>
</tr>
<tr>
<td>M.S. &amp; E. 160, 161, 162</td>
<td>Experimental Methods in Materials Science</td>
<td>6</td>
</tr>
<tr>
<td>M.S. &amp; E. 170</td>
<td>Undergraduate Research</td>
<td>6</td>
</tr>
<tr>
<td>Phys. 56. (concurrent with Phys. 55)</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### MECHANICAL ENGINEERING

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.E. 101</td>
<td>Visual Thinking</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 103</td>
<td>Manufacturing Technology</td>
<td>4</td>
</tr>
<tr>
<td>M.E. 111</td>
<td>Stress, Strain and Strength</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 112</td>
<td>Mechanical Systems</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 113</td>
<td>Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 131A, B, C</td>
<td>Thermosciences</td>
<td>14</td>
</tr>
<tr>
<td>Engr. 104</td>
<td>Dynamic Response or</td>
<td></td>
</tr>
<tr>
<td>M.E. 161</td>
<td>Engineering Vibration</td>
<td>3</td>
</tr>
<tr>
<td>Any M.E. course in the 100 or 200 series</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PETROLEUM ENGINEERING

(Petroleum Engineering is offered through the School of Earth Sciences).

### INTERDISCIPLINARY MAJORS (GENERAL ENGINEERING)

General Engineering programs must be approved by the Special Programs Committee of the Engineering Undergraduate Council. Petitions for approval of special programs should be submitted during the junior year and should include a statement that describes a well-defined educational objective. General engineering programs must meet University (Writing and Distribution and Language) and school (Mathematics, Science, Breadth, Depth, and Functional Balance) requirements. To fulfill the engineering depth requirement, General Engineering programs should include at least 18 units of courses within the School of Engineering. These courses should represent a coherent
package and should correspond in academic rigor to departmental depth sequences. Additional information and sample programs regarding these majors may be obtained from the office of the Dean of Engineering.

### AERONAUTICS AND ASTRONAUTICS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. 104</td>
<td>Dynamic Response</td>
<td>3</td>
</tr>
<tr>
<td>A.A. 100</td>
<td>Introduction to Aeronautics and Astronautics</td>
<td>3</td>
</tr>
<tr>
<td>A.A. 131</td>
<td>Experimentation in Aeronautics and Astronautics</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engr. 114</td>
<td>Mechanics of Materials</td>
<td>4</td>
</tr>
<tr>
<td>Mech. Engr. 131C</td>
<td>Thermosciences Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>A.A. 200A</td>
<td>Engineering Analysis of Flight Vehicles</td>
<td>3</td>
</tr>
<tr>
<td>A.A. 192</td>
<td>Vector Analysis and Cartesian Tensors</td>
<td>3</td>
</tr>
<tr>
<td>Math. 130</td>
<td>Ordinary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>A.A. 210A</td>
<td>Fundamentals of Compressible Flow</td>
<td>3</td>
</tr>
<tr>
<td>Restricted Electives</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL ENGINEERING

An environmental engineering education stresses interdisciplinary work in social sciences such as economics, political science, and sociology as well as in the natural sciences, particularly biology and engineering. Students in this program are encouraged to seek a strong fundamental background, to become knowledgeable about a wide range of environmental issues, and to pursue knowledge in depth in areas which are most compatible with their future interests.

(36 units from the following:)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civ. Engr. 107</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 130</td>
<td>Transportation</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 133</td>
<td>Urban Planning</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 160</td>
<td>Water-Resources Engr.</td>
<td>4</td>
</tr>
<tr>
<td>Civ. Engr. 170</td>
<td>Environmental Science.</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 171</td>
<td>Environmental Planning.</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 176</td>
<td>Small Scale Energy Systems</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 238</td>
<td>Decentralized Energy Planning</td>
<td>2</td>
</tr>
<tr>
<td>Civ. Engr. 270</td>
<td>Water Quality</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 276</td>
<td>Environ. Impact of Power</td>
<td>3</td>
</tr>
<tr>
<td>Civ. Engr. 277</td>
<td>Nuclear Environmental Engr.</td>
<td>3</td>
</tr>
<tr>
<td>A.E.S. 130</td>
<td>Environ. Earth Sciences</td>
<td>5</td>
</tr>
<tr>
<td>Mech. Engr. 137</td>
<td>Air Pollution</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 138</td>
<td>Noise Pollution</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 150</td>
<td>Energy and Society</td>
<td>3</td>
</tr>
<tr>
<td>Chem. E. 20</td>
<td>Intro Chem. Engr.</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 176</td>
<td>Nuclear Energy</td>
<td>3</td>
</tr>
</tbody>
</table>

### INNOVATIVE MAJORS (GENERAL ENGINEERING)

General Engineering programs must be approved by the Special Programs Committee of the Engineering Undergraduate Council. A coordinated sequence of courses that provides mastery of the important principles and techniques in a well-defined field will ordinarily be approved. Petitions for approval of special programs should be submitted during the junior year and should include a statement that describes a well-defined educational objective. General Engineering programs must meet University (Writing, Distribution and Language) and school (Mathematics, Science, Technology in Society, Breadth, Depth, and Functional balance) requirements. To fulfill the Engineering Depth requirement, General Engineering programs should include at least 18 units of courses within the School of Engineering. These courses should represent a coherent package and should correspond in academic rigor to departmental depth sequences. Programs such as Bio- or Premedical-Engineering, Urban Planning, and Ocean Engineering may be developed within the framework of the innovative major. For further information consult the office of the Dean of Engineering.

### ENGINEERING IN BIOLOGY AND MEDICINE

School of Engineering Advisory Committee on Engineering in Biology and Medicine: L. J. Leifer, Mechanical Engineering (Chairman); Robert L. Piziali, Mechanical Engineering; I-Dee Chang, Aeronautics and Astronautics; L. J. Leifer, Mechanical Engineering, J. D. Meindl, Electrical Engineering; Charles R. Steele, Mechanical Engineering; Felix Zajac, Mechanical Engineering.

Though Stanford does not have a formal department of bioengineering, there are approximately ten faculty in the School of Engineering whose primary research activities are in the general area of bioengineering. There are many opportunities in the medical and biological sciences for collaboration. The study of bioengineering at Stanford is most appropriate at the Ph.D. level. The faculty working in bioengineering are spread throughout the various departments of the School of Engineering, and a list of their names, together with a summary of their research interest, is available from the
committee chairman. Students interested in pursuing graduate study in bioengineering apply for admission and financial aid to the appropriate department on the grounds of their prior training and future interests. Their applications are judged on substantially the same ground as other applicants to the department.

The research being conducted in the field of bioengineering within the various departments reflects the technological emphasis of those departments. For instance, research on membrane transport and enzyme engineering is pursued in the Chemical Engineering Department. Faculty in Mechanical Engineering are doing research on neuromuscular dynamics, computer aided clinical neurology, bone elasticity, knee mechanics, spinal stabilization, and robotic aids for the disabled. Cardiovascular dynamics and haemodynamics are being studied in the Aeronautics and Astronautics department. Biomaterials research is available in the Department of Materials Science and Engineering. In the Electrical Engineering Department a superb integrated circuits facility is used in research on advanced medical instrumentation, such as ultrasonic imaging systems, Dopplershift blood flowmeters and micropower implantable electronics for neural prostheses and biological microsensors. Also in Electrical Engineering advanced analysis techniques are applied to signal processing EKG, EEC, and X-ray image. Most research projects are carried out in collaboration with faculty of the Medical School or members of the local medical community.

A major new opportunity for bioengineering experience is now available in the Rehabilitation Research and Development Center, a Veterans Administration sponsored cooperative program with the School of Engineering. (Contact Professor Leifer.)

The typical graduate student in bioengineering first seriously confronts the medical or biological aspects of his or her education at the thesis research level. Prior courses in Biology, Chemistry, etc., are beneficial, but students are admitted and advanced on their engineering abilities. Advanced courses in physiology are generally taken only by Ph.D. students. Bioengineering courses exist at the M.S. level, and students can take these as electives. The student's advisor will assist him or her in constructing a program of study incorporating these courses and also satisfying the degree requirements of the department in which he or she is registered. Both the master's degree and the Ph.D. degree are ordinarily awarded by a particular department, and the candidate must meet the degree requirements of that department. While the degrees of Master of Science in Engineering and Master of Science in Engineering in Biology and Medicine are available, there is no prescribed program and these degrees are not encouraged. An interdepartmental committee must approve these special programs for the rare case where a student's background makes it unrealistic to satisfy a departmental Ph.D. qualifying requirement. A faculty committee can be formed to supervise an appropriate qualifying and research program, as a Graduate Division Special Program.

A student wishing to earn the M.S. in Engineering while pursuing the M.D. degree, must apply separately for admission to both schools. If the student is admitted to both, each school will encourage his or her pursuit of the other degree. Such students are usually advised to take technical science and engineering courses rather than to concentrate on bioengineering courses, since much of the biology will be treated in greater depth in their medical studies.

In addition to the financial support available through the departments in the form of fellowships, research assistantships and teaching assistantships, there are externally administered fellowship programs for the support of graduate study in health-related fields. In particular, both the National Institute of Health and the National Science Foundation offer such fellowships on the basis of national competition.

BACHELOR OF ARTS AND SCIENCE (B.A.S.)

This degree is available to students who complete both the requirements for a B.S. degree in engineering and the requirements for a major or program ordinarily leading to the A.B. degree. More information is included in the "Degrees" section of this publication.

COTERMINAL DEGREE PROGRAMS

A Stanford undergraduate may work simultaneously toward bachelor's and master's degrees, i.e., A.B. and B.S., A.B. and M.S., A.B. and A.M., B.S. and M.S., or B.S. and A.M. The degrees may be granted simultaneously or at the conclusion of different quarters. Usually five years will be needed for a combined program.

1. Coterminal A.B. and B.S. Degree Program—To qualify for both degrees, a student must: (1) complete the stated University requirements and departmental requirements for each degree, (2) complete 15 full-time quarters or 3 full-time quarters after completing 180 units and (3) complete a total of 225 units (180 units for the first bachelor's degree plus 45 units for the second bachelor's degree.)
2. Coterminal Bachelor/Master Program —
A Stanford undergraduate may be admitted to the University Division for the purpose of working simultaneously toward a bachelor’s degree and a master’s degree. To qualify for both degrees, a student must (1) complete 15 full-time quarters (or the equivalent) or 3 full-time quarters (or the equivalent) after completing 180 units; (2) complete, in addition to the 180 units required for the bachelor’s degree, the number of units required by his or her graduate department for the master’s degree (not fewer than the University minimum of 36 units); (3) complete the requirements for the bachelor’s degree (department, school and University) and apply for the degree at the appropriate time at the office of the Registrar, and (4) complete the department and University requirements for the master’s degree and file candidacy forms through his or her graduate department.

Admission to the coterminal program requires admission to graduate status by the pertinent department. Admission criteria varies from department to department.

3. Procedure for Applying for Admission to the Coterminal Degree Programs — A Stanford undergraduate may apply (using the white University petition form) for admission to the Coterminal A.B./B.S. Program during the student’s tenth or eleventh quarter. The student may apply for admission to the Coterminal bachelor/master Program after the beginning of the eighth quarter of undergraduate work and before the end of the eleventh quarter. Students seeking a graduate degree in engineering will apply to the pertinent department.

(3 + 2) DEGREE PROGRAMS
The School of Engineering cooperates with several accredited liberal arts colleges in providing a program that leads to concurrent award of the A.B. degree by the first college and the B.S. degree in a field of engineering by Stanford. These programs comprise three years of study at the first college, with some emphasis on mathematics and science, followed by two years of study of engineering at Stanford.

Students applying for admission to the (3 + 2) program should request transfer application forms from the Stanford University Admissions Office. The (3 + 2) program applicants are given careful consideration for admission to Stanford, provided they meet the following three requirements: 1) the recommendation of the coordinator at the liberal arts college, 2) a grade point average which is competitive with those of other transfer applicants, 3) a satisfactory scholastic aptitude test score. (3 + 2) transfer students may not receive the Stanford B.S. degree until the requirements for the particular program of study they have selected are completed. (See section above on Undergraduate Programs.)

GRADUATE ADMISSION
Application for admission with graduate standing in the school should be made to the Director of Graduate Admissions of the University; applications are reviewed by the appropriate department of the school before admission is authorized. Inquiries may be addressed to the Dean of Engineering or to the Chairman of the Department. While most graduate students have undergraduate preparation in an engineering curriculum, it is feasible to enter from other programs including chemistry, physics, or mathematics (see, for example, the Four-Two program described under "Master of Science").

THE HONORS COOPERATIVE PROGRAM
A number of industrial firms, government laboratories, and other organizations participate in the Honors Cooperative Program (HCP), a plan which permits qualified professional employees to register for graduate Stanford courses on a part-time basis. Most of the students in the HCP are in the School of Engineering though several departments within the Schools of Humanities and Science and Applied Earth Sciences also offer graduate degree programs under this plan. The majority of coursework taken in the HCP is done via the Stanford Instructional Television Network (SITN). A four-channel network which enables students to enjoy live lectures with talk-back privileges at their company plants. Further details can be obtained from the Stanford Instructional Television Network (415) 497-3616.

GRADUATE REGISTRATION
New graduate students should follow procedures for registration as listed in the Time Schedule. Advisor assignments can be obtained from the Department Office.

GRADUATE PROGRAMS
Departments and divisions of the school offer graduate curricula, as follows:

AERONAUTICS AND ASTRONAUTICS
Acoustics
Aeroelasticity
Aerophysics
Aerospace Structures
Aerospace Systems Synthesis and Design
Analytical and Experimental Methods in Solid and Fluid Mechanics
Biomedical Solid and Fluid Mechanics
Computational Fluid Dynamics
Flight Mechanics
Gaskinetics
Guidance and Control
Physical Gasdynamics
Propulsion
Transportation
Waves and Vibrations

ENGINEERING
Interdisciplinary Programs
Interdepartmental Programs

ENGINEERING IN BIOLOGY AND MEDICINE
Biomaterials
Orthopaedic Biomechanics
Neuromuscular Biomechanics
Rehabilitative Engineering
Biostatistics
Design for Medical Applications
Water Quality Control
Information Processing in and for Biomedical Systems
Integrated Circuits for Medical Electronics
Transport Phenomena in Biological Systems

CHEMICAL ENGINEERING
Newtonian and Non-Newtonian Fluid Mechanics
Polymer Adsorption
Rheo-optics of Polymeric Liquids and Colloidal Suspensions
Hydrodynamic Stability
Electrochemical Energy Conversion
Applied Chemical Thermodynamics and Kinetics
Surface and Interface Science
Adsorption and Catalysis
Bioengineering
Polymer Science
Membrane Separation Processes

CIVIL ENGINEERING
Construction Engineering and Management
Infrastructure Planning and Management
Infrastructure Management
Infrastructure Planning
Structural and Geotechnical Engineering
Earthquake Engineering
Reliability and Risk Analysis

Structural Analysis and Design
Foundation Engineering
Soil Mechanics
Structural Mechanics
Environmental and Water Studies
Environmental Engineering and Science
Water Resources Engineering
(including elements of hydraulics, hydrology, hydromechanics and nuclear environmental engineering)

ELECTRICAL ENGINEERING
Bioelectronics
Communications and Information Theory
Computer Applications
Computer Systems
Electromagnetic Theory and Microwaves
Electronic Circuits and Devices
Information Processing
Integrated Circuits
Integrated Systems
Modern Optics and Optical Devices
Network Theory
Plasmas
Quantum Theory and Applications
Radioscience
Solid State Materials and Properties
Systems and Control Theory
VLSI

ENGINEERING-ECONOMIC SYSTEMS
Decision Analysis
System Economics
Energy Modeling and Analysis
Information Policy
Mathematical System Analysis
Social Analysis

INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT
Production Systems
Engineering Economy — Financial Analysis
Organizational Design and Control
Engineering Management

MATERIALS SCIENCE AND ENGINEERING
Electrical and Optical Behavior of Solids
Electron Microscopy
Energy Storage
Fracture
Imperfections in Crystals
Kinetics
Magnetic Behavior of Solids
Materials Synthesis and Processing
Mechanical Behavior of Solids
Phase Transformations
Photovoltaic Materials
Physical Ceramics
Physical Metallurgy
MECHANICAL ENGINEERING
Air Pollution
Biomechanics
Combustion
Composites, Fracture of Solids
Continuum Mechanics
Controls
Dynamics
Energy Conversion
Engineering Design
Environmental Measurements
Experimental Mechanics
Fluid Mechanics
Heat Transfer
High Temperature Gasdynamics
Kinematics
Nuclear Engineering
Optimization
Product Design
Solar Energy
Thermodynamics
Transport Processes
Turbulence

OPERATIONS RESEARCH
Applied Probability
Dynamic Programming
Simulation Methodology
Inventory Theory
Queueing Theory
Reliability Theory
Mathematical Programming
Networks
Energy and Economic Modeling

SPACE SCIENCE
See the "Center for Space Science and Astrophysics" section in this bulletin.

For further details about the above programs, see the department sections in this bulletin.

Related aspects of particular areas of graduate study are commonly covered in the offerings of several departments and divisions. Graduate students are encouraged, with the approval of their departmental advisors, to select courses in departments other than their own to achieve a broader appreciation of their field of study. For example, most departments in the school offer courses concerned with properties of materials, and a student interested in an aspect of materials engineering can often gain appreciable benefit from the related courses given by departments other than her or his own.

MASTER OF SCIENCE
The degree of Master of Science (M.S.) is conferred on graduate students in engineering according to the University regulations stated in the "Degrees" section of this bulletin, and is described in the various department listings. A minimum of 45 units is usually required in M.S. programs in the School of Engineering. However, the presentation of a thesis is not a school requirement in Engineering. The Engineering Science degree is appropriate when the program of study emphasizes the scientific background of some aspect of engineering (e.g., Bioengineering) and contains a high percentage of courses in mathematics, physics, chemistry, etc. The Engineering degree is appropriate to all other cases including programs in fields lying between two departments. Further information may be obtained from the particular department in which the student is interested.

Four-Two Program—Superior students who hold baccalaureate degrees in physical science with adequate physics and mathematics may complete the requirements for an M.S. in engineering at Stanford (in most of the curricula above) in two academic years (six quarters). Programs will be worked out in consultation with an advisor from the department in which the student wishes to study. Further information may be obtained from the department in which the student is interested.

MASTER OF SCIENCE IN ENGINEERING

The degree of Master of Science in Engineering is available to those who wish to follow a program of study of an interdisciplinary nature that does not conform to a normal graduate program in a department.

There are three school requirements for the M.S. degree in Engineering: (1) the student’s program must be a coherent one with a well defined objective and be approved by a department within the school; (2) the student’s program must include at least 21 units of courses within the School of Engineering with numbers 200 or above in which the student receives letter grades; (3) the program must include a total of at least 45 units. These programs are administered by the departments and of course must meet the standard of quality of the departments.

Applications for admission to the Engineering program should indicate the department in the school in which the student expects to take most of his or her courses, or, if undecided, indicate the Office of the Dean, School of Engineering. Transfer into this program is also possible from any department program within the school by application to the appropriate department.
ENGINEER

The degree of Engineer is awarded at the completion of a comprehensive two-year program of graduate study. It is intended for those who desire more graduate training than can be obtained in a Master of Science program. The program of study must satisfy the student’s department and usually includes 90 units beyond the B.S. degree of which at least 60 must be devoted to advanced or graduate study in the major subject or closely related subjects. The presentation of a thesis is required. The University regulations for the Engineer degree are stated in the “Degrees” section in this bulletin, and further information will be found in the department sections following.

DOCTOR OF PHILOSOPHY

Programs leading to the degree of Doctor of Philosophy are offered in each of the departments of the school. Special Ph. D. programs which may be interdepartmental in nature (e.g., Bioengineering) can be arranged. See “Graduate Division Special Programs” section in this bulletin. University regulations for the Doctor of Philosophy are given in the section “Degrees” in this bulletin. Further information will be found in the departmental listings.

FELLOWSHIPS AND ASSISTANTSHIPS

Departments and divisions of the School of Engineering award graduate fellowships, research assistantships, and teaching assistantships each year. Information and application blanks may be obtained from the chairman of the appropriate department or division.

COURSES

The “Engineering” courses deal with subject areas within engineering which are, in their essential nature, broader than the confines of any particular branch of engineering. These courses are taught by professors from the several departments of the School of Engineering, under the supervision of those listed above.

Of the courses described in this section, many are of general interest to both engineering and non-engineering students. In addition, certain departmental courses are of general interest and without prerequisites.

Students interested in the interactions between technology and society should also consult the “Values, Technology, Science, and Society” section of this bulletin.


Associate Professors: Bruce Lusignan, J. David Powell, Robert Sinclair

Assistant Professors: Lambertus Hesselink, M. Elisabeth Paté-Cornell

Lecturers: Gerd Wallenstein, David Lougee

COURSES OF INTEREST PRIMARILY TO UNDERGRADUATES

1. Nature of Engineering—This course is intended to show what engineering is and what engineers do. It consists of lectures, readings, demonstrations, case studies, problems, and discussions designed to cover the various phases of the engineering process; problem definition, conceptualization, optimization, detailing, production, and commercial implementation. Interactions between engineering, human values, and social forces will be considered. Open to freshmen and sophomore engineering students and all non-engineering students. (DR:8)

3 units, Aut (Adams) MWF 1:15

5. The Microscopic World of Technology—An introduction to the microscopic world of technology through the use of optical and electron microscopes. A combination of classroom discussion and student participation in the application of various microscopes to study technological components. Typical experiments will involve examination of silicon integrated circuits or broken metal parts at magnifications ranging from 10X to 1,000,000X. (Open to freshmen).

2 units, Spr (Sinclair) T 1:15-3:05

3. Applied Mechanics: Statics—Equilibrium of particles; moments, couples; equilibrium of rigid bodies; analysis of trusses, frames, machines, dry friction; hydrostatic forces. Vectors and vector algebra are introduced and used in the course. Recommended for sophomores. Prerequisites: high school algebra and trigonometry. Concurrent registration in Math 41 or 19 is required. (DR:8)

3 units, Aut (Barnett) MWF 9
Win (Shah) MWF 10

6. Engineering at Stanford — Weekly seminar designed for freshman and undeclared soph-
omores interested in engineering. The course will provide information on the various engineering majors and the resources available for engineering undergraduates. Speakers will include departmental representatives, faculty and industry researchers, and representatives from Overseas Studies, Career Planning and Placement, and the Academic Information Center.

1 unit, Win (Staff) M 3:15-4:45

10. Aeronautics and Astronautics—The key historical developments leading to controlled, powered flight; atmospheric flight beyond the sound and temperature barriers; and space flight are presented. The fundamental principles of atmospheric and extraterrestrial flight are explained physically, with minimized dependence on mathematics. Participatory discussion is generated on the social, economic, and political ramifications of the rapid growth, achievements, challenges, and potential of aeronautics and astronautics. Open only to freshmen and sophomores who have taken both Mathematics 21 or 42 and Physics 21 or 51 or equivalents.

3 units, Spr (Staff) TTh 11-12:15

11. Applied Mechanics: Stress Analysis—Introduction to the mechanics of deformable structures under direct tension/compression, direct shear, torsion, and bending loads. Stress-strain relations, including thermal effects. Analysis of stresses, strains, and deformations of statically determinate and indeterminate structures. Alternative use of energy principles. Additional topics include pressure vessels, elasto-plastic analysis, and buckling of columns. Prerequisites: 3, Math 21 or 42. (DR:8)

4 units, Win (Gere) MWF 9

problem sessions by arrangement

Spr (Chilton) MWF 9

problem sessions by arrangement

12. Intermediate Dynamics—Review of first and second order linear dynamic systems; damping, resonance, instability, characteristic equations. Rigid body dynamics; gyrosopes; balancing rotating machinery; vibrations, and dynamic response of simple mechanical systems. Writing dynamic system equations of motion, their solution and interpretation. Prerequisites: Math 23 or 43 and Physics 51. (DR:8)

4 units, Aut (Bryson) MWF 9

Spr (Ashley) MWF 9, problem sessions by arrangement

21. Mechanics of Fluids—Physical properties of fluids and their effect on flow behavior; the equations of motion for incompressible ideal flow, including the special case of hydrostatics; energy and momentum principles; the control volume analysis; real fluid effects—laminar and turbulent flows; specific engineering applications. Laboratory exercises. Prerequisites: Engineering 3, Physics 51 and Math 23 or 43; Engineering 12 recommended but not required.

4 units, Win (Staff) MWF 10

lab M 2:15 and

one hour by arrangement

Spr (Franzini) MWF 9

lab M 1:15 and

one hour by arrangement

32. Introduction to the Thermosciences—Introduction to the concepts of energy and entropy from elementary considerations of the microscopic nature of matter. Use of basic thermodynamic concepts in the solution of engineering problems. Methods and problems in the socially responsible economic generation and utilization of energy in central power stations, solar systems, gas turbine engines, refrigeration devices, automobile engines, etc. Prerequisites: freshman calculus and physics. (DR:8)

3 units, Aut (Moffatt) MWF 10

Win (Eustis) MWF 10

41. Circuits—Introduction to electrical signals, circuits, and analytical techniques. Circuit principles, natural and forced response, a-c circuits, network theorems, block diagrams, and feedback. Prerequisites: Physics 53 and Math 43. (DR:8)

3 units, Aut (Helliwell) MWF 9

Win (Staff) MWF 10

42. Electronics—Electronic devices; linear and non-linear applications. Digital devices and logic circuits; microprocessors; power, small-signal, and operational amplifiers. Prerequisite: 41 or equivalent.

4 units, Win (Staff) MWF 9

Win (Manning) MWF 11

one 3-hour lab weekly

by arrangement

Spr (Manning) MWF 10

one 3-hour lab weekly

by arrangement

43. Electromechanics—Energy conversion, magnetic fields and devices, electromechanical devices, rotating machinery, automatic control. Prerequisite: 41 or equivalent.

3 units, Win (Lindau) TTh 10-11:15

Spr (Helliwell) TTh 11-12:15

one 3-hour lab weekly

by arrangement

44. Basic Electronics—Electronics for the non-specialist. Electrical quantities and their measurement including the operation of the
oscilloscope. Digital logic circuits and their functions including an elementary microprocessor. Function of electronic components including diodes and transistors. Amplifiers including operational amplifiers. Amplitude modulation and de-modulation. The necessary laboratory assignments are timed to complement the lecture content. Not intended for those who take 41. Prerequisite: calculus and college physics. (DR:8)


3 units, Aut (Pease) MWF 11-12:15

51. Materials Technology for Structural Applications—Metals, alloys, ceramics, glass, materials used primarily for their mechanical properties. Description of materials processing techniques, e.g., heat treatment, used to develop optimum properties. This course provides information necessary for materials selection and processing for engineering applications. Prerequisite: 50.

3 units, Win (Shyne) MWF 11-12:15

52. Materials Engineering of Microelectronic Devices—Brief discussion of materials parameters required of integrated circuit and other components of microelectronic structures, and their physical basis. Unit processes utilized in the synthesis and fabrication of desired microstructures in silicon-based integrated circuits and selected other devices used in modern electronic and magnetic systems. Preparation of high purity materials, crystal growth, deposition of epitaxial layers and thin films. Diffusion, ion implantation, oxidation, chemical and plasma-assisted etching, organic and inorganic photoresist materials and techniques. Assembly and packaging technology. Prerequisite: 50.

3 units, Aut (Huggins) TTh 11-12:15

90. Energy in the U.S.—Presentation of energy resources, conversion techniques to liquid and gaseous fuel and to electricity, energy policies, and extrapolations of energy use for the future. Traditional and alternative energy sources, environmental considerations, waste disposal, and nuclear proliferation. Elementary concepts of thermodynamics and presented to provide basis for understanding limits imposed by nature on conversion processes. Course is aimed at nonscientists, and mathematical sophistication is at the algebra level. (DR:8)

4 units, Spr (R. Eustis) MWF 1:15

95. Automotive Technology—An engineering description of today's automobile engine, the auto's use of the nation's energy supplies, and generation of air pollution; emission control technology, catalysts, engine modifications, and their effect on fuel consumption; a description of alternate power plants and fuels and the options they offer for the long term. Course is aimed at nonscientists. (DR:8)

3 units, Aut (Powell) MWF 2:15

100. Teaching Public Speaking—Theory and practice of teaching public speaking. Lectures and discussions on developing an instructional plan, using audio-visual equipment for instruction, devising tutoring techniques, and teaching delivery, organization, audience analysis, visual aids, unique speaking situations. Weekly practice speaking. Students serve as apprentice speech tutors. Students who successfully complete this course may become paid speech instructors in the Technical Communications Program. Admission by consent of instructor.

3 units, Spr (Staff) M 12:15

101. Teaching Technical and Expository Writing—Theory and practice of teaching technical and expository writing. Discussions of composing and writing process: analyzing audiences, defining purpose, generating and selecting report materials, structuring reports clearly and convincingly, designing and drafting effective reports, editing reports that are clear, concise, emphatic, and mechanically and grammatically "clean". Review of writing conventions; description of evaluation techniques. Supervised field work conducting individual tutorials. Admission by consent of instructor after review of student's writing. Students who complete the course successfully may become paid writing instructors in the Communications Program.

3 units, Spr (Lougee) W 7:30-10 p.m.


1 unit, Win, Spr (Lougee, Staff)

102W. Technical and Professional Writing—Explores systematically the process of writing technical and professional documents; lectures and discussions on analyzing audiences, defin
ing purpose, generating and selecting appropriate report materials, structuring clear and convincing reports, designing and drafting effective reports, and editing reports that are clear, concise, emphatic, and mechanically and grammatically "clean". Weekly writing assignments and individual conferences. Recommended especially for upperclassmen or graduate students who have worked or will soon work as professionals.

3 units, Aut, Win, Spr (Lougee)

102S. Writing: Special Projects—Writing assistance and instruction for students working on non-course-related materials (theses, dissertations, journal articles). Neither a course in remedial English nor an editing service, 102S aims to make students self-sufficient writers. Weekly individual conferences.

1-5 units, Aut, Win, Spr (Staff)

103. Public Speaking—Introduction to the full range of speaking activities, from impromptu speaking to carefully rehearsed formal presentations. Teaches students to organize and write speeches for a variety of occasions, to analyze audiences, to create and use visual aids, to combat nervousness, to deliver informative and persuasive speeches effectively. Helps students develop confidence in their speaking ability through weekly practice in class, rehearsals in one-on-one tutorials, and video-tape feedback. Open to all students, but priority given to engineering students.

3 units, Aut, Win, Spr (Staff)


3 units, Aut (Cannon) MW 11-12:15


3 units, Aut (Franklin) MWF 9
Win (Cannon) MW 11-12:15

110. Black Perspectives in Engineering—Designed to assist students in understanding the basic benefits and opportunities available to Blacks in the various fields of Engineering. The emphasis will be on diversity. Experts from various fields will lecture on pre-college needs, the social obligations of students and engineers; problems faced by Black Engineers, Black women in engineering; M.B.A., J.D., M.D. and sales options for engineers; small versus large companies, graduate versus industrial opportunities; consulting and starting ones own business; opportunities for Black Engineers and businesses in Third World Countries; trips to industrial and academic laboratories. Each student will have weekly reading assignments with a short paper due each week; a final term paper will be assigned.

3 units, Spr (Bates)

161. Engineering Economy—Economic analysis for decision making among alternative courses of action in engineering, business, government and personal finance. Use of compound interest calculations to compare the consequences of different alternative decisions is stressed. Effects of depreciation accounting methods, national and state income taxes, decision under uncertainty, and the selection of appropriate minimum attractive rates of return are considered in problems relating to multiple alternatives, sunk cost, incremental cost, replacement, resource allocation and publicly financed projects. May be taken by freshmen, but recommended for second year or higher students. Two lectures and one small problem session, plus one optional question session per week. Prerequisite: Math 41 or equivalent.

3 units, Aut (Paté-Cornell) MWF 10
Win (Hodder) MWF 10
Sum (Staff) MTWTh 10

170. Introduction to Modern Optics — Introduction to recent developments in modern optics. The course material is of a general purpose nature. Emphasis is placed on understanding of physical principles. Topics include: Geometrical Optics and Ray Matrices, Maxwell's Equations, Optical Properties of Materials, Interferometry, Diffraction Phenomenon, Fourier Optics, Lasers, Holography. Applications of optical techniques in Engineering and Science will be discussed and classroom demonstrations given. Prerequisite: Some familiarity with fourier transforms.

3 units, Aut (Hesselink) MW 2:15-3:30
alternate years, given 1984-85

176. Nuclear Energy—Theory, design and applications of nuclear energy systems; radioisotope heat sources, fission chain reactors and
concepts of fusion reactors. The information thus developed is applied to a number of topics of current interest: nuclear waste disposal, health effects of nuclear radiation, fusion reactor development, laser separation isotopes, etc.

3 units, Spr (Connolly) MWF 1:15

190. Problem Solving—(Same as Industrial Engineering and Engineering Management 201.) An investigation of problem solving with particular emphasis on problem definition, creativity, and interpersonal and organizational factors that influence thinking. Common blocks to problem solving will be explored and methods of dealing with them will be presented. The advantages of integrating various problem solving strategies will be stressed through use of reading, abstracted problem situations, and projects. Open to undergraduates and graduates in any field.

3 units, Spr (Adams) TTh 10-12

199. Special Studies in Engineering—Special studies, laboratory work, or reading under the direction of a faculty member. Often research experience opportunities exist in ongoing research projects. Interested students are invited to make arrangements with individual faculty. By consent only.

1 or more units, any quarter (Staff) by arrangement

COURSES OF INTEREST PRIMARILY TO GRADUATE STUDENTS

205. International Telecommunication Agreements—(Same as Communication 230.) Examination of the International Telecommunication Union (ITU) as a model for worldwide collaboration in resource allocation, standardization, and planning of services. Interdisciplinary focus on outcomes achieved by voluntary agreement. Case studies of ITU action, particularly in new services. Lectures and study projects.

3 units, Sum (Wallenstein) W 7-9 p.m.

206. Control System Design and Simulation—Sequel to Engineering 105. Analog computers are used for simulation of linear and nonlinear systems. Construction techniques for differential actuators and sensors. Student teams design, build, and test a miniature controlled system. Synthesis of on-off control system logic using phase-plane analysis and describing functions. Prerequisite: 105.

4 units, Win (Powell) MWF 1:15; lab by arrangement

207. Digital Control I—Study of the digital computer in feedback control. Sampling, z-transforms, digital filters, discretization of continuous compensation, discrete compensation design, quantization errors, state variable design of digital controllers and observers. Laboratory experiments on a minicomputer analog computer system. Limited enrollment. Prerequisite: 105.

4 units, Aut (Powell) TTh 11-12:15; lab by arrangement

Win (Staff) TTh 11-12:15; lab by arrangement

Spr (Powell) TTh 11-12:15; lab by arrangement

208. Digital Control II—Design of digital control systems including multivariable controller/observers, steady state optimal techniques, w-plane frequency response methods. Parameter identification. Kalman filter implementation. Laboratory experiments on a mini-computer/analog computer system. Prerequisite: 207.

3 units, Spr (Bryson) TTh 11-12:15; lab by arrangement


3 units, Spr (Franklin) alternate years, given 1984-1985


3 units, Aut (Venakides)

220B. Methods of Mathematical Physics—(Enroll in Mathematics 220B.) Continuation of 220A.

3 units, Win (Venakides)

220C. Methods of Mathematical Physics—(Enroll in Mathematics 220C.) Continuation of 220B.

3 units, Spr (Venakides)

221. The Social Impact of Technology—The functions of science and technology in various cultures; historical development; underlying patterns and concepts. Unifying frameworks to enable simultaneous consideration of technical
factors, human needs and ecological requirements. The adequacy of "traditional" and "scientific" philosophies as criteria for judging the satisfying of these needs. Systems, system methods, and their limits; the role of disciplines. For graduate students in engineering and science; run conjointly with VTS 106.

4 units, Spr (Kline) T 1:15-2:05, Th 1:15-3:05

235A,B. Space Systems Engineering — 40-50 students, mostly from engineering, but also from business, political science, law, and education, form a team to prepare a preliminary design study of a space system. Systems designed in previous years include a Mars Exploration System, several International Weather Systems, a Communications and Educational Satellite System for Developing Countries, and a shuttle-launched Science Platform System. About 20 invited speakers from government and industry give the class the necessary background information. At the end of the second quarter, the class gives a verbal briefing to government and industry representatives and publishes a final report on the system.

235A. 3 units, Win (Banks, Lusignan)
TTh 1:15-3:05
and two hours by arrangement

235B. 3 units, Spr (Banks, Lusignan)
TTh 1:15-3:05
and two hours by arrangement

287. Methods and Experiences in Engineering Education—Analysis of effective teaching in an engineering college. Theories of how people learn, use of media, when and how to lecture, self-paced learning, student and teacher evaluation, writing of instructional objectives. Emphasis will be on gaining experience and self-evaluation by such methods as practice teaching with videotape recording. Available to advanced graduate students from all disciplines with an interest in a college teaching career.

3 units, Win (Chilton) by arrangement

295. Products Liability and the Engineer — Products Liability laws define the responsibility of engineers and manufacturers towards the way their products affect public safety. It applies to consumer products as well as products used in industry. The course tries to teach what an engineer should know about the law, how and when she/he can get involved in product liability cases, and what action she/he can take to protect him or herself. Guest lecturers will include practicing trial lawyers, engineering experts, and insurance investigators. Students will reconstruct a few real cases and "try" them in class to get first hand experience with depositions, giving testimony, and presenting technical data to juries.

3 units, Aut (Chilton) by arrangement

297A,B,C. Ethics of Development in a Global Environment (EDGE)—(Same as Anthropology 133A,B,C; Education 274A,B,C; Political Science 140A,B,C.) The EDGE seminars present a series of speakers on current development issues with emphasis on the problems of the poorer nations. Autumn Quarter speakers discuss world resources — energy, food, housing, population and environment — and the political development and dependencies of developing regions. Winter Quarter speakers address the international institutions and their roles: international banking, international business, U.S. and foreign Universities, East-West political policies, and organizations of developing countries. Spring Quarter speakers address the roles of individuals in national backgrounds and present candid and often differing points of view. The series gives students working in developing countries or in institutions dealing with developing countries a better knowledge of the challenges they face and the issues they must deal with.

One unit credit for attendance of the speaker series; three units additional credit for optional workshops treating selected issues in more depth. (Sequential registration not required.)

1 unit (lecture only) or 4 units (plus workshop), Aut, Win, Spr (Fagan, Fuenzalida, Lusignan, McWhorter, Siegel, Textor) lectures M 7:30-9:30 p.m.
workshops by arrangement

298. Seminar in Fluid Mechanics—Interdepartmental seminar on problems in all branches of fluid mechanics, with talks by visitors, faculty, and students. Graduate students may register for one unit, without letter grade; a letter grade is given for students presenting talks.

1 unit, Aut (Ashley) T 4:15
Win (Homsy)
Spr (Staff)

299. Special Studies in Engineering—Special studies, laboratory work, or reading under the direction of a faculty member. By consent only.

1 or more units, any quarter (Staff) by arrangement
AERONAUTICS AND ASTRONAUTICS

Emeriti: Nicholas J. Hoff (Professor), John V. Breakwell (Professor); Chi-Chang Chao (Professor); Erastus H. Lee (Professor), Walter G. Vincenti (Professor)

Chairman: Robert H. Cannon, Jr.
Associate Chairman: Daniel Bershader

Professors: Holt Ashley, Donald Baganoff, Daniel Bershader (on leave Autumn and Winter Quarters), John V. Breakwell, Arthur E. Bryson, Jr., Robert H. Cannon, Jr., I-Dee Chang, Daniel B. DeBra (on leave Winter and Spring Quarters), Krishnamurty Karamcheti, Jean Mayers (on leave Autumn Quarter), J. David Powell, John R. Spreiter, Charles R. Steele, Milton D. Van Dyke

Associate Professor: Brian J. Cantwell
Assistant Professor: Lambertus Hesselink

Professors (Research): Dean R. Chapman, Sotiris P. Koutsoyannis, Leonard Roberts, Richard S. Shevell


OFFERINGS

This department prepares the student for a professional career in aeronautics and astronautics by offering a comprehensive program of graduate teaching and research. Particular emphasis is given to structural, aerodynamic, guidance and control, and propulsion problems of aircraft, missiles and spacecraft. Courses in the teaching program lead to the degrees of Master of Science, Engineer, and Doctor of Philosophy. Aeronautics and Astronautics offers two curricula for the Master of Science and Doctor of Philosophy—one oriented toward the sciences, the other emphasizing engineering. Specific programs are available in the following areas:

- Acoustics
- Aerodynamics
- Aeroelasticity
- Aerophysics and Experimental Space Science
- Aerospace Structures
- Aerospace Systems Synthesis and Design
- Analytical and Experimental Methods in Solid and Fluid Mechanics
- Biomedical Solid and Fluid Mechanics
- Computational Fluid Dynamics
- Flight Mechanics
- Gaskinetcs
- Guidance and Control
- Modern Optical Diagnostics in Fluid Mechanics
- Physical Gas Dynamics
- Propulsion
- Transportation
- Waves and Vibrations

Requirements for all degrees include courses on basic topics in aeronautics and astronautics, as well as in mathematics, physics and applied mechanics.

The current research activities cover a number of advanced fields, with special emphasis on:

- Aerodynamic Noise
- Aeroelastic Optimization
- Aerophysics of Hypervelocity Fluid Motion and Atmospheric Entry
- Aircraft Performance and Control
- Astrodynamics
- Bio-Fluid Mechanics and Physiological Acoustics
- Computational Fluid Dynamics
- Control of Flexible Spacecraft
- Control of Robots
- Differential Games
- Experimental Space Sciences
- Geophysics
- Inertial Instruments
- Laser Methodology for Fluid Flow Studies
- Multiphase Flows
- Nonequilibrium Flow
- Nonlinear Structural Mechanics
- Optical Diagnostics in Fluid Dynamics
- Optimal Control and Estimation
- Plasticity and Viscoelasticity
- Propulsion
- Structural Aeroacoustics
- Conventional and Composite Structures/Materials Systems Optimization
- Transportation Systems Analysis
- Wave Propagation

FACILITIES FOR INSTRUCTION AND RESEARCH

The work of the department is centered in the William F. Durand Building for Space Engineering and Science. This 120,000 square foot building houses the departments of Aeronautics and Astronautics, and Aerospace Engineering. The building is equipped with state-of-the-art laboratories, offices, and lecture rooms, providing the necessary resources to support the academic and research activities of the department.
building houses advanced research and teaching facilities and concentrates in one complex the Department of Aeronautics and Astronautics as well as the activities of other engineering organizations allied in space exploration and aerospace technology.

The Guidance and Control Laboratories include a wide spectrum of specialized facilities for making and testing novel instruments of extremely high precision. The facilities include active table-leveling (0.1 arc sec); low-level accelerometer evaluation chamber (10^-4 to 10^-8 g); spacecraft thruster test stand with 10 kHz bandwidth; spherical gyro rotor alignment facility (optical-to-principal-axis alignment less than 1 arc sec); air cushion vehicle to simulate the Stanford Drag-Free Satellite in an orbital dynamic environment to 275 km altitude; air-bearing simulator for spinning-spacecraft attitude control to a few arc secs, plus facilities for a number of inertial instrument test stands on an isolated test pad having visual access to Polaris. Clean facilities, ultra-precision machining, and advanced electronics design and fabrication capability support the guidance, control, and instrumentation experiments using these facilities. A new facility provides for testing systems for controlling flexible spacecraft on laboratory models. Dedicated high-capacity digital-control computers are part of this facility. Cryogenic gyro test facilities are available in the nearby Varian Physics Building, and Electrical Engineering’s Integrated Circuit Fabrication Facility is adjacent. Active flutter suppression research is performed in 0.5m x 0.5m low speed wind tunnel. Computer-aided engine test facilities are available in the Mechanical Engineering Laboratories and are an integral part of the Guidance and Control research program.

Stanford's new Center for Automation and Manufacturing is located in the Guidance and Control Laboratories. It includes facilities for building and testing new, flexible robot control designs, as well as several commercial robots. An ultra-precision machining laboratory is also part of the Center.

The spectro-interferometric laboratory does tuned-laser experiments on resonant refractivity in gas flows. The Stanford high-pressure combustion-driven shock tube is utilized for aerodynamic studies as well as hypervelocity aerophysics research. There is also a specially designed laboratory for studies of aerodynamic noise. Other laboratories recently outfitted include one making use of laser techniques to study droplet evaporation in shear flows; and others dealing with holography, tomography, optical data processing and related problems involving Fourier optics. Several student instructional laboratories include facilities to study supersonic jets, flame temperature by line reversal, supersonic flow fields with schlieren techniques, refractive index of gases and free-correction flow fields with interferometer equipment, shock-wave interaction by use of a shock tube, gyroscopic behavior, vibration modes of a simulated wing, blunt-body flow with ballistic freewheel range equipment, and hot-wire application with a small low-turbulence air-flow apparatus. An experiment using laser photography is currently being designed. A continuous low-speed wind tunnel with an 18" x 18" working section and speeds to 200 feet per sec. is available for use in instructional laboratories and research.

For the development and evaluation of new techniques, excellent facilities exist in the Fourier Optics and Optical Diagnostics Laboratory, including stable continuous wave and pulsed laser sources, extensive optical and electronic equipment as well as a complete standalone digital image processing computer, linked to a VAX 11/780.

Research in hypervelocity fluid dynamics and aerophysics makes use of the Stanford high-pressure shock tube, a device which can produce gas motion at very high Mach numbers, but which can also be used as a transonic wind tunnel. The shock tube can also generate high density, partially ionized plasmas under well-defined conditions. The associated instrumentation stresses modern optical diagnostics, including laser interferometry.

Included among the facilities in the building are structural laboratories for demonstrating and studying the behavior of small-scale structures. For the purpose of conducting structural tests of large-scale prototype structures in static, dynamic, and thermal environments, a new central laboratory for the School of Engineering has recently been constructed. Specific facilities include a static/dynamic testing bed; a programmable horizontal crash simulator; and high-load rate, materials test systems.

Service facilities in the building include a full machine shop, chemistry laboratory, an aeronautics library, several conference rooms, extensive digital and analog computer equipment, including several time sharing terminals. Attached to the building is a modern classroom building which is equipped for televising lectures and which contains a lecture auditorium.

The University’s Computation Center is complemented by a “satellite” computer facility in the adjacent Terman Engineering Center which is readily available to department researchers and students. Terminals in the facility provide for individual on-line, time-shared computation with the campus facility IBM 3033 and with the campus academic computer system (LOTS). They are available to all students at no
cost for their course work or unsponsored re-
search. Three digital mini-computers and sev-
eral analog computers are located in the Durand
Building with interfacing equipment that per-
mits combining the computers as hybrid facil-
ities or running independently. The instruc-
tional facilities for courses such as E206, E207,
and E208 are closely integrated with the equip-
ment used for research activities.

The department sponsors a student branch of
the American Institute of Aeronautics and
Astronautics, which holds periodic meetings,
including comprehensive faculty research-area
seminars, and conducts visits to nearby re-
search, government, and industrial facilities.

The Joint-Institute for Aeronautics and
Acoustics, co-sponsored by Stanford University
and NASA Ames Research Center was origi-
nated in 1973. Its purpose is to provide long-
term co-operative research in conjunction with
graduate education. In addition to acoustics per-
se, specializations encompassed by the Institute
include: aerodynamics, fluid mechanics, flight-
dynamics, systems analysis, guidance and naviga-
tion, etc. The Stanford University faculty and
staff interfaces with the center staff, utilizing
unique research facilities and experiencing
leadership in long-term complex research as
well as in resolving problems facing the aero-
nautics industry. The Institute uses several
specially designed laboratories: a blow-down
facility to study the mixing and acoustic char-
acteristics of jets issuing from different nozzle
configurations at both subsonic and supersonic
speeds; a rotor noise lab, to investigate the
aerodynamics and noise of surfaces in motion at
speeds ranging from 30 m/s to Mach 1 with
special application to rotor noise; an instrument
lab equipped with data acquisition and analysis
equipment with modern mini computers. A
large anachoric chamber and several wind
tunnels at NASA are actively used by the JIIA's
faculty, staff and students. Further information
can be obtained about opportunities for re-
search participation in the JIIA by writing to its
director, Professor K. Karamcheti, care of the
Aeronautics and Astronautics Department at
Stanford.

In addition, the department participates in an
interdisciplinary program in Acoustics and
Noise. Students desiring to either acquire spe-
cial training in the field or major in Acoustics
and Noise are referred to the Undergraduate
Studies Special Programs section of Courses
and Degrees for a description of the program
and a list of course offerings at both the under-
graduate and graduate levels.

A program in Computational Fluid Dynamics
(CFD) is operated jointly by the departments of
Aeronautics and Astronautics and Mechanical
Engineering. At the master’s level this program
is an option within the general structure of the
master’s requirements of each department. At
this level, students interested in a still greater
emphasis on CFD may register for the M.S. in
Engineering or Engineering Science (see be-
low) and design a program in consultation with
their respective advisors which meets their
specialized needs. Students intending to seek a
Ph. D. degree with an emphasis on CFD should
prepare for the post-master’s series in CFD (AA
214A-C) by planning a M.S. program strong in
mathematics and numerical analysis (ME
200A-C or the equivalent) and in advanced fluid
mechanics (e.g., AA 200A-B, ME 251A-B, AA
210A-B, ME 261, etc.) Choice of math courses,
theoretical and experimental dynamics courses,
and electives most suitable for the CFD pro-
gram should be selected in consultation with
the student’s advisor. Research topics in CFD
are supervised by a number of faculty members
in the two participating departments, and
utilize the large computer facilities of the
NASA-Ames Research Center through a coop-
erative program with the University.

The experimental fluid dynamics group has
developed an extensive capability in modern
optical diagnostics methods for fluids studies,
including several applications of laser tech-
niques, interferometry and Fourier optics. Spe-
cial opportunities exist for students with over-
lapping interests in fluid dynamics and experi-
mental physics.

A brochure describing and illustrating the
facilities and programs of the Aeronautics and
Astronautics department is available on request
to the Academic Secretary of the department.

ADMISSION AND
REGISTRATION

To be eligible for registration in the depart-
ment a student must have received the bach-
elor’s degree in engineering, physical science,
mathematics, or an acceptable equivalent. Stu-
dents with an aeronautical engineering back-
ground should be able to qualify for the master’s
degree in three quarters of work at Stanford.
Students with a bachelor’s degree in physical
science, mathematics, or other areas of engi-
neering may find it necessary to take certain
prerequisite courses, which would lengthen the
time required to obtain the master’s degree.

SCHOLARSHIP REQUIREMENTS

A minimum-grade-point average of 2.75 is
required to fulfill the department’s M.S. degree
requirements and 3.0 is the minimum re-
quired for eligibility to attempt the Ph. D. quali-
fying examination. Thus it is incumbent up00
both M.S. degree and potential Ph.D. candidates to request letter grades in all courses except those which fall into the categories of colloquia and seminars (e.g., AA129, 295, 297, and 298). Insufficient grade points upon which to base the grade point average may delay expected degree award or, if appropriate, result in refusal of permission from the Candidacy Committee to take the qualifying examinations. In any event, candidates with grade point averages 3.0 through 3.2 must request the permission of the Candidacy Committee to attempt the qualifying examinations.

WAIVERS AND TRANSFER CREDITS

All students who receive faculty approved waivers of required courses for the M.S. (also, Engineer and Ph.D.) degree in Aeronautics and Astronautics by virtue of substantially equivalent and satisfactorily performed course work at other institutions should have such action documented in their record folders. A memorandum from the course instructor (or advisor, if appropriate) to the Candidacy Committee via the Academic Secretary indicating (1) the Stanford University course number and title, and (2) the institution and number(s) and title(s) of the course(s) wherein substantially equivalent material was treated, will suffice. Compliance with this procedure will accelerate the approval and forwarding of degree candidacy forms to the Graduate Program Office.

A similar procedure should be followed with regard to transfer credits. Please note, however, that transfer credit is allowed only for courses in which equivalence to Stanford courses is established and a grade of "B" or better has been awarded. The number of transfer credits accepted for each degree (M.S., Engineer, and Ph.D.) is delineated in the "Advanced Degrees" section of Courses and Degrees.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

An interdisciplinary program in Aeronautics and Astronautics leading to the Bachelor of Science degree in Engineering is available in the form of 36 units of electives to constitute the engineering depth requirement for the B.S. degree. For further information on this program, see the "School of Engineering" section of this bulletin and the Freshman Handbook available from the Office of the Dean of Engineering.
satisfy a prerequisite in Category A can be used for credit toward the M.S. degree requirements only in Category D (Other Electives).

A. Basic Courses—Candidates will select eight courses as indicated.

AA.200A
AA.210A or AA.206A (ME.258A)
AA.240A and (AA.240B or AA.246 or AA.247)
or
AA.245A and (AA.245B or AA.246 or AA.247 or AA.249A)
AA.242
AA.271A or AA.279A
AA.280 or AA.283A
AA.131

B. Mathematics Courses—Each candidate is expected to develop a competence in the applied mathematics methods pertinent to his or her major field. This requirement can be met either (1) formally, through a minimum of six units in applied mathematics taken from ME.200A or Math 113 (linear algebra), ME.200B or Math 131 and Math 132 (partial differential equations), ME.201 or Math 106 (complex variables), CS.135 (computer science), and Stat 116E (probability); or (2) informally through matriculation in those basic (breadth) and technical electives (depth) courses which strongly emphasize methods of applied mathematics. Courses to be offered in informal fulfillment of the Category B requirement may appear in either or both of Categories A and C; however, they should not be considered as satisfying the mathematics requirement without obtaining the prior approval of the advisor. Note that the major-field Ph.D. qualifying examination provides for 25%-time devoted to pertinent mathematics. (See “Information on Ph.D. Qualification” available from the Academic Secretary). Note, also, that when the mathematics requirement is being satisfied via the informal route, six units of additional course work must appear in Category C, Technical Electives. Students may also elect the “science degree option”, which consists of taking 9 Math units. In this case, 3 less units of Technical Electives are required.

C. Technical Electives—Candidates, in consultation with their advisors, will select at least four major-field courses (in addition to those taken under Category A) from among the three-digit-series courses offered by the departments and divisions of the School of Engineering and the Department of Physics in the School of Humanities and Sciences. This requirement increases by two additional courses (taken from either the major or peripheral fields) when the mathematics requirement is being satisfied informally.

D. Other Electives—It is recommended that all candidates enroll in at least one humanities or social sciences course. Practicing courses in, for example, art, music, and physical education do not qualify in this category.

ENGINEERING OR
ENGINEERING SCIENCE
(45 Quarter Units)

For students who do not wish to meet the department's specified requirements for the M.S. degree in Aeronautics and Astronautics, the opportunity is available to pursue programs leading to an M.S. degree in either Engineering or Engineering Science. These programs are described in the School of Engineering “Graduate Programs of Study” section of this bulletin.

As described under the School of Engineering section of this bulletin, each department in the School of Engineering may sponsor students in the more general degrees, Master of Science in Engineering or Master of Science in Engineering Science. Sponsorship by the Aeronautics and Astronautics department requires that the student file a petition for admission to this program; no more than 18 units used for the proposed program may have been completed previously. The proposed program must include at least 9 units of graduate level work in the department of Aeronautics and Astronautics. The petition must be accompanied by a statement explaining the objectives of the program, how it is coherent, contains depth, and fulfills a well-defined career objective. The grade and unit requirements are the same as for the Master of Science in Aeronautical and Astronautical Engineering.

ENGINEER

The University's basic requirements for the Engineer degree are outlined in the "Degrees" section in this bulletin. The following are department requirements. The candidate's study program must fulfill the department's requirements for the master's degree or their substantial equivalent. Beyond the master's degree, a total of 45 units of work is required, including a minimum of 30 units of courses. The 30 units beyond the master's degree are chosen as follows:

1. 24 units of approved electives, of which 9 shall be in mathematics and the remainder usually selected from one of the following fields: (a) Acoustics, (b) Aeroelasticity, (c) Aerophysics, (d) Aerospace Structures, (e) Aerospace Systems Synthesis and Design, (f) Analytical and Experimental Methods in Solid and Fluid Mechanics, (g) Biomedical Solid and Fluid
Mechanics, (h) Computational Fluid Mechanics, (i) Flight Mechanics, (j) Gas Kinetics, (k) Guidance and Control, (l) Physical Gas Dynamics, (m) Propulsion, (n) Transportation, (o) Waves and Vibrations; and

2. 6 units of free electives.

A list of courses currently accepted as approved electives can be obtained upon request to the department. Candidates for the degree of Engineer will be expected to have a minimum grade point average of 3.00 for work in courses beyond those required for the master's degree.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree are outlined in the “Degrees” section of this bulletin. Departmental requirements are stated below.

Qualifications for candidacy for the doctoral degree are contingent on:

1. The student's having fulfilled the department’s requirements for the master's degree or its substantial equivalent.

2. The student's maintaining a high scholastic record for graduate course work at Stanford.

3. The student's having completed three units of a directed research problem (course AA290).

4. In the second year of graduate study, the student's passing an oral examination given by the department during the Autumn Quarter (following mid-term exams but before Dead Week) or in the seventh week of Spring Quarter.

Detailed information about the nature and scope of the Ph.D. Qualifying Examination can be obtained from the department. Research on the doctoral dissertation may not be formally started prior to passing this examination.

Beyond the master's degree, a total of 90 additional units of work is required, including a minimum of 45 units of courses. Normally, continued registration is expected for each quarter the student requires departmental consultation in completing thesis work.

Engineering Curriculum—The 45 course units beyond the master’s degree are chosen by the candidate and the advisor from a list of courses which can be obtained upon request to the department and must include 12 units of advanced mathematics.

Science Curriculum—The 45 course units beyond the master's degree are chosen by the candidate and the advisor from a list of courses which can be obtained upon request to the department and must include 15 units of advanced mathematics.

University Oral and Dissertation—Each Ph.D. candidate is required to take the University Oral Examination after the dissertation is substantially completed (with dissertation draft in writing) but before final approval of his or her dissertation. The examination consists of a public seminar presentation of dissertation research, followed by substantive private questioning on the dissertation and related fields by the University Oral Committee (4 selected faculty members, plus a chairman assigned by the University Graduate Program Office representing the University at large). The University Oral normally occurs toward the end of the fourth graduate year. Once the oral has been passed, the student finalizes his or her thesis for Reading Committee review and final approval. Forms for the Ph.D. Reading Committee and University Oral scheduling are obtained from the department's academic secretary and submitted with a one-page thesis abstract at least 3 weeks prior to the date approved for the oral by the student’s advisor.

Ph.D. Minor in Aeronautics and Astronautics—A student who wishes to obtain a Ph.D. minor in Aeronautics and Astronautics should consult the Department Office for designation of a minor advisor. A minor in Aeronautics and Astronautics may be obtained by completing 15 units of graduate level courses in the Department of Aeronautics and Astronautics, following a program (and performance) approved by the department’s Candidacy Committee.

FELLOWSHIPS AND RESEARCH ASSISTANTSHIPS

Both fellowships and research assistantships are available to qualified graduate students. For fellowships sponsored by Gift Funds, Stanford University, and Industrial Affiliates of Stanford University in Aeronautics and Astronautics each carries a grant of $13,400 or more for the nine-month academic year to cover tuition and living expenses. Students who have demonstrated research capability are eligible for half-time research assistantships. The stipend for half-time research assistants, on the basis of 20 hours of work per week, ranges from $550-$650 per month, plus tuition. Research assistants are normally given the opportunity of full-time summer employment at twice the above cited half-time rate. They may use their work as the basis for a thesis and for University credit toward an advanced degree.

Further information and application forms may be obtained upon request to the department.
COURSES

10. Aeronautics and Astronautics—(Enroll in Engineering 10.)

100. Introduction to Aeronautics and Astronautics—Explanation of the principles of fluid flow, flight and propulsion; discussion of the creation of lift and drag, aerodynamic performance including take-off, climb, range and landing performance, structural concepts, propulsion systems, trajectories and orbits outside the atmosphere. Remarks on the history of aeronautics and astronautics. Prerequisites: Math 41, 42, elementary physics or consent of instructor.

3 units, Aut (Shevell) TTh 11-12:15

104. Dynamic Response—(Enroll in Engineering 104.)

105. Control System Analysis and Design—(Enroll in Engineering 105.)

129. Life in Space — A sequence of lectures describing chemical evolution, the origin and evolution of life, the search for extraterrestrial intelligence: physiological changes in animals, plants and man in space; life support systems; biological experimentation in space; and life sciences aspects of future space settlements: given by investigators from the NASA-Ames Research Center.

3 units, Win (Billingham, Goldwater, Greene, Holton, Johnson, Lawless, Quattrone) TTh 3:15-4:30

131. Experimentation in Aeronautics and Astronautics—Principles and importance of experimental methods used in aeronautics and astronautics; experimental design, performance, evaluation and reporting of results; laboratory experiments selected from the major areas, including fluid dynamics, structural mechanics, guidance and control, and propulsion.

3 units, Spr (Cantwell, Hesselink) lec. Th 1:15-2:05; lab Th 2:15-5:05 or T 1:15-4:05

132. Introduction to Modern Optics — (Enroll in Engineering 170.)

135. Introductory Acoustics—The objective of this course is to introduce the student to the basic concepts of acoustics and their applications, on the basis of one-dimensional acoustic motion. The presentation will consist of lectures with experimental demonstrations: one-dimensional acoustic motion of a homogeneous inviscid fluid; wave equation and its general solution; travelling plane sound waves; speed of sound in gases and liquids; sound energy density, flux, and intensity; intensity and pressure levels and the decibel scale; one-dimensional sound propagation in an elastic solid; monochromatic waves; frequency, wave length, wave number and phase speed; reflection and transmission of sound between different media; mass law of transmission through walls; acoustic impedance of surfaces and sound absorption; spherical and cylindrical waves; acoustic source and dipole radiators; analysis of acoustical systems—electrical and mechanical analogies; acoustic resistance, inductance, capacitance and impedance; combinations of various acoustical elements; filters and transformers; measurement of impedance and absorption coefficients; propagation through a rigid duct of varying cross section; introduction to acoustical measurements; remarks on the effects of friction and heat-flow, and of motion of the medium and sound propagation.

3 units, Aut (Krothpalli) MWF 10

136. Introduction to Psychoacoustics—An introduction to quantitative relationships between auditory experience and the acoustic stimulus and the methods used to obtain such relationships. A brief review of physical sound description and auditory system physics and physiology. Measurement of sensitivity and masking. Scaling of pitch and loudness. Applications in noise pollution, audio systems, and the perception of speech and music. Experiments will be demonstrated during the lectures. Prerequisites: junior standing or consent of instructor. Open to graduate students.

3 units, Win (Ahumada and Nagel) MWF 3:15 alternate years, given 1984-85


3 units, Aut (Salmon) TTh 1:15-2:30

192. Vector Analysis and Cartesian Tensors with Applications—Vector algebra. Differentiation and integration of scalar and vector fields. Gradient, divergence and curl. Theorems of Gauss, Stokes, and Green. Cartesian index notation. Cartesian tensors; algebra and calculus: Dyadics. Selected applications. (All students taking graduate courses in Aeronautics and Astronautics are expected to be familiar with the basic subject matter covered in this course.) Prerequisite: Mathematics 44.

3 units, Aut (Chao) TTh 9:30-10:45

200A. Applied Aerodynamics — Atmospheric flight vehicles, the reasons for their configuration, and the nature of airflows associated with their operation. Equations of motion for rigid flight vehicles and the aerodynamic information
needed to apply them. Two-dimensional wings discussed from a historical standpoint; airfoils in incompressible flow treated by means of the complex variable; results of Joukowsky and Theodorsen; boundary-layer displacement. Subsonic thin airfoils by small-perturbation methods; prediction of pressures, lift and other properties. Historical discussion of three-dimensional wings; lifting-line theory, lifting-surface theory, and their application; analysis of slender wings and bodies. Compressibility connections; interference; discussion of other topics as time permits. Prerequisites: 100 and 210A or equivalents.

3 units, Win (Ashley, Jones) MWF 10

201B. Applied Aerodynamics — Introduction to computational fluid dynamics; Green’s theorem for linearized aerodynamics; paneling methods for slender configurations in subsonic and supersonic flight. Finite-difference solution of the fluid equations; organization of data, stability, computational efficiency and other issues. Static and dynamic performance of vehicles in the atmosphere. Dynamic stability and response; open-loop modes of the rigid flight vehicle; integrated treatment of aerodynamic stability derivatives. Further discussion of topics in flight-vehicle dynamics as student interest and schedule dictate. Prerequisite: 200A or consent of instructor.

3 units, Spr (Ashley, Lomax) MWF 10

201A. Fundamentals of Acoustics—Acoustic equations for a stationary homogeneous fluid; wave equation; sound energy density, flux, intensity, and power; r.m.s. pressure; plane, spherical, and cylindrical waves; harmonic (monochromatic) waves; simple sound radiators; reflection and transmission of sound at interfaces between different media; multiple analysis of sound radiation—monopole, dipole, and quadrupole distributions; inhomogeneous wave equation; Kirchhoff integral representation; scattering and diffraction of sound; propagation through ducts—dispersion, attenuation, group velocity; sound in enclosed regions—reverberation; elements of sound propagation in an elastic solid. Prerequisite: first year graduate standing in engineering, mathematics, sciences, or consent of instructor.

3 units, Win (Karamcheti) MWF 10

201B. Fundamentals of Acoustics — Continuation of 201A with emphasis on the acoustics of moving and inhomogeneous fields. Effects of friction and heat flow on sound propagation in a homogeneous fluid initially at rest—equations, and boundary conditions; energy considerations; simple examples of plane wave propagation—longitudinal and transversal waves; general considerations introducing the notions of dilatational and rotational waves; effects on propagation in ducts; comments on sound absorption and dispersion owing to relaxation processes; radiation from moving sources and dipoles; Doppler effect; propagation through a uniformly moving fluid—equations and energy relations; plane wave propagation in such a fluid; reflection and transmission at the interface of two differently moving fluids; radiation from a source in a uniformly moving fluid in a duct; acoustics of an inhomogeneous nonuniformly moving fluid; geometrical or ray acoustics; propagation in the atmosphere and the ocean. Prerequisite: 210A or equivalent or consent of instructor.

3 units, Spr (Karamcheti) MWF 10

202. Acoustic Measurements Laboratory—Lecture/laboratory course dealing with fundamental concepts and laboratory techniques for the measurement of the physical properties of sound fields in fluids and the development of criteria and measurement practice; use of basic acoustic instrumentation such as microphones, audio-oscillators, sound level meters, acoustic spectrum analysers, and recorders. Experiments include: classification, calibration, and refrequency response of microphones; speed of sound in fluids and solids; reflection, refraction, and absorption coefficients; sound wave propagation in bounded media; filters and resonators; reverberation time; diffraction, scattering, and dispersion of sound; Doppler effect; analysis of discrete frequency sound fields; analysis of random sound fields; power spectral density and correlation functions. Prerequisite: 135 or 201, or consent of instructor.

3 units, Spr (Krothapalli) TTh 11-12:15
plus lab by arrangement
alternate years, given 1983-84

203. Aerodynamic and Hydrodynamic Noise — Lighthill’s formulation of the theory of generation of fluid mechanical noise; Lighthill’s equation; representation of solution in unbounded and bounded regions; monopole, dipole, and quadrupole radiations; some general results; consideration of stationary and moving surfaces and source distributions; problem of a systematic theory of generation and propagation of aerodynamic noise—recent approaches; generation of discrete frequency noise—vortex tones and different kinds of edgetones generated by shear layers such as jets, wakes, and separated boundary layers interacting with surfaces; noise generation by turbulence—relevant description of turbulent motion, analysis of the random noise field in terms of the characteristics of the turbulent field; subsonic and supersonic jet noise theory and comparison with experiments; current developments in jet noise theory; jet noise suppression; noise radiation
from boundary layers on bodies and on duct walls; analysis of noise generated by propellers, helicopter rotor blades, and blades or rotating machinery; noise radiation from bodies in motion; airfoil and hydrofoil noise; noise from bodies such as those of aircraft shape; sonic boom; current topics in aerodynamic noise. Prerequisite: 201A and B or equivalent or consent of instructor.

3 units, Aut (Chang) MWF 2:15
alternate years, given 1983-84

206A. Fluid Dynamics—(Enroll in Mechanical Engineering 258A.)

206B. Fluid Dynamics—(Enroll in Mechanical Engineering 258B.)

207. Turbulence — (Enroll in Mechanical Engineering 261A.)


3 units, Aut (Chang) MWF 10

210A. Fundamentals of Compressible Flow — Emphasis placed on the development of the full three-dimensional nonsteady field equations and the associated constitutive relations representing the working fluid. Examples given for the specialized cases of flows in one and two dimensions; compressible Couette flow, normal shock wave, potential flow, linearized potential equation, lift and drag of thin airfoils, similarity rules for subsonic and supersonic flow, quasi-one-dimensional flow, conical flow, Prandtl-Meyer Flow. Prerequisite: 192 (may be taken concurrently) and Mechanical Engineering 131B or C or equivalents.

3 units, Aut (Baganoff) MWF 1:15
3 units, Spr (Bershader) MWF 1:15


3 units, Win (Ashley) MWF 1:15

211. Physical Gas Dynamics—(Enroll in Mechanical Engineering 262A.)

212. Introductory Aerothermodynamics—Dynamic and thermal phenomena in flows of gases and mixtures over a wide range of velocities and altitudes. Review of high temperature thermochemical equilibrium behavior is extended to rate process analysis for treating vibrationally non-equilibrated or chemically-reacting flows. Effects of viscosity and heat conductivity are added to study drag, heat transfer and overall flow field environment around high-velocity flight vehicles. Familiarity with the elementary concepts of compressible flow is desirable as a prerequisite.

3 units, Win (Bershader) TTh 1:15-2:30, alternate years, given 1984-85

213. Atmospheric Entry—The total atmospheric entry problem is surveyed with emphasis on the physical phenomena that influence the heating to the vehicle. A general description of planetary atmospheres, orbital mechanics, and motion in the atmosphere identifies key factors that quantify the entry problem. The overall heating problem is studied by dividing the physical phenomena into three groups: (1) the aerothermodynamic environment which includes description of processes in bow shock such as dissociation, ionization, and both line and continuum radiation. The processes are atmospheric dependent but independent of the heat shield material; (2) material response which accounts for in-depth time dependent thermal response of the heat shield including chemical degradation and ablation. These processes are atmosphere independent; (3) the viscous gas-material interaction, including an account of the fluid dynamic processes of convective heating and diffusion of vaporized species into the boundary layer and the radiative transfer processes of absorption and re-radiation of the gas species. Applications to manned and unmanned vehicles and meteors are examined and active areas of research involving gas-material interactions are identified.

2 units, Spr (Nachtsheim) MW 12, alternate years, given 1984-85

214A. Numerical Methods in Fluid Mechanics—Analysis of numerical methods used to solve the Eulerian and Navier-Stokes equations. Relationship between time-accurate and relaxation techniques. Higher order implicit and explicit methods combined with splitting methods. Spectral and pseudospectral methods including the effects of aliasing errors. Accuracy, stability and programming complexity. Prerequisites: Mechanical Engineering 200A
214B. Numerical Computation of Transonic Flow—Stability and convergence requirements; relaxation methods, including successive overrelaxation and alternating-direction/implicit methods. Transonic potential flow and viscous boundary layer methods. Development of weak solutions; coordinate transformations and automatic grid generation; applications to transonic airfoils and wings. Comparisons with experiment and development of computer codes. Prerequisite: 214A.

3 units, Win (Steiger) MWF 9

214C. Numerical Computation of Transonic Flow — Treatment of shock waves and rotational flow phenomenon in computational methods cast in generalized coordinates. Convergence and stability requirements; calculation of convection and diffusion processes in high Reynolds number flows; approximate factorization of Euler and Navier-Stokes equations; turbulence modeling for compressible flow, practical applications, comparison with experiments, and computer code development. Prerequisites: 214B.

3 units, Spr (Steiger, Chapman) MWF 1:15

217. Geophysical Fluid Dynamics—(Enroll in Mechanical Engineering 260.)


220. Optical Methods in Engineering Science — Emphasis is on design and understanding of modern optical systems. Topics include: optical systems design, optical metrology, refractive properties of matter, optical processors, including Doppler systems, three-dimensional imaging, inverse source problems, optical data storage and retrieval systems, and selected topics of current interest. Prerequisite: Engineering 170 or Electrical Engineering 366 or equivalent.

3 units, Win (Hesselink) MW 2:15-3:30 alternate years, given 1983-84

225. Stochastic Processes in Aeronautics—Applications of probability theory to problems in aeronautics; analysis of a linear system subject to a random forcing function; correlation function; power spectrum; difference and differential equations for probability densities; Fokker-Planck equation with application to diffusion; Ehrenfest model and approach to thermodynamic equilibrium; random walk model for vibrational relaxation; introduction to the statistical theory of turbulence.

3 units, Spr (Baganoff) MWF 1:15, alternate years, given 1983-84

226. Modern Photodiagnostic Techniques in Gas Dynamics Research—An introduction to nonintrusive flow diagnostics using laser-spectroscopic techniques. Topics include: diagnostic requirements in aerodynamic and combustion research; overview of laser performance and technology for diagnostic applications; laser velocimetry; linear and nonlinear laser spectroscopy including laser-induced fluorescence, Rayleigh scattering, Raman processes, and multi-photon processes. Emphasis will be placed on the practicality and limitations of these methods in realistic diagnostic requirements. Recommended prerequisites: Engineering 170, Electrical Engineering 231 (or equivalents), or consent of the instructor.

2 units, Spr (McKenzie) MW 2:15-3:05

227. Atmospheric and Space Physics—Introduction to selected topics of geophysics and astronomy with emphasis on conditions in the solar and planetary atmospheres, interplanetary space, and on solar-terrestrial relations. Elements of gravitational theory and orbital mechanics with application to determination of density of the upper atmosphere and the shape and internal structure of the Earth. Properties, time variations, and theoretical representation and interpretation of the upper atmosphere, ionosphere, magnetic field, and magnetosphere of the Earth, the photosphere, chromosphere, the corona of the Sun, and the solar wind in interplanetary space. Theory of Motion of a charged particle in electric and magnetic fields with application to Van Allen particles and cosmic rays. Outline of the principal features of the interaction of the solar wind with the Earth and other objects in the Solar System.

3 units, Spr (Spreiter) TTh 2:45-4, alternate years, given 1984-85


3 units, Spr (Chang) TTh 11-12:15

230. Aerodynamics of Rotary Wing Aircraft and Power Generators—Recent advances in rotary wing technology as applied to the helicopter and the VTOL aircraft and the windmill are highlighted. Fundamental aerodynamics of rotors are examined, including general momentum theory, blade element theory, and an intro-
duction to vortex theory. Aerodynamic and mission performance of the modern helicopter and other VTOL aircraft are considered using simple preliminary design methods.

3 units, Aut (Schmitz) MWF 3:15 alternate years, given 1983-84

231. Dynamics and Control of VTOL Aircraft
—The known methods of controlling the modern helicopter and other VTOL aircraft (tilt-rotor, tilt-wing, etc.) are explored, as are questions of control uniqueness and redundancy. The VTOL aircraft as a dynamic body is considered using linearization techniques. Laplace transform-root locus techniques are used to deduce the vehicle’s dynamic stability and response characteristics. These are related to ease of control by a human operator with and without feedback compensation. Primary emphasis is on a basic understanding of principles involved. A model helicopter is designed, constructed, and flown as a part of this course. The open loop stability of the model is calculated and several methods of stabilizing the resulting motion are considered. Prerequisite: 231 or equivalent.

3 units, Win (Schmitz) MWF 3:15
alternate years, given 1983-84

232. Structural Dynamics and Aeroelasticity of Rotary Wing Aircraft—Techniques are introduced to handle aeroelastic problems of rotating blades. The kinematics of finite rotation are used to describe nonlinear deflections in the blade. The principle of virtual work is used to obtain equations of motion including the contributions of simple aerodynamic models. Modal and finite element solution techniques are compared. Effects of aeroelastic couplings on the stability of rotating blades are explored. Ground and air resonance problems of the helicopter are also addressed. Primary emphasis is on a basic understanding of the principles involved. Prerequisite: 231; recommended, 244A, and either 242 or Mechanical Engineering 231A.

3 units, Spr (Hodges) MWF 3:15
alternate years, given 1983-84

233. Compressible Aerodynamics and Noise of Rotary Wing Aircraft—Potential methods are introduced for the aerodynamic analysis of rotary-wing aircraft. These are generalized to develop the classical vortex analyses, and are applied to the incompressible flow problem. Acceleration potential methods are extended to the linear compressible problem and finally to a nonlinear compressible aerodynamic formulation. These techniques are then used to formulate the discrete frequency noise of rotary-wing aircraft and horizontal axis windmills. Linear and nonlinear formulations are explored and used to predict rotor impulsive noise. Other sources of rotor noise are reviewed and surveyed as to their relative importance commercially. Prerequisite: 231; recommended 232.

3 units, Auth (Schmitz) MWF 3:15 alternate years, given 1984-85

240A. Analysis of Structures—Elements of one- and two-dimensional linear and nonlinear elasticity theory; reduction to strength of materials theory; strain-functional variational principle; direct and indirect methods of the calculus of variations applied to deflection and stability analysis of beam, ring, plate, and shell elements; introduction to finite-element methodology. Prerequisite: Civil Engineering 114 or equivalent.

3 units, Aut (Staff) MWF 10

240B. Analysis of Structures—Effects of deflectional, rotational, and extensional elastic restraint; introduction of Lagrangian multiplier, Dirac delta function, and Galerkin methods; bending/torsion of plates with nonuniform planforms; stress-functional variational principle with applications to redundant structures, torsion of thin-wing sections, and shear lag in “sheet-stringer” construction; thermal effects; introduction to stress/strain-functional (Reissner) variational principle and application to stress/deflection analysis of beams, plates, and pressurized shells; introduction to composite materials. Prerequisite: 240A or consent of instructor.

3 units, Win (Staff) MWF 11

240C. Analysis of Structures—Unified approach to structural analysis of isotropic, orthotropic, anisotropic structural elements; application of variational formulations to kinetically and constitutively nonlinear analysis of beam, plate, and thin-shell structures under static dynamic and thermal loadings; bending, buckling, post-buckling and vibration of conventional, stiffened, sandwich and composite structures. Role of variational formulations in finite-difference and finite-element analysis of complex structures. Prerequisite: 240B or consent of instructor.

3 units, Spr (Staff) MWF 10, alternate years, given 1983-84

241A.B. Introduction to Aerospace Systems Synthesis and Analysis—The total development of new aircraft systems is explored with emphasis on commercial aircraft; the underlying economic and technological factors that create markets for new aircraft from both rational and historical viewpoints; methods of determining market demands and system mission performance requirements; techniques of optimizing configurations to comply with requirements with emphasis on the interaction of the various disciplines such as aerodynamics,
structures, propulsion, guidance, payload, and ground support; parametric studies; applied aerodynamic and design concepts for use in configuration analysis including airplane layout, wing design, high lift systems, drag, stability and control requirements, and tail sizing. Application to a hypothetical aeronautical system; applied structural fundamentals with emphasis on fatigue and fail-safe considerations; design load determination; weight estimation; propulsion system performance and installation; engine types; environmental problems such as noise and smoke; performance estimation including takeoff, climb, cruise, and landing. Direct and indirect operating costs prediction and interpretation. Aircraft functional systems such as hydraulic, electrical, environmental control; avionics; importance and achievement of aircraft reliability and maintainability.

241A. 3 units, Win (Shevell) MWF 2:15
241B. 3 units, Spr (Shevell) MWF 2:15

242. Classical Dynamics—Accelerating and rotating reference frames. Kinematics of rigid body motion; Euler angles, direction cosines. D'Alembert's principle, equations of motion. Inertia properties of rigid bodies. Dynamics of coupled rigid bodies. Lagrange's equations and their use. Dynamic behavior, stability, and small departures from equilibrium are considered throughout the course. Prerequisite: Engineering 12 or equivalent.

3 units, Aut (DeBra) MWF 8

243A. Spacecraft Dynamics I—(Same as Mechanical Engineering 232A.) Kinematics of spacecraft; specification of large orientation changes of a rigid body in terms of direction cosines, Euler parameters, Rodrigues parameters, orientation angles; generalized speeds, partial angular velocities and partial velocities. Gravitational forces and moments. Dynamics of simple spacecraft; effects of gravitational moments and orbit eccentricity; gyrostats.

3 units, Win (Kane) TTh 2:45-4
alternate years, given 1984-85


3 units, Spr (Kane) TTh 2:45-4
alternate years, given 1984-85

244A. Free and Forced Motion of Structures—Vibrations and forced response of linear systems with a finite number of degrees of freedom. Vibrations and forced response of continuous structures, developed in a framework of analytical dynamics; rods, beams, membranes and other elastic systems. Discussion of approximate methods for analyzing nonuniform and built-up structures. Finite-element methods presented in a dynamic context. Introduction to random responses and to nonlinear systems, with emphasis on stability. Prerequisites: 240A, 242.

3 units, Aut (Ashley, Lehman) MWF 2:15

244B. Structural Dynamics and Aeroelasticity—Continuation of the 244A treatments of finite-element methods and vibration of continuous, two-dimensional structures. Introduction to aeroelasticity from a unified viewpoint applicable to flight vehicles, rotating machinery and other elastic systems. Introduction to aeroelastic operators and unsteady aerodynamics in two dimensions. Forced response, static and dynamic eigenvalues of a simplified system. Aeroelastic analysis of representative one-dimensional and two-dimensional systems. Prerequisite: 244A or equivalent.

3 units, Win (Ashley) MWF 8
alternate years, given 1984-85

244C. Aeroelasticity—Continuation of 244B. The unrestrained elastic flight vehicle. Modern unsteady aerodynamic theory, including transonic flow and numerical methods for three-dimensional surfaces. Review of experimental methods. Special topics of current interest, such as optimization, coupling between aeroelastic phenomena and automatic controls systems, and problems of power machinery, windmills, etc. Prerequisite: 244B.

3 units, Spr (Ashley) MWF 9,
alternate years, given 1984-85

AERONAUTICS AND ASTRONAUTICS 113

245A. Theory of Elasticity—(Enroll in Mechanical Engineering 238A.)

245B. Theory of Elasticity—(Enroll in Mechanical Engineering 238B.)

245C. Theory of Elasticity—(Enroll in Mechanical Engineering 238C.)

246. Theory of Plates—(Enroll in Mechanical Engineering 241A.)

247. Theory of Shells—(Enroll in Mechanical Engineering 241B.)

248. Theory of Shells—(Enroll in Mechanical Engineering 241C.)

249A. Introduction to Nonlinear Continuum—(Enroll in Mechanical Engineering 242A.)

249B. Introduction to Nonlinear Continuum Mechanics—(Enroll in Mechanical Engineering 242B.)
253A. Waves and Vibrations—(Enroll in Mechanical Engineering 236A)

253B. Wave Propagation — (Enroll in Mechanical Engineering 236B.)


3 units, Spr (Chao) TTh 2:45-4

270. Introduction to Linear System Theory—
(Enroll in Electrical Engineering 363.)


3 units, Win (Staff) MWF 10
alternate years, given 1983-84


3 units, Spr (Cannon) MW 11-12:15
alternate years, given 1983-84

273A. Digital Control I—(Enroll in Engineering 207.)

273B. Digital Control II—(Enroll in Engineering 208.)

275. Fluid Power Control—(Enroll in Mechanical Engineering 229.)

276. Control System Design and Simulation—(Enroll in Engineering 206.)

277. On-Off Control Logic—(Enroll in Engineering 209.)


3 units, Win (Bryson) TTh 2:45-4


3 units, Spr (Powell) TTh 2:45-4


3 units, Aut (Breakwell) MWF 11
alternate years, given 1984-85

279A. Space Mechanics—Orbits of near-earth satellites and interplanetary probes; transfer and rendezvous; decay of satellite orbits; influence of earth's oblateness; sun and moon effects on earth satellites.

3 units, Win (DeBra) TTh 9:30-10:45

279B. Advanced Space Mechanics—Effects of several centers of attractions; restricted three-body problem; libration points; Encke's method for accurate orbit computation; expansion matching for lunar and interplanetary orbits. Hamilton's principle and elements of the calculus of variations; canonical perturbation theory; application to non-linear oscillations and orbital
analysis; non-linear resonances. Prerequisite: 279A.
3 units, Spr (Breakwell) MWF 10, alternate years, given 1984-85

279C. Optimal Space Trajectories—Optimal interception and rendezvous in free space; optimal transfer in a central field, for either high-thrust or low-thrust propulsion; the power-limited case; optimal orbit corrections, interplanetary guidance. Prerequisite: 279A, 278A or equivalent.
3 units, Spr (Breakwell) MWF 10, alternate years, given 1984-85

280. Rocket Propulsion Fundamentals—Introductory rocket dynamics; fundamentals of nozzle flow; use of performance parameters; thermochemical calculation of performance; heat transfer in rockets; basic design procedures; elements of electric propulsion; recent developments in space transportation systems. Prerequisites: thermodynamics or elementary gas dynamics.
3 units, Win (Chang) TTh 11-12:15

283A. Aircraft Propulsion I—Design and performance of airbreathing engines. Topics covered include an introduction to 1-D gas dynamics, physical parameters and cycle analysis of ramjets, turbojets, turbofans and turboprops; design of supersonic inlets and nozzles, compressor maps, component matching, fuel injection, ignition and combustion systems, equilibrium combustion calculations.
3 units, Aut (Cantwell) TTh 1:15-2:30

283B. Aircraft Propulsion II — This is an in-depth course which emphasizes the off-design and dynamic behavior of airbreathing engines. Topics covered include compressor and turbine aerodynamics, boundary layer flows, models for cascade efficiency, transonic compressors, turbine cooling and turbine materials, multiple jet exhausts, nonequilibrium combustion, detonations and deflagrations, dynamic models and transfer function relations for ramjets and turbojets. Prerequisite: 283A or consent of instructor.
3 units, Win (Chang) TTh 11-12:15

286. Advanced Space Propulsion—Topics selected from recent developments in rocket propulsion: Solid-fueled ramjet, ducted rocket, hybrid rockets, dual-fuel and mixed-mode rockets, advanced space propulsion concepts, combustion, ablative heat transfer, electric propulsion and applications to satellite control and station-keeping.
3 units, Spr (Chang) TTh 1:15-2:30

290. Problems in Aeronautics and Astronautics—Investigation, experimental or theoretical, of problems in aeronautics and astronautics. Offers opportunity to students to work in any field of special interest.
1 to 5 units, any quarter (Staff)

291A. Linear Transforms and Their Applications to Engineering Problems I—Introduction to linear integral transforms; Fourier, Laplace, Hankel, Mellin transforms. Applications to boundary and initial value problems in acoustics, waves in solid, vibration, random vibration, and heat conduction. Inverse transformation, contour integration. Methods of steepest descent and stationary phase. Group velocity for dispersive waves. Prerequisite: mathematics 106 or its equivalent (may be taken concurrently).
3 units, Win (Chao) TTh 11-12:15, alternate years, given 1982-83

291B. Linear Transforms and Their Applications to Engineering Problems II—Continuation of 291A: Advanced techniques in integral transforms. Cagniard's method and its applications to seismology. Weiner-Hopf technique, defraction and scattering of waves by an obstacle. Prerequisite: 291A.
3 units, Spr (Chao) TTh 9:35-10:50, alternate years, given 1983-84

297. Seminar in Flight Mechanics and Control—Problems in all branches of vehicle control, guidance and instrumentation presented by researchers from on and off the campus. Graduate students with an interest in automatic control applications in flight mechanics, guidance, navigation and mechanical design of control systems normally attend. Others are invited. Registration for a unit of credit, without letter grade, is optional; a letter grade is given for students who make presentations.
1 unit, Win, Spr (Powell) W 4:15

298. Seminar in Fluid Mechanics—(Enroll in Engineering 298.)
CHEMICAL ENGINEERING*

Chairman: Robert J. Madix
Professors: Andreas Acrivos, Michel Boudart, George M. Homsy, Robert J. Madix, David M. Mason, Channing R. Robertson
Associate Professor: Curtis W. Frank
Assistant Professor: Gerald G. Fuller
Senior Lecturer: Robert H. Schwaar
Lecturer: Manesh Shah
Consulting Professors: C. Richard Brundle, Ralph Dalla Betta, Robert M. Kendall, Ralph Landau

UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE

The B.S. Chemical Engineering program consists of the basic 36-unit engineering depth requirement (described under the “Degrees” section in this bulletin) which provides a broad background in the fundamentals of chemistry as well as basic training in separations processes, engineering thermodynamics, transport phenomena, polymer science, process analysis and control, plant design, and applied chemical kinetics. In addition, this program includes courses in physics, mathematics, chemistry, and basic engineering. With the exception of these certain basic courses and the engineering depth sequence, there is no set program which all undergraduate students follow.

A sample B.S. program is available from the Department of Chemical Engineering advisors or the Dean’s Office, School of Engineering. It is recommended that the student discuss the prospective program with his or her advisor, especially if transferring from chemistry, physics, or another field in engineering. With some advanced planning, the student can usually arrange to attend one of the overseas campuses.

GRADUATE PROGRAMS

MASTER OF SCIENCE

A Master of Science program comprising an academic year of appropriate course work is available to accommodate students wishing to pursue professional chemical engineering work after receiving the M.S. degree, including foreign students who plan on returning to their homeland. The M.S. degree is awarded without requiring a formal thesis after a minimum of three quarters of broad study subject to the specifications stated below.

Unit and Course Requirements—For those students terminating their graduate work with the M.S. degree in chemical engineering, a program consisting of 45 units of academic work is required, including at least four lecture courses selected from the Chemical Engineering 200-lecture series. The remaining courses may be chosen from departmentally approved graduate or advanced undergraduate courses in basic or applied sciences and engineering according to the following guidelines: (1) Approved courses include (a) all graduate courses offered in the Departments of Aeronautics and Astronautics, Chemical Engineering, Civil Engineering, Electrical Engineering, Materials Science and Engineering, Mechanical Engineering, Operations Research, Applied Physics, Biological Sciences, Chemistry, Computer Science, Mathematics, Physics, Statistics, and the School of Earth Sciences, and (b) all upper-division undergraduate courses in Biological Sciences, Computer Science, Mathematics, Physics, and Statistics. (2) Undergraduate courses in chemical engineering excluding Ch.E. 110, 120, 130, 180A,B may be included as part of the 45-unit master’s program. Any departure from these guidelines is to be resolved by petition of the student to the chairman of the Department of Chemical Engineering. Credit toward the M.S. degree will not be given for Chemical Engineering Special Topics courses numbered Ch.E. 270-277, or for the Colloquium, Ch.E. 300. Note, however, that the student must register for Ch.E. 300 and attend the Colloquia. Students wishing to obtain research experience should choose a research advisor and enroll in Chemical Engineering Research 290, for which up to 6 units may count toward the 45-unit requirement; Ch.E. 290, however, may not be substituted for any of the required four lecture courses in the Chemical Engineering 200-series. A written report describing the results of this research must be submitted to and approved by the research advisor.

To insure that an appropriately balanced program is being taken by all M.S. candidates, the student’s program must be approved by the departmentally appointed graduate advisor, and a tentative program for the entire academic year should be worked out by the student and advisor at their first meeting of the academic year.

Minimum Grade Requirement—All courses taken to satisfy the M.S. degree requirements must be taken for letter grades, if offered, with the minimum letter-grade equivalent of 3.00 for

* The curriculum leading to the B.S. degree in Chemistry is described in the School of Humanities and Sciences section in this bulletin.
The degree of Engineer is awarded after completion of six quarters of study plus the requirements listed below. This degree is not required to enter the Ph.D. program.

Unit and Course Requirements—A total of 45 units of course work (excluding chemical engineering courses numbered 270-300) is required, with six courses being chosen from the Chemical Engineering 200-lecture series. The remaining electives must be advanced technical courses chosen with the consent of the departmental advisor according to the guidelines noted for the master's degree in chemical engineering. All courses must be taken for a letter grade, if offered, and a minimum letter grade equivalent of 3.00 must be maintained. After completion of this series of courses and at least three quarters of residence (36 units or more of course work) the student will be eligible to apply for the M.S. degree in chemical engineering.

Thesis Requirement—The thesis must represent a substantial piece of research equivalent to nine months of full time effort and must be approved by a reading committee consisting of two members of the chemical engineering faculty.

Qualification for the Ph.D. Program by Students Receiving the Degree of Engineer—After completing all the requirements for the Engineer's degree, a student may request to be examined on the Engineer's research work for the purpose of qualifying for the Ph.D. If the request is granted, the student's thesis must be available in its final form for inspection by the faculty and must have been approved by the Reading Committee at least two weeks prior to the scheduled date of the examination.

DOCTOR OF PHILOSOPHY

The Ph.D. degree is awarded after completion of a minimum of nine quarters of study plus the requirements listed below.

Unit and Course Requirements—A minimum of 60 units of course work is required for the Ph.D. degree, including six courses chosen from the Chemical Engineering 200 lecture series. After completion of this series of courses and at least three quarters of residence (36 units or more of course or research work) the student will be eligible to apply for the M.S. degree in chemical engineering. The remaining courses, to total 60 units, may be chosen from the basic sciences and engineering, including up to six units of Chemical Engineering 270 through 277. A few selected students may participate in a research project during their first year. Following consultation with their advisor and approval by the Graduate Committee, they may register for up to six units of Chemical Engineering Research. This research need not be the same as the student's ultimate Ph.D. research. These research units may be applied toward the 36-unit requirement for the M.S. but may not be applied toward the 60-unit requirement for the Ph.D. degree. No credit will be given for Chemical Engineering 300, undergraduate Chemical Engineering courses, or courses usually required for the B.S. degree. All courses taken to satisfy the degree requirements must be taken for letter grades, if offered, and a letter grade equivalent of a 3.00 average must be maintained.

Qualifying Examination—To be advanced to candidacy for the Ph.D. degree, the student must pass a qualifying examination. (1) First-year students identified by the Graduate Committee as making less than satisfactory progress in their courses during the academic year will be asked to present orally and defend a critical review of a published paper before the faculty at the beginning of the Spring Quarter. This examination shall be used as the basis for deciding whether or not these students will be allowed to choose research advisors and begin their thesis research. Failure of this examination will lead to termination of the student's study with an M.S. degree and precludes financial aid beyond that already promised. (2) Students considered to be making satisfactory progress in course work are permitted to choose a research advisor and begin their Ph.D. research in the Spring Quarter of their first year. These students and those passing the examination described in (1) above will take a qualifying examination consisting of an oral defense of their research work before the faculty early in the Fall Quarter of their second year.

Thesis Requirement—A dissertation based on a successful investigation of a fundamental problem in chemical engineering is required, and the student enrolls in Chemical Engineering 290 during the course of this research. It is expected that normally in three to four calendar years after enrolling in the department the student will have fulfilled all the requirements for the Ph.D. including submission of a completed thesis, which has already been approved by his or her research advisor, to the Reading Committee. No sooner than four weeks after this date, the student's University Oral Examination will be scheduled. This exam, based on the candidate's thesis research, is in the form of a public seminar followed by private questioning by an examining faculty committee. After
satisfactory performance in the examination, the Ph.D. degree is awarded.

**RESEARCH ACTIVITIES**

Research investigations are currently being carried out in the following fields: Newtonian and non-Newtonian Fluid Mechanics, Polymer Adsorption, Rheo-optics of Polymeric Liquids and Colloidal Suspensions, Hydrodynamic Stability, Electrochemical Energy Conversion, Applied Chemical Thermodynamics and Kinetics, Polymer Physics, Surface and Interface Science, Adsorption and Catalysis, Membrane Separation Processes, and Bioengineering. A brochure describing research projects currently being pursued in these areas is available from the department upon request.

**FELLOWSHIPS AND ASSISTANTSHIPS**

A number of fellowships and assistantships are awarded each year to incoming students. Application forms may be obtained upon request to the department. The completed application should be received no later than January 15 preceding the start of the academic year for which the award is to be made.

**COURSES PRIMARILY FOR UNDERGRADUATE STUDENTS**

110. Equilibrium in Thermodynamic Systems—Review of the postulates of thermodynamics; properties of nonideal systems including mixtures; phase equilibria and chemical equilibria. Prerequisite: Chemistry 171. 3 units, Win (Madix) MWF 10

120. Separations Processes—Application of the equilibrium-stage concept to design of mass-transfer devices; phase relationships; countercurrent multistage extraction and distillation processes, simplified graphical and computer design methods; chromatographic separations, thermal diffusion, reverse osmosis, zone refining, flow field fractionation. Prerequisite: 110 or equivalent. 3 units, Spr (Fuller) MWF 10

130. Chemical Kinetics: Theory with Applications to Chemical Engineering—Reaction rates, chain and catalytic reactions. Coupling between chemical and physical variables. Ignition and explosion. Reaction networks. Operating characteristics of the following types of chemical reactors: batch, semi-batch, continuous stirred tank, and tubular-flow. Ways of optimizing performance of reactors. Examples for discussion from chemical processing, air pollution, combustion, and energy devices. Prerequisites: 110, 140, 150, Chemistry 171, 173. 3 units, Win (Boudart) (M)WF 2:15-3:30

140. Fluid Mechanics—The flow of isothermal fluids from a momentum transport viewpoint. Continuum hypothesis; scalar fields; fluid statics; deformation of continuous media; non-Newtonian fluids; the equations of motion; creeping flow; potential flow; boundary layer theory; turbulence; free-surface phenomena; porous media flows. Prerequisites: junior standing in chemical engineering or consent of instructor; Mechanical Engineering 33 or Engineering 21; Mathematics 130 or equivalent. 3 units, Aut (Robertson) TTh 1:15-2:30

150. Energy and Mass Transport—A basic course in the transport of energy and mass in solid and fluid continua. Fourier's law, heat transfer in solids, laminar flow, forced and free convection, boundary-layer heat transfer, natural convection with application to geophysical flows, energy transport by radiation, Fick's Law, binary diffusion, the equation of convective diffusion, mass transfer with chemical reaction, transport in turbulent flows, heat and mass transfer analogies. Prerequisite: 140 or equivalent. 3 units, Win (Homsy) MWF 9

155. Process Analysis and Control—Dynamic behavior of simple plant units examined to design their controllers. Emphasis on stability analysis of closed loop control systems and stable controller design with acceptable performance. Physical systems with first, second and higher order dynamics analyzed together with instrument and controller characteristics. Several simple practical examples discussed to relate theory to practice. Use of standard root locus and frequency response methods for controller systems design. Use of computer simulation programs for analysis and controller design of simple as well as complex interacting and distributed parameter systems encountered in practice. Digital computer for multi-variable analog and digital control introduced. Prerequisite: Mathematics 130. 3 units, Aut (Shah) MF 11-12:15

160. Chemical Engineering Plant Design—Application of chemical engineering principles to design of practical plants for chemical manufacture. Topics include: equipment design for distillation, chemical reactions, heat transfer, pumping, and compression; estimation of capital expenditures and production costs; plant construction. Open to seniors in chemical engineering or by advance consent of instructor. 3 units, Spr (Schwaar) TTh 3:15-5:05

165. Thermodynamics of Combustion Systems—Focuses on the fundamentals of combustion processes, integrating the student's back-
ground in thermodynamics, transport processes and chemical reaction theory. Includes presentations on detonation waves, combustion limits, ignition theory, premixed and diffusion flames, droplet and pulverized fuel combustion, NOx formation and catalytic combustion. Prerequisite: senior standing in chemical engineering or consent of instructor.

3 units, Spr (Kendall)  
MW(F) 8:30-9:45

170. Introduction to Polymeric Materials—Examines fundamental molecular aspects related to the use of polymers as engineering materials. Topics include: morphology and order in crystalline polymers, glass transition behavior in amorphous polymers, and linear viscoelasticity and rubber elasticity.

3 units, Aut (Frank) TTh 9:30-10:45

180A,B. Chemical Engineering Laboratory—Investigation of a number of experimental aspects of chemical engineering science with a strong emphasis on development of communications skills. Fourteen experiments illustrating subjects developed in the lecture courses 110, 120, 130, 140, 150, 155, and 170 are available. Six of the fourteen experiments must be performed.

180A. 3 units, Win (Staff)  
180B. 3 units, Spr (Staff)  
TTh 12-1 plus laboratory section by arrangement

190. Undergraduate Research in Chemical Engineering—Laboratory or theoretical work for undergraduate students under the direct supervision of a faculty member. Research in one of the graduate research groups or other special projects in the undergraduate chemical engineering laboratory. Students should consult their advisors for information on available projects.

(Staff) by arrangement

COURSES PRIMARILY FOR GRADUATE STUDENTS

In addition to the courses listed below, graduate students in chemical engineering would be expected normally to enroll in relevant graduate courses offered by the other engineering departments, as well as the Departments of Mathematics, Physics, and Chemistry.


3 units, Aut (Homsy) MWF 9

201. Bioengineering—Analytical and experimental aspects of selected biological and physiological problems as viewed from a chemical engineering perspective, with emphasis on transport phenomena. Topics treated are: solute and water transport through membranes with applications to renal function; the design of immobilized enzyme and whole cell bio-reactors; pharmacokinetics; advanced drug delivery systems; the engineering aspects of recombinant DNA; biomaterials.

3 units, Aut (Romney) MWF 2:15-3:30

204. Kinetics of Chemical Processes—Elementary steps; sequences at the steady-state. Reaction networks. Theoretical principles and applications to the study of chain and catalytic reactions. In particular, the kinetics of heterogeneous catalytic reactions is discussed in detail, with emphasis on quantitative aspects.

3 units, Aut (Boudart) (M)WF 2:15-3:30

205. Transport Processes in Reacting Systems—Treatment of engineering problems where transfer of mass, energy or momentum is accompanied by chemical reactions. Topics include behavior of reactors; nonisothermal porous catalysts with complex kinetics; thermal properties of reacting fluids; combustion, electrode, and photochemical kinetics; and oscillatory reactions. Physical problems to be solved analytically for simplified models and with the aid of the computer for complex systems.

3 units, Spr (Mason) TTh 1:50-3:05

206. Dynamics of Polymeric Liquids—Structure of polymers, flow phenomena of polymeric liquids; fundamental concepts of rheology; measurement techniques in rheometry; ideal polymer chain statistics; molecular models of dilute and concentrated polymer solution dynamics (both flexible and rigid macromolecules); prediction of rheo-optical properties from molecular models. Prerequisites: 140 and 200 or equivalent.

3 units, Win (Fuller) TTh 10:30-11:45

209. Reactive Processes on Surfaces—An examination of advanced topics concerning the reactions occurring on and with solid surfaces. Particular emphasis placed upon reactive interactions between species bound on surfaces and the thermodynamic description of adsorbed layers. Includes structure of surfaces, surface-bulk precipitation, thermodynamics of adsorbed layers, bonding at surfaces, evaporation and condensation, surface compound for-
mation, surface intermetallic alloys, surface passivation and reactive scattering from surfaces.

3 units, Spr (Madix) TTh 9:30-10:45

210A,B. Viscous Flow Theory (With Applications to Heat and Mass Transfer)—An intensive course dealing with the fundamental principles of momentum, heat and mass transfer and their application to problems of physical interest. Derivation and analysis of the Navier-Stokes equations, the energy equation, and the equation for mass transport; flows at small Reynolds numbers and Stokes' law; the method of matched asymptotic expansions; laminar boundary layer theory; hydrodynamic stability and the Orr-Sommerfeld equation; interfacial instability.

210A. 3 units, Win (Acrivos)
given 1984-85
210B. 3 units, Spr (Acrivos)
given 1984-85


3 units, Win (Frank) TTh 9-10:15
alternate years, given 1983-84

217. Polymer Chemistry—Examines the principal methods of polymer synthesis, with emphasis on polymerization mechanisms and reaction kinetics, and their role in influencing polymer composition, structure, and ultimate properties. Topics include condensation-, radical- and ion-initiated-chain polymerizations; heterogeneous and stereo-regulated polymerizations; copolymerization; bulk, solution, emulsion, and suspension polymerizations.

3 units Win (Frank)
alternate years, given 1984-85

270-277. Special Topics in Chemical Engineering—Discussion of recent developments and current research in specialized fields. Open to qualified students with consent of instructor; units by arrangement.

Aut, Win, Spr (Staff) by arrangement

270A,B,C. Fluid Mechanics (Acrivos)
271A,B,C. Adsorption and Catalysis (Boudart)
272A,B,C. Applied Chemical Thermodynamics and Kinetics (Mason)
273A,B,C. Bioengineering (Robertson)

274A,B,C. Microrheology of Polymeric Liquids (Fuller)
275A,B,C. Surface and Interface Science (Madix)
276A,B,C. Polymer Physics (Frank)
277A,B,C. Stability of Fluid Motions (Homsy)

290. Graduate Research in Chemical Engineering—Laboratory and theoretical work for graduate students on chemical engineering problems leading to partial fulfillment of requirements for an advanced degree. Credit is not given until the student has satisfied the specific report or dissertation requirement.

(Staff) by arrangement

298. Seminar in Fluid Mechanics—(Enroll in Engineering 298.)

300. Colloquium—Students enrolled in this course should attend the colloquia of the Department of Chemical Engineering. Must be taken every quarter by candidates for advanced degrees in Chemical Engineering.

1 unit, Aut, Win, Spr (Staff)
by arrangement

CIVIL ENGINEERING


Chairman: Perry L. McCarty
Associate Chairman: Boyd C. Paulson, Jr.

Professors: John W. Fondahl (on leave Autumn Quarter), Joseph B. Franzini, James M. Gere, George Herrmann, En Y. Hsu, Paul Kruger, James O. Leckie, Perry L. McCarty, Leonard Ortolano (on leave Autumn and Winter Quarters), George A. Parks, Haresh C. Shah, Robert L. Street (on leave Winter and Spring Quarters), William Weaver, Jr.

Associate Professors: Helmut Krawinkler (on leave Autumn Quarter), Raymond E. Levitt, Boyd C. Paulson, Jr., Paul V. Roberts, Clyde B. Tatum

Assistant Professors: David L. Freyberg, Dunja Grbić-Galić, Greig W. Harvey, Edward Kavazanjian, Jr. (on leave Autumn Quarter), Anne S. Kiremidjian, Peter N. Pinsky, Raymond B. Seed, Lyna L. Wiggins

Professor (Research): Allin C. Cornell
OFFERINGS AND FACILITIES

The undergraduate Civil Engineering major provides a preprofessional program stressing the fundamentals common to many special fields of civil engineering. Free elective units, plus the proper selection of courses for the requirements in Mathematics, Science, and Engineering Breadth, permit the student to obtain either a broad general civil engineering education or a more specialized education in a specific branch, such as construction, environmental engineering, hydraulics, transportation, public works administration, structures, or a great variety of other branches. Laboratory facilities are available to the student in construction, fluid mechanics, environmental engineering and science, materials, soil mechanics, structural and earthquake engineering, and experimental stress analysis.

At least one year of graduate study is essential for the professional practice of civil engineering and is strongly recommended. Students who contemplate advanced study at Stanford should discuss their plans with their advisors late in their junior year. The opportunity to participate in the coterminus B.S.-M.S. program should be explored by students desiring an integrated five-year program.

The Civil Engineering Department, in collaboration with other departments of the University, offers graduate programs with particular strength in:

- Construction Engineering and Management
- Infrastructure Planning and Management
- Infrastructure Management
- Infrastructure Planning
- Structural and Geotechnical Engineering
- Earthquake Engineering
- Reliability and Risk Analysis
- Structural Analysis and Design
- Structural Mechanics
- Foundation Engineering
- Soil Mechanics
- Environmental and Water Studies
- Environmental Engineering and Science
- Water Resources Engineering (including elements of hydraulics, hydrology, hydromechanics and nuclear environmental engineering)

Research work and instruction under these programs is carried out in the following facilities—the hydromechanics laboratory, the water quality control research and teaching laboratories, the construction research laboratory (SCRL), the materials laboratory, the concrete laboratory, the soil mechanics laboratory, and the structural engineering laboratory. Research in earthquake engineering is conducted in the John A. Blume Earthquake Engineering Center. Office space is provided for most of the graduate students who act as research or teaching assistants.

PROGRAMS OF STUDY

CONSTRUCTION

The Construction Engineering and Management program prepares technically qualified students for responsible management roles in all phases of the development of major constructed facilities. The program emphasizes management techniques useful in planning, coordinating and controlling the activities of diverse specialists—designers, contractors, subcontractors and client representatives—within the unique, project environment of the construction industry. In addition, the program offers subjects which focus on engineering aspects of heavy construction as well as building and industrial construction. By appropriate choice of elective subjects, students wishing to work for a contractor, designer firm, construction management consultant, or the construction department of an owner’s organization can design a program for their needs.

Subjects offered within the program include: estimating; equipment and methods; planning and control techniques; planning and control applications; managing human resources; project and company organizations; concrete construction; construction administration; real estate development; labor relations; and computer applications. Additional related coursework is available from other programs within the department, from other engineering departments, and from other schools in the University such as Earth Sciences and the Graduate School of Business. The construction faculty also offers a program leading to a Master of Science in Engineering construction; this program is primarily intended for students having undergraduate degrees in electrical, mechanical, mining or chemical engineering. Each student, together with an advisor, can design a curriculum to meet individual educational goals.

The program leads to the degrees of Master of Science, Engineer and PhD. Opportunities are available to support a limited number of grad-
The program focuses on the engineer as a planner and manager of life-support and public facility systems which are necessary for the development of cities and regions. These systems, which are referred to collectively as infrastructure, include water resources and water quality projects, transportation systems, energy facilities, emergency services and land use controls. The planning and management of these systems require the integration of a variety of technical, social, economic, institutional and environmental considerations, all of which are incorporated into the curriculum of the infrastructure planning and management program.

Students design their programs by selecting an appropriate mix of courses from either the planning core or the management core, and from an analytical series and a specialty area. Core courses cover social, economic, institutional, financial and environmental aspects of infrastructure planning and management. The analytic series includes courses in quantitative methods and techniques. Courses making up the specialty may emphasize one or more of the following areas: water resources, water quality, transportation, energy, environmental planning and urban and regional planning. Emphasis is on planning and management as a discipline, and men and women are prepared for all levels of career positions with private industry, consulting firms and government agencies.

Faculty members in the Infrastructure Planning and Management Program maintain very close ties with the Undergraduate Urban Studies Program; civil engineering students are encouraged to use appropriate Urban Studies courses as part of their graduate program.

Students seeking training in engineering management, in areas outside of construction and infrastructure management, should consider the Engineering Management program in the Department of Industrial Engineering and Engineering Management.

STRUCTURAL AND GEOTECHNICAL ENGINEERING

Instructional programs and research opportunities are provided in the areas of structural, earthquake, and geotechnical engineering. Particular emphasis is given to earthquake engineering, risk and reliability analysis, computer-aided structural analysis and design, structural dynamics, finite-element methods, foundations and earth structures, and soil-structure interaction. Flexible programs enable students to prepare for careers as consulting engineers or as engineers in industry, government and universities. The John A. Blume Earthquake Engineering Center provides support and facilities for instruction and research in earthquake engineering and structural dynamics.

ENVIRONMENTAL AND WATER STUDIES

This program covers a broad spectrum of specialities, including environmental engineering and science, water resources engineering and water resources and environmental planning. Course offerings are scheduled to permit either intensive study in a single area or interrelated study between areas. Seminars provide a broad coverage of water problems.

Students with backgrounds in all areas of engineering and science who are interested in applying their specialized abilities to the solution of water problems are welcome. Comprehensive introductory courses in each major area of study are given to provide a common basis of understanding among those with dissimilar backgrounds. The major areas of specialization in the graduate program are: environmental engineering and science and water resources engineering.

Within the Environmental Engineering and Science program the major focus is on water, but much broader aspects of environmental concern and planning activities are covered as well. Thus the chemical, biological, nuclear, and engineering aspects of water supply and water pollution control, and fate and effects of pollutants in surface and ground waters can be covered in depth through the environmental engineering and science courses. Additional study is available in air pollution, noise pollution, environmental aspects of energy generation, and environmental planning and impact assessment.

The Water Resources Engineering program is directed toward an integrated understanding of the quantitative aspects of the movement of water in streams, reservoirs, and estuaries, over land and beneath the ground. Those with strong specific interests develop coherent programs by combining water resources with, e.g., environmental engineering and science courses, or for hydrology, courses from the School of Earth Sciences and the Department of Statistics, or for a fluid mechanics focus, courses from the Department of Mechanical Engineering, etc.
The programs are kept flexible to foster interaction among students and to encourage the development of individual programs suitable for a broad range of engineering and science backgrounds and career goals. Modern laboratories for water quality control, hydraulics and hydromechanics are well-equipped and instrumented for advanced research and instruction.

Specialization in environmental planning or water resources planning is offered through the Infrastructure Planning and Management Program of the department.

**UNDERGRADUATE PROGRAMS**

**BACHELOR OF SCIENCE**

Students who major in Civil Engineering must complete the requirements for the B.S. degree listed under the School of Engineering, "Undergraduate Programs of Study." Suggested courses to be taken in satisfaction of the requirements in Mathematics, Science, and Engineering Breadth are available from the office of the Dean of Engineering. Free elective units may be used in any way the student desires, including additional studies in civil engineering. Because the undergraduate engineering curriculum is designed to insure breadth of study, students who intend to enter the professional practice of civil engineering should obtain their professional education at the graduate level.

**UNDERGRADUATE HONORS PROGRAM**

The proposed program will lead to a Bachelor of Science with Honors in Civil Engineering. The program is designed to encourage highly qualified students to undertake a more intensive study of civil engineering than is required for the normal major, with course and research work of high distinction.

The Honors Program involves an in-depth research study in an area proposed to and agreed to by a Civil Engineering Department faculty advisor, and completion of a thesis of high quality. A written proposal for the research to be undertaken must be submitted and approved in the fourth quarter prior to graduation. At the time of application the student must have an average grade (LGI) of at least 3.5 for coursework at Stanford, and must maintain this through graduation. The thesis will be supervised by a Civil Engineering Department faculty advisor, but must also involve input from the School of Engineering Writing Program via Engineering 102S or equivalent. The student is also encouraged to present his results in a seminar for faculty and other students. Up to ten (10) units of CE 199, Directed Reading and Special Studies in Civil Engineering, may be taken to support the research and writing (not to duplicate Engineering 102S). These units are beyond the normal Civil Engineering program requirements, with the exception that the CE 198 requirement will be fulfilled with the thesis.

**GRADUATE PROGRAMS**

**MASTER OF SCIENCE**

Basic University requirements governing degrees of Master of Science, Engineer, and Doctor of Philosophy are described in the "Degrees" section of this bulletin.

Programs are available leading to the degree of M.S. in Civil Engineering with special designation on the diploma as follows: Infrastructure Management, Infrastructure Planning, Construction Engineering and Management, Environmental Engineering and Science, Geotechnical Engineering, Soil Mechanics and Foundations, Structural Engineering, Structural Mechanics, Earthquake Engineering, and Water Resources Engineering. Detailed statements of the requirements for all master's degrees and the specific course requirements for a degree with special designation may be secured by request to the Civil Engineering Department.

Students having undergraduate degrees in civil engineering normally can satisfy requirements for the M.S. degree with three quarters of graduate work of satisfactory quality. Students with undergraduate degrees in other fields may need longer residence for the M.S. degree in order to make up specified basic undergraduate civil engineering subjects. The specific requirements differ depending upon the M.S. degree sought. For example, in environmental engineering and science, students with undergraduate degrees in science or other fields of engineering generally can complete course requirements within three quarters. Students desiring to do so may take an additional 45 units of course work to qualify for a second M.S. degree in Civil Engineering in an area other than that of the first degree, providing they also fulfill the specific requirements for the second degree.

A minimum 2.7 letter grade indicator (LGI) and a program of at least 45 quarter units are required for candidates to be recommended for the M.S. degree. The program of study must be approved by the faculty of the department and shall include at least 40 units of courses in engineering, mathematics, science, and related fields unless it can be shown that other work is pertinent to the student's objectives.
ENGINEER

A minimum of six quarters (90 units) of graduate work including a thesis (12 to 15 units) is required for the degree of Engineer in Civil Engineering. (Thesis research in absentia is not permitted.) This degree is recommended for all students desiring more graduate education than is provided by the master’s degree, especially for those planning a career in professional practice. The student normally should start his thesis in the first quarter of graduate work beyond the M.S. degree. Programs leading to the degree of Engineer are offered in the fields of specialization mentioned above. A minimum “B” average (3.0 LGI) is required for candidates to be recommended for the degree. The program of study must be approved by the faculty of the department.

DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy is offered under the general regulations of the University as set forth in the section “Degrees” in this bulletin. This degree is recommended for those who expect to engage in a professional career in research, teaching, or technical work of an advanced nature in planning, design, and analysis. The Ph.D. program is rigorous and should be undertaken only by students with ability for independent work. It requires a minimum of three years (nine quarters) of graduate study, at least two years of which must be at Stanford. Experience has shown that few students complete the Ph.D. within the minimum residence period. Prospective doctoral students should anticipate the possibility of at least one extra year. All candidates for the Ph.D. degree are required to spend part of one quarter as a teaching assistant. Further information about Ph.D. requirements and regulations will be found in the department handout entitled “Information and A Typical Timetable for the Ph.D. Degree.”

The first year is represented by the M.S. program described above. The second year will be devoted partly to additional courses of graduate study and partly to the preliminary work toward a dissertation. The third and subsequent years will be applied to further course work and to the completion of an acceptable dissertation. Dissertation research in absentia is not permitted.

The program of study will be arranged by the prospective candidate at the beginning of the second year with the advice of a faculty committee whose members are nearest in the field of interest to that of the student. The chairman of the committee will serve as the student’s pro-

tem advisor until such time as a member of the faculty has agreed to direct the dissertation research. Insofar as possible the program of study is adapted to the interests and needs of the student within the framework of the requirements of the Department and the University. In the second year of graduate study the student is expected to pass the Departmental General Qualifying Examination to be admitted to candidacy.

FINANCIAL ASSISTANCE

The department maintains a large and continuing program of financial aid for graduate students. Fellowship or scholarship awards for the academic year range from $2,000 to $10,890. A generous student loan program is available. Applications for financial aid and assistantships should be filed by January 15; it is important that GRE scores be available at that time.

Teaching assistantships (normally awarded only to Engineer and Ph.D. candidates) carry stipends for as much as one-third time work as teaching aides during the academic year. Research assistantships are also available. Engineer and Ph.D. candidates may be able to use research results as a basis for the thesis or dissertation. Assistantships and other basic support may be supplemented by fellowship and scholarship awards or loans. Continued support is generally provided for further study toward the Engineer or Doctor of Philosophy degree subject to performance of the student, availability of research funds, and requisite staffing of current projects. Detailed information may be obtained by writing to the Department of Civil Engineering.

ADMISSIONS

Admission as a graduate student in Civil Engineering is obtained by applying to the Office of Graduate Admissions. Applications normally require submission of the application form, statement of purpose, letters of recommendation, results of Graduate Record Examination, and transcripts of courses taken at all colleges and universities attended. Policies for each of the department’s programs are available from the Graduate Admissions Office or the Department of Civil Engineering. Successful applicants will be advised as to the degree for which they are admitted and to the Program described above to which they are admitted. If students wish to shift from one Program to another after being accepted, an application for transfer must be filed with the department, and they will be advised if the transfer is possible. If, after enrollment at Stanford, students wish to continue toward a degree beyond the one for which they were originally admitted, a written
UNDERGRADUATE COURSES

107. Mechanics of Fluids—Dimensional analysis and principles of similarity, including application to hydraulic modeling, open channel flow, elementary hydrodynamics. Prerequisite: Engineering 21.
3 units, Win (Hsu) MWF 10

3 units, Spr (Kiremidjian) TTh 10 and W 1:15-2:05

116. Concrete Mix Design—Testing of aggregates, design of concrete mixes including statistical mix design, testing of concrete samples, and physical properties of Portland cement concrete. Student reports and project. Course consists of lecture followed by laboratory. Enrollment limited to 22 students.
4 units, Win (Staff) lecture session meets with CE 255 for several weeks, MWF 11, plus lab TTh 2:15-5:05

130. Transportation—Introduction to transportation studies. Social and economic role of transportation; technical characteristics of transportation systems; the institutional and political setting of transportation; analyzing the performance of transportation system components; the energy and environmental impacts of transportation; forecasting the effects of new systems and policies; approaches to transportation planning. (Graduate students register for 230). One year of college math is recommended.
3 units, Aut (Harvey) MWF 1:15

131. Analysis of Transportation Systems—Analytic techniques for evaluating the performance of transportation services and for predicting the results of transportation, policy initiatives. Economic, psychological, geographic, operations research and engineering approaches adapted and applied to transportation studies. Projective and "behavioral" techniques for demand analysis; representation of vehicular and guideway performance; transportation network analysis; approaches to traffic assignment and "equilibration"; the supply of transportation services by private and public operating entities; dynamic and lagged responses to system changes. Critical review of current and emerging approaches. Basic calculus, introductory statistics, and 130 are recommended. (Graduate students register for 213.)
3 units, Win (Harvey) MWF 2:15

133. Introduction to Urban Planning—The nature of urbanization and evolution of urban forms; conceptual modeling of urban growth and decay; the rational for planning; steps in the planning process and basic studies of plan formulation; estimating requirements for commercial, industrial and residential land uses; measures of plan implementation; and the application of the planning process to typical problems of community growth and development.
3 units, Win (Wiggins) MWF 10

140. Surveying—Care and use of instruments; leveling; topographic surveying; triangulation; horizontal and vertical curves; engineering astronomy. Enrollment limited to 27, with priority given to seniors in Civil Engineering.
4 units, Spr (Staff) TTh 11 lab TTh 1-5:30

3 units, Aut (Fondahl) MWF 11, not given Aut 1983-84
Win (Fondahl) MWF 11

144. Construction Engineering and Management—Introduces techniques for coordinating decisions and actions of the various participants involved in the design and construction of civil engineering projects. Covers legal, contractual and behavioral determinants of company and project organization structures; markets for key construction resources and products; and techniques used in estimating, planning, coordinating and controlling time, cost, quality and scope. Limited to juniors, seniors, and graduate students. This is an appropriate course for GSB or other non-CE majors who wish to become "informed buyers" of construction services.
3 units, Aut (Levitt) MWF 10

145. Construction Equipment and Methods—Construction engineering fundamentals; equipment economics; selection and efficient application of equipment; design and simulation of construction operations; analysis of production output and costs. Prerequisites: Engineering 3 and 161.
3 units, Aut (Paulson) MWF 11 (Note: There will be one or more field trips by arrangement.)

160. Water-Resources Engineering—Hydrologic measurements, runoff relations, groundwater, water law, reservoir design, frequency analysis, hydraulic structures, planning of
water-resources projects. Prerequisites: 107, Engineering 161.

4 units, Spr. (Franzini) MWF 11 and W 2:15-4:05

170. Environmental Science and Technology — An introduction to the causes, effects and methods of controlling environmental degradation. Stress placed on problems associated with water resource development and water pollution; air pollution; population; and environmental effects of energy consumption. (Intended for both science and nonscience majors). (DR:8)

3 units, Aut (Masters) MWF 8

171. Environmental Planning—Alternative strategies for air and water quality management; environmental impact assessment requirements; interactions between land use, physical infrastructure and environmental quality; forecasting and evaluating environmental effects; survey of techniques for assessing visual, biological, noise air quality and water quality impacts. Open to all students. One year of college mathematics and C. E. 170 are recommended, but not required. (Graduate students register for 228.)

3 units, Win (Staff) MWF 9

172. Air Pollution—(Enroll in Mechanical Engineering 137.)

173. Energy and Society—(Enroll in Mechanical Engineering 180.)

174. Noise Pollution—(Enroll in Aeronautics and Astronautics 138.)

176. Small Scale Energy Systems—Theoretical and practical considerations involved in the design of small scale energy systems suitable for a single dwelling or small cluster of buildings. Emphasis on solar water heating and passive and active solar space heating. Photovoltaics and wind-electric systems are also considered. Open to all students. (Graduate students register for 236.) (DR:8)

3 units, Win (Masters) TTh 11-12:15

177. Building Energy Laboratory — Measurement of building heat losses, infiltration, indoor air pollution, use of thermal mass. Efficiency measurements of renewable energy sources. Use of the microcomputer as a lab instrument. Prerequisite: 106 and 176. Enrollment is limited.

3 units, Spr (Masters) M 1:15 plus one 2-hour lab weekly by arrangement

180. Elementary Structural Analysis — Analysis of beams, trusses, frames; influence lines for beams, girders, trusses; 3-dimensional trusses; deflections by virtual work, moment area, elastic loads; indeterminate analysis by superposition equations, slope-deflection, moment distribution. Introduction to matrix methods. Prerequisites: 114 and Engineering 11.

4 units, Aut (Kiremidjian) MWF 9 and W 2:15-4:05

181. Design of Steel Structures—Concepts of elastic design of structures; types of loading; structural systems for buildings and bridges; elastic design and analysis of structural elements, i.e., tension members, compression members, beams, beam-columns, and connections; design of trusses and moment resisting frames; introduction to plastic design. Prerequisites: Engineering 11 and C. E. 180 or equivalent.

4 units, Win (Staff) TTh 10 and W 2:15-4:05

182. Design of Reinforced Concrete Structures—Properties of concrete and reinforcing steel; behavior of structural elements subjected to bending moments, shear forces, torsion, axial loads, and combined actions; design of beams, slabs, columns, footings, and retaining walls; ultimate strength design and service ability requirements; design of simple structural systems for buildings. Prerequisites: Engineering 11 and C. E. 180 or equivalent.

4 units, Spr (Krawinkler) TTh 9-11

190. Geotechnical Engineering—Principles of soil mechanics employed in the analyses of earth retaining structures, structural foundations, earth dams and embankments, and landslides. Course includes design-type laboratory projects. Prerequisite: Engineering 11.

4 units, Aut (Staff) MWF 11 lab to be arranged.

198. Senior Report—Practice in execution of a simple engineering investigation; preparation of a written report on the investigation. Required of all candidates for the bachelor's degree. During the third quarter prior to graduation, arrangements must be made with a faculty member to supervise the project and with the student's advisor; notification of these arrangements must also be given to departmental secretary. The course must be taken in one of two quarters prior to graduation. The investigative plan should be established in second week of the quarter in which the course is taken. The student's report must satisfy the requirements of a Communications Project writing tutor as well as the technical criteria of the faculty supervisor.

1 unit, Aut, Win, Spr (Staff) by arrangement

199. Directed Reading and Special Studies in Civil Engineering—Open to senior students by consent.

1 or more units, any quarter (Staff) by arrangement
201. Economics and Infrastructure Planning—Focus on mathematical and numerical models for simple physical systems in the environmental and water studies context. Governing equations plus appropriate boundary and/or initial conditions derived from physical principles. Application of ordinary and partial differential equation theory, Fourier series, numerical integration and finite difference techniques, and introduction to method of characteristics. Prerequisites: Mathematics 43, Computer Science 106 and 103, or equivalent experience and consent of instructor.

3 units, Aut (Street) MWF 11

203. Statistical Models in Civil Engineering—Applications of probability and statistical analysis to civil engineering; model construction from probability theory; descriptive statistics; estimation with small samples; recognition of variation including professional elements; models for reliability studies of civil engineering designs; construction of complex models. Prerequisite: graduate standing, Mathematics 43.

4 units, Aut (Shah) TTh 9-11

204. Stochastic Processes for Civil Engineers—Description of stochastic processes; transportation models, structural dynamics models; harmonic analysis of processes; application of Markov chains to civil engineering problems. Prerequisite: 203 and a course in statistics or probability.

2 units, Spr (Kiremidjian) TTh 1:15-2:05

205. Structural Reliability—Definition of failure events of structural components and systems; statistical uncertainties; derivation of minimal cut sets systems; solution techniques for complex systems, load combination and capacity deterioration; application to structural codes. Prerequisite: 203 or equivalent.

3 units, Win (Kiremidjian) TTh 11-12:15

210. Seminar in Infrastructure Planning and Management—Discussion by faculty and students on various aspects of infrastructure planning and management. Introduction to planning theory with emphasis on the alternative roles of the civil engineer/planner. Students will complete a short computer assignment using the LOTS computing facility. Course credit restricted to students in the graduate program in Infrastructure Planning and Management or by special permission.

1 unit, Aut (Staff) T 2-4

221. Economics and Infrastructure Planning—Applications of microeconomics in the planning and management of physical infrastructure. A survey of basic elements from theories of demand, production, input-output analysis, and welfare economics. Role of economics in environmental equality management and in benefit-cost analysis. Introduction to planning and evaluation in the face of multiple-objectives. Prerequisite: Math 43. Students with no prior exposure to economics, matrix algebra and Lagrange’s method of undetermined multipliers should co-register in CE 221A.

3 units, Aut (Staff) MWF 10

221A. Economics and Infrastructure Planning Tutorial—Intended for students enrolled concurrently in 221 who either (a) have had no prior exposure to economics or (b) want a review of the mathematical techniques used in 221. Topics include elementary microeconomics, elementary matrix algebra, and Lagrange’s method of undetermined multipliers.

1 unit, Aut (Staff) Th 3:15-5:05.
First five weeks of quarter only.

222. Planning and Management Methods I—Role of research and analysis in infrastructure planning; research design and problem formulation; theory construction and hypothesis formulation. Role of forecasting in the planning process; time series analysis; judgmental forecasting techniques; population forecasting. Planning applications of the general linear model. Sources of planning data. Survey research topics; sampling; measurement, scaling and instrument design; reliability and validity of measures. Prerequisites: 203 and 220 or consent of instructor.

3 units, Win (Wiggins) MWF 11

223. Planning and Management Methods II—Data preparation and processing; descriptive and inferential analysis of nominal and ordinal data; incorporating the results of data analysis in technical reports. Applications of simulation models in infrastructure planning; socioeconomic impact analysis. Selected topics in econometrics; analysis of spatial data. Introduction to methods of regional analysis; forecasting employment. Prerequisite: 222 or consent of instructor.

3 units, Spr (Wiggins) MWF 11

224. Institutional Setting of Infrastructure—The effects of institutional structures and policies on the delivery of infrastructure services. Elements of planning and implementation theory; the role of bureaucracy; outcomes of different planning paradigms; the influence of federal policy-making and the erosion of federalism; focus of planning and implementation authority; involvement of legislatures in policy-making; the importance of citizen input; sources of implementation initiative; role of the private
231. Analysis of Transportation Systems—(Same as 131.) A paper and different assignments required for graduate credit.
3 units, Win (Harvey) MWF 2:15

234. Land Use Planning and Control—Theory, practice, and methods for the control and protection of land. First part of course covers concepts of ownership and other interests in land; legal rights and limitations on its use; public and private approaches to land use control. Course then addresses relationships of land use planning to environmental protection, growth management, and community development and renewal; impact of infrastructure on land use and development; other policy issues. Students will carry out case studies.
3 units, Aut (Staff) MW 3:15-4:30

235. Urban Development Models—The structure of static and dynamic urban development models and their empirical application to policy issues. Qualitative and quantitative aspects of the interactions of transportation systems and other infrastructure with land use and urban development, and methods for analyzing these interactions. Selected policy issues and case studies dealing with the impact of mass transit, public facilities and other forms of infrastructure on real estate values, housing markets, urban land use and urban development patterns. Prerequisites for undergraduates: Mathematics 43; prerequisites for students enrolled for graduate credit include 203 and Mathematics 43 and Statistics 110.
3 units, Win (Staff) TTh 3:15-4:30 and one hour by arrangement

236. Small Scale Energy Systems—Same as 176 with additional assignments for students who desire graduate credit.
3 units, Win (Masters) TTh 11-12:15

238. Planning for Decentralized Energy Systems—Defining and planning for an energy future that emphasizes energy efficiency and renewable energy systems. Solar access, subdivision planning, building codes, community energy audits, local energy plans, energy legislation. Solar/utility interface and cogeneration. Prerequisite: 176 or 236.
3 units, Spr (Staff) MWF 9

239. Planning for Centralized Energy Systems—Case studies in electricity utility system planning. Methods of forecasting demand for electric energy; incorporating conservation and uncertainty into demand forecasts; choice of technology including political, environmental and cost considerations; the state role in determining need. The existing siting pattern for centralized electric generating plants; implications of federal regulations for siting decisions; analysis of resource consumption and residual production in environmental assessment; state-of-the-art siting techniques; impact of recent state siting legislation. Prerequisite: 203 or Statistics 110. Enrollment limited to 40 students, with priority given to graduate students in civil engineering.
3 units, Spr (Wiggins) MWF 2:15

240. Operations Analysis for Work Improvement in Construction—Application of crew balance, process charts, time/lapse motion pictures, and other techniques for work methods improvement. Quantitative analysis and design of construction field operations. Accident prevention and safety management. Prerequisite: graduate standing.
3 units, Aut (Paulson) MWF 9

241. Techniques of Project Planning and Control—Analytical techniques for planning and controlling the design and construction of projects. Provides additional concepts of networking techniques including treatment of uncertainty, subnetworks, resource allocation and leveling, time/cost tradeoffs and specification
requirements. Also covers basic techniques for cost engineering, materials, procurement and quality control.

4 units, Win (Fondahl and Tatum)  
MWTThF 9

242. Applications of Project Planning and Control—Integration and application of methods and procedures for planning and controlling the design and construction of projects. Includes relationship of information systems to organizational structure and behavior, and practical applications of techniques introduced in 241 and 251. Requires an individual term project and team efforts on problems and case studies. Prerequisite: 241.

3 units, Spr (Tatum) MWF 11

243. Computer Applications in Construction—Emphasis on analysis, design, development and implementation of computer-based systems for construction engineering and management. Supporting topics cover computer hardware and software technology. This is a seminar-laboratory course requiring an extensive term project. Prerequisites: 240 and a computer course equivalent to Computer Science 106, corequisite 241. Enrollment limited to 20, with priority given to students in graduate construction program.

4 units, Win (Paulson) TTh 1:15-3:05


3 units, Spr (Fondahl) MWF 8

247. Building Contracting and Systems—A seminar course to discuss various technical, administrative and legal aspects of building construction. Topics include: conceptual estimating; value engineering; project control; design-building mechanical and electrical systems. Enrollment limited to 15 with priority given to students in graduate construction program.

3 units, Win (Kroll) Th 7-10 p.m.

248. Construction Financing in Real Estate and Land Development—Study of the interrelationships between all of the variables that make up a successful real estate project, places heavy emphasis on the financial aspects involved in land acquisition, land development, construction, permanent lending, and project management. In addition, various aspects of joint venturing, including the control of functions and equity financing are discussed. Enrollment limited to 30. Prerequisite: graduate standing.

3 units, Spr (Medearis) TTh 8, plus one hour by arrangement

249. Labor and Industrial Relations in Construction—Study of the history, laws, institutions and social and economic forces affecting labor and industrial relations in construction; covers both union and open-shop sectors. Enrollment limited, with priority given to students in the graduate construction program.

4 units, Win (Levitt and Paulson)  
TTh 10-12

250. Managing Human Resources in Construction—Study of human behavior: individual, in small groups, and in project and company organizations. Develops integrated theories of perception, motivation and learning with examples drawn from construction. Provides both independent and supervised exercises in group problem solving, using selected case material. Consists of one one-hour lecture and one two-hour group meeting each week. Co-requisites: 144 and 240. Enrollment limited to 40 students, with priority given to those from the graduate construction program.

3 units, Aut (Levitt)  
Lecture MW 8  
Group meeting T, W or Th 3:15-5:05

251. Construction Project and Company Organizations—Provides a theoretical framework to analyze and design appropriate organization structures for projects and firms in the construction industry. Subject relates construction organization structure to key characteristics of the tasks to be performed, available technologies for production and administration, skills and motivation of the workforce, and the degree of uncertainty in the task environment. Considerable attention is devoted to issues in the structuring of matrix organizations for design tasks, and project organizations for construction tasks. Some consideration of matrix organizations in industrial research and development settings. Students will work in teams of four to develop written solutions to case problems.

3 units, Win (Levitt) TTh 8-9:15

253. Estimating for Building Construction—Estimates and costs attached to construction of large buildings, such as apartment houses, warehouses, and other commercial and industrial structures. Enrollment limited to 20, with priority given to graduate students in the construction option. Students may not receive full credit for both 253 and 254.

3 units, Spr (Jessup, Stetson)  
by arrangement

254. Heavy Construction Methods and Estimating—Methods and equipment selection together with techniques for estimating and bidding heavy construction works. Construction engineering topics include rock excavation,
tunneling, pile driving, conveyors, and temporary facilities. Estimating topics include site investigation, quantity take-off, work analysis, costing and bid preparation. Prerequisites: 145 and 255.

4 units, Spr (Staff) MWF 10

255. Concrete Construction—The procedures, methods, and equipment for manufacturing concrete, including form design, mix design placement and curing of concrete. Special placement techniques and the use of non-standard concretes are discussed. Prerequisite: 145 or equivalent experience and 180.

3 units, Win (Staff) MWF 11

258A,B,C. Seminar in Construction Engineering and Management—Weekly evening discussions of special topics with speakers from industry and government. Normally taken by construction graduate students each quarter for three quarters. Because lecture content builds upon required construction graduate courses, credit registration is restricted to students in the graduate construction program.

258A. 1 unit, Aut (Staff) by arrangement
258B. 1 unit, Win (Staff) by arrangement
258C. 1 unit, Spr (Staff) by arrangement

259A,B,C. Construction Problems—Analysis of group selected problems in construction techniques, equipment, or management, followed by preparation of oral and/or written reports. Students are expected to consult specialists from the construction industry as well as make use of University facilities. Prerequisites: graduate standing in construction and consent of instructor. See 299 for alternative for individual studies.

259A. 1 to 3 units, Aut (Staff) by arrangement
259B. 1 to 3 units, Win (Staff) by arrangement
259C. 1 to 3 units, Spr (Staff) by arrangement

260. Engineering Hydrology—A first course in hydrology for civil engineers and other graduate students interested in water studies. An engineering analysis of watershed hydrology, emphasizing physical principles and applications. Introduction to streamflow, groundwater, stochastic, simulation and tracer hydrology.

4 units, Aut (Kruger) MWF 9 and W 2:15-4:05

261B. Surface-Water Hydrology — Techniques and models for the analysis of watershed hydrology, with a focus on the flow of water on and above the earth's surface. Unsteady open-channel flow, overland flow, flood routing, analysis of watershed models, with emphasis on calibration, parameter estimation, and practical application. Prerequisites: 201, 260, 107 or equivalents.

4 units, Spr (Freyberg) TTh 8-9:50

263. Fluid Mechanics of Closed Conduits—Review of fundamental principles of turbulent flow and application to closed conduits; pipe systems and branching of pipes; unsteady flow in pipes; flow establishment, application of methods of characteristics to water hammer problems. Prerequisite: Engineering 21 or consent of instructor.

3 units, Spr (Hsu) MWF 10


3 units, Win (Franzini) TTh 10 and one hour by arrangement.

265. Water Resources Planning—Environmental, social and economic impact of water projects; methods of public involvement in water planning. Water conservation and relationships between water and energy. Planning and project evaluation in the face of multiple objectives. Course uses a group discussion format. Short written assignments and oral presentations are used to further develop students’ communication skills. Enrollment will be limited to 20 students. Prerequisite: 260.

3 units, Spr (Ortolano) T 1:15-3:05

266. Water Resources Systems Engineering—Application of mathematical optimization techniques (e.g., linear programming) to the analysis and design of water systems. Consideration is given to both quantity and quality of water. Topics include reservoir and conduit sizing, time phasing of capacity expansions, and reservoir operations. Water quality issues are considered in the context of waste water treatment plant design and alternative schemes for the attainment of water quality standards. Course includes an introduction to multi-objective programming and the combined use of simulation and optimization. Students will use the LOTS computing facility to solve selected problems. Prerequisite: 260.

3 units, Win (Male) MW 3:15-4:30

268. Professional Seminar in Environmental and Water Studies—Discussion by faculty, students and visitors of study programs, professional opportunities, and research activities in
the fields of environmental engineering and water resources engineering. All candidates for the M.S. degree in environmental and water studies are required to take this course.

1 unit, Aut (Franzini) W 4:15-5:30

269B. Seminar in Fluid Mechanics—(Enroll in Engineering 298.) Interdepartmental seminar on problems in all branches of fluid mechanics, with talks by visitors, faculty, and students. Graduate students may register for one unit, without letter grade; a letter grade is given for students presenting talks.

1 unit, Aut, Win, Spr (Staff) T 4:15

270. Water Quality in Water Resource Development—Effects of organic and nutrient pollutants on the ecology and chemical quality of streams, lakes, reservoirs, estuaries and groundwater; cause, analysis, and control of eutrophication; modeling of water quality impacts; water quality requirements for various beneficial uses. Prerequisites: freshman chemistry and calculus.

3 units, Aut (McCarty) MWF 8

271A. Water Quality Control I—Physical and chemical unit operations for water and wastewater treatment with emphasis on treatment process combinations for drinking water supply. Application of principles of chemistry, rate processes, fluid dynamics, and process engineering to define and solve water treatment problems. Control of particulate and dissolved pollutants by flocculation, sedimentation, filtration, disinfection, and adsorption. Prerequisites: 270 and Engineering 21 or equivalents; or consent of instructor.

4 units, Win (Roberts) MWF 8 and T 12:15-1:05

271B. Water Quality Control II—Aerobic and anaerobic biological unit processes for the treatment of municipal and industrial wastewaters. Prerequisites: 274 or equivalent and 271A.

3 units, Spr (McCarty) MWF 8

271C. Water Quality Control III—Analysis of advanced or specialized wastewater treatment flowsheets, including industrial problems. Emphasis on physical and chemical processes in treatment of municipal wastewater and processing of treatment residuals. Definitions of problems and objectives, and evaluation of alternatives for example cases. Use of these concepts in preliminary process design. Design-oriented class project and field trips. Prerequisites: 271A and concurrent registration in 271B.

3 units, Spr (Roberts) MWF 10 and W 1:15-3:05

273. Water Chemistry—A systematic presentation of chemical principles and application of those principles to the analysis and solution of problems in aqueous geochemistry (temperatures near 25°C and atmospheric pressure).

Particular attention is given to the analysis of natural water systems and to the understanding and solution of specific chemical problems in water purification technology and water pollution control. Thermodynamics is used for prediction of direction and extent of chemical processes such as precipitation/dissolution, hydrolysis, complex formation and oxidation-reduction. Prerequisite: Chemistry 31 and 33 or equivalent.

3 units, Aut (Leckie) TTh 11 plus F 2:15

273A. Water Chemistry Laboratory—Laboratory application of techniques for the analysis of natural waters and wastewaters; special emphasis on instrumental techniques. Limited enrollment. Prerequisite: consent of instructor.

2 units, Aut (Leckie) T 2:15-5:05

274. Water Microbiology—Fundamental aspects of microbiology and biochemistry as related to environmental pollution and water quality control processes; the role of major groups of microorganisms as pollutants, as purifying agents, and as agents of biogeochemical change; microbial identification and ecology as related to the aquatic environment. Prerequisite: 273.

2 units, Win (Staff) TTh 9

274A. Water Microbiology Laboratory—Experimental approach to understanding fundamentals of microbiology; topics include morphology, metabolism, microbial interactions and water quality parameters. Prerequisite: 273.

1 or 2 units, Win (Staff) W 2:15-5:05

275A. Water Quality Control Processes I—Laboratory and pilot plant studies of physical and chemical processes for the treatment of water and wastewaters. Prerequisites: 273 and 273A.

3 units, Win (Roberts) M 2:15-5:05 and Th 1:15-5:05

275B. Water Quality Control Processes II—Laboratory and pilot plant studies of biological processes for the treatment of water and wastewater. Prerequisites: 274 and 273A (or equivalent) and 271B which may be taken concurrently.

3 units, Spr (McCarty) M 1:15-5:05 and Th 2:15-5:05

276. Energy and Environment—Analysis of environmental impact of energy production in the U.S.; energy demand and supply of commercial and future energy resources; economic analysis; environmental impacts and risk; analysis of fossil fuel and nuclear fuel cycles; role of conservation; specific environmental threats:
air pollution, climatic change, radiation, heat, and noise.

3 units, Win (Kruger) MWF 10

277. Nuclear Environmental Engineering—A review of nuclear methods useful in environmental studies, the conflict of energy production and environmental quality, and the problems of environmental radioactivity. Topics included are: nuclear civil engineering, survey of available nuclear methods, application in water studies, commercial nuclear power; emission of retroactive residuals; radioactive waste management; biological importance of ionizing radiation.

3 units, Spr (Kruger) MWF 9


1 unit, Spr (Leckie) W 4:15

280A. Matrix Analysis of Framed Structures—Analysis of framed structures by matrix methods; flexibility and stiffness methods developed, with emphasis on the latter; orientation toward solution by digital computer. Optional concurrent registration in 280B. Prerequisite: elementary structural analysis (or mechanics of materials) and elementary matrix algebra.

3 units, Aut (Weaver) MWF 9


2 units, Aut (Weaver) M 3:15-4:30

281A. Finite Elements for Structural Analysis—Theory of finite elements applied to problems in structural mechanics; plane stress and plane strain; isoparametric formulations; axisymmetric and general solids; flexure in plates; axisymmetric and general shells; vibrations and instability. Optional concurrent registration in 281B. Prerequisite: 280A or equivalent.

3 units, Win (Weaver) MWF 11

281B. Computer Programming for Finite Elements—Development of digital computer codes for analysis of discretized continua; discussion of vector, skyline, and substructures techniques for solution. Mandatory concurrent registration in 281A.

2 units, Win (Weaver) M 3:15-4:30

282A. Earthquake Engineering I—Earthquake motions and their engineering interpretations; strong ground motion studies; design spectrum and design earthquake; importance of dynamic analysis of structures; geologic and soil engineering problems; design of structures to minimize earthquake damage; risk analysis; earthquake codes. Prerequisite: 282A or consent of instructor.

3 units, Win (Gere) MWF 9

282B. Earthquake Engineering II—Earthquake engineering II—Earthquake phenomena, their engineering interpretations; strong ground motion studies; design spectrum and design earthquake; importance of dynamic analysis of structures; geologic and soil engineering problems; design of structures to minimize earthquake damage; risk analysis; earthquake codes. Prerequisite: 282A or consent of instructor.

3 units, Spr (Shah) MWF 9

286. Design of Structures II—General aspects of design; serviceability and failure criteria; types of loading; methods of design; structural systems for buildings; elastic and plastic analysis and design of tier buildings for gravity loads and lateral loads; earthquake resistant design; effects of dynamic loading on strength and ductility of structural elements. Laboratory experiments on structural elements and frame models. Prerequisites: basic courses in design of steel and reinforced concrete structures.

4 units, Win (Krawinkler) TTh 10 and W 2:15-4:05


4 units, Spr (Kavazanjian) TTh 2:15-4:05

290. Advanced Soil Mechanics—Examination of basic principles of soil behavior. Discussion of shear strength of soil under static and dynamic loading; liquefaction phenomena; new methods of soil exploration and testing; selection of shear strength parameters for soil. Prerequisite: 190 or equivalent.

3 units, Win (Kavazanjian) TTh 2:15-4:05

291. Foundation Engineering—Types and characteristics of foundations; design methodology for shallow and deep foundations; problems created by construction of foundations; stresses in soils. Problem sets, design project. Prerequisite: 190 or equivalent.

3 units, Win (Kavazanjian) TTh 2:15-4:05

292. Earth Structures—General aspects of design and construction of retaining structures, excavations, slopes and earth embankments and dams. Excavation support systems; braced and tied-back walls; slurry walls; underpinning. Slope stability analysis methodology; types of earth dams. Prerequisite: 190 or equivalent.

3 units, Spr (Staff) TTh 11-12:15
293. Experimental Soil Mechanics—Laboratory investigations of soil behavior; triaxial, direct shear, simple shear tests; measurement of pore pressure; seismic loading of soil. Illustrations of basic soil behavior principles. Seven laboratory experiments; weekly reporting of results and final course report. Prerequisite: 290 or equivalent.

3 units, Win (Kavazanjian) lab by arrangement

295. Introduction to Geological Engineering—Basic principles of rock mass behavior under loadings by engineering structures. Classification of rock; response of rock to loads; measurement of in-situ stress. Design of slopes and underground openings in rock. Prerequisite: 190 or equivalent.

3 units, Aut (Staff) given 1984-85

296A. Structural Dynamics I—Vibrations and dynamic response of simple structures to periodic and arbitrary loadings; support motion; response spectra; two-degree-of-freedom systems. Prerequisites: 180 and Engineering 12.

3 units, Aut (Gere) MWF 10

296B. Structural Dynamics II—Vibration and dynamic response of framed structures and discretized continua by matrix methods; linear analysis of multi-degree-of-freedom systems by normal-mode and direct integration methods; nonlinear analysis with step-by-step approximation formulas; response of framed structures and discretized continua to dynamic loads and ground motion. Optional concurrent registration in 296C. Prerequisites: 280A, 281A, and 296A or equivalents.

3 units, Spr (Staff) MWF 11

296C. Computer Programming for Structural Dynamics—Implementation of matrix methods for structural dynamics on a digital computer; application of normal-mode and numerical approximation methods; automatic computation of dynamic response for discretized structures. Mandatory concurrent registration in 296B.

2 units, Spr (Staff) M 3:15-4:30

297. Stability Problems—Beam-columns; elastic buckling of columns; non-prismatic columns; inelastic bending and buckling of bars; torsion of bars of open section; lateral buckling of beams; buckling of frames. Prerequisite: 114.

3 units, Spr (Gere) MWF 10

298. Structural and Geotechnical Engineering Seminar—Lectures on topics of current interest. Recommended for all graduate students.

1 unit, Aut (Gere) W 4:15
Win (Shah)
Spr (Cornell)

299. Independent Study in Civil Engineering—Directed study for graduate students on subject of mutual interest to student and staff member. Student must obtain faculty sponsor.

1 to 3 units, any quarter (Staff) by arrangement


Aut, Win, Spr (Staff) by arrangement

310. Post-Master's Seminar—For post-master's students to serve as orientation to the selection of a research topic.

1 unit, Aut, Win, Spr (Staff) by arrangement

361A. Stochastic Hydrology—The analysis of hydrologic processes as stochastic phenomena. Regression and correlation, precipitation and stream flow frequency analysis, hydrologic time series and synthetic hydrology. Emphasis on underlying statistical theory and its application in practice. Prerequisites: 260 and Statistics 110 or equivalents.

4 units, Aut (Freyberg) MWF 9 and W 2:15-4:05

361C. Soil Moisture and Groundwater—Flow of water in saturated and unsaturated porous media. Governing equations and their solutions for such problems as infiltration and redistribution of soil water, evapotranspiration from soils, seepage and drainage, well hydraulics, and groundwater recharge. Prerequisites: 201, 260, Engineering 21, Geology 230 or equivalents.

3 units, Spr (Freyberg) TThF 1:15

362. The Role and Modeling of Turbulence in Water Resources—Introduction to turbulence concepts and models. Introduction to basic concepts of computer modeling of turbulence. Application of various models to open channel, estuary, lake and reservoir simulations. Use of state-of-the-art computer models for simulation of reservoir dynamics, of stream water quality, and of ocean outfall hydraulics. Consideration of dimensional/scale analysis and physical models as a means to understand flow dynamics. Prerequisites: 107, 201, Engineering 21, and Computer Science 103 and 106, or equivalents and consent of instructor.

4 units, Win (Street) MTWF 1:15
not given in 1983-84

372A. Mass Transfer in Aqueous Systems—Basic concepts of diffusion and interphase mass transfer. Applications to water treatment and treatment and natural aqueous systems, with emphasis on organic containments. Prerequisites: Engineering 21 or equivalent and concurrent registration in C.E. 270.

2 units, Aut (Roberts) TTh 1:15 alternate years, given 1983-84
372B. Hydrogeochemical Cycles—A study of the processes and mechanisms responsible for the natural circulation of major, minor, and trace elements through the hydrosphere atmosphere, lithosphere, and biosphere. Emphasis will be placed on a mechanistic interpretation of global cycling of elements and man’s influence on accelerating or intercepting the normal processes. Consideration will include chemical weathering processes, biotransformations of elements, residence times in various environmental compartments, and fluxes between environmental compartments. Prerequisites: 273 and 274.

2 units, Spr (Leckie) by arrangement alternate years, given 1984-85

390. Advanced Topics in Geotechnical Engineering—Topics selected on the basis of current research programs and student and faculty interests.

1 unit, Spr (Staff) Th 4:15

397. Random Vibrations—Concept of random vibrations; description of the vibratory motion of probabilistic summary; concept of stationarity, ergodicity; correlation and autocorrelation; Fourier Analysis; spectral density function; input/output relationship for linear systems; transmission of random vibrations. Prerequisites: post-M.S. standing.

2 units, Win (Shah) TTh 11 alternate years, given 1984-85

399. Advanced Engineering Problems—Individual projects on selected topics. Provides for independent graduate work under the direction of a faculty member on a subject of mutual interest. Student must find faculty sponsor. A written report is usually required.

1 to 5 units, any quarter (Staff) by arrangement


Aut, Win, Spr (Staff) by arrangement

ELECTRICAL ENGINEERING


Chairman: Robert L. White

Associate Chairmen: James B. Angell, Thomas Kailath


Associate Professors: James H. Clark, John T. Gill III (on leave), John L. Hennessy, Bruce B. Lusignan, Susan S. Owicki, James D. Plummer, Fouad Tobagi, Charles S. Williams


Assistant Professors: Abbas El Gamal, Umran S. Inan, Robert G. Mathews, John A. Newkirk, Brian Reid, Richard M. Swanson


Courtesy Assistant Professor: Keith Lantz

Lecturer: Dennis Allison

Acting Associate Professor: Andrew Nagy

Acting Assistant Professor: Werner Trattnig

Consulting Professors: Frederick W. Crawford, Bruce Deal, Owen K. Garriott, Stig B.M. Hagstrom, Franklin Kuo, Jorma Rissanen, William R. Sutherland
Consulting Assistant Professor: Willem van Cleemput

PROGRAMS

UNDERGRADUATE

Students desiring to specialize in Electrical Engineering during their undergraduate period may do so by following the depth sequence given earlier in the general discussion of the School of Engineering. Majors are expected to maintain a "C" average in the Electrical Engineering courses. Interdisciplinary Majors providing work in electrical engineering combined with study in another department are available. Note that it is possible for a Stanford undergraduate to work simultaneously toward the B.S. and M.S. degrees (see the "School of Engineering" section).

GRADUATE

The Electrical Engineering department offers graduate courses in the following areas:

- Bioelectronics
- Communications and Information Theory
- Computer Systems
- Electromagnetic Theory and Microwaves
- Electronic Circuits and Devices
- Information Processing
- Integrated Circuits
- Modern Optics and Optical Devices
- Plasmas
- Quantum Theory and Applications
- Radioscience
- Solid State Materials and Properties
- Systems and Control Theory
- VLSI (very large scale integration)

Descriptions of courses will be found in the following pages.

APPLICATION FOR ADMISSION

Applications for admission with graduate standing in Electrical Engineering are made to the Graduate Admissions Office, Old Union, Stanford, CA 94305, and are reviewed by this department. Inquiries may be addressed to the Committee on Graduate Admissions of the Department of Electrical Engineering.

Applicants who have not yet earned the equivalent of a Master of Science degree should apply for admission to study first toward the Master's degree, indicating any intention of later working toward a more advanced degree. Admission to study directly toward either the Engineer or Ph.D. degree is normally available only to students who will have completed a master's degree prior to the quarter for which they are seeking admission. No time is lost in first completing the master's degree since a thesis is not required. (See sections on study beyond the master's degree below.)

GRADUATE PROGRAMS

The practice of the profession of Electrical Engineering demands a strong foundation in physical science and mathematics, a broad knowledge of engineering techniques, and an understanding of the relation between technology and man. Curricula at Stanford are planned to offer the breadth of education and depth of training necessary for leadership in the profession. For those who wish to engage in this profession with competence, four years of undergraduate study and at least one year of postgraduate study are strongly recommended. For those who plan to work in highly technical development or in fundamental research, additional graduate study is desirable.

A one-year program of graduate study in electrical engineering may lead to the degree of Master of Science. A two-year program, offering wider selection of engineering course work, more opportunity for study in the related fields of physics, mathematics, and engineering, and in particular more independent work and individual guidance may lead to the degree of Engineer.

The degree of Doctor of Philosophy is offered under the general regulations of the University. The doctoral program, requiring a minimum of three years (nine quarters) of graduate study, should be considered by those with the ability and desire to make a life work of research or teaching.

MASTER OF SCIENCE

University regulations governing the degree of Master of Science are described in the "Degrees" section in this bulletin; note that this department has waived the thesis requirement. Applications for admission with graduate standing in Electrical Engineering are made to the Director of Admissions of the University and are reviewed by this department. Inquiries may be addressed to the Associate Chairman, Admissions, Department of Electrical Engineering.

Modern electrical engineering is a broad and diverse field, and graduate education in this department may satisfy a great variety of objectives. Students with undergraduate degrees in physics, mathematics, or related sciences, as
well as in various branches of engineering, are invited to apply for admission. Such students will ordinarily be able to complete the master's degree in one calendar year. Students with undergraduate degrees in other fields may also be admitted for graduate study (see below).

The master's degree program may provide advanced preparation for professional practice or for teaching on the junior college level, or it may serve as the first step in graduate work leading to the degree of Engineer or Doctor of Philosophy. The faculty does not prescribe specific courses to be taken. Each student with the help of a program advisor prepares an individual program and submits it to the faculty for approval. This should be done as soon as possible and must be done before completion of the first 12 units of graduate study (modifications may be made later). A Supplementary Information Sheet providing detailed instructions, and including a worksheet for preparing a program proposal, is available from the department office.

Programs of at least 42 quarter units that meet the following guidelines will normally be approved:

1. A sequence of three or more graded electrical engineering courses numbered above 200, to provide depth in one area.
2. At least one electrical engineering course numbered above 200 in each of three additional course areas, outside of the area selected under item 1, to provide breadth.
3. Enough additional units of electrical engineering courses so that items 1 through 3 total at least 21 units of graded electrical engineering courses numbered above 200, including at least 9 units of such courses numbered in the 300's or 400's. Some 600 or 700 level summer courses may also be considered for inclusion in the M.S. Program.
4. At least three courses in departments other than electrical engineering for a total of nine units.
5. At least three quarters of 201, 200 seminar, unless there is a schedule conflict, with the total amount of pass credits, including 201, 200, not to exceed 6 units in the basic 42 units.
6. Additional courses, such as undergraduate electrical engineering courses, to bring the total to 42 or more quarter units, at least 36 units of which must be courses in which letter grades are given.

It is emphasized, however, that any properly prepared student with a specific objective in mind may submit for approval a program which meets his or her particular needs but does not conform to the normal pattern. Such a program should be accompanied by a clear statement of objective and a description of how the proposed program achieves the stated objective and should carry the endorsement of the student's program advisor.

Able students without formal undergraduate preparation in electrical engineering may also be admitted for graduate study. Such students may have graduated in any field and may hold either the B.S. or A.B. degree. Each student, with the help of an advisor, prepares a program of study to meet his or her particular needs and submits it to the faculty for approval. A student with adequate preparation in mathematics through calculus and college physics including electricity, can usually complete the M.S. degree requirements within two academic years. A student with some additional preparation in electrical engineering may be able to complete the M.S. requirements in only one academic year.

Graduate study in Electrical Engineering is demanding, and it is essential that students be adequately prepared in physics, mathematics, circuits, fields, electronics, digital systems, and laboratory work. The ability to take advantage of modern computing facilities is an essential skill for electrical engineers, and an increasing number of our courses routinely require it. Every student should acquire this skill early in the program, either by taking one of the regular computer science courses or one of the special "short courses" given by the Computation Center, or by self-study.

It is the student's responsibility, in consultation with an advisor, to determine whether the prerequisites for advanced courses have been met. Prerequisite courses ordinarily taken by undergraduates may be included as part of the graduate program of study. However, if the number of these is large, the proposed program should contain more than the typical 42 to 45 units, and the time required to meet the degree requirements may by increased.

Permission to study beyond the Master of Science degree must be obtained from the department (if possible, well before the M.S. degree is received). Full information should be obtained from the department office. The decision is based on the applicant's academic record, performance in independent work, and potential for advanced study, and on the ability of the faculty to supervise such study.

Admission to the post-M.S. level is available only to students who have a Master of Science degree or its equivalent and from whom the department committee on Graduate Admissions has been able to identify a faculty research supervisor.
The master's degree carrying the distinction "Electrical Engineering: Administration" on the diploma is conferred upon students who combine not less than 25 units of study in electrical engineering with about 25 units of study in industrial engineering or business. Four academic quarters are required to complete this program, which combines the technical education that is represented by the master's degree in Electrical Engineering with a substantial amount of work in industrial engineering or business.

The degree of Engineer is also offered for an administration program. Six academic quarters are required, and a thesis is to be written. Work toward this degree is usually divided about evenly between business and engineering. The thesis may be in either department, with proper approval.

Students wishing a degree with the designation "Electrical Engineering: Administration" should so indicate on the application for candidacy for the degree.

ENGINEER

The degree of Engineer requires a minimum of two academic years of study beyond the B.S. degree (three academic quarters beyond the M.S.). University regulations governing the degree of Engineer are described in the "Degrees" section of this bulletin.

Work toward the degree of Engineer in Electrical Engineering normally includes the requirements for work toward the master's degree in Electrical Engineering, including qualifications for admission.

The additional year allows time for a broader program, or a more concentrated program, or whatever arrangement of study may seem suitable to the candidate, his advisor, and the department. Advanced study at other universities, or in other departments at Stanford, may be allowed within the foregoing consideration. The equivalent of approximately one quarter is devoted to independent study and thesis work with faculty guidance. The thesis is often of the nature of a professional report on the solution of a design problem. The degree of Engineer differs from the Ph.D. primarily in looking toward professional engineering work rather than toward theoretical research. The candidate may select courses that are suitable for either the degree of Engineer or the Ph.D. degree, and decide later which program to pursue.

The best procedure for the prospective applicant to follow is: (1) if you are now working toward the Stanford M.S. degree in Electrical Engineering, request permission to continue your graduate studies beyond the master's degree using a form obtained from the Electrical Engineering Department Office or, (2) if you are not planning to receive the Stanford M.S. degree in Electrical Engineering, apply for admission to the Electrical Engineering Department as a candidate for the degree of Engineer.

A tentative application for candidacy, including a proposed program of study, must be filed in the department office before the end of the first quarter of post-M.S. study at Stanford. The program of study is prepared by the student with the help of an advisor and submitted to the faculty for approval. A formal application for candidacy including the signature of a thesis supervisor must be filed in the department office before completion of 25 units of work beyond the master's degree. Approval of formal application will normally be dependent on completion of courses at Stanford with a satisfactorily high record.

DOCTOR OF PHILOSOPHY

A complete statement regarding the degree of Doctor of Philosophy will be found in the section "Degrees" in this bulletin. The requirements are administered by the University Committee on the Graduate Division.

Admission to the graduate school does not imply that the student is a candidate for the Doctor of Philosophy degree. Advancement to candidacy requires superior academic achievement, satisfactory performance on a qualifying examination, and sponsorship by two faculty members. Enrollment in Electrical Engineering 391, Special Studies is recommended as a means for getting acquainted with a faculty member who might be willing to serve as a supervisor.

Not later than the first autumn quarter after receiving the Master of Science degree, the applicant should submit an application to take the department qualifying examination (given each Winter Quarter). Upon successful completion of the qualifying examination and after securing agreement by two faculty members to serve as dissertation advisors, the student should file an "Application for Doctoral Candidacy". Only after receiving the departmental and university approval of that application does the student become a candidate for the Doctor of Philosophy degree.

Requirements may be summarized as follows: The student is to complete successfully (1) a minimum of three years of residence with graduate standing, two years of which must be in residence at Stanford; (2) one or more qualify-
ing examinations given by the faculty of the Electrical Engineering Department; (3) an approved program of courses in electrical engineering and allied subjects; (4) an oral examination near the completion of the doctoral program; (5) a dissertation, based on research, which must be a contribution to knowledge.

About one-fourth of the program of graduate study should be in departments other than Electrical Engineering. Courses shall be selected to form an integrated program, to be approved by the department. A student wishing to fulfill the requirements for a formal minor may elect to do so.

Ph.D. Minor—For a minor in Electrical Engineering, the student will take 15 quarter units of course work in the Electrical Engineering Department following a program to be approved by the Department Ph.D. Degree Committee.

FINANCIAL ASSISTANCE

The department annually awards fellowships, teaching and research assistantships to graduate students. The fellowships are usually awarded only to first-year graduate students. Most of the awards to Engineer and Ph.D. candidates are research assistantships. These research assistantships are awarded by individual faculty research supervisors, working in conjunction with the Committee on Graduate Admissions of the department. Research assistants are normally able to carry out their Engineer or Ph.D. thesis work and write their thesis as an integral part of their assistantship.

Applicants for all three forms of financial assistance should obtain the necessary application forms from the Office of Graduate Admissions, Old Union, Stanford, CA 94305.

OTHER ASSISTANCE PROGRAMS

Many of the department's graduate students are supported by other programs which provide particular advantages. The Honors Cooperative Program makes it possible for academically qualified engineers and scientists in nearby companies to be part-time graduate students in Electrical Engineering while continuing nearly full time professional employment (see discussion in "School of Engineering" section of this bulletin).

Further information about this program can be obtained by writing to the Committee on Graduate Admissions, Electrical Engineering Department, Stanford, CA 94305.

AREAS OF RESEARCH

Candidates for advanced degrees participate in the research activities of the department as paid research assistants or as students of individual faculty members. At any one time, certain areas of research will have more openings than others. A new applicant should express a second choice of research interest in the event that there are no vacancies in the primary area of interest. At present faculty members and students are actively engaged in research in the areas listed below.

SPACE PHYSICS AND RADIOSCIENCE

Galileo Spacecraft Studies of Jupiter
Voyager Studies of Saturn and Uranus
Radio and Optical Observations of Winds and Turbulence
Space Plasma Physics
Space Science and Engineering (also see Index, Space Science and Astrophysics)
Solar-Terrestrial Interactions
Electromagnetic Waves and Plasmas
Very Low Frequency Wave Propagation
Computer Simulation of Wave-Particle Interactions
Active Electron Beam Experiments in Space
Space Vehicle Electrodynamics

TELECOMMUNICATIONS AND SPACE INFORMATION SYSTEMS

Analog and Digital Voice Processing
Digital Telephone Switch Development
Satellite Communication Stations
Antennas and Transmitters
Radar Signal Processing
Telephone and Data Network Planning
NASA Science Satellite Data System Research
Underwater Communications

SOLID STATE

Semiconductor and Solid State Physics
Electronic and Optical Properties of Solids
Crystal Preparation: Epitaxy and Ion Implantations
Solid State Devices: Physics and Fabrication
Physics and Chemistry of Surfaces and Interfaces
Applied Superconductivity
Electron Spectroscopy
Laser, Electron and Ion Beam Processing and Analysis
Generation of Focused Particle Beams
Solar Energy Conversion
Defect Analysis in Semiconductors
Microstructure Fabrication and Applications
INTEGRATED CIRCUITS
Bipolar, MOS and other silicon devices
Linear, Digital, and Optoelectronic Integrated Circuits
VLSI Device Structures and Physics
VLSI Fabrication Technology
VLSI Systems in Silicon
Process, Device and Circuit Modeling
Micropower Electronics
Computer-Aided Analysis & Design
Biomedical Applications of Custom Integrated Circuits, Biomedical Systems
Integrated Sensors and Transducers

PLASMAS
Active plasma experiments in space
Plasma transport
Magnetohydrodynamics

QUANTUM ELECTRONICS
Laser Devices and Laser Physics
Nonlinear Optical Devices
Coherent UV and X-Ray Sources
Fiber Optics
Picosecond Laser Pulses
Laser Applications in Physics, Chemistry, Biology, Aeronautics and Electronics
Holography
Photoacoustic Phenomena

MICROWAVE PHYSICS AND ELECTRONICS
Microwave Acoustics
Acoustic Imaging
Nondestructive Testing
Magnetoacoustic, Acoustooptic and Photoacoustic Phenomena
Acoustic and Optical Microscopy
Acoustic Signal Processing

INFORMATION SYSTEMS
Adaptive Systems
Biomedical Signal Analysis
Control Theory and Optimization
Cryptography and Data Security
Detection, Identification, and Estimation
Diagnostic Imaging
Fourier and Statistical Optics
Information and Coding Theory
Integrated Systems
Multivariable Linear Systems
Pattern Recognition and Complexity
Real-Time Computer Applications
Statistical Communication Theory
Statistical Signal Processing
VLSI

COMPUTER SYSTEMS
Computer Reliability
Performance Measurement and Modeling

ELECTRICAL ENGINEERING
Computer Architecture
Computer Organization
Computer Networks
Operating Systems
Local Area Networks
Design Automation
Program Verification
Software Engineering
Programming Languages
Compilers
VLSI
Distributed Systems
Concurrent Processes and Processors
Concurrent Languages
High Speed Computer Techniques

COURSE NUMBERING SYSTEM
Electrical engineering courses are numbered according to the year in which the courses are normally taken:
0-99 first or second year
100-199 third or fourth year
200-299 mezzanine courses for advanced undergraduates or graduates
300-399 first graduate year
400-499 second or third graduate year
600-799 special summer courses

COURSES FOR UNDERGRADUATE STUDENTS
Attention is called to courses listed under "Engineering," that may be of special interest to Electrical Engineering undergraduates.

100. Seminar—Weekly discussion of special topics of interest to electrical engineering undergraduates: research in EE, the department graduate schools, employment opportunities, and state of the art technology.
1 unit, Aut (Williams) MWF 3:15

3 units, Aut (Tyler) MWF 9
Win (Helms) MWF 9
hybrid integrated circuits. 113: Applications of
discrete and integrated circuits in the design of
communications equipment including the
design of rectification, detection, modulation,
amplification, oscillation, switching, and wave-
shaping circuits. Prerequisite: previous or con-
current registration in 101 (or consent of in-
tstructor, in special cases).

111. 3 units, Aut (Gibbons) TTh 8-9:15
   Win (da Rosa) MWF 11

112. 3 units, Win (Gibbons) TTh 8-9:15
   Spr (daRosa) MWF 11

113. 3 units, Aut (da Rosa) MWF 11
   Spr (Gibbons) TTh 8-9:15

121. Digital Laboratory—Introduction to
digital circuits and their application. Topics
include measurement technique, logic fami-
lies, switching speed, Boolean algebra, state ma-
chines, digital data transmission, analog and
digital converters, and digital displays. Prere-
quisite: Engineering 42; co-requisite: Engi-
neering 102E.

2 units, Win (Staff) T 1:15 plus 3-hour lab
   weekly by arrangement

2 units, Spr (Staff) T 1:15 plus 3-hour lab
   weekly by arrangement

122. Analog Laboratory—Introduction to the
design and measurement of active analog cir-
cuits. Construction and measurements (in the
frequency and in the time domains) of a pre-
amplifier, a power amplifier, an oscillator, and a
simple communications system. Regulated
power supplies. Prerequisite: 121. Corequisite:
113.

3 units, Aut (DaRosa) TTh 9:30-10:20
   plus 3-hour lab weekly by arrangement
   Spr (DaRosa) TTh 1:15 plus
   3 hour lab weekly by arrangement

139. Design Project—A laboratory course in
which individuals or small teams design, build
and test special circuits or simple systems.
Projects are proposed by students or the pro-
fessor. Ideally two students would make a team
and propose a project. The requirements in-
clude a report giving the details of the project
and the test results, a presentation to the class of
the design features, and the constructed (and
hopefully, working) project. Those primarily
interested in digital circuits or microprocessors
should take 183 or 281. Class will be strictly
limited to 15 students.

3 units, Win, Spr (McWhorter) Th 1:15 plus
lab by arrangement

141. Electromagnetic Fundamentals—the
field concept, vector analysis, boundary-value
problems, electrostatics, computation of fields,
magnetostatics, dielectric and magnetic media,
time-varying fields. Maxwell’s equations, plane
waves in simple media. Prerequisites: Physics
53 and Mathematics 43.

3 units, Aut (Waterman) MWF 2:15
   Win (Inan) MWF 9

111,112,113. Electronics—Basic electronic de-
vices, integrated circuits and an introduction to
their applications in electronic systems. 111: Care-
ful description of the physical principles of
charge motion in semiconductors leading to
operating principles and circuit models for
MOS devices (transistors, gates, CCD’s). Basic
circuit and system design using both discrete and
integrated MOS components. 112: Operat-
ing principles and circuit models of pn junction
diodes and transistors. Basic circuit design
using primarily discrete junction devices;
142. Electromagnetic Waves—Continuation of 141. Emphasis on waves—plane waves in lossy, inhomogeneous and anisotropic media, and waves in simple guided systems such as transmission lines, waveguides and optical fibers. Phenomena of reflection, refraction, standing waves and polarization. Antennas and radiation of energy. Elements of radio transmission systems and radar. Prerequisites: 141 or Physics 120.

3 units, Spr (Waterman) MWF 2:15

180. Systematic Programming—(Enroll in Computer Science 107.) Introduction to systematic program design, use of a variety of data structures, recursion manipulation of text. Records and pointers. Notions of program correctness and testing. Modularization, portability, and good programming practice. This course is intended as a second course in programming for the practicing scientist or engineer. Persons intending to continue their education in computer science beyond programming should enroll in Computer Science 108A, B instead of 180. Prerequisite: Computer Science 104, 105B, 106 or equivalent; knowledge of simple PASCAL.

3 units, Aut, Win, Spr

181. Introduction to Computer Organization, Machine and Assembly Languages—The organization of a simple digital computer; binary arithmetic; instruction execution; machine language programs; symbolic assembly language; the assembly process; subroutines and coroutines; simple data structures; arrays, stacks, queues; input-output programming; interrupts and multiple processes. Students will use the LOTS facility and will program and operate a small computer. Enrollment limited to 50. Prerequisite: Computer Science 105 or 106 or equivalent.

(Also see Computer Science 111.)

3 units, Aut (Staff) MWF 11
(Same as Computer Science 111)

3 units, Win (Trattning) MWF 11
3 units, Spr (Williams) MWF 10

182. Digital Computer Organization—Basic digital circuits; introduction to switching theory and logic design; computer arithmetic; memories, processors, control, input/output, and mass storage; data formats, addressing and instruction sets. Study of the logic control of a small computer. Prerequisites: 181 or 181S (or Computer Science 111 or 111S may be concurrent).

3 units, Aut (Manning) MWF 11
3 units, Win (Banks) MWF 11

183. Digital Logic Laboratory—Experiments in digital logic design using TTL integrated circuits, including SSI gates and flip-flops. MSI registers and ALU's and LSI memories. Choice of projects including: basic combinational and sequential circuits, various sequential machines, D/A converters and CRT displays, integrators, arithmetic processors, rudimentary stored-program processors, game-playing machines. Prerequisites: 182 and 121 or equivalent.

3 units, Aut (Flynn) TTh 9:30-10:45
plus 4 hour lab by arrangement
3 units, Win (Staff) TTh 9:30-10:45
plus 4 hour lab by arrangement
3 units, Spr (Staff) TTh 9:30-10:45
plus 4 hour lab by arrangement

190. Special Studies or Projects in Electrical Engineering—Independent work under the direction of a faculty member. Individual or team activities involving laboratory experimentation, design of devices or systems, or directed reading. Graded on a pass/no credit basis.

by arrangement

191. Special Studies and Reports in Electrical Engineering—Independent work under the direction of a faculty member; a written report or a written examination is required. A letter grade is given on the basis of the report or examination. If a letter grade based on written work is not appropriate, student should enroll in 190.

by arrangement

192. Special Seminars—Seminars associated with and supplementing various courses are offered when there is sufficient interest. See the Time Schedule and bulletins in the department office.

COURSES FOR UNDERGRADUATE OR GRADUATE STUDENTS

200A,B,C. Seminar—Special section of 201A,B,C (See description below) open to students holding assistantships and registering under limited tuition grants. Given for Pass/No-credit only.

200A. 0 units, Aut (Staff) Th 11
200B. 0 units, Win (Manning) Th 11
200C. 0 units, Spr (Manning) Th 11

201A,B,C. Seminar—Weekly discussion of special topics of current interest in electrical engineering.Speakers from faculty and from outside the University. Normally taken by graduate students each quarter for 3 quarters. Given for Pass/No-credit only.

201A. 1 unit, Aut (Pantell) Th 11
201B. 1 unit, Win (Manning) Th 11
201C. 1 unit, Spr (Manning) Th 11

202. Medical Electronics—Primarily biological in nature. Purpose is to introduce electrical
engineers to the physiological and anatomic aspects of medical monitoring and imaging. In addition to the biological content, transducers, electronic systems, the socio-economic impact, and the constraints unique to medicine will be discussed. Prerequisites: Course presumes no biological background, but some familiarity with circuits and electrical instrumentation techniques (e.g., 113) will make it more meaningful.

3 units, Aut (Thompson) TTh 3:35-4:50

204. Thoracic and Abdominal Anatomy and Physiology—(Enroll in Physiology 211.)

205. The Entrepreneurial Engineer—A seminar to further the knowledge base of prospective entrepreneurs with an engineering background. Major part of the content will include contributions made to the business world by engineering graduates. Speakers will include Stanford (and other) engineering and MBA graduates who have founded large and small companies in nearby communities. Contributions from faculty members and other departments, such as law, business and industrial engineering will also be made.

1 unit, Win (Melen) T 11

208. Biological Information Processing—The primary purpose of this course is to acquaint the student with the basic signal processing elements occurring in biological systems, and how these elements can be assembled to execute fairly complex signal processing. The physiological basis of the signal processing is investigated so that a good sense of the signal magnitudes, propagation delays, etc. can be obtained. The signal processing capabilities of various neural networks are examined and compared to naturally occurring systems. Examples are taken from both lower animal and human systems. Peripheral signal processing, such as occurs in auditory and optical sensory systems, is discussed, as well as regulatory systems and the central nervous system.

3 units, Spr (White) MWF 9

209. Nerve and Muscle—An in-depth introduction to the processes underlying the excitation and propagation of electrical impulses in nerves to the development of contractile force in muscle. Introduction to bioelectric phenomena; physical forces on charged particles; introductory neuroanatomy; structure and function in unit membranes; ionic channels; Hodgkin-Huxley action potential model; neuromuscular synapse, quantal hypothesis, noise analysis of molecular events, excitatory and inhibitory synapses; action potentials in cardiac muscle membranes; excitation-contraction coupling; general features of motile systems; muscle ultrastructure—skeletal, heart, smooth; contraction biochemistry; contractile dynamics; muscle energetics and thermodynamics; theories of contraction; cardiac muscle and chamber dynamics.

3 units, Spr (Ingels) MWF 10

211. Principles of Pulse and Timing Circuits—Switching, timing, wave-shaping, and logic circuits to generate the diversity of waveforms and functions used in pulse systems, instrumentation, and computers. Emphasis on techniques of analysis and obtaining appropriate circuit models for solid state devices in these highly nonlinear circuits. Prerequisite: 113 or equivalent.

3 units, Aut (McWhorter) MWF 10

216. Principles and Models of Semiconductor Devices—Fundamentals of carrier generation, transport, recombination and storage in semiconductors. Physical principles of operation of the p-n junction, metal-semiconductor contact, bipolar junction transistor, MOS capacitor, MOS and junction field-effect transistors and related devices such as CCD’s and solar cells. First-order device models that reflect physical principles and are useful for integrated-circuit analysis and design. Prerequisites: 111, 112 for undergraduates, none for graduates (though equivalent of 111, 112 is recommended).

3 units, Aut (Angell) TTh 8-9:15, or Aut (Dutton) MWF 11
Win (Linvill) MWF 9

217. Electron and Ion Optics—Principles of geometric optics and optical properties of trajectories of electrons and ions in electric and magnetic fields. The paraxial ray equation and limits to obtainable current density. Aberrations including spherical aberration, chromatic aberration and astigmatism. Principles and limits of electron and ion optical instruments including various forms of electron microscopes, electron microprobes, electron lithographic tools and ion probes. Prerequisites: Recommended—undergraduate physics including elementary optics.

3 units, Win (Pease) MWF 8
alternate years, given 1983-84

221A. Linear Active Networks—The general small-signal properties of active devices and the use of the devices in amplifiers and oscillators. Various forms of two-port network parameter and their properties. The relation between these parameters and various models for active devices. Properties and design of common ac and dc amplifier and oscillator configurations. Prerequisite: an undergraduate electronic sequence.

3 units, Win (McWhorter) MWF 10

221B. Linear Active Networks—Introduction to the common network functions for approx
matting constant gain in a desired band (lowpass and bandpass). Implementation of these functions by active filters and LC networks. General concepts relating to effects in multiple-stage amplifiers. The origin of amplifier noise; means for maximizing the signal-to-noise ratio in single and cascaded stages. Prerequisite: 221A.

3 units, Spr (McWhorter) MWF 10

238. Basic Physics for Solid State Electronics—Course intended as a prerequisite for graduate level courses in physics of solid state devices and materials. Topics include a review of classical kinetic theory, introduction to statistical mechanics, quantum phenomena, introduction of quantum mechanics and the band theory of solids. Prerequisite: Physics 57 or equivalent.

3 units, Aut (Pease) MWF 3:15

231. Lasers—Introduction to how lasers work, including quantum transitions in atoms, stimulated emission and amplification, rate equations, regeneration and feedback, coherent laser oscillation, and laser applications. Uses primarily classical models for atomic transitions, with no quantum mechanics background required. Prerequisites: electromagnetic theory to a level of at least 241, and some knowledge of atomic or modern physics at an advanced undergraduate level, such as Engr. 50, Physics 130-131, or EE 238.

3 units, Aut (Siegman) MWF 8

232. Lasers—Continuation of 231. More detailed coverage of selected topics in lasers, optics, quantum electronics. Prerequisite: 231.

3 units, Win (Siegman) MWF 9

233. Electric and Magnetic Properties of Solids—Electric and magnetic properties of solids from a fundamental point of view. Introduction to band theory, surface states, dielectric and ferroelectric materials, magnetic materials, ferromagnetism, and superconductivity. Emphasis on physical understanding. A large amount of material is systemized using the twin concepts of extended wavefunctions (transport, band theory, etc.) and more localized wave functions, ferroelectricity, ferromagnetism, etc.

3 units, Win (Spicer) TTh 2:45-4

239A. Solid State Theory—(Enroll in Applied Physics 239.)

239B. Solid State Theory—(Enroll in Applied Physics 240.)

241. Waves I—Introduction to a variety of waves and wave phenomena as they appear in different natural, laboratory, and application settings. Electromagnetic, acoustic, seismic, atmospheric, plasma, and water waves and their mathematical and physical correspondence in terms of Hamilton’s principle. Propagation, attenuation, reflection, refraction, surface and laminal guiding, and intrinsic and structural dispersion; energy density, power flow, and phase and group velocities. Geometrical and structural complexities are minimized in order to stress basic wave concepts common to diverse fields of application. Analysis in terms of transmission line and impedance concepts using exponential notation and vector phasors. Treatment limited to plane harmonic waves in isotropic media. Nonhomogeneous cases limited to plane interfaces and exponentially stratified media. Prerequisite: 142 or equivalent or other wave course.

3 units, Win (Eshleman) MWF 10

242. Waves II—Continuation of 241 with emphasis on fundamental topics of importance for further study and application of microwave, optical, acoustic, or plasma phenomena. Plane, cylindrical, and spherical waves and boundary value problems; radiation, dipole and array antennas, interferometers, and reciprocity; wave guides, fiber optics, and acoustic delay lines. Uniaxial and gyrotropic anisotropic media with magnetoionic plasma, and ferrite applications. Non-linear effects. Mode coupling, resonators, and gaussian wave packets. Prerequisite: 241.

3 units, Win (Eshleman) MWF 11


3 units, Win (Staff) MWF 11

244A. Communication Engineering Telephony—Covers engineering principles used in current telephony system research and development, including telephone transmission lines, concept of traffic, traffic theory, and analog and digital (PCM) transmission of telephony. Course reviews signaling methods, practical signaling systems in use and international standards. Review of past switch design is followed by description of current digital switch design drawing from current research and development projects. A brief review is given of telephone network planning. Prerequisite: senior or graduate standing in Electrical Engineering or permission of instructor.

3 units, Aut (Lusignan) TTh 1:15-2:30

244B. Communication Engineering Transmission Systems—The design of transmission systems for television, telephony and data-using satellites. Microwave repeaters, mobile radio, cable, and fiber optics. Also reviews modulation
performance of FM, AM, SSB and common
digital schemes. Emphasis is on link perform-
ance, capacity, system design and cost optimiza-
tion. The course introduces current industry
design problems and research results. Prerequi-
site: Senior or graduate standing in Electrical
Engineering or permission of instructor.

3 units, Win (Lusignan) TTh 1:15-2:30

244C. Communication Engineering Project
Applications of material covered in 244A or
244B to design of a practical telecommunication
system. Class works as a team with each member
having responsibility for one area of the
system. Past projects have included an Interna-
tional Satellite, Space Shuttle Communication
Link, and Science Station Communication Sys-
tem. Project may coordinate with other areas of
engineering in Engineering 235, Systems Engi-
neering. Prerequisite: permission of the in-
structor.

3 units, Spr (Lusignan) TTh 1:15-2:30

245. Wave Measurement Techniques—Com-
bined lecture and laboratory course on experi-
mental techniques used for measurement of
waves. The techniques employed are common
to several fields. Experiments selected from the
following examples related to research at Stan-
ford: microwave interferometry, measurement
of waveguide impedance, fiber optic waveguide
measurements, optical diffraction, laser cavity
and laser beam measurements, acoustic-optic
diffraction, ultrasound imaging, and satellite
communications. Prerequisite: 241 or equiva-
 lent. Registration by consent of instructor.
Enrollment limited to 15.

3 units, Spr (Kino) TTh 9:30-10:20

246. Microwave Circuit Theory—Basic con-
cepts and theory of representing microwave
circuits by combinations of lumped circuit ele-
ments and transmission line sections. Impe-
dance matching with stubs and irises. Direc-
tional couplers, hybrids, ferrite devices, and
filters. Particular attention will be given to
stripline and microwave integrated circuit com-
ponents and their application to microwave
semiconductor devices. Examples of compon-
ents and devices will be discussed in class.
Emphasis on physical concepts, not detailed
analysis. Prerequisite: 142 or approximate equi-
 valent.

3 units, Win (Auld) MWF 2:15

250. Seminar on Telecommunications—A
seminar covering recent development in tele-
communications research, including satellite
applications, mobile radio, telephone network
planning, digital switch development, voice
and data modulation systems. Speakers are
drawn from Stanford research laboratories and
the telecommunications industries.

1 unit, Aut (Lusignan) T 4:15
Win (Lusignan) T 4:15
Spr (Lusignan) T 4:15

252. Antenna Theory and Design—Fundament-
al parameters of antennas. Radiation inte-
grals and potential functions. Region separa-
tion. Small and finite length dipole antennas,
Effects of a ground plane. Monopoles. Small
and finite size loops. Aperture antennas; rect-
tangular E-, H-plane and pyramidal horns.
Arrays. Analysis and synthesis of linear arrays.
Self impedance of linear elements. Moment
methods. Some practical travelling wave (long-
wire, vee) and broadband (helix, yagi-uda)
Antennas. Reflectors. Prerequisite: 142 or

3 units, Spr (Inan) MWF 1:15

261. The Fourier Transform and Its Applica-
tions—The Fourier transform as a tool for solv-
ing physical problems. Convolutions and corre-
lations, the Dirac delta function, Fourier trans-
form theorems, measures of time duration and
bandwidth, the uncertainty relation, and the
central limit theorem. Additional topics include
analysis of linear systems, sampling theorems,
the discrete Fourier transform, and two-dimen-
sional Fourier analysis. Prerequisite: previous
exposure to Fourier series at the level of E. E.

3 units, Aut (Bracewell) MWF10
(Staff) TTh 2:45-4
Spr (Buneman) MWF 1:15

262. Two Dimensional Imaging—Two dimen-
sional autocorrelation, Fourier spectra, spatial
frequencies, diffraction, antennas, Hankel
and Abel transforms, circular symmetry, line inte-
gration, two dimensional impulses and sam-
pling, restoration, principal solution, restor-
ation with noise and correlation, reconstruction
from line integrals, mapping instrumentation
applications to various fields. Prerequisite: 261
or equivalent.

3 units, Aut, Spr (Bracewell) MWF 2:15

263. Digital Signal Processing—An introduc-
tion to computer-implemented signal process-
ing systems. Digital impulse response and
transfer functions; convolution; sampling
theory; z-transforms; digital Fourier transforms;
FFT algorithms; filters; generation of stochastic
signals; quantization theory and roundoff; syn-
thesis of digital filters to meet design specifica-
tions; digital Wiener filters. Prerequisite:

3 units, Aut (Staff) TTh 8-9:15
Win (Widrow) MWF 3:15

264. Digital Filtering—An introduction to
modern digital filtering techniques. Major top
ics include: an introduction to discrete-time
state space system theory, filter approximation
theory, s-plane to z-plane mappings, optimal
design procedures for finite impulse response
(FIR) and infinite impulse response (IIR) filters,
and some aspects of hardware implementation.
Prerequisites: Knowledge of z-transform the-
ory; 263, 104, or consent of instructor. 261 is
recommended.

3 units, Win (Staff) TTh 8-9:15

268. Introduction to Modern Optics—(Enroll
in Engineering 170.)

271. Introduction to VLSI Systems—An intro-
duction to large-scale nMOS design. Topics
include: stick diagramming; nMOS transistors;
switch and gate logic; programmable logic
arrays; 2-phase dynamic design; finite state
machines; scalable design rules; speed and
power considerations; floor-planning; and lay-
out techniques. Ideas are reinforced through
exercises in the design and layout of nMOS ICs.
Course is intended for E.E. and C.S. students
with background in computers, signal process-
ing, or programming. Background in IC fabrica-
tion or physics is not required. Prerequisites:
acquaintance with the basic notions of circuits,
logic, and digital systems; and programming.

3 units, Aut (Staff) MWF 3:15 plus
lab by arrangement

3 units, Win (Williams) MWF 1:15 plus
lab by arrangement

3 units, Spr (Staff) MWF 11 plus
lab by arrangement

272A. Design Projects in VLSI Systems—Ex-
perience in designing large-scale nMOS ICs.
Working in teams of two, students must com-
plete modest-sized nMOS projects through lay-
out, simulation, and design-rule checking. Lec-
ture topics include: design tools and techni-
ques, including instruction on the use of com-
puter tools; common design problems and some
solutions to them; testing and testability; and
floor planning and communication. Intended
for students with research and applications
interest in VLSI systems. Students who take
272A are expected to take 272B for at least one
unit as well. Prerequisites: 271, experience
with timesharing facilities.

3 units, Win (Staff) T 1:15-2:30
plus lab by arrangement

272B. Testing and Simulation of VLSI Sys-
tems—A continuation of 272A, principally for
simulating, testing, and elaborating projects
designed in that course. Students must func-
tionally simulate and test their projects and
report the results. By arrangement, students
may undertake more extensive work for addi-
tional credit. Lectures include simulation and
testing techniques used in the laboratory and
advanced topics in design. Prerequisite: Com-
pleting the 272A design project.

1-3 units, Spr (Staff) T 1:15-2:30
plus lab by arrangement

274. The Computer as a Laboratory Instru-
ment—Practical experience on a small, real-
time digital computer system. Minicomputers,
I/O programming techniques, data acquisition,
computer-generated displays and some signal
processing. "Hands-on" experience in these
subjects is acquired by completing a series of
laboratory assignments. Enrollment limited to
30 students. Prerequisite: 181, 181S or equiva-

lent assembly programming experience.

3 units, Aut (Staff) MWF 3:15 plus
lab by arrangement

3 units, Win (Williams) MWF 1:15 plus
lab by arrangement

3 units, Spr (Staff) MWF 11 plus
lab by arrangement

278. Introduction to Statistical Signal Process-
ing—Review and elaboration of elementary
probability theory: expectation, characteristic
functions (transforms), limit theorems. Intro-
duction to random processes: definitions and
properties, covariance and spectral density,
time average, stationarity, ergodicity, and
linear system relations. Selected applications in
noise analysis, communication systems, estima-
tion theory. Prerequisite: elementary linear
systems, transforms, and probability. 102 or 261
and Stat 116E or equivalent.

3 units, Aut (Gray) TTh 9:30-10:45,
(Inan) MWF 9
Win (Staff) TTh 1:15-2:30

279. Information Transmission and Modula-
tion—Analysis and design of communication
systems; analog and digital modulation and de-
modulation, frequency conversion, multiplex-
ing, noise and quantization; spectrum, enve-
lope, and instantaneous frequency relations.
Prerequisites: 278.

3 units, Aut (Gray) TTh 9:30-10:45,
(Inan) MWF 9
Win (Staff) TTh 1:15-2:30

280A,B. Computer Applications and Signal
Processing Laboratory—Real-time applica-
tions of mini-and microcomputers in signal
processing and control. Experimental research
projects are developed in cooperation with fac-
culty of Electrical Engineering, the Medical
School, and other research laboratories. Pre-
vious topics include interference cancelling in
fetal electrocardiography and blood pressure
control based on a real-time model of an animal's
reaction to a pressure-elevating drug. Should be
taken for two consecutive quarters. Prerequi-
site: mini- or microcomputer programming
experience.

3 units, Win, Spr (Widrow) T 7:30 p.m.
organizational meeting; weekly meetings
by arrangement
281. Microcomputer Laboratory—Introduction to a specific microprocessor, for example, the Zilog Z-80. Lectures covering the programming and design of a microcomputer system, accompanied by laboratory exercises. A final laboratory project is required. Prerequisites: 181 or 181S and 182 or equivalents, and some hands-on experience with TTL logic, such as 121 or 183.

3 units, Aut (Staff) TTh 2:45-4 plus lab by arrangement
Win (Peterson) TTh 8-9:20 plus lab by arrangement
Spr (Staff) TTh 9:30-10:45 plus lab by arrangement

282. Computer System Architecture—Structure of systems using processors, memories, input/output (I/O) devices, and I/O interfaces as building blocks. Computer System organization and architecture—accumulator, general-register, stack machines, multiprocessors, and other organizations. Memory and I/O buses, I/O interface design and typical I/O devices. Memory Hierarchies. Prerequisites: 181, 182. (Also see Computer Science 311.)

3 units, Aut (Hennessy and Basket) TTh 2:45-4

283. Compilers—The grammars of programming languages; lexical analyzers, parsers, code emitters and interpretation; global and peephole optimization; run-time support; error management; translator writing systems. A small project will be assigned. Prerequisite: 285. (Also see Computer Science 143.)

3 units, Win (Hennessy) TTh 9:30-10:45

284. Basic Tools in Computer System Modeling—Basic tools for the analysis, and performance evaluation of computer systems. Topics include: review of probability theory; Poisson distribution, exponential distributions transforms; Poisson process; discrete-parameter Markov chains; birth-death processes; queueing theory; network of markovian queues; elements of graph theory; graph algorithms. Prerequisite: Statistics 116. (Also see Computer Science 147.)

3 units, Win (Tobagi) TTh 9:30-10:45

285. Programming Languages—Introduction to several programming languages, such as LISP, Ada, Snobol, APL, and/or Simula. Comparison of issues in programming language design, and language features that result from them. Runtime representation of data and control constructs. Memory management issues, recursion, binding and allocation, scoping, parameter passing mechanisms, compilation vs. interpretation, modules and classes, abstract data types, exception handling. Several programming assignments, each in a different language, will be given; emphasis will be on proper use of the features and facilities of each language and its runtime system. Prerequisites: 180 or Computer Science 108A, 181, knowledge of Pascal. (Also see Computer Science 142.)

3 units, Aut (enroll in Computer Science 142) Spr (Owicki) TTh 1:15-2:30


(Also see Computer Science 146.)

3 units, Aut (Lantz) TTh 1:15-2:30
Win (enroll in Computer Science 146)


3 units, Win (Wiederhold)

288. Software Engineering Laboratory—An apprenticeship program in the science, craft, and folklore of programming system design and implementation. Individual and group problem-solving techniques, design methodologies, project planning and management, communication skills, and the effective application of computer science theory are stressed. Practical and theoretical issues of computer systems are explored through projects, written reports, oral presentations, and class discussions. Students should have some knowledge of programming and experience with Pascal.

3 units, Win (Attison) MWF 10 plus lab by arrangement

289. Topics in ADA Programming—Ada Language will be used to focus on current research issues in design and implementation of concurrent programming languages and methodology of concurrent programming. Topics include Ada language design and programming techniques, multi-task programming, compilation algorithms for tasking, design and implementation of runtime scheduling packages, detection of concurrency errors, design of high level anno
tation languages, verification and validation methods, and programming support environments. Prerequisites: 180 or 285 (or Computer Science 156 and Pascal).

3 units, Spr (Luckham) TTh 1:15-2:30

292. Special Seminars—Each year special seminars and experimental courses are given on topics of current interest. These courses are usually announced one or two quarters prior to their presentation and are given by specialists in the field. See the Time Schedule and bulletins in the department office.


3 units, Aut (da Rosa) MW 3:15


3 units, Win (da Rosa) MW 3:15

COURSES FOR GRADUATE STUDENTS

305. Seminar on Electronics in Medicine—Weekly seminars on the application of electronics technology to problems of medical practice or research featuring speakers from educational institutions or industry.

1 unit, Aut, Win (White) W 4:15

306. Seminar on Computers in Biochemical Research—(Same as Computer Science 321, Medical Information Science 214.) Seminar will survey medical-computing research at Stanford and nearby industries. Lectures will be presented by local faculty and research staff. Typical topics include computers in the operating room, automated interpretation of medical data, and applications of artificial intelligence and databases to medical problems.

1 unit, Spr (Owicki, Shortliffe) T 2:45-3:45

310. Integrated Circuits Technology and Design Seminar—In-depth treatment of technology and circuit design problems in integrated circuits. Content is designed to parallel and complement topics in 312 (Aut), 313 (Win), and 314 (Spr).

1 unit, Aut (Plummer) T 4:15

Win (Staff) T 4:15

Spr (Dutton) T 4:15

311. Characterization and Computer Modeling of Semiconductor Devices—Experimental and computer simulation techniques for IC process and device modeling. Use of SUPREM for process modeling and comparison analysis to characterize one- and two-dimensional effects such as bipolar current gain and MOS threshold voltage. Computer controlled device measurements and model parameter extraction for SPICE. This laboratory complements 216 and 312 and can be taken concurrently.

3 units, Aut (Dutton)

TT h 9:30-10:45

312. Integrated Circuit Fabrication Processes—Fundamental principles of silicon integrated circuit fabrication processes. Technological limitations on integrated circuit design. Physical and chemical models of bulk and epitaxial crystal growth, oxidation, diffusion, ion implantation and photoengraving. Geometrical layout of bipolar and MOS devices and integrated circuits. This course is designed to be taken Autumn Quarter by students who will be using the laboratory facilities for doctoral research since it is a prerequisite for 410 and 411. Those interested in the course as part of their breadth sequence may take it either Autumn or Spring Quarter. Prerequisite: 113 or equivalent.

3 units, Aut (Staff) TTh 1:15-2:30

3 units, Spr (Plummer) TTh 9:30-10:45


3 units, Win (Dutton) TTh 9:30-10:45

314. Linear Integrated Circuits—Analysis and Design—Description and quantitative study of linear IC's made with both bipolar and MOS technologies. Principles of biasing, common-mode rejection, low-drift, and reducing temperature dependence of amplifying circuits and such related circuits as voltage references. Applications to specific case studies, such as phase-locked oscillators, wide-band amplifiers and multipliers. Prerequisite: 216.

3 units, Spr (Angell) TTh 8-9:15

315. Design of Analog CMOS Integrated Circuits—Fundamentals of analog circuit design using CMOS. Operational amplifiers design is
used as initial example. The design of analog switches, sample and hold, comparator and voltage references are discussed. Analog subsystems to be used as examples include D/A and A/D conversion and switched capacitor filter techniques. The course entails a design project. Prerequisite: 313 or consent of instructor.

3 units, Spr (Plummer) TTh 2:45-4

316. VLSI Devices and Technology—Course will concentrate on the fabrication techniques used to make modern high performance ICs and in particular will look at how these techniques impact device electrical characteristics and performance. Specific topics include oxidation, diffusion and ion implantation techniques and physical models for submicron structures, point defect mechanisms in fabrication technology, control of electrical characteristics (threshold voltage, breakdown voltage, current gain) in small structures and alternative device structures for VLSI. Prerequisites: 216, 312, or equivalent.

3 units, Win (Plummer) TTh 1:15-2:30

317. Microlithography—Fundamentals of exposure and development of resist patterns down to sub-micron dimensions. This includes the interaction of the exposing radiation with resists and the generation of high quality images using light, X-rays, electrons and ions. Part of the course will be a "hands-on" computer simulation of the exposure and development of patterns in resist.

3 units, Win alternate years, given 1984-85

320. Condensed Matter Seminar—Discussion by guest specialists, faculty, and students of research topics and current literature in solid state physics.

1 unit, Aut, Win (Spicer) Th 4:15

Spr (Lindau) Th 4:15

322A. Basic Quantum Mechanics—Beginning with the failure of classical physics to describe phenomena on a microscopic level (black body radiation, photoelectric effect, etc.) the basic concepts of nonrelativistic quantum mechanics are introduced. These include operators, wave functions, eigenfunctions, probability amplitudes, eigenvalues, and stationary states. The basic postulates are given and the mathematical formalism is developed using the statistical interpretation. Emphasis will be placed on understanding the relationship between the formalism (Hilbert space representation) and the measurement process. Both the Shrödinger wave function approach and the matrix formulation of quantum mechanics will be given. The equivalence of the two schemes will be dis-

322B. Basic Quantum Mechanics—This course will deal with the various approximation schemes for determining the energy levels and other properties of real systems. These will include the variational method, WKB approximation, time independent and time dependent perturbative schemes for solving time dependent problems. Applications to the calculations of the ground state of the helium atom, quantum mechanical tunneling, magnetic resonance, masers and lasers and the two-level problem will be presented. Also given will be a generalized treatment of angular momentum including definition in terms of infinitesimal rotations, choice of representations, eigen values and eigenstates, matrix representations and addition of angular momenta, including the Clebsch-Gordon or vector-coupling coefficients. Prerequisite: 322A.

3 units, Win (Bates) TTh 9:30-10:45

323. Acoustic Devices—Introduction to basic physics relevant to acoustic devices. Applications to nondestructive testing, medicine, radar, and sonar. Topics covered include wave propagation in isotropic materials, piezoelectric transducers, diffraction, focusing, scattering from flaws and body tissue, surface acoustic waves, and normal mode and coupled mode theory. Prerequisites: 142, 242, or equivalent.

3 units, Aut, (Kino) MWF 1:15

324. Applications of Quantum Theory—A unified approach involving the density matrix to lasers, field quantization, and multiple quantum effects. Emphasis on the techniques for obtaining the appropriate equations of motion, rather than on detailed investigation of specific devices. Topics included are rate equations, spontaneous emission, laser action, infrared absorption, multiple photon absorption, and relativistic quantum effects. Prerequisite: 322B or Phys 231.

3 units, Spr alternate years, given 1984-85

325. Analog Signal Processing—Introduction to analog filters with emphasis on acoustic surface waves and related optical and semiconductor devices. Topics covered include CCD and SAW transversal filter, correlators, convolvers, tapped optical fibers, the chirp Z transforming the appropriate equations of motion, rather than on detailed investigation of specific devices. Applications to the calculations of the ground state of the helium atom, quantum mechanical tunneling, magnetic resonance, masers and lasers and the two-level problem will be presented. Also given will be a generalized treatment of angular momentum including definition in terms of infinitesimal rotations, choice of representations, eigen values and eigenstates, matrix representations and addition of angular momenta, including the Clebsch-Gordon or vector-coupling coefficients. Prerequisite: 322A.

3 units, Win (Bates) TTh 9:30-10:45

323. Acoustic Devices—Introduction to basic physics relevant to acoustic devices. Applications to nondestructive testing, medicine, radar, and sonar. Topics covered include wave propagation in isotropic materials, piezoelectric transducers, diffraction, focusing, scattering from flaws and body tissue, surface acoustic waves, and normal mode and coupled mode theory. Prerequisites: 142, 242, or equivalent.

3 units, Aut, (Kino) MWF 1:15

324. Applications of Quantum Theory—A unified approach involving the density matrix to lasers, field quantization, and multiple quantum effects. Emphasis on the techniques for obtaining the appropriate equations of motion, rather than on detailed investigation of specific devices. Topics included are rate equations, spontaneous emission, laser action, infrared absorption, multiple photon absorption, and relativistic quantum effects. Prerequisite: 322B or Phys 231.

3 units, Spr alternate years, given 1984-85

325. Analog Signal Processing—Introduction to analog filters with emphasis on acoustic surface waves and related optical and semiconductor devices. Topics covered include CCD and SAW transversal filter, correlators, convolvers, tapped optical fibers, the chirp Z transform
form, analog and digital coding, acousto-optical processors, and the storage correlator. Applications of these signal processing ideas to bandpass filters, adaptive filtering, acoustic imaging, spread spectrum, and other communication systems, radar, and sonar will be discussed. Prerequisites: 142 and 261.

3 units, Win (Kino) MWF 1:15

327A. Acoustic Waves in Solids I—(Enroll in Applied Physics 252.)
alternate years, given 1983-84

327B. Acoustic Waves in Solids II—(Enroll in Applied Physics 253.)
alternate years, given 1984-85

328A,B. Physics of Semiconductor Devices—Introduction to the physical principles underlying semiconductor device operation and the application of these principles to specific devices. Emphasis will be placed on understanding device operation, rather than circuit properties. Topics in 328A include elementary excitations in semiconductors such as phonons, photons, conduction electrons and holes, charge and heat transport, carrier trapping and recombination, effects of high doping, contacts, and the p-n junction. 328B will consider the junction transistor, surface effects, the MIS diode, and the MOSFET. Prerequisites: 216, 228 and 328A (for 328B) required; 238 recommended but not required.

3 units, Win (Swanson) MWF 3:15
Spr (Swanson) MWF 3:15

329. The Electronic Structure of Surfaces and Interfaces—Electronic structure of surfaces and interfaces and its relevance to new developments in semiconductor device technology. Basic concepts as the surface Brillouin zone, surface states and resonances, the interaction of electrons and photons with surfaces, structural and electronic changes induced by metal/oxide overlayers and various spectroscopic techniques to probe these changes, the nature of the chemical bond in the interfacial region, different mechanisms for interdiffusion, intermixing, alloying and/or compound formation at the interface. Prerequisites: Physics 57 or equivalent; 238 or consent of instructor.

3 units, Win (Beasley) TTh 1:15-2:30

332. Optical Properties of Solids—Basic theory with emphasis on the relationship between electronic structure and optical properties of solids. Representative semiconductors, insulators, and metals will be discussed. Impurities and defects in solids. Surface states. Photoemission, Luminescence, applications. Prerequisite: 322A or equivalent.

3 units, Spr (Staff) TTh 1:15-2:30
alternate years, given 1983-84

334. Superconducting Electronics—Introduction to superconducting electronics and applications. Course proceeds from a brief introduction to the phenomena of superconductivity through a discussion of Josephson junctions and superconducting quantum devices and finally to an analysis of some promising applications in computer logic and memory, magnetometry, and low noise electromagnetic detectors and mixers in the millimeter and submillimeter wave region. No formal prerequisites but an exposure to quantum mechanics and a good grounding in electromagnetic theory are desirable.

3 units, Win (Beasley) TTh 1:15-2:30

338A. Quantum Theory of Energy States in Solids—(Enroll in Materials Science and Engineering 233.)

338B. Electronic Transport in Solids—(Enroll in Materials Science and Engineering 234.)

338C. Photoelectronic Properties of Solids—(Enroll in Materials Science and Engineering 235.)

344. High Frequency Laboratory—A combination lecture/laboratory course with emphasis on the lab. Class covers techniques in the 1MHz-1GHz range useful in designing and measuring oscillators, amplifiers, and mixers. Basic high frequency measurement techniques including s-parameter measurements are included. Prerequisites are a good understanding of transmission lines, Smith charts, 221B. Lectures will be given by the professor and experts from H.P. (Two lectures, one lab per week.) Class limited to 15 students.

3 units, Aut (McWhorter) MWF 3:15
346A. Introduction to Nonlinear Optics—Wave propagation in anisotropic, non-linear, and time-varying media. Microscopic and macroscopic description of electric dipole susceptibilities. Free and forced waves—phasematching; slowly varying envelope approximation—dispersion, diffraction, space-time analogy; harmonic generation; frequency conversion: parametric amplification and oscillation; and electro-optic light modulation. Prerequisites: 241, 242, 322A or equivalent.

3 units, Spr (Harris, S.) MWF 2:15

346B. Nonlinear Optics—Frequency conversion with focused, temporally compressed, and resonant beams; Green's function and Fourier methods; stimulated Brillouin and Raman scattering; acousto-optic modulation, frequency translation, and scanning; mode locking of lasers; nonlinear image conversion and complex wavefront conjugation; multiphoton absorption; laser induced interactions between colliding atoms, techniques for short wavelength generation. Prerequisite: 346A.

3 units, Aut (Harris, S.) MWF 2:15 alternate years, given 1983-84

347. Optical Methods in Engineering Science—(Enroll in Aeronautics and Astronautics 220.)

348. Ionospheric Processes—The neutral atmosphere; the solar ionizing radiation; the role of production, loss and diffusion processes in establishing the ionosphere; thermal behavior of the ionospheric plasma; temperature and electron-density profiles. Introduction to space plasma electrodynamic processes; Joule heating, ion drag, force-free currents, global current systems. Prerequisite: 142 or equivalent.

3 units, Spr (Banks) TTh 2:45-4 alternate years, given 1983-84

349. Magnetospheric Processes—The earth's magnetic field and plasma environment. Coupling processes between the upper atmosphere, ionosphere and magnetosphere with emphasis on mass, energy and electric transfer. Formation of the magnetopause, magnetosheath phenomena, magnetic reconnection, substorms and general disturbances. Prerequisites: 241 or equivalent.

3 units, Spr (Banks) TTh 2:45-4 alternate years, given 1983-84

350. Star Laboratory Seminar in Radioscience—Student-faculty discussion of research problems in the fields of ionospheric and magnetospheric physics; radio propagation in, and radio emission by, ionized media; solar terrestrial relations, and radio and radar astronomy, plasma physics, and communications planning.

1 unit, Aut, Win, Spr (Vesecky) M 4:15

352. Electromagnetic Waves in the Ionosphere and Magnetosphere—Magnetoionic theory in multi-component media; signal dispersion; group ray velocity; wave polarization; refractive index surfaces; ray tracing; absorption; boundary effects; interpretation of natural phenomena (e.g., whistlers and VLF emissions); remote sensing in plasmas; communication; theory of wave-particle interactions in the magnetosphere. Prerequisite: 142 or equivalent.

3 units, Spr alternate years, given 1984-85

353. Electromagnetic Waves in the Ionosphere and Magnetosphere—Magnetoionic theory in multi-component media; signal dispersion; group ray velocity; wave polarization; refractive index surfaces; ray tracing; absorption; boundary effects; interpretation of natural phenomena (e.g., whistlers and VLF emissions); remote sensing in plasmas; communication; theory of wave-particle interactions in the magnetosphere. Prerequisite: 142 or equivalent.

3 units, Spr alternate years, given 1984-85

354. Introduction to Radio Wave Scattering—Integral and differential equations of radio wave scattering; exact, approximate and numerical solutions of single particle scattering for spheres and cylinders. Multiple scattering; formulation and solution techniques for equation of transfer in discrete media and scattering by continuous media in weak and strong regimes. Scattering from rough surfaces with large and small roughness scales. Applications to radar, radar astronomy, remote sensing, and biological media. Prerequisite: 241 or equivalent or consent of instructor.

3 units, Spr, (Tyler) TTh 11-12:15 alternate years, given 1983-84

356. Introduction to Plasma Physics—Plasma as a new medium; its significance in space and fusion research, individual and collective phenomena; ionization, charged particle orbits, collisions, plasma oscillations; Boltzmann distributions, Debye length, Landau damping, magnetoionic propagation and dispersion. Sheath and probe theory, magnetic confinement, pinches, mirrors, magnetogasynamics; computer simulation of plasmas. Prerequisite: 141 or equivalent.

3 units, Aut (Buneman) MWF 2:15

358A,B. Quantum Electronics Laboratory I, II—(Enroll in Applied Physics 358A,B.)

359. Remote Probing of Atmospheric Environment—Techniques for measuring the structure, content, properties, and motions of the atmosphere by remote means. Interactions between propagated waves and the atmosphere medium. Scattering, reflection, absorption and radiation of radio, optical and acoustic waves. Applications to measurement of temperature, humidity, rain, aerosols, inversion layers, waves, winds, turbulence, and pollutants. Prerequisite: 142 or 241 or Physics 121 or equivalent.

3 units, Spr alternate years, given 1984-85
363. Introduction to Linear System Theory—Analysis of finite-dimensional linear systems, state space realizations and canonical forms. Controllability, observability, and minimality. Relations to transfer function descriptions. Time- and frequency-domain design of controllers and observers. State-variable realizations from input-output data. Prerequisite: 102 or Engineering 104 and Mathematics 113S or equivalent is helpful.

3 units, Aut (Kailath) MWF 3:15
Spr (Staff) TTh 2:45-4

364. Multivariable System Theory—Structural properties, controllability, observability, canonical forms. Applications to pole-shifting, decoupling, system realization and identification. Introduction to algorithms for reliable computation of solutions to control problems. A sequel to 363 where similar problems are studied for scalar systems. Prerequisite: 363.

3 units, Win (Franklin) MWF 11


3 units, Spr (Franklin) TTh 2:45-4

366. Introduction to Fourier Optics—Application of Fourier theory to the analysis and synthesis of optical imaging and optical data processing systems. Propagation and diffraction of light, Fresnel and Fraunhofer approximations, Fouier transforming properties of lenses, image formation with coherent and incoherent light, transfer functions of imaging systems, optical data processing, and holography. Prerequisite: familiarity with Fourier analysis, 261 recommended.

3 units, Win (Macovski) MWF 10

367. Statistical Optics—Applications of statistical tools to a variety of problems in modern optics. First-order statistical properties of thermal and laser light, effects of partial polarization, basic definitions of coherence, propagation of mutual coherence functions, the Van Cittert-Zernike theorem, imaging with partially coherent light, imaging through randomly inhomogeneous media, and statistics of optical detection processes. Prerequisites: 278, 366.

3 units, Spr (Staff) alternate years, given 1984-85

368. Digital Image Processing—This course covers various topics in the field of digital image processing, including: physical descriptions of continuous images; properties of the human visual system; sampling and quantization of images; matrix representation of image forming

and image processing systems; unitary transforms; image enhancement and restoration; and scene matching and recognition. Prerequisites: 261, Mathematics 114S.

3 units, Win (Hesselink) MWF 9

369. Medical Imaging Systems—Basic modalities used for imaging internal structures within the volume of the body from a systems viewpoint: X-ray radiography, computerized tomography, nuclear medicine, and ultrasound. Analysis of existing and proposed systems in terms of resolution, modulation transfer function, detection sensitivity, noise, ability to visualize disease processes, and potential for improving diagnosis. Prerequisites: Fourier transforms: 366 recommended.

3 units, Spr (Macovski) TTh 11-12:15

Win (Williams) Th 4:15
Spr (Macovski) Th 4:15

370. Information Systems Seminar—Lectures and discussions of topics and research areas in information systems; sample topics are computational and statistical complexity, rate distortion theory, algebraic systems theory, simultaneous communications, signal processing, and telecommunications policy.

1 unit, Aut (Staff) Th 4:15

Win (Williams) Th 4:15
Spr (Macovski) Th 4:15


3 units, Spr (Widrow) MWF 10

374. Introduction to Digital Telecommunications—Introduction to and comparison of analog and digital telecommunications; voice digitization—PCM, DPCM, and DM techniques; low bit rate coding of speech; segment companding laws in PCM; time division multiplexing-framing, synchronization and pulse stuffing; transmission of digital signals—baseband and carrier techniques; introduction to digital switching. Prerequisite: 261 or equivalent.

3 units, Win (Staff) MWF 9
376A. Information Theory—The Shannon Theory of Communication for memoryless sources and channels: entropy and information, asymptotic equipartition property, source coding (data compression) and coding for noisy channels (reliable communication). Prerequisite: 278, Statistics 116 or equivalent.
3 units, Aut (El Gamal) TTh 2:45-4

376B. Information Theory—Jointly typical sequences. Capacity theorems for multiple user channels: broadcast channels, multiple access channels, two-way channels, Gaussian channels, channels with feedback. Multiple user data compression: rate distortion theory; Slepian Wolf theorem; data compression with side information. Kolmogorov complexity. Prerequisite: 376A.
3 units, Win (Cover) TTh 2:45-4

3 units, Spr (Cover) TTh 2:45-4

3 units, Win (Kailath) TTh 1:15-2:30

378B. Fast Algorithms for Signal Processing—Levinson-Schur algorithms and lattice filters for stationary processes. Parallel and modular implementations. Processes with low displacement rank: generalized constant gain lattice filters; adaptive lattice and transversal filters. High resolution spectral estimation techniques for autoregressive and sinusoidal signals in noise. Applications in speech, communications, sonar, etc. Prerequisite: 278 or 378A.
3 units, Spr (Staff) TTh 1:15-2:30

379. Communication Channels—Digital modulation and coding; detection of signals in Gaussian noise; channel capacity and channel reliability functions; applications to signal selection, input and output quantization, error-correcting codes; equalization. Prerequisite: 278.
3 units, Spr (Gray) TTh 9:30-10:45

380. Seminar on Computer Systems—Discussion of current research in the design, implementation, analysis, and use of computer systems ranging from integrated circuits to operating systems and programming languages.
1 unit, Aut (Flynn) W 4:15-5:05
Win (Allison) W 4:15-5:05
Spr (Flynn) W 4:15-5:05

381. Logic Design—Principles and techniques of logic design. Topics include combinational circuit analysis including hazard detection, combinational circuit design including PLA and MSI techniques as well as testing techniques, IC logic families, flip-flop properties, sequential circuit analysis and synthesis for both fundamental and pulse mode circuits, design for testability techniques. Prerequisites: 181 and 182 or equivalent.
(Also see Computer Science 211.)
3 units, Aut (Peterson) MWF 9 also (Aut) (offered as Computer Science 211) Th 2:45-4
Win (McCluskey) TTh 2:45-4

382A. Processor Design-ALU and Its Control—Data representation, integers, floating point and residue representation. Bounds on arithmetic speed, algorithms for high speed addition, multiplication and division. Pipelined arithmetic. Implementation and control issues using PLA's and microprogramming control. Prerequisites: 181, 182, or equivalent.
3 units, Win (Flynn) MWF 1:15

382B. Processor Design - Memory Hierarchy and Control Unit Design—Cache and main memory design, virtual storage system. Instruction decoding and timing. Pipelined execution and interlocks. Instruction set characteristics, branching, supervisory state. Recommended 382A.
3 units, Spr (Flynn) MWF 1:15

383. Advanced Compilers—Lectures and discussion will explore implementation issues in depth. The major focus will be optimization techniques and advanced code generation. A significant project will be included. Prerequisites: 283.
(Also see Computer Science 243.)
3-6 units, Spr (Hennessey) TTh 1:15-2:30

384. Computer Networks; Architectures and Protocols—Objectives of computer networks network structure and components; switching techniques (circuit-switching and packet-switching); network functions; layered network architectures (the ISO reference model); datagramm like protocols (character-oriented protocols, bit-oriented protocols, error Sara, window flow control, and multiaccess protocols); network control (datagrams, virtual circuits, routing, and congestion control); transport and session protocols (end to end communication, intercommunication of networks); presentation layers protocols (virtual terminal and file trans
fer protocols). Specific examples and standard protocols will be cited throughout the course for point-to-point, satellite, packet radio, and local area networks. (Also see Computer Science 244).

3 units, Aut (enroll in Computer Science 244)

3 units, Win (Tobagi) TTh 2:45-4

385. Digital Systems Reliability Seminar — Student-faculty discussions of research problems in the design of reliable digital systems. Specific areas include modeling and evaluation of multiprocessor and redundant architectures, as well as testing and diagnosis theories. Emphasis is placed on student presentations and Ph.D. thesis research.

1-4 units, Aut, Win, Spr (McCluskey) M4:15

386. Advanced Operation Systems—(Enroll in Computer Science 246.) In-depth treatment of selected topics in operating system design. Emphasis will be on topics not covered in 286, such as naming and binding, protection, reliability, user interfaces, construction strategies, modeling and performance evaluation, system management, and portability. Significant project will be included. Prerequisite: 286.

3-6 units, Spr (Lantz)

387. Error-Correcting Codes—Theory and implementation of codes for detection and correction of random and burst errors. Finite field theory. Linear block codes, cyclic codes, Hamming codes, Fire codes, BCH codes, Reed-Solomon codes. Decoding algorithms for BCH codes. Prerequisites: Some familiarity with discrete mathematics and linear algebra.

3 units, Spr (El Gamal) MWF 2:15

389. Programming Language Design—Exposure to the problems of programming language design and their known solutions will be undertaken. Topics may include formal semantics, implementation considerations, extensibility, very high level languages, evaluation of language designs, and other timely topics. The innovative features of a variety of modern programming languages will be discussed. Prerequisite: 285.

(Also see Computer Science 242.) alternate years, given 1984-85

390. Special Studies or Projects in Electrical Engineering—Independent work under the direction of a faculty member. Individual or team activities involving laboratory experimentation, design of devices or systems, or directed reading. Graded on a pass/no credit basis.

by arrangement

3 units, Spr (Meindl) TTh 1:15-2:30

412. Advanced Integrated Circuit Laboratory—Experimental projects and seminars on integrated circuit fabrication using epitaxial deposition, oxidation, diffusion, ion implantation and photolithographic processes with emphasis on techniques for achieving advanced device performance. May be repeated for additional credit. Prerequisites: 312, 410, 411, and consent of instructor.

by arrangement

413. Ion Implantation Techniques—Theory of ion implantation and related processes, with applications to the study of solid-state materials and the fabrication of solid-state devices. Prerequisite: consent of instructor.

1-3 units, Spr alternate years, given 1984-85

414. Physical Limits in VLSI—Hierarchy of physical performance limits on very large scale
integration (VLSI) including fundamental law of physics, properties of materials, device characteristics, fabrication processes, circuit topologies and system architecture. Minimum energy operation of bipolar transistors, MOS transistors and charge transfer devices in amplifiers, oscillators, multipliers, delay lines, logic elements and memory cells without compromising speed, gain, bandwidth, stability margins, etc. Prerequisites: 216, 312, 313 and (or concurrently) 314 or equivalents.

3 units, Spr (Meindl) TTh 9:30-10:45

428A, B. Physics of Advanced Electronic Devices—A two-quarter course intended for second and third year graduate students specializing in solid state electronics and integrated circuits. The focus of the course will be on device physics where the device dimensions approach the wavelength of electronics in the solid. Under such conditions, quantum size effects, tunneling and hot electron phenomena dominate classical device phenomena as well as providing possibilities for entirely new types of solid state devices. Prerequisites: 328A & B or Physics 230 or equivalent.

3 units, Win (Harris) MWF 1:15
Spr (Harris) MWF 1:15

430. Surface and Interface Seminar—A better fundamental understanding of the electronic structure of surfaces and interfaces is becoming increasingly important for many practical applications, e.g., semiconductor devices and metal catalysts. This seminar concentrates on electron spectroscopic methods and basic theoretical approaches for studying surfaces and interfaces. Faculty members and advanced graduate students, as well as invited speakers from outside the University, present material for discussion.

1 unit, Aut, Win (Spicer) W 2:15-4:15
Spr (Staff) W 2:15-4:15

431. Quantum Electronics—Quantum theory of lasers and of the interaction of radiation and atoms. Coupling of radiation to atoms; stimulated transitions; the density matrix; quantum noise. Provides the quantum theory underlying the semiclassical approach of 231-232. Prerequisites: quantum theory to the level of 322B or Physics 231. A course in lasers, such as 231-232 is not a prerequisite, but background reading from this course material may be necessary.

3 units, Spr (Seigman) MWF 10
alternate years, given 1983-84


477. Information and Statistics—(Enroll in Statistics 362.)
alternate years, given 1984-85

478. Topics in Statistical Signal Processing—Problems selected from recent research of the faculty in areas that have reached a level of development suitable for course presentation. given 1984-85

479. Topics in Statistical System Theory—Problems selected from recent research of the faculty in areas that have reached a level of development suitable for course presentation.

3 units, Spr (Staff) TTh 2:45-4

482. Advanced Computer Organization—Top- ic in computer arithmetic; models of memory systems; single stream system concurrency detection and control; multiple stream system design, analysis and algorithms; relationship between processor architecture and organization. Prerequisites: 282 and 382.

3 units, Spr alternate years, given 1984-85

483. Topics in Concurrent Programming—(Enroll in Computer Science 343.) Current research topics in the design and verification of concurrent programs of the sort that occur in operating systems, networks, distributed systems, etc. Subjects that may be covered include programming language features, formal models, specification and verification, atomic transactions, remote procedure call and system design. Prerequisite: 286.

2-4 units, Win (Lantz) alternate years, given 1984-85

484. Computer Network Modeling and Analysis—Review of network functions, architecture and protocols; computer traffic characterization; resource sharing; packet-switched store- and-forward networks (e.g., ARPANET); delay analysis, network design and optimization including capacity assignment, routing and topological design; analysis of multi-access / broadcast protocols (used in packet-switched satellite, ground radio, and local networks): fixed assignment, random access, demand assignment, adaptive strategies, stability considerations and dynamic control. Prerequisite: 284, knowledige of 384 is also highly recommended.

(Also see Computer Science 347.)

3 units, Spr (Tobagi) TTh 9:30-10:45

485. Database System Theory—(Enroll in Computer Science 245.) Overview of database systems, the entity—relationship model of the real world; the network data model and the DBTG proposal; the hierarchical model; the relational model; relational algebra and calculus; query languages based on algebra and calculus, such as ISBL, QUEL, SQL, and Query...
by-Example; functional dependencies and their influence on database design; multivalued dependencies; query optimization; concurrent operations on the database; query optimization and concurrency control for distributed database systems. Prerequisites: A familiarity with file organization, as in 287, and with predicate calculus, as in 156, will be assumed.

3 units, Spr (Ullman)

486. Advanced Computer Architecture—Machine mapping issues, design of image machines, including addressing, name space design, operations and formats; emulation, semantics, interpreters and levels of emulation. Image machine analysis and statistical usage. Information theoretic limits and canonical interpretive program forms for high level languages. Directly Executed Language (DEL) synthesis. Prerequisites: 282 and 382.

3 units, Spr (Staff) TTh 11-12:15 alternate years, given 1983-84

487. Digital Signal Processing Architecture & Circuits—The architecture, system design and hardware implementation of real time signal processors and digital filters. Signal processing operations including the Discrete Fourier Transform, Discrete Convolution, Cosine transform, Hadamard transform and the estimation of power spectra. Design of Finite Impulse Response and Infinite Impulse Response implementations of low pass, high pass, bandpass and all-pass filters. Applications in speech processing, image processing, communication, sonar and radar signal processing. Possibilities for LSI implementation of signal processing and digital filter computation structures will be investigated. Prerequisites: 381, 382. Recommended: 263.

3 units, Spr (Peterson) MWF 10 alternate years, given 1983-84

488. Testing Aspects of Computer Systems—Fundamental principles of testing computer systems and designing for testability. Failure and fault models. Deterministic and probabilistic techniques of test generation and testing. Techniques for testing memories and microprocessors. Design for testability. Prerequisite: 381.

(Also see Computer Science 318.)

3 units, Spr alternate years, given 1984-85


(Also see Computer Science 319)

3 units, Spr (McCluskey) TTh 2:45-4 alternate years, given 1983-84

ENGINEERING-ECONOMIC SYSTEMS

Chairman: David G. Luenberger
Professors: Donald A. Dunn, Willis W. Harman, Ronald A. Howard, David G. Luenberger, James L. Sweeney
Associate Professors: Richard J. Gilbert, Edison T. S. Tse
Assistant Professors: Carson E. Agnew, Samuel S. Chiu, Ross D. Shachter
Lecturer: Gerd D. Wallenstein.
Consulting Professors: Robert E. Larson, James E. Matheson, Richard D. Smallwood
Consulting Associate Professors: Edward G. Cazalet, Peter A. Morris, D. Warner North
Consulting Assistant Professor: Charles D. Feinstein

OFFERINGS AND FACILITIES

The Department of Engineering-Economic Systems is dedicated to preparing individuals for careers dealing with the planning, operation, analysis, and control of complex technological and economic systems through programs of study, internship, and research on the graduate level. EES emphasizes mathematical modeling and other analytical approaches to problems, but also devotes careful attention to nonquantitative aspects of problem formulation, solution, and implementation.

The formal coursework provides the basic framework of professional training and emphasizes the system analysis techniques that have application in the planning and operation of the complex systems required by modern society.

A unique feature of the doctoral program is the internship, a period of experience in government or industry that allows a student to gain first-hand experience in the limitations of existing methodology. The internship experience often provides the basis for formulating meaningful doctoral research problems.

BACKGROUND REQUIRED

Students admitted for graduate study in Engineering-Economic Systems must have a background of undergraduate work that indicates a level of mathematical maturity customarily found in an intensive undergraduate engineering or physical science program. A full year's college-level calculus course, and several courses applying calculus, constitute an absolute minimum of preparation. Undergraduate
course work in economics is not required, but will prove helpful in graduate study in this field.

The department's core courses require a fair degree of mathematical maturity. Incoming students who feel they are not adequately prepared for a rigorous analytical methodology should take recommended courses in the Department of Mathematics prior to taking the core courses.

GRADUATE PROGRAMS

There are three programs of study, all at the graduate level, leading to the degrees of Master of Science, Engineer, and Doctor of Philosophy in Engineering-Economic Systems.

Study programs should be selected to give a broad coverage as well as work in depth in one or more specific areas. System analysis is a young discipline that draws many of its models and methods from mathematics, physical science, and social science. Future developments in system analysis will often be an outgrowth of concepts born in these foundation fields. The student's course program should include a selection of foundation material from the offerings of other departments so that the student will have the breadth to contribute to the growth of his or her profession both now and for the years to come.

MASTER OF SCIENCE

Department requirements for the degree of Master of Science provide great flexibility for meeting individual objectives. The master's degree may be viewed as a terminal degree program with a professional focus, or as an exploratory vehicle to formulate and select a more advanced graduate school program. Course programs are approved individually by Engineering-Economic Systems faculty.

The degree of Master of Science requires a minimum of one academic year of study beyond the B.S. degree. University regulations governing the degree of Master of Science are described in the "Degrees" section of this bulletin. The department does not have a thesis requirement for the master's degree. In addition to meeting University requirements, M.S. programs must contain a total of 45 units of course work. This total must include at least 36 units of regular lecture courses, 24 units of which must be courses in Engineering-Economic Systems with letter grades. Included in these courses must be at least five of the department's core courses. An M.S. program must also contain at least 3 units of project work. (See "Courses" below for a list of courses that meet this requirement.) Finally, a letter grade average of 3.0 must be achieved on the course program.

Up to 18 units of a student's program for the M.S. degree may be taken outside the department. However, most M.S. programs include more E.S. units than the minimum required. A typical program for a student whose M.S. is a terminal degree would include 18 units of E.S. core courses (201A, 212A, 221, 231, and 241); a 4-unit project course such as 236 or 256; two or three other E.S. courses; and courses from other departments such as Industrial Engineering 133, Statistics 219/220, Operations Research 245 or 251. Students who view the M.S. as an intermediate degree would substitute additional E.S. core courses (e.g. 211B or 212B), mathematics courses (e.g. Mathematics 114 and 115), or other courses in their planned area of interest. Although not a requirement, students without prior experience in computer programming should take a course in this subject (such as Computer Science 106) early in their M.S. program.

ENGINEER

The degree of Engineer requires a minimum of two academic years of study beyond the B.S. degree (three academic quarters beyond the M.S.). University regulations governing the degree of Engineer are described in the "Degrees" section of this bulletin. Requirements may be summarized as follows: (1) The successful completion of an approved academic program consisting of a 3.1 letter grade indicator at the end of the first year; 45 units beyond an M.S. degree (which may or may not be in E.E.S.); completion of all E.E.S. core courses during either the M.S. or Engineer degree program; and a 3.1 or better letter grade indicator on the courses taken. (2) Approval of a thesis proposal by the thesis supervisor. Such a proposal may be based on a successful tutorial project. (3) Satisfactory oral presentation of the thesis to the thesis adviser and one other faculty member appointed by the department. (4) Completion and approval of the engineer's thesis by the thesis supervisor.

Permission to study beyond the Master of Science degree must be obtained from the appropriate department committee. The decision of the committee is based on its evaluation of the applicant's academic record, performance in independent work, and potential for advanced study, and on the ability of the faculty to support and supervise such study.

DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy requires a minimum of three academic years of study beyond the B.S. degree. A complete statement
regarding University regulations governing the degree of Doctor of Philosophy will be found in the "Degrees" section of this bulletin. The requirements are administered by the University Committee on Graduate Studies.

Admission to the graduate school does not imply that the student is a candidate for the Doctor of Philosophy degree. Only after the Application for Doctoral Candidacy has received official departmental and University approval does the student become a candidate for the degree.

All students who have not already earned a master’s degree must receive the Master of Science degree in Engineering-Economic Systems as a prerequisite to candidacy for the Ph.D. Not later than the first Autumn Quarter after receiving the Master of Science degree the student should submit an application to participate in the department qualifying procedure.

Requirements may be summarized as follows: The student is to complete successfully (1) a minimum of three years of residence with graduate standing, (2) department qualifying procedure, (3) an approved program of courses, (4) a 3.5 average letter grade indicator on the core courses (see "Courses" below), (5) an oral examination near the completion of the doctoral program, (6) a dissertation, based on research, which must be a contribution to knowledge. The department does not have a foreign language requirement.

Examples of student programs for the Ph.D. which emphasize different foundation disciplines are as follows:

1. A quantitative system analysis program which emphasized mathematics might include the following mathematics courses: 113, 114, 115, 116, 117, 205A, B, C, 261A, B, C.

2. A program which emphasized economics might include the following economics courses: 155, 202, 203, 204, 210, 257, 258, 272, 273, 280, 281, 282.

Similar programs with an emphasis in other specific areas such as political science or sociology can be developed with the aid of an adviser. In most such cases it is possible to obtain a minor in the student's additional area of special interest.

In some cases a student may wish to emphasize an interdisciplinary area such as communications which might involve taking courses in a number of other departments. Individual programs can be developed with the aid of an adviser to meet particular student interests, but an attempt should be made to develop substantial depth in at least one area outside the EES department during the course of the Ph.D. program.

**Ph.D. Minor**—Doctoral students throughout the University may complete a minor in Engineering-Economic Systems by taking 21 units of courses selected from the list below. The selection must be approved by the student's department adviser and by the Engineering-Economic Systems faculty. The primary aim of this minor is to develop system analysis and decision-analysis capabilities for graduate students who anticipate careers associated with system problems.

**INTERNERSHIPS**

Since most large-scale system problems cannot be made available within a university, internships are offered to help the student develop the ability to solve system problems by working on real problems.

Problems of broad scope requiring a system viewpoint and thus suitable for the internship experience are found in large industrial firms; in companies and research groups concerned with the design, operation, and planning of complex projects and systems; on Congressional staffs; and in government agencies.

The duration of an internship ranges from 6 to 24 months, depending on the time required to complete the project successfully. While interning, the student lives on location and works as an employee responsible to the company or agency concerned. The Engineering-Economic Systems faculty locates and screens suitable internship opportunities in a variety of areas, and reviews each proposed project to verify its educational value.

The student's internship work is mainly directed toward the successful solution of a real problem. Consequently, the student gains an appreciation for the approximations and compromises with rigor that characterize applied work in the field. Internships are not required, but many students elect to participate in an internship. Over 175 EES students have been on internships to date.

**RESEARCH AND APPLICATIONS**

It is important for students to receive experience in the application of system concepts in at least one specific problem area. This experience can be gained through the internship program, through applied research projects, and through special courses that concentrate on the application of system concepts to specific areas.

The major research programs of the department are listed below. Regular and consulting faculty who are active in these programs are indicated.
DECISION ANALYSIS
(Howard, Matheson, Shachter)

This program is dedicated to advancing the discipline of decision analysis by extending the theoretical foundations, increasing the effectiveness of practice, and expanding the field of application. Decision analysis is a philosophy, a body of knowledge, and a professional practice for the logical illumination of decision problems; it simultaneously considers the uncertain, dynamic, and complex consequences of a decision, as well as the assignment of value to its consequences.

Many large and important problems covering the spectrum of business, government, medicine, and law, have been successfully treated by decision analysis. Applications have been made to such problems as evaluating hazardous processes, research and development, and energy investment.

The university program maintains a close relationship with professional decision analysts working on major decision problems. Internships are available at several local consulting firms.

Much of the research in this program is conducted through the Decisions and Ethics Center directed by Professor Howard. Current research areas include: (1) the design of agreements to govern the actions of several participants to a venture, (2) the development of procedures for clarifying unstructured areas of concern as a first step in formulating decision problems, (3) the analysis of decisions and disputes involving risks of injury or death, and (4) the mutual exploration of the fields of decision analysis and artificial intelligence.

DECISION SYSTEMS
(Chiu, Dunn, Luenberger, Shachter, Tse)

This program is dedicated to the design, implementation and evaluation of computer-based decision systems. A decision system is referred to as any environment that enhances the process of decision-making and includes human-machine decision systems, as well as fully automatic ones. The program emphasizes the impact of computer technology on the design of effective decision systems. In particular, it examines how computers can be exploited as a powerful tool to acquire, in real time, the relevant knowledge pertaining to a specified decision, perform the appropriate analysis (either analytical or verbal), and relate both of these to the decision maker.

Several disciplines are important components of the program: decision analysis, systems modeling, mathematical optimization, artificial intelligence, and cognitive psychology. The integration of these diverse disciplines is a research focus of this program.

Much of the research in this program is conducted through the Decision Systems Laboratory directed by Professor Tse. Internships are available at several local firms active in developing computer-based decision systems for different decision environments. Current research areas in the laboratory include: (1) decision systems for strategic planning, (2) decision systems for organizational management of resource allocation, (3) decision systems for the management of fishery resources, (4) decision systems for the management of oil resources, (5) decision systems for equipment maintenance and quality assurance.

SYSTEMS ECONOMICS
(Gilbert, Luenberger, Shachter)

Systems economics is an emerging discipline that combines advanced theories of economics (in finance, general equilibrium theory, and decision theory) with the problem-solving viewpoint and techniques of systems analysis. The field is a response to the growing magnitude and complexity of economic decision problems in both the private and public sectors. Its orientation reflects the conviction that solution methods for these problems must simultaneously be solidly based on theoretical principles and capture the structural complexity inherent in actual situations. The theoretical basis is found mainly in economics, while the techniques for handling complex structure are found mainly in systems analysis.

The program sponsors student internships outside the university, conducts internal applications projects, and conducts Ph.D. dissertation research. Some current theoretical research topics include: (1) development of efficient algorithms, based on fixed-point theory, for calculating equilibrium prices, (2) development of the "descriptor variable" approach to representation and analysis of complex dynamic phenomena, (3) development of "implicit mathematical programming," a theory combining control theory and mathematical programming to analyze dynamic investment problems, (4) a study of equilibrium storage theory, to explain the storage policies for commodities such as wheat, and (5) a study of futures markets using the concept of "rational expectations."

ORGANIZATIONAL ECONOMICS
(Agnew, Dunn, Gilbert, Shachter, Tse)

Organizational economics is the study of incentives and information in organizations and interorganizational systems. The incentives of interest are those created by rules governing
such activities as information sharing, cost allocation, and transfer pricing within an organization. Information in organizations is obtained from a variety of different sources, combined, and used in decision making. Which method of combining and using information in decision making is best depends on a variety of factors and is a subject of current research. Of special interest are problems involved in decision making and planning in groups of organizational units with differing objectives.

Current areas of research include: (1) power pooling and long-term planning in the electric utility industry; (2) management of the frequency spectrum; (3) pricing shared services and facilities in interorganizational networks with multiple owners; and (4) incentives for innovation in systems with interconnected and interrelated components.

ENERGY MODELING AND ANALYSIS
(Sweeney)

The energy modeling activity centers around the Energy Modeling Forum (EMF) and involves the analysis and application of formal models in the study of energy policy issues. Sponsored by the Electric Power Research Institute, the Gas Research Institute, the Department of Energy, and several industrial affiliates, the EMF is based at Stanford with Professor Sweeney as Director. A national activity, the EMF seeks to improve the application of energy models for policy and planning purposes and to improve communication between energy model builders and users. Ad hoc working groups, typically consisting of 40 energy experts with an equal number of modelers and model users (assisted by EES students serving as research assistants), are the foundation of EMF studies. Each group is organized around a single topic to which several existing energy models can be applied.

The current EMF study focuses upon the macroeconomic impacts of energy shocks to the U.S. and world economies.

Current dissertation work includes: regulation of public utilities, optimal stockpiling under a gaming strategy, energy and the environment, representation of uncertainty in models, development models of OPEC, oil and gas finding rates, and disequilibrium modeling under stochastic rationing.

INFORMATION POLICY
(Agnew, Dunn)

The information policy program is concerned with the analysis of national and international policies with respect to the creation, distribution, and utilization of information services and products in society. The program emphasizes the application of economics and system theory to the analysis of information policy in such fields as patents and copyrights, research and development, innovation and technology transfer, the regulation of telecommunications and information services, the operation of information services markets, and the roles of information in the operation of markets generally.

Recent dissertations have included studies of: (1) the choice of contract structures by firms and individuals in information product markets facing uncertain demand, (2) product selection in markets for information services, and (3) warranties as a source of information in markets for consumer products.

Current projects include studies of: (1) the effects of consumer information on innovation, (2) economic analysis of alternative approaches to spectrum management, (3) the economics of electronic publishing, (4) innovation and growth in multiproduct markets, and (5) optimal tariffs and product differentiation in telecommunications services.

MATHEMATICAL SYSTEM ANALYSIS
(Chiu, Larson, Luenberger, Morris, Smallwood, Tse)

Mathematical system analysis is the development and application of those mathematical principles and techniques that form the basis for problem formulation and solution in the system area. The field is one of great multiformity, both with respect to the types of mathematics employed and in the areas of application. The Stanford program emphasizes the development of new techniques through involvement in a variety of practical problems. Faculty and students in the program have developed effective analytical approaches to problems such as: the design of a national housing allowance experiment; planning of electric power expansion; analysis of U.S. agricultural policy; the theory of instruction; land-use planning; word processing system evaluation; market forecasting systems; water resource planning; and surveillance strategies for air defense. Students have often been employed by local firms while working on these problems.

SOCIAL ANALYSIS
(Howard, Matheson)

This program is concerned with the political, legal, and economic arrangements that comprise our society. These arrangements and resulting institutions are examined from the perspective of ethics (what is right), as well as from the perspective of efficacy (what works in ad-
advancing the goals of human action.) This program is closely affiliated with the Decisions and Ethics Center.

Particular attention is focused on the role of government in society. To this end, the program examines the likely or past effect of government action, develops the ethical basis of law appropriate to a free society, explores the potential of voluntary systems in meeting human needs, and evaluates various economic and political theories.

A major emphasis of the program is on the use or abuse of technologies and natural resources in society. Current doctoral research includes: (1) ethical legal remedies for risk and harmful side effects posed by technology, (2) analyzing market arrangements for the provision of safety with hazardous goods and services, (3) comparing the parallel development of subjectivism in decision analysis and the Austrian School of Economics, and (4) an analysis of federal drug policy.

FINANCIAL ASSISTANCE AND ADMISSION

Most students in the EES Ph.D. program have found that, after completing the qualifying procedure, they are able to obtain financial support through a combination of research assistantships, teaching assistantships, and their internships, all of which contribute directly to their educational programs as well as providing financial support. In the recent past students have typically received $1100 per month during the period of their internships. The critical period financially for most students has been the first year to year-and-a-half of graduate work. A financial commitment of about $16,500 per year is required to cover tuition and expenses.

A limited number of fellowships for first-year students are available through the department. These pay tuition plus an allowance of approximately $490 per month during the academic year. Two other potential sources of first-year support are research assistantships and loans. However, research assistantships are, in most cases, awarded to students who have completed the qualifying procedure.

Information about loan programs may be obtained from the School of Engineering. Applicants for all forms of assistance may obtain the necessary application forms from the Graduate Admissions Office. Applications for fellowships must be made by February 15 preceding the Autumn Quarter that admission is desired and must be accompanied by application for admission. Research assistantships, however, are awarded by the individual faculty research supervisors, not by the department, and have no such deadline. Applicants, because of the individual nature of these awards, are advised to contact directly the faculty member under whom they wish to work. Formal applications to the department for research assistantships will be referred to the individual faculty research supervisors.

Except in unusual circumstances, admission to the department of newly entering graduate students is confined to the Autumn Quarter because the course offerings are arranged sequentially with basic courses and prerequisites falling early in the academic year.

COURSES

There are four types of courses in the department, as follows:

Core Courses:

Project Courses:
- 206, 214B, 236, 283 (4 units).

Lecture Courses:

Other Courses:
- 290, 292, 293, 294, 400 series.

Course descriptions, organized by general subject area, are listed below.

SYSTEMS


3 units, Aut (Chiu) MW 11-12:15
3 units, Sum (Staff) MW 10:30-12

201A. Dynamic Systems—An introduction with about equal emphasis given to development of general dynamic system theory and to exploration of classical models from social, physical, and life systems. Goal is to develop ability to recognize and analyze dynamic phenomena in diverse situations. Concepts covered include: formulation and analysis of difference and differential equations; state-space formulation: linear systems, fundamental solution sets equilibria, dynamic diagrams; eigenvector anal
ysis of linear systems, the concept of stability. Systems with positive variables: Frobenius-Perron theory, stability, existence of positive equilibria, comparative statics. Applications that are discussed in some detail include: cohort population models, social structures, migration models, national economies, price cycles, cultural media dynamics, Peter Principle of organizational hierarchies, Richardson's theory of arms races, Homans-Simon model of group interaction, population growth. Prerequisite: Mathematics 113 or equivalent.

4 units, Win (Chiu) TTh 1:15-2:30

201B. Dynamic Systems—Transforms, concepts of control, and feedback, controllability, observability, and canonical forms. Nonlinear system analysis; stability, Liapunov functions, general summarizing functions. Introduction to optimal control theory; variational methods, the Ponctagin maximum principle, the Hamilton-Jacobi-Bellman equation. Applications include: Volterra's predator-prey model, genetic transference, the spread of epidemics, optimal resource allocation.

4 units, Spr (Tse) TTh 1:15-2:30

209. Quantitative Methods in Transportation and Urban Service Systems—Quantitative techniques of engineering, management and systems sciences with emphasis on applications in transportation systems analysis (urban, air, ocean, highway, pick-up and delivery systems) and in the planning and design of logistically oriented service systems (e.g., fire and police departments, emergency medical services, emergency repair services). Unified study of functions of random variables, geometrical probability, multi-server queueing theory, spatial location theory, network analysis and graph theory. Discussion of implementation difficulties. Examples of applications: evaluation of technologies for vehicle location, routing and control, controlling randomness in mass transit systems, design of dial-a-ride transportation systems, operation and control of police patrol dispatch strategies. Prerequisite: 221 or equivalent.

3 units, Spr (Chiu) MW 12:45-2

PROBABILITY

221. Probabilistic Analysis—A self-contained development of probability theory that is both theoretically sound and suited to application. Appropriate either as a terminal course or as a foundation for further graduate work in applied areas. Theory presented axiomatically with emphasis on outcome space representation for both discrete and continuous random variables. Discussion of basic concepts, description of random variables, changes of variable, transform techniques, named distributions, and computer simulation. Most enrolling students have had previous probability courses, but they share a desire to learn how to apply probability concepts to problems of uncertainty. The course objective is to provide students with the same understanding and competence in analysis of probabilistic problems that they already possess in dealing with deterministic problems. Prerequisite: working knowledge of calculus.

5 units, Aut (Howard) TTh 11-12:15


3 units, Win (Shachter) MW 9:30-10:45

OPTIMIZATION


4 units, Aut (Shachter) TTh 9:30-10:45


4 units, Spr (Shachter) MW 9:30-10:45
248. Dynamic Programming—The discrete-time dynamic optimization problem. Bellman's principle of optimality. The basic computational procedure. Advanced computational procedures, including successive approximations, approximations in policy space, dynamic programming with shift vectors, and state incremental dynamic programming. Dynamic programming for continuous time systems and the calculus of variations. Linear systems. Dynamic programming for stochastic and adaptive systems. Applications in system expansion planning, operations research, process control, power systems, environmental systems, and trajectory optimization.

3 units, Aut (Larson) MW 1:45-3:15
alternate years, given 1983-84

253. Optimal Dynamic Systems—Development of optimal control theory and its applications to social, economic, and life systems. Pontryagin maximum principle is developed from geometric point of view. Problems with integral and inequality constraints; transversality condition; singular control; linear systems with quadratic cost; discounting cost; infinite horizon problem. Sufficient conditions for optimality. Applications that are discussed in detail include: management of renewable resources, dynamic theory of the firm, control of predator-prey systems, and optimal economic growth. Prerequisite: 201B.

3 units, Aut (Tse)
alternate years, given 1984-85

263. Principles of Optimization—The main objective of this course is to demonstrate that a rather large segment of the field of optimization can be effectively unified by a few geometric principles of linear vector space theory. Introduction to functional analysis; linear vector spaces, normed spaces, Banach space, Hilbert space. Projection theorem in Hilbert spaces with applications to least-square estimation and minimum norm control. Dual spaces and linear functionals, the Hahn-Banach theorem. Convex optimization, duality theory, Kuhn-Tucker theorem with applications to production planning, resource extraction. Prerequisite: 201B or Mathematics 113, Mathematics 115.

3 units, Aut (Tse) MW 9:30-10:45
alternate years, given 1983-84

ECONOMICS

155. Economics of Natural Resources—(Enroll in Economics 155.)
5 units, Spr (Dasgupta)

212A,B. Economic Analysis—Analytic modeling of economic phenomena; methodologies for modeling choices of individual agents, for modeling the interactions among choice-making agents, and for analyzing normative economic models. Models of individual agents include theories of consumers and of firms. Models of interactions include theories of competitive and noncompetitive markets and general equilibrium theories. Normative economic models include those which focus on the conditions for economic efficiency, the mechanisms by which markets may fail to be efficient, and planning rules for improving resource allocation.

First quarter attention devoted to basic theory in a deterministic and static setting. Second quarter focuses on extensions of basic theory to uncertain and/or dynamic environments. Focuses on issues of implementation including model building techniques, project evaluation principles, and private or public project evaluation procedures. Prerequisite: E.E.S. 241 or equivalent. Prior work in microeconomics at the level of Economics 51/151 is helpful but not required.

212A. 3 units, Win (Gilbert)
TTh 9:30-10:45

212B. 3 units, Spr (Gilbert)
TTh 9:30-10:45

214A,B. Public Policy Analysis—An approach to public policy analysis drawing on law, economics, and system analysis in developing a conceptual framework for policy formulation and evaluation. Neoclassical welfare economics used as reference point for studies of property rights, contracts, accident law, antitrust law, and public utility regulation. Political-economic models used to study non-market interactions among business firms, the government, and consumers. Emphasis on rulemaking as a process in which participation of the industry affected by the rules plays a central role. Economic incentives for competition and cooperation among firms in relation to rulemaking and the effects of intra and inter-industry cooperation on the national economy are studied. Student project teams analyze specific policies in depth in the second quarter. Prerequisite: Prior work in microeconomics at the level of Economics 51/151, or concurrent registration in 212A.

214A. 3 units, Win (Dunn)
MW 11-12:15

214B. 3 units, Spr (Dunn)
MW 11-12:15

258. Systems Economics—Discussion of the systems aspects of economic problems, with particular emphasis on principles and techniques for dealing with complex investment opportunities. The general objective is to relate economics, finance, and systems concepts to complex investment problems. The course, which is partly tutorial and partly research-oriented, consists of presentations by faculty.
DECISION ANALYSIS

231. Decision Analysis—Development of a normative rationale for individual and group action in the face of uncertainty, complexity, and dynamism. Presentation of the procedures necessary to reduce the rationale to practice. Encoding of information and preferences. Discussion of utility measures of risk preference and discounting measures of time preference. Analysis of problems using decision trees that include risk and time preference. Determination of the economic value of perfect and imperfect information on one or several variables in a decision problem. Design of economic information-gathering experiments. Presentation of examples that range over the fields of business, engineering, law, and medicine. Applications drawn from private and public sectors of the economy. Prerequisite: Knowledge of basic probability (221 or equivalent).

3 units, Win (Howard) TTh 11-12:15

232. Advanced Decision Analysis—Extension of decision analysis beyond the basic paradigm. Emphasis on determining and extending the boundaries of logical analysis of decisions. Discussion of such representative topics as creation of alternatives; the encoding of subjective information without bias; foundations of inference; invariance and exchangeability principles; relationship of decision analysis to classical inference and data analysis procedures; analysis of complex preference structures; normative preference principles; repetitive, iterative, and decentralized decision systems; value of information in special contexts; use of experts; competitive and social decision analysis; sensitivity and approximation; and decision analysis in dynamic processes. Content will vary with current research interests. Prerequisite: 231.

3 units, Spr (Howard) Th 2:15-3:45

233. Strategic Decision Analysis—Extension of concepts of decision analysis to decision problems that are not yet suitable for decision analysis, either because they are still vague concerns or because their scope extends across customary fields of activity of the individual or the organization. Presentation and examination of formal approaches to the identification, formulation, and resolution of strategic decision problems. Discussion of responsibilities of the analyst for the creation and evaluation of the decision basis. Development of procedures for treating the complex dependency relations often present in strategic decision problems. Prerequisite: 231.

3 units, Spr (Luenberger) T 2:15-3:30

234. Decision Analysis and Artificial Intelligence—Advanced modeling techniques for decision analysis. Introduction to artificial intelligence for use in the design of decision systems. Topics covered include knowledge representation and symbolic modeling, search algorithms and heuristics, automatic theorem proving, rule-based systems, and planning systems. Discussion of the use of expert systems to aid decision making. Specific content varies with current research interests. Prerequisites: 231 and a working familiarity with computer programming.

3 units, Aut (Howard) T 1:45-5

236. Decision Analysis Practice—Provides an opportunity for students trained in the theory of decision analysis to apply that knowledge in practice, and also to extend the domain of rational analysis. Teams of students each analyze a current decision problem faced by an actual decision maker. They must carry out the technical procedures of modeling, information assessment, and value encoding by communicating with individuals who are usually not trained in logical analysis. Problems chosen by students have covered every level of decision-making from the university to the community of nations, and many fields of human endeavor. Project evaluations are based solely on the professional quality of analysis and presentation. Prerequisite: 231.

4 units, Spr (Matheson) TTh 11-12:15

238. The Ethical Analyst—The professional analyst who uses his or her technical knowledge in support of any individual, organization, or government is ethically responsible for the consequences of his or her acts. The purpose of this course is to sensitize the individual to ethical issues and to provide him or her with the means to form ethical judgments. The course especially questions the desirability of physical coercion as a means to reach any end. An exploration of human action and relation in society will be conducted in the light of previous thought and used to provoke additional research on the desired form of social interactions. Technical questions such as the bearing of risk and the design of agreements will be carefully examined. Selected issues from the full range of human affairs will be presented and explored to test the student's framework for ethical judgment.

1-3 units, Spr (Howard) T 1:15-3:45
APPLICATIONS AND RESEARCH

206. Decision System Project Course—Class will work together to study recurring decision problem and build prototype system to assist in solution. Emphasis on developing methodology to inform decision-maker, using techniques from core courses. Design and implementation focus on data representation and interactions among different subsystems created by class. Possible generalization of tools for use in future quarters. Prerequisites: Four EES core courses or consent of the instructor.

4 units, Sum (Shachter) TTh 9:30-11

283. Energy Policy Models—Design and application of formal models in the study of strategic public and private sector energy planning problems. The course addresses policy problems involving issues of individual choice, social welfare, technology tradeoffs, resource management, and uncertainty in a national or international setting. Emphasis on the integrated utilization of modeling tools drawn from diverse methodologies and the requirements for successful application in a policy-making context. Focus on the links between art, theory, and practice. Prerequisites: 212A and 212B, 231, and 241 or equivalent.

3 or 4 units, Spr (Weyant) MW 1:15-2:30

287. Voluntary Social Systems—Exploration of the ethical theory, feasibility, and desirability of a social order in which coercion by individuals and government is minimized and in which people pursue ends on a voluntary basis. Topics addressed include: natural rights theory, the non-aggression principle, property rights and homesteading, contracts, defense, and legal remedies; spontaneous order and the free market; the state and interventionism, the hypothesis of reverse results, class theories of the state, historical fallacies; applications to various topics, including help for the needy, victimless crimes, environmental protection, and monopoly and anti-trust; transition strategies to a voluntary society.

1-3 units, Win (Howard) TTh 2-3:15

OTHER COURSES

290. Introduction to Engineering-Economic Systems—Introductory lectures by faculty and research staff describing department research programs.

1 unit, Aut (Staff) Th 4:15

292. Directed Reading and Research in Engineering-Economic Systems—Directed study and research on subject of mutual interest to student and staff member.

1 or more units, any quarter (Staff) by arrangement

293. Seminar in Engineering-Economic Systems—Lectures on research problems and recent results in engineering-economic systems by faculty, students, and visiting specialists.

1 unit, Aut, Win, Spr (Gilbert) T 4:15

294. Thesis and Thesis Research—Limited to students who have established candidacy for the degree of Engineer or Ph.D. A grade of + indicates satisfactory work; no letter grade is assigned.

any quarter (Staff) by arrangement

400 Series. System Research Seminar—Group study of an area of current system research. Topics may include areas of theory as well as areas of applications. Topics will be announced on a quarterly basis. In 1981-1982 the following seminars were held: Seminar on Economics and Systems (Agnew), Seminar on Nontechnical Aspects of Engineering (Martin)

1 or more units, Aut, Win, Spr (Staff) by arrangement

INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT

Emeritus: Eugene L. Grant, W. Grant Ireson, Robert V. Oakford, David A. Thompson (Professors)

Chairman: Warren H. Hausman


Associate Professors: James V. Jucker, Modesto A. Maidique

Assistant Professors: Kathleen M. Eisenhardt, James E. Hodder, Hau L. Lee, Elisabeth Paté-Cornell, Robert I. Sutton

Professor (Teaching): Robert McGinn

Lecturer: Charles F. Banfe

Affiliated Faculty: Professors: Frederick S. Hillier, Charles A. Holloway, Douglass J. Wilde, Richard S. Shevell, Arthur F. Veinott

By Courtesy: Gayton E. Germane, Steven C. Wheelwright.

PROGRAMS OF STUDY

Industrial Engineering is concerned with how best to organize people, information, money, and materials to produce and distribute services and products. Depending on the degree level, students are prepared to design manage, perform research on, or teach about productive systems which may be in private, industry, federal, state or local government, o
in public, quasi-public, or non-profit institutions.

Engineering Management is concerned with the knowledge and processes required to manage technically based enterprises.

UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE

The program leading to the degree of Bachelor of Science in Industrial Engineering is stated earlier under the School of Engineering. This curriculum is planned to serve those students whose long-run objective is the planning, designing, and implementing of complex economic and technological management systems where a scientific and engineering background is necessary or desirable. The fundamentals of engineering are stressed. The Industrial Engineering program is designed to introduce the student to measurement and control theory, organization theory and behavior, management, economic analysis and modeling, facilities planning and design, and utilization of computers and information systems. The objective is to provide the student with systems concepts, the role and function of management, methods of analysis, and the human and economic factors that bridge the gap between pure engineering design and pure management. To achieve the objective, the student will take several courses in which group projects comprise an important part of the course. In these projects, the student has the opportunity to formulate and solve problems and implement solutions for firms and organizations in the surrounding community.

Many students completing the bachelor's program will wish to pursue graduate study in industrial engineering, in other professional schools—law, medicine, or business—or in fields related to industrial engineering such as economics, statistics, or operations research.

GRADUATE PROGRAMS

The Department of Industrial Engineering and Engineering Management, in collaboration with other departments of the University, offers programs leading to the degrees of Masters of Science, Engineer, and Doctor of Philosophy in Industrial Engineering and to the degree of Master of Science—Engineering: Engineering Management.

Applicants for admission as graduate students in Industrial Engineering and Engineering Management must submit the results of the verbal, quantitative, and analytical aptitude parts of the Graduate Record Examination.

MASTER OF SCIENCE

The Master of Science degree programs require a minimum of 45 units beyond the equivalent of a Bachelor of Science degree at Stanford. All programs represent substantial progress in the major field beyond the equivalent of a bachelor's degree.

INDUSTRIAL ENGINEERING

The Master of Science program is designed to provide sufficient additional skills over the B.S. course in Industrial Engineering to better prepare students for a professional career. It is also designed to prepare students with bachelor's degrees in other engineering disciplines to learn more about production and distribution systems. An additional use of the master's degree is as a step toward a second advanced degree.

The requirements for the Master of Science degree may be obtained from the Department of Industrial Engineering and Engineering Management.

All Master of Science degree programs must contain certain core courses unless the student has already had equivalent courses before entering the Industrial Engineering graduate program. Only 20 units of these core courses may be applied toward the 45 units required for the M.S. degree.

Any student admitted to graduate standing on the basis of a bachelor's degree in a field other than engineering must complete 45 units of work as outlined above, but must also have successfully completed or must complete the equivalent of 45 units of mathematics, science and engineering breadth. In addition, the student must be sure that he or she has complied with the prerequisites for the courses listed on the program for the M.S. degree.

ENGINEERING: ENGINEERING MANAGEMENT

The Master of Science degree in Engineering with a concentration in Engineering Management is designed to provide knowledge of the process of management as applied to technically-based enterprises and to provide additional skills in the student's basic engineering discipline. It is intended for students with the B.S. or M.S. degree in engineering disciplines other than Industrial Engineering (those with a B.S. degree in I.E. should pursue their M.S. in I.E.). It should be considered a terminal degree and not a step toward a second advanced degree. The Ph.D. is not offered in Engineering Management. Those students who expect
eventually to pursue an M.B.A. degree should not apply. Students interested in management of construction or Civil Engineering Infrastructure should apply to the Civil Engineering department at Stanford.

The Degree of Master of Science in Engineering with a concentration in Engineering Management requires 30 units of specified courses in the Engineering Management area and a coherent package of 15 additional units of coursework typically in the student’s technical area (beyond the previous degree level). A sample program outlining detailed requirements for the degree is available from the department of Industrial Engineering and Engineering Management. This program should be of particular interest to Honors Cooperative students.

ENGINEER

The Engineer degree is designed for students desiring the maximum academic preparation for a career of professional practice in the activities and areas described previously.

The Engineer degree requires two years of academic work beyond the bachelor’s degree. Normally a program of study for the Engineer degree will include the courses required for the M.S. plus approximately 30 units of additional courses of a more advanced level and a thesis. Up to 15 units may be allowed for the thesis. The purpose of the thesis is to prove the professional competence of the candidate and not necessarily to make an original contribution to knowledge.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy in Industrial Engineering is for students who desire careers in teaching or in research, rather than in professional practice.

The degree of Doctor of Philosophy is offered under the general regulations of the University. The program requires a minimum of three years (nine quarters) of graduate study, at least two years of which must be at Stanford. The first year of study is usually represented by the M.S. program. A minimum of three quarters of half-time service as a teaching assistant is required. The completion of an acceptable dissertation may occupy most of the candidate’s third year of study.

The program of study will be arranged by the candidate with the advice of a Faculty Committee of three, appointed by the department head and having as chairman the faculty member who will direct the thesis work. The final program must be approved by the department.
approaches will be covered. Prerequisites: 100, 121.

3 units, Spr (Jucker, Sutton) MWF 10

133. Industrial Accounting—Introduction to basic accounting concepts and operating characteristics of accounting systems. Principles of financial and cost accounting, design of accounting systems, techniques of analysis and cost control. Course is designed for the user of accounting information and not as a first course for those preparing for careers as professional accountants. Interpretation and use of accounting information for decision making is stressed. Students who have taken or are taking another University course in elementary accounting should not enroll.

3 units, Aut (Riggs and Staff) MWF 8 or 12 or 1:15 or 4:15

Spr (Staff) MWF 11

141. Utilization of Computers—Some background necessary for the effective use of computers in industrial engineering and management problems. Basic techniques used in data processing, information systems, and optimization are stressed. Topics covered include data representation, metaprograms, searching, sorting, list processing, network problems, and branch and bound. Prerequisites: Computer Science 106 or its equivalent.

3 units, not given 1983-84; refer to Computer Science 107

144. Simulation—The design, creation, and analysis of simulations. The use of simulation for estimation, comparison of policies, and optimization. Emphasis is primarily on applications in the areas of production and management. Prerequisites: 121, 141 or Computer Science 107 and Operations Research 153 or their equivalents.

3 units, Spr (Jucker) MWF 9

161. Engineering Economy—(Enroll in Engineering 161.)

180. Senior Project — Organizations — Each student will participate in a major project as a member of a group of four students. Special attention will be given to problem identification and definition, and emphasis will be put on synthesizing feasible solutions to real problems. Restricted to I.E. majors in their senior year not enrolled in either 180 or 186. Not open to graduate students. Designed as a sequel to 235.

3 units, Win (Maidique, Paté-Cornell) TTh 11-12:15

186. Senior Project—Production—Each student will participate in a major project as a member of a group of four students. Special attention will be given to problem identification and definition. Students will be expected to apply analytic methodology obtained from previous course work, when appropriate; but the emphasis will be on synthesizing feasible solutions to real problems. Restricted to I.E. majors in their senior year not enrolled in either 180 or 183. Not open to graduate students. This course is designed as a sequel to 260. Prerequisite: 260.

3 units, Win (Carlson, Hausman, Lee) TTh 11-12:15

191. Directed Study—Directed study on subject of mutual interest to student and staff member. Student must find a sponsor and submit a one-page description of plan.

1 or more units, (Staff) by arrangement

COURSES PRIMARILY FOR GRADUATE STUDENTS

201. Problem Solving—(Same as Engineering 190.) An investigation of problem solving with particular emphasis on problem definition, creativity, and interpersonal and organizational factors that influence thinking. Common blocks to problem solving will be explored and methods of dealing with them will be presented. The advantages of integrating various problem solving strategies will be stressed through use of reading, abstracted problem situations, and projects. Open to undergraduates and graduates in any field.

3 units, Spr (Adams) TTh 10-12

203. Organizational Behavior and Management—A study of organization theory; concepts and functions of management; behavior of the individual, the work group; and the organization. Substantial emphasis on case and related discussion. Enrollment limited and restricted to graduate students.

3 units, Aut (Jucker) TTh 11-12:50

216. Airline Management—This course is designed to be an action-oriented curriculum concerned with functional airline management in five basic fields: Marketing, Finance, Administration, Operations, and Planning. Airline management problems and techniques will be studied both academically and on airline field
270. Managing Technical Companies—This course focuses on the strategic management and positioning of technological enterprises. Special emphasis is placed on the technological dimension of competitive strategy. During the first part of the course, the concept of technological policy is developed and its dimensions (technology, design, R & D investment, technology licensing and sales, entry to market and R & D organization and policies) are explored through case analyses which provide real life opportunities for analysis, planning, and decision making. The second part of this course focuses on how technical organizations are created and managed with emphasis on new product development and launch. Some of the principal topics considered are managing scientists, corporate venturing, dual-career ladders, creativity, project management, and the technical supervisor. Cases are used extensively. Open to graduate engineers and MBA's. Enrollment limited and at discretion of instructor. Prerequisites: 269 or first year MBA core.

4 units, Spr (Maidique) TTh 11-12:15

271. New Enterprise Management—(Same as Graduate School of Business 353.) This course is offered for students interested in starting a new business and/or participating in the management of a small, ongoing business during its formative stages. Emphasis is on the development and evaluation of realistic, action-oriented business plans to launch new enterprises. Legal, financial and related considerations that are peculiar to new ventures are also discussed. Students, working alone or in small groups, are required to develop a detailed business plan for a specific, proposed new venture. Enrollment limited and at discretion of instructor based upon previous management training and particular new venture being proposed.

4 units, Spr (Staff) by arrangement

290. Risk Analysis Seminar Series — Five seminars per quarter covering a wide range of aspects of risk analysis techniques and applications; assessment problems as well as valuation questions; technical, political, economic, and psychological aspects of risk-benefit decision making presented by speakers from universities as well as industry. No letter grades will be given. Attendance required.

1 unit, Win (Paté-Cornell) Th 4:15-5:30
Spr (Paté-Cornell) Th 4:15-5:30

291. Industrial Engineering Problems—Directed study on subject of mutual interest to student and staff member. Student must find a faculty sponsor.

1 or more units, (Staff) by arrangement
MATERIALS SCIENCE AND ENGINEERING

Emeritus: O. Cutler Shepard (Professor)
Chairman: Richard H. Bube (Professor)
Associate Chairman: William D. Nix (Professor)
Associate Professors: Alan K. Miller, Robert Sinclair
Professors (Research): Robert S. Feigelson, Klaus Heinemann
Lecturers: Alan L. Fahrenbruch, Jeffrey Gibeling, Claus G. Goetzler, Ann Marshall, J. T. Adrian Roberts
Consulting Professors: Robert I. Jaffee, Helmut R. Poppa, Arden Sher, John Stringer
Consulting Assistant Professor: Jeffrey Wadsorth

OFFERINGS

Materials Science and Engineering is concerned with the relation between the structure and properties of materials, factors which control the internal structure of solids, and processes for altering the structure and properties of solids. It brings together in a unified discipline the developments in physical metallurgy, ceramics, and the physics and chemistry of solids. The undergraduate program of the department, described under the School of Engineering, provides training for the physical metallurgist or materials engineer and also preparatory training for graduate work in materials science. Able students are encouraged to take at least one year graduate study to extend their coursework and to obtain training in research. Coterminal degree programs are encouraged both for undergraduate majors in Materials Science and Engineering and for undergraduate majors in related disciplines. Graduate programs lead to the degrees of Master of Science, Engineer, and Doctor of Philosophy.

FACILITIES FOR INSTRUCTION AND RESEARCH

The Materials Science and Engineering department occupies an area of 30,000 square feet in the Thomas F. Peterson Engineering Laboratory building. The laboratory includes modern facilities for teaching and research in physical metallurgy and materials science. Heat-treating furnaces and furnaces for crystal growing are available. Mechanical testing equipment includes hardness measuring devices, variable strain rate machines for mechanical deformation studies, creep machines and equipment for dynamic elastic modulus and internal friction measurements. For studying the structure of solids there are laboratories for optical scanning and transmission electron microscopy. Facilities for X-ray diffraction and fluorescence, and electrical, magnetic and optical measurements are also available.

The department, together with Chemical Engineering and Electrical Engineering, participates in an Institute for Surface and Microstructural Research, a collaborative research effort between Stanford University and the Materials and Physical Sciences Branch of the NASA Ames Research Center.

The department, together with other engineering departments and the Departments of Physics, Chemistry, and Applied Physics, participates in an interdisciplinary Center for Materials Research. The Center provides equipment, service facilities, and funds for faculty and student research. In addition the Center provides 35,000 square feet of space for materials research in the McCullough Building.

Opportunities are also available for research at the Stanford Synchrotron Radiation Project (SSRP). Located at the Stanford Linear Accelerator, SSRP utilizes the extremely intense x-ray and ultraviolet synchrotron radiation produced in the electron-positron storage ring for a large variety of studies of solids, liquids and gases. For more information, see the section describing SSRP in this bulletin.

UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE

The undergraduate Materials Science and Engineering program provides training in solid state fundamentals and in physical metallurgy. Students desiring to specialize in this field during their undergraduate period may do so by following the curriculum outlined earlier under the School of Engineering. The University’s basic requirements for the bachelor’s degree are discussed in the “Degrees” section in this bulletin. Electives are available so that students
with broad interests can combine Materials Science and Engineering with work in another science or engineering department.

GRADUATE PROGRAMS

Graduate students can specialize in any of the areas of Materials Science and Engineering. In collaboration with other departments of the University, additional special programs are available.

MASTER OF SCIENCE

The University’s basic requirements for the Master of Science degree are discussed in the “Degrees” section in this bulletin. The following are general departmental requirements:

1. Completion of the equivalent of the requirements for the B.S. degree in Materials Science and Engineering. Deficiencies in previous training should be made up.

2. Completion of 45 units of an approved program with a minimum grade average of B for course work.

The department offers a variety of programs of study leading to the Master of Science degree. The majority of students take a general program in Materials Science; however, programs are available that specialize in various technological areas of Materials Engineering. The requirements for the M.S. degree programs are itemized below:

1. **Materials Science**
   - This program should be taken by those who wish to pursue a Ph.D. degree in Materials Science and Engineering.
     - a) All courses in the 180 series (18 units) except for students who have had equivalent courses at other universities.
     - b) A minimum of 12 units of advanced course work (beyond the 180 series) in the department (excluding the 202 laboratory series, attendance-only seminars and research and special problems).
     - c) The entire 45-unit master’s program should represent an integrated technical program. Approval of the program by the student’s advisor is reviewed by the Advanced Degree Committee prior to admission to candidacy.

   (A minimum of 6 units and not more than 12 units of Materials Science and Engineering 200 (Special Problems) with a Master’s Research Report approved by two faculty members may be used to satisfy the requirements for the master’s degree.)

2. **Materials Engineering**
   - Additional programs may be designed for those students who wish to obtain a working knowledge of Materials Science and Engineering applied to materials technology. These programs are terminal M.S. programs. A minimum of 24 units in Materials Science and Engineering, including a minimum of 12 units of advanced course work (beyond the 180 series and excluding the 202 laboratory series, attendance-only seminars, and research and special problems), is required in a coherent program directed toward the educational goals of the student, approved by the student’s advisor and the Advanced Degree Committee. Course sequences listed below are illustrative and for the guidance of the student; program-oriented substitutions and changes are possible with approval.

MECHANICS OF MATERIALS

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.&amp;E. 185</td>
<td>Mechanical Behavior of Solids</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 203</td>
<td>Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 205</td>
<td>Strength and Microstructure</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 238</td>
<td>Fracture of Solids</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 249</td>
<td>Time-dependent Plasticity</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 238A,B</td>
<td>Theory of Elasticity</td>
<td>6</td>
</tr>
<tr>
<td>Mech. Engr. 200A,B</td>
<td>Math. Methods (or equivalent)</td>
<td>6</td>
</tr>
</tbody>
</table>

ELECTRICAL, OPTICAL, AND MAGNETIC PROPERTIES OF MATERIALS

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.&amp;E. 188</td>
<td>Electrical, Optical, and Magnetic Properties of Materials</td>
<td>4</td>
</tr>
<tr>
<td>M.S.&amp;E. 210</td>
<td>Semiconductor Materials Processing</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 215</td>
<td>Photovoltaic Solar Energy Conversion</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 222</td>
<td>Statistical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 322A,B</td>
<td>Quantum Mechanics</td>
<td>6</td>
</tr>
<tr>
<td>M.S.&amp;E. 233</td>
<td>Quantum Theory of Energy States in Solids</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 234</td>
<td>Electronic Transport in Solids</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 235</td>
<td>Photoelectronic Properties of Solids</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 332</td>
<td>Optical Properties of Solids</td>
<td>3</td>
</tr>
</tbody>
</table>

ELECTRICAL, OPTICAL, AND MAGNETIC PROPERTIES OF MATERIALS

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.&amp;E. 188</td>
<td>Electrical, Optical, and Magnetic Properties of Materials</td>
<td>4</td>
</tr>
<tr>
<td>M.S.&amp;E. 210</td>
<td>Semiconductor Materials Processing</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 215</td>
<td>Photovoltaic Solar Energy Conversion</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 222</td>
<td>Statistical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 322A,B</td>
<td>Quantum Mechanics</td>
<td>6</td>
</tr>
<tr>
<td>M.S.&amp;E. 233</td>
<td>Quantum Theory of Energy States in Solids</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 234</td>
<td>Electronic Transport in Solids</td>
<td>3</td>
</tr>
<tr>
<td>M.S.&amp;E. 235</td>
<td>Photoelectronic Properties of Solids</td>
<td>3</td>
</tr>
<tr>
<td>Elec. Engr. 332</td>
<td>Optical Properties of Solids</td>
<td>3</td>
</tr>
</tbody>
</table>

ENGINEER

The University’s basic requirements for the degree of Engineer are outlined in the “Degrees” section in this bulletin. The following are departmental requirements:

1. Completion of the substantial equivalent of the requirements for the Master of Science degree in Materials Science and Engineering.
2. Completion of an acceptable thesis and 15 units of approved advanced course work beyond the requirements of the Master of Science degree.
3. A program of study should be submitted to the department for approval prior to the end of the third quarter at Stanford.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree are outlined in the "Degrees" section in this bulletin.

The following are departmental requirements:
1. Complete the substantial equivalent of the requirements for the Master of Science degree in Materials Science and Engineering.
2. Pass a departmental oral qualifying examination one year after admission.
3. Graduate students working toward the Ph.D. degree must submit a program of study to the department prior to the end of the student's third quarter at Stanford. The program should contain at least 72 course units beyond the B.S. degree and should include the following:
   a) All courses in the 180 series or their equivalent. These must be taken on a letter grade basis.
   b) Completion of 6 units of Materials Science and Engineering 202A, B, and C (Materials Science Laboratory), except for students who have had equivalent experience.
   c) A minimum of 36 units of advanced course work which, when taken as a group, comprise a coherent and well-designed program leading to proficiency in a certain area of Materials Science and Engineering. These courses are to be taken for a letter grade and must include a minimum of 21 units of graduate courses within the Materials Science and Engineering department.
4. Maintain a grade average of B for all course work taken as a graduate student at Stanford.
5. A candidate must present the results of his or her dissertation at a departmental seminar prior to his University Oral Examination.

COURSES

05. The Microscopic World of Technology—(Enroll in Engineering 05.)
50. Introductory Science of Materials—(Enroll in Engineering 50.)
51. Materials Technology for Structural Applications—(Enroll in Engineering 51.)
52. Materials Engineering of Microelectronic Devices—(Enroll in Engineering 52.)
100. Undergraduate Special Problems — Independent study in Materials Science under supervision of a faculty member.
   1 to 3 units, any quarter (Staff), by arrangement
150. Atomic Arrangements in Solids—(For undergraduates, see 180 for description.)
   5 units, Aut (Sinclair) MTWTh 10, M 2:15-5:15
151. Thermodynamic and Phase Equilibria—(For undergraduates, see 181 for description.)
   5 units, Aut (Staff) MTWThF 9
152. Rate Processes in Materials—(For undergraduates, see 182 for description.)
   4 units, Spr (Shyne) MTWF 9
155. Mechanical Behavior of Solids—(For undergraduates, see 185 for description.)
   4 units, Win (Nix) MWF 9, T 1:15
158. Electrical, Optical and Magnetic Properties of Materials—(For undergraduates, see 188 for description.)
   5 units, Win (Bube) TTh 9:30-11:15, M 4
160, 161, 162. Experimental Methods in Materials Science—(For undergraduates, see 202 A, B, C for description.) 160 equivalent to 202B; 161 equivalent to 202A; 162 equivalent to 202C.
170. Undergraduate Research—Participation in a research project.
   3-6 units, any quarter (Staff) by arrangement
180. Atomic Arrangements in Solids—Description and determination of atomic arrangements in perfect and imperfect crystals, including treatment of formal crystallography, crystalline defects, and diffraction phenomena.
   4 units, Aut (Sinclair) MTWTh 10
181. Thermodynamics and Phase Equilibria—Application of thermodynamics to the control of the properties of materials. Heterogeneous equilibria with emphasis on solids. Prerequisite: elementary thermodynamics.
   4 units, Aut (Staff) MTWTh 9
182. Rate Processes in Materials—Diffusion in solids, structural transitions including recrystallization and liquid-solid and solid-solid phase transformations, property control by microstructural control. Prerequisites: 180 and 181.
   3 units, Spr (Shyne) MWF 10
185. Mechanical Behavior of Solids—Introduction to the mechanical behavior of solids

4 units, Win (Bube) TTh 9:30-11:15

200. Graduate Special Problems.
any quarter (Staff) by arrangement

201. Principles and Methods of Crystal Growth—Main emphasis on principles and qualitative understanding. Broad look at the important phenomena involved in the growth and perfection of crystalline solids from the melt, solution, vapor or electro-deposition, etc. Application to electrical, metallurgical, chemical, geological and medical fields. Discussion of relative merits of different crystal growth techniques.

3 units, Aut (Tiller) TTh 11-12:15

202A,B,C. Experimental Methods in Materials Science—Laboratory course involving experimental techniques in different areas of materials science. Typical experiments are listed below: 202A: Experiments on the thermodynamics and kinetics of materials including phase diagram determination, diffusion, oxidation, phase transformations. 202B: Structural characterization by optical microscopy, scanning electron microscopy, x-ray diffraction and electron diffraction. 202C: Experiments on the mechanical, electrical, optical and magnetic properties of solids. Prerequisites: previous concurrent registration in the Materials Science and Engineering 180 series or their equivalent.

2 units, Aut (Shyne) T 1:15
Win (Sinclair) T 4:15
Spr (Nix, Bates) M 4:15


3 units, Spr (Barnett) MWF 9

204. Energy Storage—Technical principles and phenomena involved in various approaches to energy storage in both small devices and large systems, such as utility and solar system load levelling and vehicular applications. Electrochemical, chemical and thermal, mechanical, and magnetic energy storage systems. Current status and problem areas, fundamental limits, economic aspects, and potential prospects. Prerequisite: Engineering 50.

3 units, Win (Huggins) MWF 1:15
given 1984-85

205. Strength and Microstructure—Mechanical properties of solids as viewed by the materials scientist or physical metallurgist. Basic aspects of dislocation theory and the role of dislocations and other defects on mechanical behavior of solids. The elastic, anelastic, and plastic properties of solids, stressing the relation between the internal structure of solids and the corresponding mechanical properties. Methods of hardening materials and mechanisms of hardening. Specific mechanical properties such as fracture, fatigue, and creep. Application of the concepts developed will be made to materials useful in technology. The course is directed primarily toward non-materials science majors. Prerequisite: upper division or graduate standing in Engineering or Science.

3 units, Aut (Sherby) MWF 8


3 units, Aut (Nix) MWF 9


208. Computer Techniques in Experimental Materials Science—Introduction to computers and languages; communication between the computer, peripherals and instruments; data acquisition techniques; digital and analog control of experiments; and data analysis techniques.

3 units, Sum (Staff) by arrangement

trips. There will be extensive use of case studies and project studies with airline executives.

4 units, Spr (Banfe) MF 3:15-5:05


3 units, Aut (Oakford) TTh 10-11:50

235. Introduction to Financial Decisions—(Same as Economics 112.) This course focuses on the models and techniques in financial decision-making under uncertainty. Topics covered include risk measurement, expected utility theory, decision trees, and portfolio and capital market theories. The effects of taxation and inflation are also discussed. Prerequisites: 133, Engineering 161, Operations Research 152, and Statistics 116. Enrollment limited and at discretion of instructor.

3 units, Aut (Staff) MWF 9
Win (Hodder) MWF 10

237. The Firm in the International Economy—The response of firms to international economic forces. Exposure to exchange rate movements, trade barriers, and international taxation. Implications for accounting, financial and production practices. Prerequisites: 235 (required) and Economics 165 (recommended). Enrollment limited and at discretion of instructor (preference given to students with recommended prerequisite).

3 units, Spr, (Hodder) MWF 9

240. Engineering Risk-Benefit Analysis—Techniques of analysis of engineering projects involving a trade-off between risks (technical, human, environmental, etc.) and benefits. The course has four parts: elements of decision analysis; reliability analysis and probabilistic techniques (fault trees and event trees); economic analysis of failure consequences (including property damage, financial loss, and human casualties); and case studies. The case studies (such as safety of nuclear power plants, liquefied natural gas terminals, and dams) are designed to be of interest to the students of several engineering departments. The emphasis is put on the questions of human safety for decisions of the public and the private sector. Prerequisites: Statistics 116 and Engineering 161 or equivalent.

3 units, Spr (Paté-Cornell) MWF 11

242. Financial & Organizational Control—A survey of design strategies for rewards, structures, and performance evaluation systems in organizations. Approaches from economics/accounting, and the behavioral sciences are used. Prerequisites: 100 or 203 and 133. Enrollment preference to IE/EM graduate students and seniors, and is at the discretion of the instructor.

3 units, Win (Eisenhardt) TTh 1:15-2:30

260. Analysis of Production Systems I—Introduction to the design, operation, and control of production systems using mathematical, computational, and other modern analytical techniques. Areas investigated will include capabilities and costs of production systems, determination of optimal facility location, determination of production lot sizes, and optimal timing and sizing of production capacity expansion. Prerequisites: 121 (recommended); Operations Research 152, Engineering 161, Statistics 116 (required).

3 units, Aut (Carlson) TTh 9:30-10:45
Win (Staff) TTh 9:30-10:45

261. Analysis of Production Systems II—Scheduling and control of production—inventory systems. Demand forecasting, inventory control, production scheduling, aggregate production and work force planning, materials requirements planning and integrated systems. Prerequisites: 260 and Operations Research 153.

3 units, Spr (Staff) MW 1:15-2:30

262. Analysis of Production Systems III—Design and operation of production—inventory systems. Production scheduling, capacity planning, plant location, sequencing, assembly line balancing, multigoal optimization. The reading material will be drawn primarily from journal articles. Prerequisite: 260.

3 units, Spr (Carlson) TTh 9:30-10:45

269. Industrial Management—The operations elements of business strategy (marketing, manufacturing, and R & D) are analyzed as they relate to industrial (as contrasted with consumer) products and services. The course focuses on real life industrial settings in which an executive is faced with important create, make, or market decisions. Some of the major topics addressed are: plant location, processing technology, vertical integration, technology selection, product design, R & D organization, pricing, channels of distribution, sales organization, promotion, communication and response to competitive actions. Throughout the course, the interaction of functional policies and overall corporate strategy is stressed. Cases are used extensively. Open to graduate students only. Enrollment limited and at the discretion of
boundary value problems using separation of variables and related methods. Elementary complex variables, matrix and tensor analysis with applications to problems of interest to materials scientists.

3 units, Aut (Barnett) MWF 11

given 1984-85

210. Semiconductor Materials Processing—
Basic principles of the synthesis processing of elemental and compound semiconducting materials and techniques for characterizing structural defects in semiconductors. Topics include: thermodynamic and kinetic considerations in crystal growth from the liquid and by chemical vapor deposition; structural characterization techniques such as scanning and transmission microscopy, x-ray topography, photoluminescence and mass spectroscopy; and analytical techniques used to study failures in processing and in service. Field trips will be made to observe industrial processing operations. Prerequisite: Engineering 52 or Electrical Engineering 111 or equivalent.

3 units, Win (Tiller) MWF 11

213. Structural Materials for Nuclear Power Systems —
Fundamental material responses of the major load-bearing components of fission and fusion reactors to their thermal, irradiation, and chemical environments. Examples of components and design-limiting behavior: creep, swelling, and stress-corrosion cracking of fuel element cladding; radiation embrittlement of pressure vessels; corrosion and stress-corrosion cracking of piping, heat exchangers, and turbines; blistering and fatigue of fusion first wall materials. Prerequisite: Familiarity with mechanical behavior of materials.

3 units, Win (Roberts) MWF 10

given 1984-85

215. Photovoltaic Solar Energy Conversion—
This course discusses the fundamental of solar cells as well as pertinent disciplines including electronic properties of materials, semiconductor junction theory, and crystal and film growth. The Si single crystal, AlGaAs/GaAs heterojunction, and Cu3S/CoS thin film cells are described in detail as examples of the basic types of solar cells. Prerequisites: 188 (may be concurrent) and Electrical Engineering 112 or equivalent or by permission.

3 units, Spr (Fahrenbruch) TTh 2:30-3:45


3 units, Aut (Shyne)

alternate years, given 1984-85

222. Statistical Thermodynamics—
Systematic development of the methods of statistical mechanics with application to problems in Materials Science. Prerequisite: 181.

3 units, Aut (Sher) TTh 1:15-2:30

226. Electrochemistry and Corrosion—
Development of electrochemical principles with application to corrosion, electrolytic processes, and galvanic cells. Prerequisites: elementary thermodynamics.

3 units, Spr (Stevenson) TTh 10

plus lab by arrangement

227. High Temperature Oxidation and Corrosion of Metals—

3 units, Win (Stringer) MWF 10

230. Materials Science Colloquium.

1 unit, Aut, Win, Spr (Barnett, Bates, Huggins) F 3:30

232. Solid State Ionics—
Structure of point defects in crystalline and noncrystalline solids. Defect equilibria and transport; influence of chemical and electrical potentials, interfaces, association. Solid-state electrochemical transducer systems and effects; compositional and structural control. Various scientific and technological applications including sensors, batteries and fuel cells. Prerequisites: Engineering 50 and MSE 181 or equivalent.

3 units, Spr (Huggins) MWF 1:15

233. Quantum Theory of Energy States in Solids—
Applications of wave mechanics and approximate methods of atomic systems, free electron model of metals, and energy bands in one and three dimensional crystals. Prerequisite: 188 or Electrical Engineering 322A.

3 units, Spr (Bates) TTh 1:15-2:30

234. Electronic Transport in Solids—
Time dependent wave mechanics and wave packets. Electrical conductivity, mobility and scattering processes. Interpretation of the Boltzmann equation for galvanomagnetic, thermal, and thermoelectric processes in metals and semiconductors. Localized levels and Fermi level analysis of semiconductors. Prerequisite: 233 or Electrical Engineering 322B.

3 units, Aut (Bube) MWF 2:15

given 1984-85

235. Photoelectronic Properties of Solids—
Selected topics in photoelectronic properties of solids, including photoconductivity, luminescence, photovoltaic effects, and methods of photoelectronic analysis of ordered and dis-
236. Modern Imaging Techniques in Materials Science—Currently important methods of directly examining the microstructure of materials are surveyed. The following topics are covered: optical microscopy, scanning electron microscopy, field-ion microscopy, transmission electron microscopy, x-ray topography and scanning transmission electron microscopy. Emphasis is placed on the electron-optical techniques. Prerequisite: 180.


238. Fracture of Solids—The stress fields about elastic cracks developed from both a conventional elastic and a dislocation approach. Energy of deformation and the Griffith-Irwin brittle fracture criterion, and the extensions to incorporate small-scale plastic yielding. Fracture toughness testing. Microscopic mechanisms of crack nucleation and propagation; mechanisms of ductile fracture. Prerequisites: 185, 203


243. Transmission Electron Microscopy—Image formation and interpretation is covered in detail. The contrast phenomena associated with perfect and imperfect crystals are discussed both from a physical point of view and from a formal treatment of electron diffraction theory. The importance of electron diffraction to systematic analysis is emphasized and recent imaging developments are described. Prerequisite: 180.

244. Failure Analysis—A study of techniques and methods used in the analysis of failures in the field of materials science and engineering. Topics covered include optical and electron fractography, localized chemical analysis, x-ray techniques, voltage contrast scanning electron microscopy, nondestructive testing methods, and selected case studies from the areas of mechanical properties and solid state electronics.

245. Dislocation Dynamics—A study of dislocation dynamics and the mechanics of yielding in crystalline solids; delayed yielding and dislocation multiplication yield point phenomena; theoretical treatments of dislocation mobilities in imperfect crystals.

247. Mechanisms of Fatigue—A study of the mechanisms of fatigue of metals. Topics include a phenomenological description of cyclic deformation and fatigue life rules, dislocation processes in cyclic deformation including persistent slip band formation, nucleation of fatigue cracks and stage I growth, continuum or stage II crack growth, threshold effects and high temperature fatigue.

248. Photoelectronic Materials and Devices Laboratory—(Enroll in Electrical Engineering 330.)

249. Time-Dependent Plasticity—Theories and mechanisms of creep. Temperature and strain rate effects on plastic flow of solids. Relation of high temperature strength and ductility of materials to structure. Prerequisite: 185 or 205 or Engineering 50.

250. Life Prediction in Engineering Structures—Modelling of deformation and fracture in metals and alloys, emphasizing methods for quantitative predicting failure of structural materials under complex histories and environments. Specific topics include the modelling of creep and plastic deformation (constitutive equations), fatigue crack initiation and propagation, stress corrosion cracking, and ductile rupture. Various types of life prediction methodologies are covered, ranging from conventional design rules to advanced physical-phenomenological computer models based on internal state variables. Prerequisite: 185 or 205.

253. Transmission Electron Microscopy Laboratory—Experimental application of electron microscopy to typical problems in materials science, including specimen preparation, mic-
176 SCHOOL OF ENGINEERING

Scanning Electron Microscope operation and alignment, recording and analysis of bright and dark field images and diffraction patterns, dislocation and stacking fault characterization, precipitate identification.

3 units, Aut, Win, Spr (Marshall) by arrangement

255. Advanced Experimental Techniques in Surface Analysis—Auger electron spectroscopy and microanalysis, secondary ion mass spectroscopy (SIMS), low energy electron diffraction (LEED), ion scattering spectroscopy, thermal desorption spectroscopy, electron stimulated desorption, work function measurement, in-situ transmission electron microscopy. Course includes visits at off-campus laboratories.

3 units, Spr (Staff) TTh 10-11:15

257. Fatigue of Metal Structures—(Enroll in Mechanical Engineering 245.)

258. Optical Properties of Solids—(Enroll in Electrical Engineering 332.)

259. Basic Quantum Mechanics—(Enroll in Electrical Engineering 322A.)

260. Basic Quantum Mechanics—(Enroll in Electrical Engineering 322B.)


3 units, Win (Stevenson) TTh 11:20-12:35

300. Research.

any quarter (Staff) by arrangement

341. Seminar in Mechanical Properties of Solids.

1 unit, Aut (Nix) M 4
Win (Miller)
Spr (Sherby)


1 unit, Aut, Win, Spr (Huggins) Th 4:15

343. Seminar in Photoelectronic Materials and Photovoltaic Cells.

1 unit, Aut, Win, Spr (Bube) Th 12:15


1 unit, Aut, Win, Spr (Stevenson) by arrangement


1 unit, Aut, Win, Spr (Sinclair) by arrangement

MECHANICAL ENGINEERING

Emeriti: Wilhelm Flügge, Henry O. Fuchs, Boynton M. Green, Miklós Hétényi, Erastus H. Lee, A. Louis London (Professors)

Chairman: Charles H. Kruger (Professor)

Associate Chairman: Thomas J. Connolly (Professor)

Division Chairmen: George Herrmann (Applied Mechanics), Robert J. Moffat (Thermosciences) (The Design Division operates without a chairman.)

Laboratory Directors: Daniel B. DeBra ( Guidance and Control), Ronald K. Hanson, (High Temperature Gasdynamics), Robert J. Moffat (Thermosciences), Larry J. Leifer (Smart Product Design)


Associate Professors: Larry J. Leifer, Drew V. Nelson

Assistant Professors: Brian J. Cantwell, John K. Eaton, Helen L. Reed

Professors (Research): Dean R. Chapman, Dennis R. Carter, Ronald K. Hanson, Alicia G. Herrmann, Sidney A. Self, Felix E. Zajac


Courtesy Professor: Robert A. Chase

Courtesy Associate Professor: Leslie J. Dorfman

Courtesy Assistant Professor: John J. Csongradi

Affiliated Faculty: John V. Breakwell (Dynamics), James M. Gere (Structures), Matthew S. Kahn (Art), Robert L. Street (Fluid Mechanics)

Consulting Professors: Floyd L. Culler, Anthony Leonard, Chauncey Starr, Harry T. Whitehouse
ORGANIZATION AND OBJECTIVES

The programs in Mechanical Engineering are designed to provide background for a wide variety of careers. The discipline of Mechanical Engineering is very broad, but is generally understood to emphasize an appropriate mix of energy science and technology, applied mechanics, and design. Graduates at all degree levels typically enter various energy industries, into the product manufacturing industries, into government laboratories and agencies dealing with these problems, and a variety of academic situations.

Since Mechanical Engineering is a very broad discipline, many students use the Mechanical Engineering undergraduate program as a springboard for graduate study in medicine, law, political science, and other professions where a good understanding of technology is often very important. The Mechanical Engineering undergraduate and graduate programs provide excellent technical background for persons who want to work in environmental pollution control, transportation, ocean engineering, and other multidisciplinary problems that concern our society. Throughout the various programs, considerable emphasis is placed on the development of systematic procedures for analysis, effective communication of one's work and ideas, practical and aesthetic aspects in design, and on the responsible use of technology. This can provide a student with an approach and a philosophy of great utility, irrespective of an ultimate career.

The department is organized into three divisions: Applied Mechanics, Design, and Thermosciences. Each division maintains its own laboratories, shops, and offices. The Applied Mechanics Division covers the areas of dynamics, mechanics of deformable solids, fluid dynamics and experimental mechanics. The Design Division emphasizes the design process and is specifically concerned with manufacturing technology, automatic controls, analytical and numerical design methods, optimization, design aesthetics, human factors, biomechanics, computer-aided design, microcomputers in design, and systems design. The Design Division also offers undergraduate and graduate programs in Product Design (jointly with the Art Department). The Thermosciences Division offers courses and specialized work in the areas of applied thermodynamics, energy systems, nuclear energy, pollution control, combustion, fluid mechanics, and heat transfer.

Many faculty members of the three divisions are involved in advanced mathematical analyses, and the department as a whole provides a number of basic and advanced courses in applied mathematics.

FACILITIES

All three divisions of the department maintain modern laboratories which are used for both undergraduate and graduate instruction and graduate research work.

The Division of Applied Mechanics provides facilities for laboratory work in experimental mechanics and experimental stress analysis. Additional facilities, including an MTS electro-hydraulic materials test system and a vehicle crash simulator, are available through the School of Engineering Structures and Solid Mechanics Research Laboratory. Laboratories for biological experimentation are available through the School of Medicine and the Palo Alto Veterans Administration Hospital. Individual accommodation is provided for the work of each research student. Weekly seminar meetings acquaint the students with a great variety of subjects in their field, and give opportunity to practice speaking on a selected topic.

Various research projects are conducted in Applied Mechanics. Qualified students participate in these as research assistants, engaged in thesis research, in close working association with the faculty director and fellow students. The projects include original experimental and theoretical investigations in the strength and deformability of elastic and inelastic elements of machines and structures; fracture mechanics, vibrations, and nonlinear dynamics; analysis, synthesis, and control of systems; flow dynamics of liquids and gases, including geophysical and astrophysical applications; and biomechanics.

The Design Division maintains machine, foundry, welding, wood and plastic shops. Laboratory space is available for use in instruction, for construction of projects, and for graduate research work in various disciplines of interest to the Design Division faculty. The School of Engineering Structures Laboratory is used extensively for experimental work in structural mechanics and biomechanics. A Smart Product Design Laboratory supports microprocessor application projects. An affiliation with the Stanford Artificial Intelligence Laboratory provides facilities for computer-aided design projects. The Design Division also has a unique "Product Design Loft," in which students in the Product Design program develop their graduate design projects.

Research and Design/Development opportunities in Rehabilitative Engineering are available at the Veterans Administration Medical
Center in cooperation with the School of Medicine. The program includes graduate assistantships and is managed by members of the Design Division Faculty. Facilities include a VAX 11/780 and two PDP-11/34's dedicated to real-time experiment control, data acquisition and graphics. A unique neural and muscular systems laboratory compliments campus facilities.

The Thermosciences Division has two primary laboratories. The Thermosciences Laboratory is equipped with representative power, fluid handling, refrigeration and heat and mass transfer equipment, and extensive special facilities for advanced graduate research in convective heat transfer and fluid mechanics, turbulence, internal combustion engine research and other work relevant to energy systems, conducted by the Heat Transfer and Turbulence Mechanics (HTTM) group. A VAX-750 computer serves as the central laboratory computer and several MINC-11 minicomputers are dedicated to individual experiments. The High Temperature Gasdynamics Laboratory (HTGL) is engaged in a variety of research activities relating to the practical generation of electrical energy from flowing plasmas, electrostatic precipitators, combustion, chemistry of pollutant formation, and the development of laser-based diagnostics for high temperature gases. Facilities in the HTGL include a large MHD power channel with normal and superconducting magnets, a shock tube, a variety of diagnostic devices for combustion gases and plasmas, and laboratory combustors, including a coal combustion facility. In addition, the Thermosciences Division has a small Environmental Measurements Laboratory which includes a variety of instrumentation for environmental measurements pertinent to energy systems, and a Thermosciences Measurements Center, which houses information on all aspects of measurements. A wide variety of instrumentation, extensive shop facilities, utilities, and research space are all available within and shared by these laboratories.

The Guidance and Control Laboratory, a joint activity with the Departments of Aeronautics and Astronautics and Mechanical Engineering, specializes in the construction of electromechanical systems and instrumentation, particularly where high precision is a factor. Work in this laboratory ranges from robotics for manufacturing to feedback control of carburetors for automotive emission control. The faculty and staff of this laboratory work in close cooperation with both the Design and Thermosciences Divisions on device development projects of mutual interest.

A wide range of computation facilities are available to department students. Three of the department's laboratories are equipped with superminicomputers, two DEC VAXES and a Prime. Numerous smaller minicomputers and microcomputers are used in the research and teaching laboratories. A microcomputer applications development laboratory equipped with several development systems is also available. Free computation is available on the DEC-20 LOTS system while larger computations are possible on the Center for Information Technology's IBM 3033.

The Thermosciences Division includes a group that conducts research, in cooperation with the NASA-Ames Research Center, in computational fluid dynamics, with emphasis on turbulent flows. This group uses NASA's CRAY computer and a most powerful CYBER 205, the two computer systems presently available.

The library facilities at Stanford are also outstanding. In addition to the general library, there are special libraries for Engineering, Mathematics, and Physics, and other departmental libraries, of which engineering students make frequent use. In addition, each division maintains a reading room and small library collection, and specific research collections in the areas of energy, high temperature gasdynamics, fluid mechanics and heat transfer.

Graduate students participating in research are provided with office space in the laboratory buildings, and have access to substantial staff support from their research group.

The Thermosciences Division faculty is deeply involved with activities of Stanford's Institute for Energy Studies. The Institute sponsors seminars, research, and other activities throughout the University, and acts as a focal point for energy at Stanford. The Institute's Energy Information Center, a special library, is located adjacent to the Thermosciences Laboratories.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

Students desiring to specialize in mechanical engineering during their undergraduate period may do so by following the curriculum outlined earlier under School of Engineering. The University's basic requirements for the bachelor's degree are discussed in the "Degrees" section of this bulletin.

A program for Product Design is offered by the Design Division and leads to the degree of Bachelor of Science in General Engineering. It is recommended, however, that this should not be considered a terminal degree and that all students who elect this program continue on through the master's degree in this field.
Grade requirements: In order to be recommended by the department for a Bachelor of Science Degree in Mechanical Engineering, a student must achieve the minimum letter grade average set by the School of Engineering (2.00 in engineering breadth and depth courses). All courses in the Mechanical Engineering Depth Sequence must be taken for letter grades.

COTERMINAL B.S./M.S. PROGRAM

Stanford undergraduates who wish to continue their studies through the Master of Science degree under the coterminal program should petition the department for entrance to the program after the beginning of the eighth quarter of undergraduate work and before the end of the eleventh quarter. The applicant's petition must provide evidence of a strong academic performance as a graduate student. The petition will be evaluated and acted upon by the graduate admissions committee of the department. Typically, at least a 3.25 grade average in engineering, science and math is expected. Applicants must have completed two of 111, 112, 113, 131A, 131B, 131C, and must take the Graduate Record Examination (GRE) before action will be taken on the application.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The master's program normally consists of three quarters of full-time course work; no thesis is required, although many students become involved in research projects during the master's year, particularly to explore their interests in working for the Ph.D. degree.

Admission and Registration—The basic University requirements for the master's degree are discussed in the "Degrees" section of this bulletin.

To be eligible for registration as a graduate student in the department a student must have received a B.S. degree in engineering, physics, or some comparable science program. The student's undergraduate record and personal recommendations must demonstrate capability of handling graduate level work and ability to complete the requirements for the M.S. degree. Students whose undergraduate backgrounds are entirely devoid of some of the major subject disciplines of engineering (for example, fluid mechanics, applied thermodynamics, applied mechanics, ordinary differential equations) may find it desirable to take some undergraduate courses to fill in obvious gaps and prepare themselves to take graduate courses in these areas. Such students may require more than three quarters to fulfill the master's degree requirements, as the make-up courses may not be used for other than the unrestricted electives (see item 4 below) in the M.S. degree program. However, it is not the policy to require fulfillment of mechanical engineering B.S. degree requirements in order to obtain an M.S. degree, and furthermore students who have already fulfilled certain categories of the M.S. degree requirements as a result of their undergraduate work may find they have sufficient time (see item "3" below) to obtain the M.S. degree in the normal three quarters.

Graduate Program—Mechanical Engineering is a varied profession, ranging from primarily aesthetic aspects of design to highly technical scientific research. The discipline areas of interest to mechanical engineers include rigid and elastic body mechanics, materials, fluid mechanics, thermodynamics, heat transfer, nuclear reactor engineering, magneto-hydrodynamics, biomechanics, systems engineering, to name a few. No mechanical engineer is expected to have a mastery of this entire spectrum.

The master's degree program requires 45 units of course work taken as a graduate student. At least 36 of these units must be taken at Stanford; any units transferred from other universities (up to 9 are allowed) must be graduate level courses taken while registered as a graduate student, and may not be applied toward fulfillment of item "2" below. No thesis is required. However, students who desire some research experience during the master's year may participate in research through Mechanical Engineering 290, 291, and 292.

The departmental requirements which must be met for the degree of Master of Science are:

1. Mathematical Competence in two of the following areas: partial differential equations, linear algebra, complex variables, or numerical analysis, as demonstrated by completion of two appropriate courses from the following list: Mechanical Engineering 200-209; Mathematics 106, 113, 131, 132; Computer Science 137A, B. (Requirement—6 units.)

   Students who completed comparable graduate-level courses as undergraduates and who can demonstrate their competence to the satisfaction of the instructors of the Stanford courses may be exempted from this requirement by their advisors, and place the units in the approved elective category.

2. 18 units of graduate-level courses in Mechanical Engineering consisting of:

   a) A Specialty in Mechanical Engineering: A set of graduate-level courses in Mechanical Engineering to provide depth in one area. These sets have been approved by the faculty as providing
180 SCHOOL OF ENGINEERING

depth in specific areas as well as a significant component of applications of the material in the context of engineering. Lists of approved depth packages are available from the Department Office. The currently approved depth packages involve 3 to 4 courses.

b) Breadth in Mechanical Engineering:
1) At least one additional approved mechanical engineering course numbered 210-285 in each of two additional depth areas outside of the depth area selected in item "2a."

2) Additional graduate-level courses, if necessary, in mechanical engineering to bring the total number of graduate course units in mechanical engineering to 18.

Courses 200-209, 280, and 286-301 may not be counted in these categories.

3. Approved electives, to bring the total number of units to 39. All of these units must be approved by the student's advisor. Graduate engineering, math and science courses are normally approved. Advisors may approve upper-level undergraduate courses if consistent with the student's program objectives. Of these 39 units, no more than 6 units may come from Mechanical Engineering 291, 292, and no more than 3 units may come from the other courses numbered M.E. 290-299 or other seminars. A student planning to go on for a Ph.D. degree should discuss with his or her faculty advisor the desirability of taking 291 or 299 during the master's year.

4. Unrestricted electives to bring the total number of units submitted for the M.S. degree to 45. Students are strongly encouraged to use these units outside of engineering, mathematics, or the sciences. Students should consult their advisors for recommendations on course loads and on ways to use the unrestricted electives to make a manageable program.

5. Within the courses satisfying the requirements above, there must be at least one graduate-level course dealing with laboratory studies. Courses which satisfy this requirement are Mechanical Engineering 210C, 218C, 226A, 248A, 248B, 249, 254, 268. Mechanical Engineering 292 will satisfy this requirement if 3 units are taken for work involving laboratory experiments. A student who has had a substantial laboratory experience in an industrial or government research institute may be exempted from this requirement by his advisor.

Candidates for the degree of Master of Science will be expected to have the approval of the faculty, and a minimum letter grade equivalent of 2.75 in the 45 units presented in fulfillment of the degree requirements. All courses used in fulfillment of requirements 1, 2, 3, and 5 must be graded courses (excluding courses numbered Mechanical Engineering 290-299, seminars, and courses for which a pass/no credit grade is given to all students).

Students falling below a letter grade equivalent of 2.50 at the end of 20 units may be disqualified from further registration. Students failing to meet the complete degree requirements at the end of 60 units of graduate registration will be disqualified from further registration. An exception to the 60-unit rule will be units used to fill deficiencies arising from inadequate undergraduate preparation for mechanical engineering graduate work.

Computational Fluid Dynamics—A graduate program in Computational Fluid Dynamics (CFD) is operated jointly by the departments of Aeronautics and Astronautics and Mechanical Engineering. At the master's level this program is an option with the general structure of the master's requirements of each department. At this level, a student interested in a still greater emphasis on CFD may register for the M.S. in Engineering or Engineering Science and design a program, in consultation with the student's advisor, with a stronger component of CFD. Students intending to seek a Ph.D. degree with an emphasis on CFD should prepare for the post-master's series in CFD (Mechanical Engineering 269 and/or Aeronautics and Astronautics 214A,B,C) by planning a M.S. program strong in mathematics and numerical analysis (Mechanical Engineering 200A,B,C or equivalents) and in advanced fluid mechanics (Mechanical Engineering 251A,B, or 258A,B, 261, etc.). Choice of math courses, theoretical and experimental dynamics courses, and electives most suitable for the CFD program should be selected in consultation with the student's advisor.

Product Design—The following one-year graduate program leading to a Master of Science in Engineering (Product Design) is intended for students who have completed Stanford's undergraduate major in this field. Students with undergraduate engineering degrees from other schools usually spend an additional year taking prerequisite undergraduate Product Design courses. The requirements for this degree are:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.E. 211A,B,C</td>
<td>Product Design</td>
<td>12</td>
</tr>
<tr>
<td>*M.E. 211A,B,C</td>
<td>Master's Project</td>
<td>6</td>
</tr>
<tr>
<td>Art 360</td>
<td>Master's Project</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 214</td>
<td>Philosophy of Design</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 221</td>
<td>Man-Machine Systems</td>
<td>3</td>
</tr>
<tr>
<td>**Approved Electives</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Free Electives</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>
MECHANICAL ENGINEERING

MASTER OF SCIENCE IN ENGINEERING OR ENGINEERING SCIENCE

As described in the School of Engineering section of this bulletin, each department in the School of Engineering may sponsor students in the more general degrees, Master of Science in Engineering, or Master of Science in Engineering Science. Sponsorship by the Department of Mechanical Engineering requires that the student file a petition for admission to this program on a Registration Day, and that the center of gravity of the proposed program lie in Mechanical Engineering; no more than 18 units used for the proposed program can have been previously completed. The proposed program must include at least 9 units of graduate level work in the Department of Mechanical Engineering other than Mechanical Engineering 200-209 and 290-292. The petition must be accompanied by a statement explaining the objectives of the program, how it is coherent, contains depth, and fulfills a well-defined career objective. The grade requirements are the same as for the Master of Science in Mechanical Engineering.

POST-MASTER'S DEGREE PROGRAMS

The department offers two post-master's degrees: the Degree of Engineer and the Doctor of Philosophy. These programs are described below. It is very strongly urged that students anticipating working for a post-master's degree arrange to do some research work under M.E. 291 or 292 prior to attempting to make a supervision arrangement. Faculty members supervising post-master's research will generally require some such evidence that a student has research potential before committing themselves to supervision and a research assistantship. It is most efficient to carry out this preliminary research effort during the M.S. degree year.

At their first post-master's registration, students seeking post-master's degrees must report their status of faculty supervision to the department. A student who has not arranged for faculty supervision must petition for registration after completing 45 units of graduate work at Stanford.

ENGINEER

The basic University requirements for the degree of Engineer are discussed in the "Degrees" section in this bulletin.

This degree represents nominally an additional year of study beyond the Master of Sci-
ence degree, and includes a research thesis. This program is designed for students who desire to do professional engineering work upon graduation, and who desire an opportunity to engage in more specialized study than is afforded by the master’s degree alone.

The admission standards for this program are substantially the same as indicated under the master’s degree. However, since thesis supervision is required, and the availability of thesis supervisors is strictly limited, the department cannot admit a student to candidacy until the student has personally arranged with some member of the faculty to supervise a research project. This will frequently involve a paid research assistantship, and research assistantships are awarded by individual faculty members (usually from the funds of sponsored research projects under the direction of individual faculty members) and not by the department, so again a personal arrangement is necessary. Students studying for their master’s degree at Stanford and desiring to continue to the engineer degree ordinarily make such arrangements during their M.S. degree year. Students holding master’s degrees at other universities will be admitted and allowed to register if they are sufficiently well qualified. However, the department cannot guarantee thesis supervision or financial assistance, and the student must make such arrangements during his or her first quarter or two of residence.

The departmental requirements for the degree include an acceptable thesis; up to 15 units of credit will be allowed for thesis work. In addition to the thesis, 30 units of approved advanced course work in mathematics, science, and engineering are expected beyond the requirements for the Master of Science degree; the choice of courses is subject to the approval of the advisor. Students who have not fulfilled the Stanford M.S. degree requirements will be required to do so (with due allowance for approximate equivalence of courses taken elsewhere).

All candidates for the degree of Engineer will be expected to have approval of the faculty and to have a minimum scholastic grade point average of 3.0 for all courses (exclusive of thesis credit) taken beyond those required for the master’s degree.

**Product Design**—A special two-year program in the field of Product Design leads to the degree of Engineer in Mechanical Engineering. It is intended for students who wish to augment in-depth graduate engineering study with education in the aesthetic and human qualities essential in new product development.

A typical program represents course and thesis content equivalent to the Master of Science in Mechanical Engineering plus the Master of Science in Engineering (Product Design). Alternatively, a program of interdisciplinary graduate study may be devised according to guidelines described in the School of Engineering section of this bulletin (e.g., in Biomedical Design, Computer-Based Design, or Man-Machine Systems). The thesis requirement for the degree of Engineer is satisfied mainly by documenting the M.E. 211A,B,C master’s project.

The total of 90 units can normally be completed in two academic years. Students deficient in prerequisite areas may take more time. Students who fulfill requirements for this program are awarded the M.S. in Engineering (Product Design) and Degree of Engineer in Mechanical Engineering (Product Design) simultaneously at its completion.

Admission to the program follows the same requirements as for the master’s degree in Product Design.

**DOCTOR OF PHILOSOPHY**

The basic University requirements are discussed in the “Degrees” section of this bulletin. The Ph.D. degree is intended primarily for students who desire to pursue a career in research, advanced development, or teaching; for this type of work a broad background in mathematics and the engineering sciences, together with intensive study and research experience in a specialized area, are the necessary requisites.

The department will allow a minor field of study, but does not require one. However, if a minor is waived, the candidate must show breadth of training by taking a group of courses in one or more related fields or departments as noted below.

A student studying for the Ph.D. degree ordinarily will not take an Engineer degree, although this is not precluded. However, the student must have a master’s degree, and must fulfill in essence the requirements for the Stanford M.S. degree in Mechanical Engineering.

Admission to the program involves much the same consideration as described under the Engineer degree. A sufficiently well-qualified student from Stanford or elsewhere will be admitted and assigned to an advisor. If the student has not arranged with a faculty member for supervision or research prior to admission, the student’s advisor will assist him or her in making the arrangement. However, the department cannot guarantee research supervision as this involves a personal arrangement between the student and the individual faculty member, and such an arrangement is entirely the responsibility of the student. Once a student has ob
tained a research supervisor, this supervisor becomes thereafter the student's academic advisor. Research supervisors may require that the student pass the departmental oral examination before starting on research work and before receiving a paid research assistantship. Note that research assistantships are awarded by the individual faculty research supervisors and not by the department.

Prior to being formally admitted to candidacy for the Ph.D. degree the student must demonstrate his or her knowledge of engineering fundamentals by passing the departmental qualifying oral examination. The academic level and subject matter of this examination correspond approximately to the Master of Science degree program described above. The examination consists of four oral interviews, one of which must be in mathematics, and the other three are chosen from the areas of controls, mechanical engineering design, fluid mechanics, heat transfer, elasticity, dynamics, high temperature gas-dynamics and combustion, materials, nuclear engineering, or applied thermodynamics. The examination is offered during the autumn and spring quarters and may in addition be offered at other times as the need arises. Normally the examination will be taken during the first post-master's year. A student must have the written approval of a tentative dissertation supervisor (sponsor) in order to be permitted to take the examination. (Sponsorship for the examination carries no implication of financial support.) To apply for the examination a student must have a Stanford graduate letter grade equivalent of at least 3.25. Courses used in the letter grade equivalent evaluation will be the same as those that would be used to meet the M.S. grade average requirement. Students entering Stanford with an M.S. from another school must have a 3.25 grade point average in the M.S. program at the previous school to take the examination in their first quarter at Stanford. After the first quarter at Stanford, such a student must meet the grade point average of 3.25 for courses taken at Stanford.

All students interested in the Ph.D. degree should consult the “Outline of Requirements for the Ph.D. Degree” which contains the current requirements and is available from the department office.

Ph.D. candidates must complete a minimum of 36 units of approved formal course work (excluding research, directed study and seminars) in advanced study beyond the M.S. degree. These courses should consist primarily of graduate courses in engineering and the sciences, although the candidate's reading committee may approve a limited number of upper division undergraduate courses and courses outside of engineering and the sciences, as long as such courses contribute to a strong and coherent program. In addition to this 36-unit requirement all Ph.D. candidates are expected to participate each quarter in one of the following (or equivalent) seminars: Mechanical Engineering 280, 290, 293, 294, 295, 296, 298, Aeronautics and Astronautics 296 or 297.

The Ph.D. thesis normally represents at least one full year of research work and must be a substantial contribution to knowledge. Students may register for course credit for thesis work (Mechanical Engineering 301) to help fulfill University residence requirements, but there is no minimum limit on registered thesis units. Candidates should note that University residence requirements (see section on “Degrees”) are expressed in terms of equivalent full-time registration and not in terms of units per se; questions on this point should be addressed to the departmental administrative assistant.

The department has a Breadth Requirement for the Ph.D. degree. Breadth may be provided either by completion of three courses outside of the four areas taken in the qualifying examination, or by a formal minor in another department. Courses chosen must be approved by the dissertation reading committee.

The final University Oral Examination is conducted by a committee consisting of a chairman, appointed by the University, and four faculty members of the department or departments with related interests. Usually the committee includes the candidate's advisor and the two faculty members chosen to read and sign the candidate's dissertation. The examination consists of two parts. The first part is open to the public and is scheduled as a seminar talk, usually for one of the regular meetings of a seminar series. The second part is conducted in private and covers subjects closely related to the dissertation topic.

A representative timetable for progress toward the Ph.D. degree may be obtained from the Departmental Office. A student wishing to complete the Ph.D. requirements in four years of graduate study should ordinarily complete the M.S. by the spring of the first year, pass the qualifying examination by the fall of the second year, and complete course work, demonstrate feasibility of research methods and obtain approval of the thesis proposal by the end of the third year.

Ph.D. MINOR

Students who wish a Ph.D. minor in Mechanical Engineering should consult the department office for designation of a minor advisor. A minor in Mechanical Engineering may be obtained by completing 15 units of approved grad-
uate level courses in Mechanical Engineering, or by completing 9 units of graduate level courses and passing the Departmental Qualifying Oral Examination in two appropriate areas identified by the minor advisor.

Courses approved for the minor must form a coherent program, and must be selected from those satisfying requirement 2 of the Master of Science program in Mechanical Engineering.

FINANCIAL ASSISTANCE

The department annually awards a number of fellowships, teaching assistantships, and research assistantships to graduate students. The fellowships are usually awarded to first-year graduate students, with the assistantship used primarily for post-master's degree students. Preference for the assistantships is generally given to students who obtain their master's degrees at Stanford. Research assistantships are awarded by the individual faculty research supervisors and not by the department as a whole. Applicants for all three forms of assistance may obtain the necessary application forms from the Department office.

Research assistants can, and normally do, carry out their thesis research work and write their theses as an integral part of the commitments of their assistantships.

FRESHMAN LEVEL COURSES

The following courses offered by the faculty of the department are suitable for freshmen.

Course No. Subject
M.E. 30. Social Aspects of Nuclear Power
M.E. 101. Visual Thinking
M.E. 103. Manufacturing Technology

Note.—Laboratory sections in experimental engineering will be assigned in groups. Insofar as the laboratory schedule permits, students will be allowed, with due regard to priority of application, to arrange their own sections and laboratory periods. Enrollment with the instructor concerned, on registration day or the first day of University instruction, is essential in order that the laboratory schedule may be prepared. Enrollment later than the first week will not be permitted under any circumstances.

30. Social Aspects of Nuclear Power—Course will present an overview of nuclear power industry, with aim of examining bases of public controversy surrounding nuclear power genera-

tion. Technical presentation is descriptive rather than analytical. Course includes: projected nuclear power demands (are they reasonable?); principles of nuclear reactor design (how a reactor supplies energy); different reactor types; breeding; the nuclear fuel cycle; radiological and environmental concerns; reactor safety; nuclear safeguards; and other topics as time permits. Open to any student who has had high school physics or chemistry. Engineering students desiring a more analytical treatment of nuclear reactor technology should take Engineering 176 instead.

3 units, Aut (Staff) TTh 1:15-2:30

32. Introduction to the Thermosciences—(Enroll in Engineering 32.)

33. Introductory Fluids Engineering—Elements of fluid mechanics, introduction to the use of thermodynamics and the momentum principle in the solution of fluids engineering problems selected from but not restricted to flow metering, energy losses in pipe flow, drag on a body, jet engine thrust, operation and performance of turbines, compressors and pumps. Prerequisites: Engineering 3 and 32. Concurrent Engineering 12 suggested, but not required. Limited enrollment Spring Quarter. Students are encouraged to register for Winter section where possible.

4 units, Win (Johnston) MWF 10
4 units, Spr (Reed) Sec. 1, MWF 11
4 units, Spr (Spreiter) Sec. 2, TTh 9:30-10:45
lab MTWTh 1:15-3:05 or 3:15-5:05, or one 2-hour lab by arrangement


3 units, Aut (Verplank, Boyle)
lec and lab
Sec. 1 MW 1:15-3:05
Sec. 2 MW 3:15-5:05

102. Design Communication—Simple design projects form the basis for learning engineering drawing as well as verbal and written communication techniques. Freehand sketching, engineering drawing (orthographic projection), charts, graphs, perspective drawing, the construction of three-dimensional models, and the organization and delivery of verbal-visual presentations. For students with little or no experience in communicating design ideas.

3 units, Spr (Boyle, Della Bona)
MWF 8-10
103. Manufacturing Technology—Fundamentals of machining, welding and casting introduced in lecture and supported by laboratory experience. Emphasis placed on prototype techniques as part of the design process. Manufacturing processes described through lecture, films and field trips. Design aspects are developed in an individual term project which is designed, described in engineering drawings and fabricated by the students. Mechanical Engineering 103D is normally taken concurrently with 103 unless the student has previous experience doing engineering drawing. Enrollment Priorities: (1) Sophomore and junior M.E. majors; (2) other engineering majors taking 103 for breadth; (3) non-engineering majors; (4) others.

3 units, Aut, Win (Beach) T 9 Th 9-11 plus lab by arrangement

103D. Engineering Drawing—Fundamentals of engineering drawing are presented including orthographic projection, dimensioning, sectioning, exploded and auxiliary views and assembly drawings. Course designed to accompany 103. Homework drawings are of parts fabricated by the student in the shop. Major assignments in 103 supported by material in 103D and assignment dates sequenced on assumption that student is enrolled in both courses simultaneously. No prior knowledge of drafting required.

1 unit, Aut, Win (Staff) one meeting per week by arrangement

Sec.1 T 7:30-9:30 p.m.
Sec.2 W 3:30-5:30 p.m.

104. Dynamic Response—(Enroll in Engineering 104.)

105. Control System Analysis and Design—(Enroll in Engineering 105.)

111. Stress, Strain and Strength—Review of free body diagram analysis and basic, elastic stress analysis. Static failure theories. Buckling (column, plate, local). Fatigue failure criteria and life prediction methods. Introduction to fracture mechanics. Corrosion, stress corrosion, corrosion-fatigue. Contact stresses and surface failures (fretting, pitting, wear). Discussion of design margins (safety factors) and product liability. Homework assignments will emphasize applications to mechanical design. Prerequisites: 103 and Engineering 3 and 11.

3 units, Aut (Nelson) TTh 1:15-3:05

112. Mechanical Systems—Emphasizes quantitative aspects of the design process. Application of basic principles and empirical relationships in the evolution from conceptual design to the detailed specification of critical components. Individual term project will apply principles developed to the quantitative design on paper of a complete mechanical system to meet specified functional goals.

3 units, Win (Barkan) TTh 1:15-3:05

113. Engineering Design—Design process involves application of information from various sources to create tangible objects and intangible system concepts to improve the quality of human life. Design is both studied as a process and experienced by students as they work on a design project. Final project results are presented to a professional jury. Prerequisites: 101, 103, 111, and 112.

3 units, Spr (Chilton) TTh 1:15-3:05

115A. Human Values in Design—Active encounter with human values in design. Lectures survey central philosophy of product design program, with emphasis upon the relation between technical and human values, the creative process, and design methodology. Laboratory exercises include the development of simple product concepts visualized in rapidly executed three-dimensional mockups. Prerequisite: 101.

3 units, Win (Sanders) MW 1:15-3:05 plus one evening lab by arrangement

115B. Concept Presentation—Presentation of design concepts, especially to non-designers. Communication needs of intended audiences are assessed and met with verbal presentations supported with diagrams, schematics, colored layouts, perspective renderings and finished models. Simple design projects that emphasize manufacturing methods and human factors provide concepts to present.

3 units, Spr (Brown) MW 1:15-4:05

116A. Advanced Product Design—Small-scale projects carried to a high degree of refinement. Emphasis upon craftsmanship and aesthetics. Prerequisite: 115B.

3 units, Aut (Moggridge) TTh 11-1:05

116B. Advanced Product Design—New product innovation via need-finding. Prerequisite: 116A.

3 units, Win (McKim and Verplank) TTh 11-1:05

116C. Advanced Product Design—Summary project utilizing knowledge, methodology, and skills obtained in 101, 103, 115A, B and 116A, B. Final presentation to professional jury. Prerequisite: 116B.

3 units, Spr (Kelley) TTh 11-1:05

119. Design of Production Processes—Lectures and shop projects directed toward current topics of interest in manufacturing. Included are machine tool metrology, plastic molding methods and computer control of manufacturing processes. Students select projects from lecture material and pursue them to hardware. Final project presentation should demonstrate application of design skills to some problem in
area of manufacturing. Prerequisites: 101 and 103.

3 units, Spr (Beach) TTh 9 lab by arrangement

130. Internal Combustion Engines—A lecture/laboratory course covering internal combustion engines, including conventional and turbocharged spark ignition engines, diesel and gas turbine engines. Lectures review basic engine cycles, engine components, methods of analysis of engine performance, pollutant emissions and methods of engine testing. Laboratory sessions involve hands-on experience with engines and test hardware. Prerequisite: Engineering 32 or equivalent. Limited enrollment.

3 units, Aut (G. Herrmann) T 10-12, Th 10-11

176. Nuclear Energy—(Enroll in Engineering 176.)

180. Energy and Society—Unified analysis of the production, distribution and consumption of energy in United States and world. Treatment includes: kinds and magnitude of energy resources; various technologies for conversion to electric energy and other consumer forms; priorities and strategies for future development; social conflicts between growing demands and environmental degradation, technological assessment; legal and economic framework of energy industry. Presentation of technical information will be in terms understandable to the non-engineering student. Prerequisites: high school physics, Mathematics 21, and junior standing or consent of instructor. (DR:8)

3 units, Aut (Connolly) MWF 1:15

191. Engineering Problems and Experimental Investigation—Directed study and research for the undergraduate student on a subject of mutual interest to student and staff member. Student must find faculty sponsor and have approval of his advisor.

1 to 5 units, any quarter (Staff) by arrangement

MEZZANINE LEVEL COURSES

The following courses are especially suitable both for advanced undergraduates and for graduates, and may be used to satisfy the M.S. requirement, item 3, approved electives.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.E. 105.</td>
<td>Control System Analysis and Design</td>
</tr>
<tr>
<td>Enroll in Engineering 105</td>
<td></td>
</tr>
<tr>
<td>M.E. 113.</td>
<td>Engineering Design</td>
</tr>
<tr>
<td>M.E. 137.</td>
<td>Air Pollution</td>
</tr>
<tr>
<td>M.E. 138.</td>
<td>Noise Pollution (Enroll in Aeronautics and Astronautics 138)</td>
</tr>
<tr>
<td>M.E. 161.</td>
<td>Mechanical Vibrations</td>
</tr>
<tr>
<td>M.E. 176.</td>
<td>Nuclear Energy</td>
</tr>
<tr>
<td>Enroll in Engineering 176</td>
<td></td>
</tr>
<tr>
<td>M.E. 180.</td>
<td>Energy and Society</td>
</tr>
<tr>
<td>M.E. 250.</td>
<td>Introduction to Heat Transfer</td>
</tr>
<tr>
<td>M.E. 255.</td>
<td>Gasdynamics</td>
</tr>
</tbody>
</table>

161. Mechanical Vibrations—Mathematical modeling of vibrating systems. Experimental determination of coefficients. Systems with one and with more degrees of freedom. Damping, Natural Modes. Prerequisites: Engineering 12 or equivalent, Mathematics 43 or equivalent.

3 units, Aut (G. Herrmann) T 10-12, Th 10-11
COURSES PRIMARILY FOR GRADUATES

ENGINEERING MATHEMATICS

   3 units, Aut (Reed) MWF 11

   3 units, Win (Ferziger) MWF 9

   3 units, Spr (Ferziger) MWF 9

201. Applications of Complex Variables—The theory of analytic functions, with applications to the evaluation of definite integrals by contour integration, the solution of physical problems by conformal mapping, and the solution of partial differential equations by means of integral transforms. A knowledge of the algebra of complex numbers and the derivative of a complex function is assumed.
   3 units, Aut (Van Dyke) MWF 11

   3 units, Aut (Venakides) MWF 2:15

205B. Methods of Mathematical Physics—(Enroll in Mathematics 220B.) Continuation of 205A.
   3 units, Win (Caflisch) MWF 2:15

205C. Methods of Mathematical Physics—(Enroll in Mathematics 220C.) Continuation of 205B.
   3 units, Spr (Venakides) MWF 2:15

206. Similarity Methods in Engineering Mechanics—Similarity methods for differential equations; applications of Lie groups to the reduction of physical problems; self-similar solutions by dimensional analysis and other groups of transformations; use of group invariance to obtain new solutions from given solutions, nonlinear superposition; reduction of the order of ordinary differential equations, integrating factors; group invariance and similarity solutions of partial differential equations with application to problems in heat conduction, viscous flow, boundary layers, transonic flow, and wave propagation. Prerequisites: 200B or Mathematics 131, or consent of instructor.
   3 units, Win (Cantwell) MWF 10

207. Perturbation Methods in Engineering Mechanics—Examples of perturbation solutions in fluid mechanics, solid mechanics, dynamics, and other fields; asymptotic expansions; series and iteration schemes; regular perturbations; computer-extended series; slow variations; singular perturbation problems; the methods of matched asymptotic expansions, multiple scales, and other; improvement of series. Prerequisites: 200B or Mathematics 131, or consent of instructor.
   3 units, Spr (Van Dyke) MWF 10

208. Vector Analysis and Cartesian Tensors with Applications—(Enroll in Aeronautics and Astronautics 192.)

209A. Linear Transforms and Their Applications to Engineering Problems I—(Enroll in Aeronautics and Astronautics 291A.)

209B. Linear Transforms and Their Applications to Engineering Problems II—(Enroll in Aeronautics and Astronautics 291B.)

DESIGN AND CONTROLS

210A, B, C. Engineering Design—Experience in the formulation, design and analysis of real engineering projects presented by industry. Designs will be developed by small groups of students, each group under supervision of an instructor from the Design Division faculty and
in close cooperation with the industrial sponsor. Sponsored projects include those of particular interest to M.E. 218 (Smart Product Design) students who should enroll in both 210 and 218. Projects will be carried through construction and testing of a prototype, and first design revision. Instruction includes design methodology, project planning, safety, liability, and patenting. Students should enroll for all three courses. Provides experience in technical presentations—both oral and written. Students unfamiliar with manufacturing process or drafting are encouraged to enroll also in 103 and 103D. Limited enrollment. Prerequisite: 113 or equivalent.

210A. 4 units, Aut (Barkan, Staff)  
TTh 3:15-5:05

210B. 3 units, Win (Barkan, Staff)  
W 3:15-5:05

210C. 3 units, Spr (Barkan, Staff)  
Th 3:15-5:05

211A,B,C. Product Design Master's Project —Three-quarter graduate design project taught jointly with Art Department faculty (enroll concurrently in Art 360). In the first quarter, the student uses rational and intuitive problem-finding procedures to identify a design project within an unexplored area of need, presents a project proposal, and performs research. In the second quarter, the student prepares a design program, develops concepts, performs necessary experiments, and carries a project to the stage of a working prototype. In the third quarter, the student refines the design from the standpoint of cost, production and aesthetics. A demonstration model is built and presented to a professional jury. (For Product Design majors only.)

211A. 4 units, Aut (McKim, Staff)  
by arrangement

211B. 4 units, Win (McKim, Staff)  
by arrangement

211C. 4 units, Spr (McKim, Staff)  
by arrangement


3 units, Aut (Wilde) MWF 9

3 units, Win (Wilde) MWF 9, given 1984-85


3 units, Aut (Wilde) MWF 9, given 1985-86

214. Philosophy of Design—Student encouraged to develop and clarify his/her personal design philosophy by reading design-related literature, writing, and experiencing projects structured to illuminate specific philosophical issues. Discussions and experiences with individual Design Division faculty will include personal creativity, design methodology, interpersonal relationships, ethics, goal-setting, aesthetics, human values in design, ecology, appropriate technology, and decision making. Prerequisite: Concurrent enrollment in 210A or 211A.

3 units, Aut (Fadiman, Thornburg)  
M 2:15-5:05

215. The Designer in Society—This course is intended to be an intensive personal experience in which the participants' career objectives and psychological orientation are compared with existing social values and conditions. The emphasis is on assisting individuals in assessing their roles in modern society. Students are required to do readings on political, social, and humanistic thought related to technology and design. A term project will be required. Limited enrollment; open to graduate students of all disciplines.

3 units, Win (Roth) M 1:15-4:05,  
given 1984-85


3 units, Spr (Wilde) MWF 10,  
given 1984-85

218A. Foundation of Smart Product Design — An introduction to the design of electromechanical products incorporating microprocessor technology, software engineering and product design methodology. Specific content includes microprocessor organization, development system architecture, assembly language programming (within the FORTH programming en
218B. Advanced Smart Product Design — 218A electronics will be expanded into a very small "stand alone" microcomputer for product emulation and real-time control of electromechanical devices. Open ended project assignments will include human I/O, discrete system I/O, and analog system I/O. Project planning and software engineering principles will be applied to the development of a "target" computer system in the final "product" assignment. Enrollment is limited.

4 units, Aut (Leifer, Zajac) TTh 1:15-2:45

219. Introduction to Robotics and Computer Vision—An introduction to the basics of robot manipulators and a review of current applications. The following topics will be discussed in detail: kinematic structure, coordinate transformations, manipulator solutions, workspace, path selection, control and dynamics, application, locomotion. Knowledge of matrix algebra and some familiarity with basic control theory and rigid body mechanics suggested.

3 units, Aut (Leifer, Zajac) MWF 10

220. An Introduction to Sensors — Sensors (transducers) are widely used in engineering and scientific research and as an integral part of products and automated systems. Students will be introduced to numerous available techniques for sensing displacement, force, pressure, acceleration, velocity, temperature, optical and nuclear radiation, and other physical parameters. Elementary electronic interface circuits will be presented in a manner which assumes that the student has no prior knowledge of electronic circuits. The instructor, who is an industrial consultant specializing in sensing and measurement, will also present case histories of several sensing systems which he has designed and patented.

2 units, Win (Adler) T 3:15-5:05

221. Man-Machine Systems—Design of man-machine systems and analysis with emphasis on conditions involving considerations of human anatomy, sensory acuity, strength and effort capability and decision-making skills. Man-machine interface issues addressed in the form of design projects.

3 units, Win (Bentley) MW 4:15-6:05

222. Kinematic Synthesis of Mechanisms—The rational design of linkages is the central theme of this course. The problem of determining linkage proportions to fulfill various design requirements is treated analytically. Topics include: three- and two-dimensional displacements and motions, the theory of higher plane curves, higher-order path-curvature analysis, circle and center-point theory.

3 units, Spr (Roth) MWF 1:15, given 1984-85

223. Design and Analysis of Dynamic Systems—Modeling, analysis and synthesis of practical devices in which dynamic response is a dominant consideration. Representations of dynamic systems including mass distribution, flexibility and friction effects. Mathematical description of actuators including hydraulic, pneumatic, springs, electro-magnetic, electro-hydraulic and cam-driven systems; dynamic significance of kinematics properties of coupling between actuator and driven systems. Design criteria. Prerequisite: 161.

3 units, Spr (Barkan) MWF 9 alternate years, given 1983-84

224A. Introduction to Robotics and Computer Vision—(Enroll in Computer Science 227B.)

224B. Advanced Robotics—(Enroll in Computer Science 227C.)

225. Control System Design and Simulation—(Enroll in Engineering 206.)

226A. Digital Control I—(Enroll in Engineering 207.)

226B. Digital Control II—(Enroll in Engineering 208.)

227A. Optimal Control of Dynamic Systems—(Enroll in Aeronautics and Astronautics 278A.)

227B. Optimal Estimation and Control Logic in the Presence of Noise—(Enroll in Aeronautics and Astronautics 278B.)

227C. Differential Games—(Enroll in Aeronautics and Astronautics 278C.)

228. On-Off Control Logic—(Enroll in Engineering 209.)
   3 units, Spr (DeBra) MWF 9, alternate years, given 1984-85

MECHANICS OF SOLIDS

230. Advanced Kinematics—Discussion of kinematics from both the mathematical and engineering viewpoints. Introduction to algebraic geometry. Application of matrix, tensor, and dual-quaternion methods to kinematic analysis and synthesis. A survey of current research and unsolved problems in kinematics.
   3 units, Win (Roth) by arrangement, given 1984-85

   3 units, Aut (Kane) TTh 9:30-10:45

   3 units, Win (Kane) TTh 9:30-10:45

   3 units, Spr (Kane) TTh 9:30-10:45

232A. Spacecraft Attitude Dynamics I—(Same as Aeronautics and Astronautics 243A.) Kinematics of spacecraft; specification of large orientation changes of a rigid body in terms of direction cosines, Euler parameters, Rodrigues parameters, orientation angles; generalized speeds, partial angular velocities and partial velocities. Gravitational forces and moments. Dynamics of simple spacecraft; effects of gravitational moments and orbit eccentricity; gyrostats.
   3 units, Win (Kane) TTh 2:45-4 alternate years, given 1983-84

   3 units, Spr (Kane) TTh 2:45-4 alternate years, given 1984-85

   3 units, Win (Breakwell) W 2:15-4:05 plus one hour by arrangement, alternate years, given 1983-84

   3 units, Aut (Hughes) TTh 2:45-4 alternate years, given 1983-84

   3 units, Win (Hughes) TTh 2:45-4 alternate years, given 1983-84
235C. Nonlinear Finite Element Analysis—
Brief survey of nonlinear continuum mechani-
ces. Eulerian and Lagrangian formulations.
Galerkin formulation of nonlinear elliptic,
eigenvalue, parabolic and hyperbolic problems.
Explicit, implicit, and "implicit-explicit" algo-

rithm in nonlinear transient analysis. Stability
of ordinary differential equation solvers for non-
linear problem classes: "energy-conserving
algorithms." Methods of solving nonlinear alge-
braic systems. Newton-type methods and
quasi-Newton updates. Architecture of com-
puter codes for nonlinear finite element anal-
ysis. Applications from structural, solid, and
fluid mechanics, e.g. nonlinear elasticity, plas-
ticity, viscoplasticity, nonlinear structural
models, material and geometric nonlinearities,
postbuckling, Navier-Stokes equations, etc.
Special topics of interest to class; e.g. nonlinear
heat conduction, contact-impact problems,
large problem computer code architecture,
blocking, overlay structures, multilevel
meshes, etc.

3 units, Spr (Hughes) TTh 2:45-4
alternate years, given 1983-84

236A. Waves and Vibrations—Free and forced
vibrations of and stress waves in rods, mem-
branes, plates, rings, spheres. Normal coordi-
lates. Group velocity. Reflection and refraction
at interfaces and discontinuities. Dispersion,
surface waves, waves in layered media. Applica-
tion to impact, explosive loadings, seismology.
Effect of high speed moving loads. Waves in
composite materials and systems. Recent develop-
ments. Prerequisites: 238A and Mathematics
131 or equivalents.

3 units, Aut (G. Herrmann) TTh 11-2:15
alternate years, given 1984-85

236B. Wave Propagation—The following con-
cepts will be presented: waves, wavefronts,
rays, phase functions, amplitude functions, ray
equations, eikonal equations, transport equa-
tions, reflection coefficients, transmission co-
efficients, edge diffraction coefficients, surface
diffraction coefficients, asymptotic expansions,
etc. Applications will made to electromagnetic,
aoustic, elastic and other types of waves. 236A
is not a prerequisite for this self-contained

3 units, Win (Keller) TTh 2:15-3:30
alternate years, given 1984-85

237. Free and Forced Motion of Structures—
(Enroll in Aeronautics and Astronautics 244A.)

238A. Theory of Elasticity—Analysis of stress
and strain. Stress-strain relations. Compatibil-
ity and uniqueness of solutions. Fundamental

238B. Theory of Elasticity—Continuation of
238A: Analysis of plane stress and plane strain.
Stress functions. Axisymmetric problems. Com-
plex potentials. Prerequisite: 238A.

3 units, Win (G. Herrmann) MWF 10

238C. Theory of Elasticity — Continuation of
238B. Westergaard solutions for plane crack (in
terms of complex potentials). Derivation of the
asymptotic stresses at crack tip. Strain energy
and material conservation laws in linear elas-
ticity. Their relation to path-independent in-
tegrals of fracture mechanics: J, L, M. Three-
dimensional problems in terms of displacement
potentials such as Boussinesq-Papkovich-
Neuber functions and the Galerkin vector. Fund-
damental solutions to the Kelvin, the Bossinesq
and the Mindlin problem, as well as their exten-
sions. Rigid punch and elastic content (Hertz)
problems. Introduction to nonlinear elasticity.

3 units, Spr (G. Herrmann) MWF 11

239A. Theoretical and Computational Plas-
ticity — Theory of plasticity with emphasis on
computational aspects. Small-deformation elas-

tic-plastic solids. Von Mises, Tresca, Mohr-
Coulomb and Drucker-Prager yield conditions.
Perfect plasticity and work hardening. Iso-
tropic, kinematic and combined hardening.
Single-yield-surface, two-surface and multiple-
surface theories. Formulation of constitutive
equations for trusses, beams, plane stress,
plane strain, axisymmetry and three dimen-
sions. Elementary solutions, torsion, bending,
propagation of plastic waves, collapse. Cyclic
phenomena. Viscoplasticity and creep. Application
to metals, soils, concrete and foams. Prereq-
quisite: Civil Engineering 114 or equivalent.

3 units, Aut (Hughes) TTh 2:45-4
alternate years, given 1984-85

239B. Theoretical and Computational Plas-
ticity — Continuation of 239A. Finite element
formulation for small-deformation static and
dynamic plasticity. Algorithms for integration of
constitutive equations based upon the concept of
controlled deformations. Large-deformation
plasticity. Constitutive equations applicable to
cases involving large strains and rotations. Ob-
jective rates. Finite element algorithms for
deformation quasi-static and dynamic
plasticity. Computer solutions to problems.
Prerequisite: 239A or equivalent.

3 units, Win (Hughes) TTh 2:45-4
alternate years, given 1984-85

240A. Theory of Viscoelasticity—Characteris-
tics of viscoelastic materials. Laws relating
stress and strain: spring-dashpot models,
hereditary integrals, complex modulus. Struc-
ture of laws in three dimensions. Methods of
stress analysis. Application to quasi-static problems and dynamic problems, e.g., vibrations. Prerequisite: 238A or equivalent.

3 units, Spr (Keller) TTh 11-12:15
alternate years, given 1984-85


3 units, Spr (Staff) MWF 2:15, alternate years, given 1983-84

241A. Theory of Plates—Analysis of stress, deformation in plates bent by transverse loads. Applications to circular, rectangular, other shapes. Vibrations, buckling. Prerequisite: 111 or Civil Engineering 114.

3 units, Aut (Steele) MWF 1:15

241B. Theory of Shells—Axisymmetric deformation of shells of revolution. Asymptotic expansions; direct and bending stresses. Application to design of domes, pressure vessels, expansion joints and pressure sensing devices. Membrane theory for general surfaces; hyperbolic paraboloids. Prerequisite: 111 or Civil Engineering 114. 241A recommended.

3 units, Win (Steele) MWF 1:15


3 units, Spr (Steele) TTh 11-12:15-2:30

242A. Introduction to Nonlinear Continuum Mechanics — Definitions of general states of stress and deformation of continua, including rate-of-deformation and spin (vorticity). General balance principles; thermodynamical foundations and entropy. Discussion of constitutive equations and influence of material symmetries. Applications of the theory with particular reference to finite elasticity. Introduction to the theory of imperfect continua (containing defects) and the role of the material momentum tensor. Discussion of new material conservation laws and their relevance to path-independent integrals of fracture mechanics. Prerequisite: 238A or equivalent.

3 units, Spr (A. Herrmann) TTh 11-12:15
alternate years, given 1983-84

242B. Introduction to Nonlinear Continuum Mechanics—Application of theory of continua to nonlinear viscoelastic materials. Thermodynamic effects including thermoelastic coupling for nonlinear elasticity at finite strain. Prerequisite: 242A.

3 units, Aut (A. Herrmann) TTh 11-12:15, alternate years, given 1984-85


3 units, Spr (Chao) TTh 2:45-4


3 units, Spr (G. Herrmann) TTh 11-12:15, alternate years, given 1984-85

245. Structural Fatigue—The mechanism of fatigue and occurrences of fatigue in service. Methods for predicting fatigue life and for protecting against premature fatigue failure. Use of elastic stress and inelastic strain analyses to predict crack initiation life. Use of linear elastic fracture mechanics to predict crack propagation life. Effects of notches, manufacturing processes, load sequence, irregular loading, multiaxial loading, and environment on fatigue behavior. The subject will be treated from the viewpoints of the designer seeking up-to-date methods of life prediction and the researcher interested in improving the understanding of fatigue behavior. Prerequisites: Undergraduate stress analysis and mechanical behavior of materials.

3 units, Spr (Chao) MWF 2:15-3:30

247A. Strength and Microstructure—(Enroll in Materials Science and Engineering 205.)

247B. Fracture of Solids—(Enroll in Materials Science and Engineering 238.)

248A. Introduction to Experimental Mechanics—Theory and applications of photoelasticity, strain gages and laser interferometric and holographic techniques. Mechanical testing using modern closed-loop, electro-hydraulic equipment. Comparison of test results with theoretical predictions of stress and strain distributions, buckling loads, limit loads, thermal
252A. Convective Heat and Mass Transfer—Prediction of heat, mass, and momentum transfer in channel flows and boundary layers. Differential equation methods for fully developed and entry length laminar tube flows. Similarity solutions for laminar heat transfer with blowing and suction. Superposition methods for non-uniform boundary conditions. Development of the integral equations of the boundary layer; approximate and semi-empirical methods of solution. Introduction to mass transfer. Prerequisite: at least one survey course in heat transfer and one in fluid mechanics, i.e. 250 and 251A or equivalent.

3 units, Win (Staff) MWF 10

252B. Convective Heat and Mass Transfer—Heat exchanger analysis and design. Theory of compact heat exchangers. Turbulent heat transfer in internal flows and boundary layers. Prerequisite: 252A.

4 units, Spr (Kays) MWF 8

253. Radiative Heat Transfer—Fundamentals of radiation heat transfer; analysis of gray-body and wavelength dependent systems; radiation from gases at high temperature, and particulate-laden gases; combined radiation and conduction. This is an advanced course intended for students with strong interests in heat transfer, particularly as applied in high-temperature energy conversion systems. Such students should also take Mechanical Engineering 252A,B to obtain depth in convective heat and mass transfer. Prerequisites: Graduate standing; an undergraduate course in heat transfer; some computer skills are desirable.

3 units, Aut (Self) MWF 9

254. Computers and Instrumentation in the Fluid Mechanics Laboratory—Use of laboratory computers including (a) interfacing of analog and digital instruments, (b) experimental control, (c) sampling strategies, and (d) data reduction techniques. Instrumentation including hot-wire, laser and pulsed-wire anemometers. Prerequisite: Previous experience with computer programming.

4 units, Spr (Eaton) MWF 10

plus one 4-hour lab

255. Gasdynamics—Introduction to compressible flow. Sound waves and normal shock waves. Quasi-one-dimensional steady flows in variable area ducts with friction, heating and cooling, etc. Other topics to be selected from oblique shock waves, Prandtl-Meyer expansions, shock wave structure, relation of continuum conservation equations to simple kinetic theory. Prerequisite: graduate standing or consent of instructor.

3 units, Aut (Mitchner) MWF 1:15
256. Fluid Dynamics of Turbomachinery—Operation, theory and elements of the design of turbines, bladed pumps and compressors, windmills, propellers and other machines that perform by the dynamic interaction of a moving fluid with a bladed rotor. Emphasis to be placed on the problem of efficient exchange of energy between the fluid stream and the mechanical elements of the machine. Prerequisites: 251A and 255 or equivalents.
3 units, Spr (Johnston) TTh 8:35-9:50, alternate years, given 1983-84

257. Fundamentals of Aerosols and Particulate Flows—Weekly two-hour seminars covering material to be selected from the following topics: aerosol characterization, transport properties—settling, diffusion, mobility, mechanics of two-phase flows, deposition by convective diffusion and impaction, coagulation, acoustics of aerosols, light scattering and experimental methods, fundamentals of particulate control devices—filters, cyclones, scrubbers, precipitators. Prerequisites: 251A or equivalent fluid mechanics.
2 units, Win (Mitchner, Self) by arrangement, alternate years, given 1983-84

3 units, Aut (Spreiter) TTh 2:45-4

258B. Fluid Dynamics—Continuation of 258A including effect of viscosity, compressibility, turbulence, and free surfaces. Mathematical analysis of selected two- and three-dimensional flows and wave motions and with application to surface waves, acoustics, aerodynamics of wings and bodies at subsonic, transonic, and supersonic speeds, and selected geophysical and astrophysical phenomena.
3 units, Win (Spreiter) TTh 2:45-4

259A. Numerical Methods in Fluid Mechanics—(Enroll in Aeronautics and Astronautics 214A.)
259B. Numerical Computation of Transonic Flow—(Enroll in Aeronautics and Astronautics 214B.)
259C. Numerical Computation of Transonic Flow—(Enroll in Aeronautics and Astronautics 214C.)

260. Geophysical Fluid Dynamics—Introduction to fluid flow and wave phenomena in the atmosphere, oceans, and interior of the Earth, in interplanetary space, and in the solar atmosphere. Effects of rotation, stratification, gravity, and electromagnetic forces. Application to general circulation, mountain lee waves, and Rossby waves in the atmosphere, surface and internal gravity waves and wind-driven circulation of the oceans, hydromagnetic dynamo processes in the liquid core, and solar-wind flow and waves in interplanetary space. Prerequisite: 258B or equivalent.
3 units, Spr (Spreiter) TTh 2:45-4 alternate years, given 1984-85

261A. Introduction to Turbulence — The objective of this course is to introduce the student to the basic physical properties of turbulent flows. Topics covered will include, a general discussion of turbulence structure, scales of motion, energy production and dissipation; the kinematics and dynamics of vorticity with emphasis on shear flows and mixing processes; similarity rules for wakes, jets and boundary layers; universal behavior of turbulent boundary layers, effects of compressibility; tensor formulations of the governing equations, tensor manipulations. Prerequisite: Any graduate fluid mechanics course that has dealt with viscous flows.
3 units, Spr (Cantwell) MWF 3:15

261B. Analytical Methods for Turbulent Flows — This course covers the analytical framework of homogeneous turbulence, turbulent transport, rational modeling of turbulence in flows of engineering interest, zonal models for turbulent flows and sub-grid scale and near-wall modeling for large eddy simulation. Prerequisite: 261A, plus a graduate sequence in fluid mechanics.
3 units, Aut (Reynolds) MWF 2:15, given 1984-85

262A. Physical Gas Dynamics—Concepts and techniques for the description of high temperature and chemically reacting gases from a molecular point of view. Introductory kinetic theory, chemical thermodynamics, and stat
tial mechanics as applied to the properties of gases and gas mixtures. Transport and thermodynamic properties, the laws of mass action and equilibrium chemical composition. Maxwellian and Boltzmann distributions of velocity and molecular energy. Examples and applications from areas of current interest, such as combustion and gas radiation.

3 units, Aut (Kruger) MWF 10

262B. Introductory Aerothermodynamics—(Enroll in Aeronautics and Astronautics 212.)

263. Introduction to Partially Ionized Gases—An introduction to the main microscopic concepts that enter into a description of partially ionized gases, and a discussion of how the microscopic properties of gases may be calculated from a knowledge of the microscopic processes. Some of the topics covered include cross sections for collisional and radiative processes, reaction rates, recombination, velocity distribution functions, Rutherford scattering, Saha equation, principle of detailed balancing, molecular radiation, transport coefficients of mixtures, electrical conductivity, plasmas, the Debye length, plasma frequency, sheaths. Prerequisite: 262A or consent of instructor.

3 units, Win (Mitchner) MWF 3:15 alternate years, given 1983-84

264. The Physics of High-Temperature Gases—This is a one-quarter course specially designed for students with a conventional mechanical engineering background. It provides an introduction to some of the fundamental ideas in electromagnetic theory and in quantum mechanics. Emphasis is placed on the relationship of these ideas to atomic processes in high-temperature gases. Topics to be covered will include radiation from an accelerated charge, black body radiation, deficiencies of classical theory, de Broglie waves, the uncertainty principle, Schrödinger’s equation and its solutions. Prerequisite: familiarity with partial differential equations.

3 units, Spr (Mitchner) MWF 3:15

265. Special Topics in High-Temperature Gasdynamics—Detailed study of selected topics in high-temperature gasdynamics, such as molecular spectroscopy, chemical kinetics of high-temperature gases or advanced kinetic theory.

3 units, Win (Hanson) MWF 9 alternate years, given 1983-84

266. Experimental Methods in the Thermosciences—Planning experimental programs, uncertainty analysis and the selection of instrument systems. Steady-state measurements of heat flux, temperature, pressure, and flow rate. Mean-velocity and mean-temperature measurements in boundary layers. Advanced laboratory problems in heat transfer and fluid dynamics. Prerequisite: at least one graduate course each in heat transfer and fluid mechanics, or consent of instructor.

4 units, Spr (Moffat) MWF 10 plus one 4-hour lab. by arrangement

269. Computational Methods in Fluid Mechanics—Finite difference methods for solving partial differential equations emphasizing the equations of fluid dynamics. Integral methods for boundary layers and their coupling to potential flow solutions, boundary integral methods for potential flow, choice of dependent variables, finite difference methods for solving boundary layer problems, finite difference methods for incompressible flows including turbulent flows, introduction to large eddy simulation. Prerequisites: 252B and 200C or equivalent.

3 units, Spr (Staff) MWF 11

THERMODYNAMICS AND ENERGY CONVERSION

270. Engineering Thermodynamics—Thermodynamic analysis of engineering systems emphasizing systematic methodology for application of basic principles. Entropy production and availability analysis. Thermodynamics of mixtures, reacting systems. Applications to a wide variety of energy conversion systems. Use of modern computational equations of state for comprehensive, realistic system analysis. Prerequisites: Undergraduate background in engineering thermodynamics and computer skills.

3 units, Aut (Staff) MWF 2:15

271. Combustion and Pollution—Heat of reaction, adiabatic flame temperature, and chemical composition of products of combustion; production of pollutants in combustion systems; kinetics of reactions; emissions of oxides of nitrogen and carbon monoxide, explosions, fuel oxidation; propagation and structure of laminar premixed flames; detonations; reduction of pollutant emissions by modification of combustion parameters. Prerequisite: 262A or 270 or consent of instructor.

3 units, Win (Kruger) MWF 2:15

272. Advanced Combustion—The role of chemical and physical processes in combustion; ignition, flammability and quenching of combustible gas mixtures; flame stabilization; laminar and turbulent flames; combustion of fuel droplets and sprays; combustion of coal. Prerequisite: 271 or consent of instructor.

3 units, Spr (Bowman) MWF 2:15

273. Thermodynamics of Propulsion Systems—Analysis of the performance of propulsion systems from thermodynamic and dynamic
points of view including rocket, ramjet, turbojet, and turbofan engines as well as piston, gas turbine and compound piston-turbine type engines. Prerequisite: 270 or consent of instructor. Some familiarity with compressible gas dynamics is desirable.

4 units, Win (Staff) MWF 1:15 plus one hour by arrangement

274. Thermodynamics of Synthetic Fuels—Analysis of the principal reactions in which the secondary energy forms, hydrogen, methane and methanol, are formed from primary energy sources, including coal and biomass. Analyses include the mass flow, temperature, pressure and equilibrium composition of various process streams, as well as energy balances and availability balances. Includes some descriptive materials on various industrial processes. Prerequisite: 270 or consent of instructor.

3 units, Spr (Connolly) TTh 10-11:15

275. Solar Energy—The Sun as a source of energy, economic value of solar energy, solar position calculations. Radiative properties of materials, materials for solar applications. Heat transfer aspects of solar collection: radiation, conduction, convection. Applications to water and space heating, air-conditioning and other uses. High performance solar devices; concentrators, special surfaces, electrical power plants. Solar conversion by biological systems, solar cells. This course will normally include a project—a solar device to be built by the student. Prerequisite: 131B or equivalent.

3 units, Spr (Connolly) TTh 10-11:15

276. Nuclear Energy —Theory, design and applications of nuclear energy systems; radioisotope heat sources, fission chain reactors and concepts of fusion reactors. The information thus developed is applied to a number of topics of current interest: nuclear waste disposal, health effects of nuclear radiation, fusion reactor development, laser separation of isotopes, etc.

3 units, Spr (Connolly) MWF 1:15


3 units, Aut (Staff) MWF 10

given 1984-85

277B. Nuclear Engineering—Heat removal from nuclear reactors, nuclear power plants. Light water reactors and fast breeders. Reactor safety. The nuclear fuel cycle. Prerequisite: 277A or consent of instructor.

3 units, Win (Staff) TTh 10-11:15

given 1984-85

279. Controlled Thermonuclear Fusion—The fusion reaction. Fundamentals of plasma physics as applied to plasma creation and containment in a fusion device. Experimental devices: pinch, mirror, stellerator, Tokamak. Concepts of fusion reactors and fusion-electric generators. Prerequisite: consent of instructor.

3 units, Spr (Staff) by arrangement
given 1984-85

BIOMECHANICS

280. Biomechanics Seminar—Weekly seminar presentations by faculty and professionals who are actively involved in biomechanics or related research. The series is intended to identify the state of the art in structural biomechanics, neuromuscular biomechanics, mechanisms of hearing and balance, biomechanics of gait, biomechanics of sports, cardiovascular dynamics, rehabilitation engineering, and injury mechanics.

1 unit, Aut (Zajac) T 4:15-5:05

281. Orthopaedic Biomechanics—Engineering mechanics applied to the human musculoskeletal system. Material and structural characteristics of bones, ligaments, muscle/tendon and synovial joints. Engineering evaluation of orthopaedic procedures and devices. Correlations between engineering predictions and clinical/biological results. Introductory anatomy and physiology will be presented. Prerequisite: graduate standing or consent of instructor.

3 units, Spr (Carter) MWF 4:15-5:05

alternate years, given 1983-84

282. Neuromuscular Biomechanics —Neuromuscular biomechanics and control, with emphasis on current experimental, analytical, modeling, and computer simulation methods. Within a framework of sports biomechanics and rehabilitation, topics will include posture, locomotion, manual control of external devices, and intermuscular control of limb movement. Prerequisite: Graduate standing or consent of instructor.

3 units, Spr (Zajac) TTh 4:15-5:30

alternate years, given 1984-85

284. Dynamics of Viscous Fluids and Suspensions—(Enroll in Aeronautics and Astronautics 209.)

285. Biomechanical Fluid Mechanics—(Enroll in Aeronautics and Astronautics 229.)

SPECIAL AREAS

286. Atmospheric and Space Physics—(Enroll in Aeronautics and Astronautics 227.)

287. Methods and Experiences in Engineering Education—(Enroll in Engineering 287.)

289. The Social Impact of Technology and Science—(Enroll in Engineering 221.)
DIRECTED STUDY
AND SEMINARS

290. Research Project Seminar—Review of work in a particular research program and presentations of other related work.
1 unit, any quarter (Staff) by arrangement

291. Engineering Problems—Directed study for graduate engineering students on subject of mutual interest to student and staff member. May be used to prepare for experimental research during a later quarter under 292. Student must find a faculty sponsor.
1 to 5 units, any quarter (Staff) by arrangement

292. Experimental Investigation of Engineering Problems—Graduate engineering student may undertake experimental investigation under guidance of staff member. Previous work under 291 may be required to provide background for experimental program. The student must find a faculty sponsor.
1 to 5 units, any quarter (Staff) by arrangement

294. Design Colloquium — Invited speakers address issues of interest to designers. Brief presentation followed by open discussion.
1 unit, Aut, Win, Spr (McKim) F 3:15-4:05

295. Seminar in Solid Mechanics—Problems in all branches of solid mechanics. All Ph.D. candidates in solid mechanics are normally expected to attend.
1 unit, Aut, Win, Spr (Steele) Th 4:15-5:30

297. Energy Policy Seminar—Weekly presentations and discussions on energy policy with emphasis on technological aspects. The status of various national programs for the advancement of energy technology will be reviewed. Views on the political, social and economic aspects of projects to which engineers devote their efforts will be presented. Prerequisite: graduate standing in engineering.
1 unit, Aut, Win, Spr (Connolly) M 4:15-5:30

298. Seminar in Fluid Mechanics—(Enroll in Engineering 298.)

2 to 15 units, any quarter (Staff) by arrangement

2 to 15 units, any quarter (Staff) by arrangement

OPERATIONS RESEARCH

Chairman: Arthur F. Veinott, Jr.
Associate Chairman: Frederick S. Hillier
Assistant Professor: Michael I. Taksar
Professor (Research): Walter Murray
Affiliated Associate Professor: Charles P. Bonini
Senior Research Associates: Philip E. Gill, Michael A. Saunders, John P. Weyant, Margaret H. Wright
Research Associate: Dorothy B. Sheffield

OFFERINGS
AND FACILITIES

Operations Research is concerned with the formulation, analysis, and use of mathematical models relevant to the understanding and/or solution of significant problems of decision making. The department's principal objectives are to provide a comprehensive program of instruction in the mathematical foundations of operations research, to acquaint students with applications of these methods to significant problems, and to develop research scholars.

The department offers programs leading to a Master of Science, Engineer and Doctor of Philosophy, and participates in a program leading to a Bachelor of Science in Mathematical Sciences. Under the Graduate Division Special Ph.D. Programs, it is also possible to arrange a well-considered program that is a combination of Operations Research with some other departmental area.

Among the many areas of operations research, the department has special competence in the following: applied probability; dynamic programming; inventory, queueing, and reliability theory; linear, nonlinear, and integer programming; networks; and energy and economic modeling.

The department's Systems Optimization Lab-
oratory provides students with the opportunity to gain firsthand experience with computational methods, to participate in research on new algorithms, and to learn about modeling complex systems dealing with energy, the economy, water, etc.

Office facilities are available for doctoral students. In addition the department has its own library, remote-access computer terminals, dedicated word processing, microcomputer, and plotter.

INTRODUCTORY COURSES

The department offers introductory courses for both undergraduate and graduate students. The courses are given at several levels and in a variety of combinations to accommodate the needs of different students.

Operations Research 50 is designed for students who wish to become familiar with the basic terminology and ideas of operations research without using any mathematics beyond high school algebra. Applications are given to important socio-economic problems.

Operations Research 152 is an introduction to linear, nonlinear, and dynamic programming for students familiar with calculus. Operations Research 151 is similar except that it also assumes a knowledge of the elements of matrix algebra, includes a discussion of game theory, and gives less emphasis to nonlinear and dynamic programming. Operations Research 153 is an introduction to stochastic processes and models in operations research for students with a knowledge of calculus and undergraduate level probability theory. Operations Research 154 is a condensation of Operations Research 152 and 153 for students with similar backgrounds.

Operations Research 240 is a first course in linear programming having matrix algebra as a corequisite. Operations Research 250 is a sequel which discusses nonlinear and dynamic programming as well as game theory. Operations Research 251 is an introduction to stochastic models in operations research for students acquainted with the elements of stochastic processes. Operations Research 240 and 250 provide a more extensive and higher-level presentation of topics of 151 and 152. Operations Research 251 bears a similar relationship to 153.

Students with a good mathematical background and an interest in an advanced introduction to the various fields of operations research may wish to consider one or more of Operations Research 340A, B, C, 342, 347, 351, 356, 359A, B.
Students wishing a more advanced master's program may substitute appropriate 300-level courses in the department for required 200-level courses in the department with the approval of their advisors.

ENGINEER

The Engineer degree in Operations Research is for students desiring additional academic preparation beyond the master's degree for a career of professional practice in Operations Research.

This degree nominally represents an additional academic year of full time study beyond the Master of Science degree in Operations Research, including a thesis. The thesis normally is in the form of a technical report on a successful contribution to (and participation in) an applied project, such as those being carried on in the department's Systems Optimization Laboratory or Energy Studies Project.

Since thesis supervision is required, and the department gives precedence to providing thesis advisors for qualified students in the Ph.D. program, the availability of thesis supervisors for the Engineer degree is very limited. Therefore, before being permitted by the department to continue study after the M.S. degree toward this degree, the student must have personally arranged for a faculty sponsor for thesis supervision and, if financial support is needed, for a research assistantship for the thesis project. These arrangements are then subject to the approval of the department's Admissions and Financial Aid Committee.

The University's basic requirements for the Engineer degree are outlined in the “Degrees” section in this bulletin.

DOCTOR OF PHILOSOPHY

The program leading to a Doctor of Philosophy in Operations Research is directed to those primarily interested in a career of research, teaching, or high-level technical work in universities, business, or government. Therefore, emphasis is given to the scientific foundations of operations research. In particular, the program is focused on:

1. The study of the abstract mathematical structure of models derived from real life situations such as allocation models of an enterprise or an economy, energy modeling, network flow models of transportation and communication systems, reliability models of complex engineering systems, queuing models of congestion, modeling and control of dynamic systems, discrete selection models for routing and pattern cutting, policy decisions for production and inventory control, and models for conflict resolution, and

2. the development of the mathematical theory necessary for the study of these models.

Examples of the disciplines studied include energy and economic modeling, mathematical programming, dynamic programming, stochastic systems, stochastic processes, network and combinatorial theory, reliability, queueing theory, inventory theory, and game theory.

Candidates for the Ph.D. in Operations Research will normally meet the course requirements shown below.

1. Prerequisites: Mathematics 113, 115, 116; Statistics 116, 119, 120; Computer Science 106. Engineering-Economic Systems 212A. Students lacking background in some of these areas can include appropriate courses in their program at Stanford.

2. Requirements in Operations Research: 340A, B, C, 342, 347, 351, 356, 359A, B; and four other 300-level, quarter courses in the department totaling 11 or more units (excluding 399 and courses requiring enrollment in other departments).

3. Requirements in other departments: Statistics 217, 218, and three 200-level, 3 or more unit, quarter lecture courses in either Computer Science, Economics, Mathematics, or Statistics (only doctoral courses in Statistics).

In addition to the course requirements, a doctoral candidate must fulfill several University requirements, as described in the “Degrees” section in this bulletin. These include passing a University Oral Examination and completion of a dissertation which represents an original contribution to knowledge expressed in a satisfactory form. The department also requires that candidates successfully complete written comprehensive examinations on the content of Operations Research 340A, B, C, 342, 347, 351, 356, and 359A, B, and have a reading knowledge of at least one foreign language (French, German, or Russian).

A student performing satisfactorily in the Ph.D. program normally would be eligible to receive a Master of Science in Operations Research, if desired, after completing 45 units of course work.

Ph.D. MINOR IN OPERATIONS RESEARCH

Doctoral students in other departments may obtain a minor in Operations Research by completing 15 units of 200 or higher-level courses in the department with an average grade of 3.0 or higher. The courses will normally include Operations Research 240, 250, 251, and 257 or approved substitutes.
FELLOWSHIPS AND ASSISTANTSHIPS

Financial aid is available on a competitive basis for qualified doctoral candidates. This includes a number of fellowships as well as some research assistantships supported by departmental research grants and contracts. Although these research assistants work closely with the faculty on their research projects, they usually are able to take close to a full course load. Supplementary financial aid can sometimes be obtained by grading, assisting in special projects, or University loans.

All applicants for financial assistance are required to take the Aptitude Test and the Advanced Test (in a field of the applicant's choosing) of the Graduate Record Examination.

Applications for fellowships and assistantships should be made to the Graduate Admissions Office by March 1.

COURSES PRIMARILY FOR UNDERGRADUATES

50. Models and Applications of Operations Research in Society—Analysis of important socio-economic problems by methods of operations research. Problem areas drawn from energy, environment, health, urban planning, and criminal justice systems. Intended for students in the social sciences or pre-engineering desiring a broad introduction to the potential role of operations research in modern society. (Graduate students register for 150.) Prerequisite: high school algebra. (DR:8)

3 units, Win (Manne) MW 10
Spr (Cottle) MW 10

150. Models and Applications of Operations Research in Society—Lectures same as 50, but a term paper is required.

3 units, Win (Manne) MW 10
Spr (Cottle) MW 10

151. Introduction to Operations Research I—Theory and computation of optimal selection of decisions under certainty. Linear programming (simplex method and duality theorem), network flows, dynamic programming, convex programming (convex sets and functions, Lagrange multipliers, Kuhn-Tucker conditions, algorithms), integer programming. Applications drawn from problems in pricing resources, production planning, inventory control, transportation, pollution control, personnel assignment, construction management, capacity expansion, and financial management. Prerequisites: Mathematics 43 or consent of instructor. (DR:8)

4 units, Aut (Hillier) MWF 2:15-3:20


4 units, Win (Taksar) MWF 1:10-2:15

154. Operations Research—An introduction to the techniques and models of operations research for students who have not had the equivalent of 151 or 152, and 153. Topics are similar to those of 152 and 153. Prerequisites: calculus and Statistics 116.

4 units, Sum (Staff) TTh 3:00-4:15

180. Applications of Operations Research—Applications of operations research to important problems arising in business, industry, government, and society will be discussed. Case studies involving formulation, analysis, data collection, technical writing, public speaking and discussion. (Graduate students register for 280.) Prerequisites: 151 or 152, or both 240 and 250, 153 or 251 (concurrently) or equivalent.

3 units, Spr (Manne) MW 9:30-10:45

COURSES PRIMARILY FOR MASTER'S CANDIDATES

These courses are oriented toward applications. Operations Research 240, 250, 251, 257, and 280 form a basic one-year core program aimed at students who desire a professional career involving application of operations research in business, government, or industry. Operations Research 245 and 246 are useful supplementary electives.

240. Linear Programming—This course treats linear programming emphasizing standard model formulation, fundamental theorems, variations of the simplex method and parametric programming. The orientation is applied
and directed to students who anticipate doing project work in government or industry which involves deterministic systems. Corequisite: Mathematics 113.

3 units, Aut (Eaves) TTh 4:15-5:30
Sum (Staff) TTh 1:15-3

241. Numerical Methods of Optimization—(Enroll in Computer Science 234.) Serves as an introduction to software and some numerical analysis aspects of algorithms used to solve unconstrained and constrained optimization problems encountered in operations research. Topics include pivotal and pricing techniques in linear programming, combinatorial search procedures, shortest path, other graph and polynomial algorithms, dynamic programming from the software point of view, trade-offs between solution time and storage needs. Students are expected to program algorithms discussed in class. Recommended as a complement to courses like Operations Research 340A. Prerequisites: Math 113; and some experience with computer programming and data structures (linked lists and binary search trees).

3 units, Aut (Dantzig)


3 units, Win (Papadimitriou) MW 8:30-9:45

246. Mathematical Programming Computation—Course presents an overview of major computational procedures used in solving mathematical programming problems, including large-scale systems. Students become familiar with computer implementation of algorithms for: linear programming; quadratic programming; unconstrained, linearly constrained, and nonlinearly constrained optimization. Gain practical experience with techniques that increase speed, stability, and accuracy of computation. Prerequisites: 250 or 340C, and Computer Science 106 or equivalent, or consent of instructor.

3 units, Sum (Staff) TTh 3:15-5

250. Deterministic Models in Operations Research—Formulation, solution, and analysis of mathematical programming models in operations research, including those of integer programming, nonlinear programming, network flow theory, dynamic programming, and game theory. Prerequisite: 240.

3 units, Win (Eaves) TTh 4:15-5:30

251. Stochastic Models in Operations Research—Introduction to stochastic modeling. Orientation is applied and directed to students anticipating doing project work in government or industry which involves stochastic modeling.

Course content stresses formulation, solution, and analysis of stochastic models in operations research. Topics covered include queuing theory, inventory theory, Markov decision processes, and dynamic programming. Prerequisite: Statistics 217.

3 units, Spr (Iglehart) TTh 4:30-5:45
Sum (Staff) MW 3:15-5

257. Simulation—Generation of uniform and non-uniform random numbers, discrete-event simulations, simulation languages, design of simulations, statistical analysis of the output of simulations, applications to modeling stochastic systems in computer science, engineering, and operations research. Prerequisites: a working knowledge of a programming language such as FORTRAN, BASIC, or PASCAL; Statistics 217 or the equivalent.

3 units, Spr (Iglehart) TTh 2:40-3:55
Sum (Staff) MW 1:15-3


3 units, Spr (Taksar) TTh 11-12:15


3 units, Spr (Manne) MW 9:30-10:45

290. Colloquium—Presentation of current research in operations research.
1 unit, Aut, Win, Spr (Staff) W 4:30-5:30

299. Independent Study—Intensive study of literature of special topics.
any quarter (Staff) by arrangement

COURSES PRIMARILY FOR DOCTORAL STUDENTS

These advanced courses are concerned with the development of the mathematical theory of operations research and sophisticated applications thereof.

340A. Mathematical Programming—Formulation of standard linear programming models. Simplex method and resolution of degeneracy. Theory of polyhedral convex sets, linear inequalities, alternative theorems, and duality. Variants of the simplex method, dual simplex method, product form of the inverse. Upper bounding, sensitivity analysis, economic interpretations. Large-scale linear programming, de-
composition principle. Prerequisite: Mathematics 113 or consent of instructor.

3 units, Aut (Dantzig) TTh 1:15-2:30


3 units, Win (Cottle) TTh 1:15-2:30


3 units, Spr (Eaves) TTh 1:15-2:30

341. Topics in Mathematical Programming—A seminar type course with presentations by students and invited speakers. General topics covered include: Structured linear programs, generalized upper bounding (GUB), generalized linear programming, decomposition principle, basis factorization, convex programming, stochastic programming, continuous programming, multi-commodity problems, large-scale networks, integer programming. In addition, one or two research topics will be selected from the following typical list: Linkage of models and submodels (for example, of different sectors of the economy); development of end conditions in finite-horizon models; experimentation with different strategies for choosing the entering and exiting variables in large linear programs, development of new algorithms for large, structured optimization problems. Corequisite: 340B.

3 units, Spr (Eaves) TTh 1:15-2:30

342. Integer Programming—Introduction to the models and methods of integer programming. Structure of integer programs; implicit enumeration and cutting plane algorithms; exploiting special structures; heuristics; extensions. Corequisite: 340A or consent of instructor.

1 unit, Aut (Hillier) F 9

344. Methods of Nonlinear Programming Seminar—Motivation and analysis of procedures for solving nonlinear programming problems in finite-dimensional spaces. One-dimen-
dynamic programs. Lattice programming, substitutes and complements in network flows, invariant network flows, minimum concave-cost flows in networks, stochastic comparison of distributions. Application to selection of optimal inventory policies for single and multi-item-dynamic inventory models with convex or concave cost functions and known or uncertain requirements. Myopic policies. Multi-echelon models. Prerequisites: Lagrangian duality theory and Statistics 116.

3 units, Aut (Veinott) TTh 10:30-11:45

357. Simulation—(Same as 257.)
3 units, Spr (Iglehart) TTh 2:40-3:55
Sum (Staff) MW 1:15-3

358. Queueing Theory—(Same as 258.)
3 units, Spr (Taksar) TTh 11-12:15


3 units, Spr (Taksar) TTh 8-9:15


3 units, Aut (Iglehart) TTh 9-10:15

363. Theory of Information and Organization—(Same as Economics 282.) This course will examine the role of information in the design of various economic organizations, including teams and markets, among others; problems of coordination and incentives under incomplete information: search, signaling, and related phenomena.

5 units, Win (Arrow)

366A,B. Interdisciplinary Seminar in Decision Analysis—(Same as Economics 386A,B, Psychology 283A,B, Business 494A,B.) Seminar aims to study a normative and descriptive decision making, particularly in the face of uncertainty. Examine general studies on the way decisions are made and problems arising in making decision analyses in applied policy contexts. Seminar will meet once every two or three weeks throughout the academic year.

A. 1-2 units, Aut (Arrow, Toersky, Wilson) by arrangement
B. 1-2 units, Win (Arrow, Toersky, Wilson) by arrangement


4 units, Spr (Wilson) by arrangement

376. Solving Nonlinear Equations Parametrically—A unified and comprehensive view of a new and powerful deformation method for solving nonlinear equations based on complementary pivot theory. Constructive proof of Brouwer’s fixed point theorem. Applications to optimization and to computation of equilibrium points in economics and game theory.

3 units, Aut (Eaves) by arrangement

390A,B. Advanced Topics in Operations Research—Two seminars will be offered, topics to be announced. Prerequisite: consent of instructor.

390A. 3 units, Sum (Staff) by arrangement
390B. 3 units, Sum (Staff) by arrangement


any quarter (Staff) by arrangement
ORGANIZATIONS

The School of Humanities and Sciences includes all members with the rank of instructor or above of the Departments of Anthropology, Applied Physics, Art, Asian Languages, Biological Sciences, Chemistry, Classics, Communication, Computer Science, Drama, Economics, English, Food Research, French and Italian, German Studies, History, Human Biology, Humanities Special Programs, Linguistics, Mathematics, Music, Philosophy, Physics, Political Science, Psychology, Religious Studies, Slavic Languages and Literatures, Sociology, Spanish and Portuguese, and Statistics.

Members of the School of Humanities and Sciences are listed under their respective departments, or under the staff for Special Interdepartmental Programs.

UNDERGRADUATE PROGRAMS

A student wishing to take a departmental major leading to the degree of Bachelor of Arts or Bachelor of Science should consult appropriate sections of the announcements given on the following pages. Further information concerning requirements may be obtained from the department concerned.

A student desiring to fulfill the requirements for the degree of Bachelor of Arts or Bachelor of Science in one of the special interdepartmental programs (see Humanities Special Programs and the Program for Individually Designed Majors in the following sections of this bulletin) should consult the Chairman of the Humanities Special Programs, or Dean of Humanities and Sciences' Advisory Committee on Individually Designed Majors (through the Academic Information Center). For general statements of the requirements for the degree of Bachelor of Arts or Bachelor of Science in these programs, students should see the appropriate sections of the announcements following.

GRADUATE PROGRAMS

Candidates for the degree of Master of Arts, Master of Science, or Doctor of Philosophy should consult appropriate sections of the announcements following and should also consult the department in which they intend to specialize.

For regional, area studies, or other special graduate programs leading to the degree of Doctor of Philosophy, see listing under Graduate Division Special Programs.

UNDERGRADUATE PROGRAM IN AFRICAN AND AFRO-AMERICAN STUDIES

Emeritus: St. Clair Drake (Anthropology and Sociology)

Chairman: Kennell A. Jackson, Jr. (History)

Committee-In-Charge: David Abernethy (Political Science), James Gibbs (Anthropology), Ewart Thomas (Psychology), Arthur B. C. Walker (Applied Physics), Sylvia Wynter (Spanish and Portuguese) (on leave 1983-84)

Participating Faculty: Ronald Alexander (Communications), Clay Bates (Engineering), Clay Carson (History), Gregson Davis (Classics), Sandra Drake (English), John Gill (Engineering), William Gould (Law), Donald Harris (Economics), Halifu Osumare (Athletics), Richard Pruitt (Philosophy), Richard Randell (Art), Condoleezza Rice (Political Science), Sandra Richards (Drama), John Rickford (Linguistics), Henry Walker (Sociology), Edgar Yhap (Medicine)

STATEMENT OF PURPOSE

African and Afro-American Studies at Stanford is the systematic investigation of the history, culture and circumstances of peoples of African descent. This investigation examines the interrelationships, the parallelisms and divergences between the Black experience in the New World Diaspora - U.S.A., Latin-America, the Caribbean—as well as the linkages between the New World experiences and that of the place of origin, Africa. At the same time however, the investigation places a central focus on
the United States Afro-American experience in its complex and contradictory relation to the mainstream American (United States) experience. The scholarly investigation therefore encompasses what might be called two area studies—that of the Diaspora and Africa and that of American Studies. Yet, in this latter context Afro-American Studies cannot represent itself as merely an additional component to that of the mainstream studies; rather it seeks to introduce a tension, a dynamic which can lead to the reinterpretation not only of the Black, but of the American experience as a whole. From this comes its challenge and theoretical excitement.

The investigation will be carried out from the perspective both of the specialized disciplines and of interdisciplinary approaches. Even with the former, the comparative element will be frequently stressed. Thus the study of literature for example, will deal with specialized in-depth studies of significant Black writers from Phyllis Wheatley to Richard Wright, to contemporary writers like Amiri Baraka, and Alice Walker, as well as with the critical tradition in which they are placed; yet it will also deal with the relation of these writers both to the American (U. S. A.) literary system and to the Western literary system; as well as with the parallelisms and divergencies in theme and treatment with the other writers of Africa and the Black Diaspora.

In anthropology, it is the study of cultures, values and social relations of the world's Black communities and how they have been viewed by W. E. B. DuBois, E. Franklin Frazier or St. Clair Drake. In political science, it is the study of African & Afro-American liberation movements, African political systems and development, and leaders such as Frederick Douglass, Martin Luther King, Jr., Malcolm X, and Amilcar Cabral. In history, it is the study of the ancient African cultures, slavery, colonialism and struggles for independence both in Africa and the Americas. In psychology, it is the study of the psychological dimensions of racism and the psychological experience of Blackness in a race-conscious environment.

The sociology of knowledge suggests that one's exposure to information is in part a function of several factors, such as time and geography, or status and position in society. Consistent with this perspective, this program of study is an eclectic concentration in which major disciplines intersect with the experiences, aspirations and world views of people of African descent. It recognizes the need for continued teaching and research in these content areas, which have often been neglected by Western education.

Because of this, scholarly investigation will focus from an interdisciplinary perspective on an analysis of the frames of reference through which the Black experience has been represented and explored in mainstream scholarship. The duality of the Black experience—Black and American—affords new insights into the ongoing definitions of a universally applicable sociology of knowledge. The original scholarship in the Black experience has much to gain from interdisciplinary approaches. The Program hopes to develop this kind of approach concomitant with the theoretical development of its offerings.

**UNDERGRADUATE PROGRAM**

The Program in African and Afro-American Studies offers the Bachelor of Arts degree only. It is designed to provide the student with an interdisciplinary approach to the history, culture and experience of peoples of African origin. Its primary thrust is to help students develop literary and analytic skills while providing an intellectual framework which satisfies the traditional expectations of a liberal education. The course of study focuses on sub-Saharan Africa and those societies in the Western hemisphere where peoples of African heritage are a significant element in the population.

The undergraduate program is especially attractive to students choosing to double major in African and Afro-American Studies and a traditional discipline. It is also beneficial to non-majors interested in augmenting their coursework through classes exploring topics on African & Afro-American culture.

Opportunities for training and education beyond the A. B. parallel those open to any student majoring in a humanities or social science discipline. Graduates of the program typically pursue advanced degrees in humanities and social science disciplines, or professional schools.

The program does not offer a graduate degree in African & Afro-American Studies. However, interested students admitted to other graduate degree programs should contact the Committee on African Studies for information on combining an African Studies minor with their program.

**REQUIREMENTS FOR THE MAJOR**

The major in African and Afro-American Studies requires 50 units of credit for the A.B. degree. Majors are required to take the introductory course (105), an African history course, and an Afro-American history course. Also, twenty units must be satisfied in a concentration area, either in one department or interdepartmentally. Majors may also satisfy the con-
cenreation requirement with study in an African language. The precise content of each student's program will be worked out in consultation with the program advisor. Information on study in Africa is available through the Overseas Studies Office and Bechtel International Center.

HONORS

Majors may receive a maximum of 10 units for completing an honors thesis or project of comparable quality by the end of the senior year. The essay or project is intended to enable the student to synthesize several of the skills he or she has acquired and produce a document or project demonstrating a measure of competence in the student's speciality. The honors project must be discussed with and approved by the major advisor and Program chair. A written proposal must be submitted for consideration no later than Autumn Quarter of the senior year.

COURSES

Beginning in 1983-84, the Core Seminar will be incorporated into the introductory course (105). As the core course of the program, 105 will provide a broad survey of the Afro-American experience. It is team taught by faculty from the humanities and social sciences and will introduce themes such as retained Africanisms, the Black family and Afro-American identity. Interaction with professors will also help students plan their future course of study.

PROGRAM OFFERINGS

* Satisfies major requirements.

AFRICAN AND AFRO-AMERICAN STUDIES

59 A,B,C. Dance Theater Production.
1-5 units, Aut, Win, Spr (Osumare)

82A,B,C. Gospel Choir Workshop
1-3 units, Aut, Win, Spr (Staff)

105. Introduction to African & Afro-American Studies. (Same as Anthropology 105.) A lecture course introducing African and Afro-American Studies as an interdisciplinary field. Explores contrasting and contradictory interpretations of several key, representative aspects of African and Afro-American social and cultural institutions. Topics covered include: 1) African survivals in the New World; 2) interpretations of slavery in the New World; 3) contrasting interpretations of the Black family; 4) the Afro-American as Artist; and 5) the Afro-American identity. The course also considers why particular ideas developed at particular times and examines the relationship between African and Afro-American Studies and other academic disciplines. No prerequisite. (DR:5*)
5 units, Aut (Staff, Gibbs, Jackson) MWF 11

113. Core Seminar: Western Culture and the Black Diaspora—The Semiotics of Self and Other—This seminar will use narrative analyses of selected texts in order to examine the significations accorded Africa, the "Negro" and the Black Diaspora in the signification system of Western culture. It will analyze the deconstruction of these significations both by some schools of modern Western scholarship and by counter-discourse of emancipatory movements in the Diaspora itself.
5 units, (Wynter) given 1984-85

114. Core Seminar: Africa and the Black Diaspora: An Introduction to its Literature, Thought and Cultural Worlds—Provides a general introduction to the parallelsisms and differences in the literature, thought, and cultural worlds, both of contemporary Africa and of the African-descended communities in the New World, i.e., the USA, Brazil, Spanish-speaking Latin America and the Caribbean.
5 units (Wynter) given 1984-85

126. Black Perspectives in Medicine—Through readings, discussions and contact with Black doctors and other health care professionals, this course examines the role of Blacks in medicine and issues specific to the delivery of health care services in the Black community.
3 units, Aut (Staff)

127. Black Perspectives in Engineering—(Same as Engineering 110.) Examines the role and opportunities available to Blacks in engineering and other technical fields with emphasis on the relationship between technological development and opportunities for Black and Third World communities.
3 units, Spr (Bates)

130. Coding Differences: Race/Class/Sex/Culture/L.Q. and the Gender Model as Functions of the Contemporary Human System — (Same as Feminist Studies 130.) This seminar will examine the use made of the analogy of Gender — i.e., biological difference — to code socially produced differences as natural difference. It will focus on the function of this analogy in the representation of the social constructs of Race/Class/Sex/Culture and I.Q. as differences that are "naturally pre-determined." It will further examine the function of the metaphorical construct of "natural determinism" in the status-organizing processes of the contemporary human order. It will do this from the frames of reference of Black, Ethnic, and Feminist scholarship.
5 units (Wynter) given 1984-85
AFRICAN AND
AFRO-AMERICAN STUDIES

CLASSICS

63. Comparative Mythology: Topics from Greek and Roman, Near-Eastern and African Cultures.
4 units (Davis) given 1984-85

DRAMA

5. Introduction to Black American Drama.
5 units, Aut (Richards)

1-3 units, Spr (Richards)

1-5 units, Spr (Richards)

ECONOMICS

118. Economics of Development.
5 units, Aut (Ray)

122. Theory of Capitalist Development.
5 units, Win (Blecker)

EDUCATION

195. An Introduction to Africa Through Film: Tarzan, Terrs, and Liberation.
given 1984-85 (Samoff)

201. History of Education in the United States.
given 1984-85 (Tyack)

217S. Teaching A Global Perspective: Cross-Culture Approaches.
4 units, Spr (Grossman)

395. Education and Radical Change: African Experiences—(Same as Political Science 221S.)
4 units, Spr (Samoff)

ENGLISH

161A. The Afro-American Novel.
5 units, Aut (Drake)

162F. Modern Literature of the Caribbean.
5 units, Win (Drake)

FOOD RESEARCH INSTITUTE

103. The World Food Economy—(Same as Economics 106.)
3 units, Aut (Johnston)

121. Development and Population Interaction in the Third World—(Same as Economics 119.)
5 units, Win (Yotopoulos)

136. Population Perspectives in the Third World—(Same as Economics 133 and Sociology 153.)
5 units, Spr (Arthur)
<table>
<thead>
<tr>
<th>Subject</th>
<th>Course Title</th>
<th>Units</th>
<th>Term</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCHOOL OF HUMANITIES</strong></td>
<td>166. International Trade Policy.</td>
<td>5</td>
<td>Spr</td>
<td>Pearson</td>
</tr>
<tr>
<td></td>
<td>251. Food and Nutrition Strategies and Development.</td>
<td>5</td>
<td>Spr</td>
<td>Johnston</td>
</tr>
<tr>
<td><strong>HISTORY</strong></td>
<td>148. Introduction to African History.</td>
<td>5</td>
<td>Aut</td>
<td>Jackson</td>
</tr>
<tr>
<td></td>
<td>149B. Imperialism, Colonialism and Neo-Colonialism.</td>
<td>5</td>
<td>Win</td>
<td>Jackson</td>
</tr>
<tr>
<td></td>
<td>152A. The Making of Urban American.</td>
<td>5</td>
<td>Spr</td>
<td>Carson</td>
</tr>
<tr>
<td></td>
<td>246/346. The New History of Africa.</td>
<td>5</td>
<td>Spr</td>
<td>Johnston</td>
</tr>
<tr>
<td><strong>LATIN AMERICAN STUDIES</strong></td>
<td>80. Culture and Society in Latin America.</td>
<td>5</td>
<td>Spr</td>
<td>Durham, Wirth</td>
</tr>
<tr>
<td><strong>LINGUISTICS</strong></td>
<td>85. Black English.</td>
<td>4</td>
<td>Aut</td>
<td>Rickford</td>
</tr>
<tr>
<td></td>
<td>162. Pidgins and Creoles—(Same as Anthropology 177.)</td>
<td>4</td>
<td>Spr</td>
<td>Rickford (given 1984-85)</td>
</tr>
<tr>
<td></td>
<td>285. The Structure of Hausa.</td>
<td>4</td>
<td>Spr</td>
<td>Leben</td>
</tr>
<tr>
<td></td>
<td>602A,B,C. Beginning Hausa.</td>
<td>5</td>
<td>Aut, Win, Spr</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td>603A,B,C. Intermediate Hausa.</td>
<td>5</td>
<td>Aut, Win, Spr</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td>606A,B,C. Beginning Swahili.</td>
<td>5</td>
<td>Aut, Win, Spr</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td>607A,B,C. Intermediate Swahili.</td>
<td>5</td>
<td>Aut, Win, Spr</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td>610A,B,C. Beginning Yoruba.</td>
<td>5</td>
<td>Aut, Win, Spr</td>
<td>Staff</td>
</tr>
<tr>
<td></td>
<td>611A,B,C. Intermediate Yoruba.</td>
<td>3-5</td>
<td>Aut, Win, Spr</td>
<td>Staff</td>
</tr>
<tr>
<td><strong>PSYCHOLOGY</strong></td>
<td>131. Seminar in Cross-Cultural Counseling.</td>
<td>3</td>
<td>Aut</td>
<td>LaFromboise</td>
</tr>
<tr>
<td><strong>POLITICAL SCIENCE</strong></td>
<td>25. Colonialism and Nationalism in the Third World.</td>
<td>5</td>
<td>Spr</td>
<td>Abernethy</td>
</tr>
<tr>
<td></td>
<td>131. International Dependency.</td>
<td>5</td>
<td>Spr</td>
<td>Abernethy</td>
</tr>
<tr>
<td></td>
<td>221. Education and Political Change.</td>
<td>5</td>
<td>Win</td>
<td>Weiler</td>
</tr>
<tr>
<td><strong>SOCIOLGY</strong></td>
<td>145. Race and Ethnic Relations.</td>
<td>3 or 5</td>
<td>Aut</td>
<td>Walker</td>
</tr>
<tr>
<td><strong>SPANISH AND PORTUGUESE</strong></td>
<td>253. Western Culture and the Latin American Experience.</td>
<td>3-5</td>
<td>Spr</td>
<td>Wynter (given 1984-85)</td>
</tr>
<tr>
<td><strong>AMERICAN STUDIES</strong></td>
<td>Policy Committee: Jay Fliegelman* (English), Chair; Barton J. Bernstein* (History), William Chace (English); William A. Clebsch (Religious Studies and Humanities); Wendell Cole (Drama); Joseph Corn* (VTS) Program Coordinator; Wanda Corn (Art); Paul A. David (Economics; Coe Professor of American Economic History); Lawrence M. Friedman (Law); Albert J. Gelpi (English, Coe Professor of American Literature); Marion Lewenstein (Communication); Hubert R. Marshall* (Political Science); Richard G. Pruitt (Philosophy); Sylvia Yanigasako (Anthropology); Morris Zelditch, Jr. (Sociology)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UNDERGRADUATE PROGRAMS</strong></td>
<td>The American Studies Program is administered through the Department of Humanities Special Programs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>BACHELOR OF ARTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Majors will complete 60 units of approved coursework in American Studies for letter grades, including the following distribution: five courses in one of the concentrations (American Thought and Imagination, American Social Organization and Behavior, American Policy and Institutions) and three courses in each of the other two. Ordinarily, the five courses in the area of emphasis will include at least two courses from one of these groups: in American Thought and Imagination, English 234A, B, C, D (or equivalent); in American Social Organiza*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
tion and Behavior, History 165A, B, C; in American Policy and Institutions, Political Science 1, and Political Science 10. The program of study of each American Studies major will be subject to approval by the Administrative Committee; on application, appropriate courses not listed here may be approved by this Committee as counting toward the major. Each program of study must include a "statement of purpose" which outlines the student's particular goals and areas of concern and indicates how the proposed courses comprise a coherent plan towards those ends.

Each major must also include in the program of study: (1) the introductory course, American Studies 50, to be taken as soon as possible after declaring the major; (2) at least the first two quarters of the History 165 sequence; and (3) at least two core seminars, usually during the junior or senior year, but only after completing at least one course in each of the concentrations.

Before graduation, each student in American Studies must place in his/her academic file copies of two papers (other than take-home or other examinations) completed and graded for approved courses in American Studies.

AMERICAN STUDIES HONORS PROGRAM

Majors with a letter-grade indicator of 3.5 in American Studies may apply, preferably during the junior year and no later than the second week of the third full quarter before graduation, to seek honors by writing a senior thesis for ten to fifteen units of credit. This application is to include the topic and a proposed outline of the senior thesis. The Administrative Committee may approve or disapprove the application, or request resubmission with revisions. The finished essay must be submitted six weeks before the date of graduation. Units for the honors project must be in addition to the 60 unit major.

AMERICAN STUDIES HOUSE

This undergraduate residence on Mayfield Avenue offers educational opportunities in American Studies that are open to majors, whether residents or not. Residents are assigned through the draw for undergraduate housing.

COURSES

See departmental listings for fuller descriptions and (DR) notations. See the Time Schedule each quarter for changes in listings.

INTRODUCTORY COURSE

American Studies 50. American Literature and Culture to 1855—(Same as English 121.) A detailed study of important and representative works of American culture from 1630 to 1855. Close textual readings will be supplemented with discussions of the intellectual, theological and political history of the period. Required of all American Studies majors joining the program as of 1980-81.

5 units, Aut (Fliegelman) MTWTh 10

AMERICAN THOUGHT AND IMAGINATION

Art 130B. Paris and New York: Transatlantic Exchange in Early Modernism. 4 units, Win (W. Corn)
Art 130C. American Art in the 1930's. 4 units, Win (W. Corn)
Art 130D. American Art after World War II. 4 units, Aut (W. Corn)
Art 231. Seminar: Winslow Homer. 4 units, Aut (W. Corn)
Art 234. Seminar: Image of Women in 19th-Century American Art. 4 units, Win (W. Corn)
Drama 157. American Drama from 1920. 4 units, Win (Cole)
English 68/168. American Indian Myth, Legend and Lore. 5 units, Win (Fields)
English 79/179A. Fitzgerald and Hemingway. 5 units, Aut (Islas)
English 120. The American Historical Novel. 5 units, Win (Dekker)
English 122. American Literature, 1855-1917. 5 units, Win (Staff)
English 123. American Literature, 1917-Present. 5 units, Spr (Fields)
English 125. American Fiction, 1917-Present. 5 units, Aut (Drake)
English 161A. The Afro-American Novel. 5 units, Aut (Drake)
English 227A. Southern Women Writers. 5 units, Aut (Rampersad)
English 234A. Colonial American Prose. 5 units, Spr (Fliegelman)
English 234C. American Fiction—Romanticism to Realism. 5 units, Spr (Staff)
English 256. The American Long Poem. 5 units, Win (Gelpi)
English 285A. Poe and Hawthorne. 5 units, Win (Halliburton)
   3 units, Win (Bowden)
   3 units, Spr (Bowden)
   5 units, Spr (Bowden)

AMERICAN SOCIAL ORGANIZATION AND BEHAVIOR

American Studies 171. The Development of American Law—(Same as Political Science 183F.) The growth and development of American legal institutions with particular attention to crime and punishment, slavery and race relations, the role of law in developing the economy, and the place of lawyers in American society, from colonial times to the present.
   5 units, Aut (Friedman) MTWTh 9
Anthropology 115. Anthropological Perspectives on American Culture.
   5 units, Win (G. and L. Spindler)
   5 units, Spr (Staff)
History 150. The Emergence of American Society.
   5 units, Spr (Rakove)
History 152A. The Making of Urban American.
   5 units, Spr (Carson)
History 152B. U.S. Urban Life and Culture.
   5 units, Win (Camarillo)
History 156. History of American Workers, 1877-Present.
   5 units, Aut (Kazin)
History 165A. 19th-Century America.
   5 units, Aut (Rakove)
History 165B. 19th-Century America.
   5 units, Win (Fehrenbacher)
History 165C. 20th-Century America.
   5 units, Spr (Kazin)
History 172A. America Since 1945.
   5 units, Win (Bernstein)
History 172A. History of Women in America to 1870.
   5 units, Win (Freedman)
History 173B. History of Women in America Since 1870.
   5 units, Spr (Freedman)
History 252S. Undergraduate Seminar: Politics and Political Thought and Revolutionary America.
   5 units, Win (Rakove)
History 256A. Undergraduate Colloquium: San Francisco and Los Angeles—A Comparative History.
   5 units, Win (Kazin)
History 257A. Undergraduate Colloquium: Black Politics and Social Movements in the 1960s and 1970s.
   5 units, Spr (Carson)
History 260. Undergraduate Colloquium: Reform and Radicalism in Postwar America.
   5 units, Win (Kazin)
History 262. Undergraduate Colloquium: Ethnicity in American Cities, Past and Present.
   5 units, Spr (Camarillo)
History 266S. Undergraduate Seminar: Research on U.S. Foreign Policy.
   5 units, Aut (Kennedy)
Linguistics 56. Language and Social Issues in America.
   4 units (Ferguson) given 1984-85
   5 units, Spr (Meyer and Staff)
   3-5 units, (Zelditch)

AMERICAN POLICY AND INSTITUTIONS

American Studies 171. The Development of American Law—(Same as Political Science 183F.) See description under Social Organization and Behavior.
   5 units, Aut (Friedman)
Communication 140. History of American Journalism.
   4 units, Spr (Lewenstein)
History 158. History of Education in the United States—(Same as Education 201.)
   3 units (Tyack) given 1984-85
History 158B. American Education and Public Policy—(Same as Education 105.)
   4 units (Tyack) given 1984-85
History 255. Undergraduate Colloquium: American Urban History.
   5 units, Win (Carson)
History 255S. Undergraduate Seminar: Race and Slavery in the American Constitutional System.
   5 units, Win (Fehrenbacher)
Political Science 1. Major Issues of American Public Policy.
5 units, Aut, Win (Marshall)

Political Science 10. American National Government.
5 units, Win (Manley)
Spr (Danelski)

5 units, Spr (Moe)

Political Science 175. Politics and Public Policy.
5 units, Spr (Manley)

5 units, Spr (Horn)

Political Science 183. Civil Liberties in the United States.
5 units Win (Danelski)

Political Science 183K. Criminal Law and the Criminal System—(Same as Law 109 and Sociology 109.)
5 units, Spr (Kaplan)

5 units, Spr (Brody)

Political Science 194D. Seminar: Media and Politics.
5 units, Win (Brody)

Political Science 195. Seminar: Political and Economic Power in the U.S.
5 units, Win (Manley)

Political Science 196M. Marxian Political Economy.
5 units, Spr (Manley)

Sociology 105. Poverty and Public Policy in America.
3-5 units, Win (Tuma)

4 units, Aut (McGinn)

4-5 units, Win (J. Corn) given 1984-85

CORE SEMINARS

American Studies 201. The South Since 1850—Perennial questions of southern identity, distinctiveness, and continuity versus change from a variety of disciplines; guest speakers from law, literature, economics, religion, political science, art, music, sociology and psychology will focus on Southern topics which end themselves to interdepartmental study.
5 units, Aut (Sosna)

American Studies 202. The Shaping of 20th-Century America—(Same as History 268.) The more important literature and significant problems in analyzing American foreign relations, the political economy, the nature of American liberalism, and the structure of politics and society.
5 units, Aut (Bernstein) T 1:15-3:05

American Studies 203. American Lives—(Same as English 100H.)
5 units, Win (Islas)

American Studies 219. Major Interpretations of American History — (Same as History 253.) Focusing on influential works between 1945 and 1960 including Hofstadter's American Political Tradition, Hartz's Liberal Tradition, Handlin's Uprooted, Elkins' Slavery, Schlesinger's Age of Jackson, Potter's People of Plenty. The particular interpretations, their historiographical significance, and their strengths and weaknesses will be considered, as well as the larger perspective from which they were written.
5 units, Spr (Rakove)

American Studies 220. Photographs as Historical Documents—(Same as Art 231A.) Methods, problems and practice of "reading" photographs as historical evidence. Consideration given to the history of photography and theories of photograph interpretation, followed by development of individual research project and writing of major essay.
5 units, Spr (J. Corn and W. Corn) TTh 3:15-5:05

American Studies 221. The Machine in American Culture—Drawing on sources in art, literature, and history, the seminar will focus on two important themes in our national experience: the emergence, development, and mythologizing of "Yankee Ingenuity"; and the pervasiveness of both the love and the fear of technology in American culture.
5 units, Win (J. Corn) TTh

HONORS PROJECT

5-15 units, any quarter (Staff)
ANTHROPOLOGY

Emeriti: St. Clair Drake, Bert A. Gerow, Benjamin D. Paul, George D. Spindler (Professors)

Chairmen (Acting): Bernard Segal (Autumn); George Spindler (Winter, Spring, Summer)


Associate Professors: George A. Collier (on leave Autumn), Jane Collier (on leave Autumn), Renato I. Rosaldo, Sylvia Yanagisako

Assistant Professors: Donald L. Donham (on leave Winter and Spring), William H. Durham (on leave Winter and Spring), James A. Fox (on leave Winter), Gilbert H. Herdt, John W. Rick

Professor (Teaching): Donald C. Johanson

Lecturers: Louise S. Spindler

Affiliated Associate Professors: Elois Berlin, Shirley Brice Heath, Reynaldo Martorell

OFFERINGS AND FACILITIES

The courses offered by this department are designed (1) to provide undergraduate students with instruction in Anthropology, a discipline treating humanity from the broad viewpoints of biological heritage, culture, society, and personality; (2) to provide undergraduate majors in Anthropology with a program of work leading to the bachelor's degree; and (3) to prepare candidates for advanced degrees in the discipline.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The Department of Anthropology offers three programs leading to the Bachelor of Arts degree: the Major in Anthropology, the Honors Program in Anthropology, and an interdisciplinary program entitled Major in Social Sciences (Anthropology). To declare a major in one of these fields a student must apply to the department's Undergraduate Committee through the Academic Secretary in the department. The Academic Secretary will explain the degree requirements and help the student choose an appropriate academic advisor. Students majoring in anthropology are required to meet with their advisor at least once every quarter. Each student's progress towards fulfillment of the major requirements is recorded in a file kept by the Academic Secretary. It is the student's responsibility to see that this file is kept up to date.

The Honors Program in Anthropology is open to all majors who have a 3.5 letter-grade equivalent in anthropology courses. Candidates of sophomore or junior standing should apply for admission no later than the end of the fourth week of the Spring Quarter. The application must include a transcript, a short paper, and a letter of recommendation from the professor who will supervise the honors project. Students who cannot meet all of these requirements but wish to be considered for admission to the Honors Program should petition the Committee on Undergraduate Studies for special consideration.

The Major in Social Science also requires a written application. The student must submit a tentative list of courses and a brief statement that presents an intellectual rationale for the proposed program of study. Applications for this major must be received no later than the beginning of the Winter Quarter of the student's junior year. The Major in Social Science allows a candidate to combine a concentration in Anthropology with a selection of courses from History, Sociology, Economics, Political Science, and Psychology. Students who want a program that combines anthropology courses with courses from some other field (e.g., Classics) are advised to arrange for a special major with the Dean of Undergraduate Studies.

All majors in the Department of Anthropology must fulfill the following requirements:

1. Competence in a foreign language. Such competence is usually demonstrated by completing a course on the second-year level, but the requirement may be met by special examination, presentation of superior foreign language placement scores, or certification in writing from an appropriate department.

2. A passing grade in Anthropology 90. This course is required of all Anthropology majors and should be taken before the end of the junior year. It introduces students to Anthropology theory and prepares them for upper division courses in the discipline.

The remaining requirements for each of the three degree programs are as follows:

Major in Anthropology—Forty-five units in Anthropology or 40 units in Anthropology and 5 units in either Sociology or Psychology. The units in Anthropology must include at least one course each in four of the five following topical categories: (a) Area Studies (8, 103-118); (b)
Social and Cultural Anthropology (1, 6, 11-16, 128-168, 219-276); (c) Linguistic Anthropology (4, 5, 70, 101, 172-178); (d) Archeological Anthropology (3, 91, 187-189); (e) Biological Anthropology (2, 80, 181, 182).

Honors Program in Anthropology—The candidate must complete all of the requirements for the Major in Anthropology and submit an honors thesis no later than four weeks prior to the end of the quarter in which graduation is anticipated. The thesis will be read by the candidate’s advisor and a second reader appointed by the Committee on Undergraduate Studies. An honors candidate may enroll in Anthropology 95 for as many as 15 units but may not count more than 5 of these units in fulfilling the 45 unit requirement.

Major in Social Sciences—Thirty units in Anthropology and 20 units in related social science fields. The 50 units must form a coherent program of study and must be approved by the student’s academic advisor.

All units required for these programs must be passed with a grade of "C" or better, and not more than 5 of the required 45 units may be taken for a Pass/No Credit grade.

Undergraduate majors who have completed the prerequisites are encouraged to enroll in 100- or 200-level seminars. They may also take part in field work on local archeological sites, obtain training in museum methods by means of research with Stanford collections, and apply for funds to support summer field research in Archeology and Social Anthropology. In addition, they are encouraged to take part in departmental activities and to attend the department’s colloquia (Mondays) and noon-hour films (Fridays). Specific topics are posted in the department.

GRADUATE PROGRAMS

Basic University requirements for the degrees of Master of Arts and Doctor of Philosophy are described in the “Degrees” section of this bulletin.

MASTER OF ARTS

The Department of Anthropology offers the Master of Arts degree to four types of students: (1) Stanford undergraduates who enroll in the coterminal program; (2) Stanford graduate students taking advanced degrees in other departments or schools at Stanford; (3) Ph. D. students in Anthropology who fulfill the A.M. requirements in the course of their work towards the Ph. D. degree; and (4) students who apply from outside of Stanford for entry into the terminal A.M. program.

Stanford students interested in the coterminal program should consult the “Degrees” section of this bulletin. Coterminal students and graduate students in other departments or schools at Stanford should consult with the Academic Secretary in the department. Students from outside of Stanford should address a letter of inquiry to the Academic Secretary of the Anthropology Department. Successful applicants for the A.M. Program may enter during any quarter. Application deadlines: April 15 (for Autumn), November 1 (for Winter) and February 1 (for Spring). Applicants must file a report of their scores on the Graduate Record Examination. Students accepted for the terminal A.M. degree program cannot transfer to the Ph.D. Program. Students planning to obtain the Ph.D. degree should apply directly to the Ph.D. program.

The requirements for the A.M. degree consist of residence at Stanford University as a graduate student for at least three quarters. Students must take a minimum of 45 quarter units in Anthropology with a grade of B or better in each course. They must have at least 15 additional units of Anthropology, taken at Stanford or elsewhere, constituting a minimum total of 60 units in Anthropology. Within the 45 units taken at Stanford, students must take one quarter (5 units) of the History of Anthropological Theory plus one additional course from those designated as “core courses” by the faculty. The remaining units may be made up of courses selected in consultation with the faculty advisor to meet the needs and interests of the student. A field or library research paper read and approved by at least two departmental faculty members must be presented. Full-time students entering the program with appropriate background in Anthropology can complete the A.M. Program in one calendar year. Others may require a longer time. To provide a meaningful A.M. program within a one-year period, advance planning of coursework with an advisor is required.

DOCTOR OF PHILOSOPHY

Prospective graduate students should apply formally through the Graduate Admissions Office, which will transmit their records to the department for consideration when application requirements have been completed. Applicants for admissions must file a report of their scores on the Graduate Record Examination and submit a sample of their writing. Successful applicants for the Ph.D. Program may enter only at the beginning of the Autumn Quarter. The final date for applications is January 15.

The Ph.D. Program consists of a number of required courses and examinations which also allow students to develop a flexible program
designed to reflect their special interests under the supervision of a faculty committee chosen by them. Students are encouraged to plan a program that will enable them to complete all work for the Ph.D. in five years.

The requirements for the Ph.D. degree include:
1. Pass within the first two years, at an acceptable graduate level, four of the courses designated as "core courses" by the faculty.
2. Submit an acceptable, substantial research paper in the Spring Quarter of the first year.
3. Serve as a Teaching Assistant for two courses, usually during the second or fifth year of graduate study. An approved internship may be substituted for part or all of this requirement.
4. By the end of the second year pass, at a satisfactory graduate level, four courses distributed in at least two of the following areas: Archeology, Biological Anthropology, Linguistics, Statistics.
5. Pass, by the end of the second year of graduate study, an examination in a foreign language in which there exists a substantial body of literature relevant to the student's program of study.
6. Pass a special examination (written and oral), normally given during the Spring Quarter of the second year or the Autumn Quarter of the third year, covering the candidate's major topic of specialization and one major ethnological area of the world. The oral part of this examination is normally taken as the University Oral.
7. Prepare a dissertation proposal to be approved by the student's dissertation committee before undertaking doctoral research.
8. Present an approved dissertation based upon independent research.

PhD MINOR IN ANTHROPOLOGY

The requirements for a minor in Anthropology consist of 30 units of Anthropology taken at Stanford with a grade of B or better in each course. All students must have a departmental advisor and should develop a coherent course of study related to their particular interests. The course of study approved by the advisor must be filed with the Committee on Higher Degrees in the department.

FINANCIAL SUPPORT

The department endeavors to provide financial support (tuition plus scholarship) when needed to all students admitted to the Ph.D. Program who maintain a satisfactory course of study. Applicants for the Ph.D. Program must file a request for financial aid when applying to the program if they wish to be considered for support. No financial support is available to students enrolled only for the A.M. degree.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the School of Education section of this bulletin or address the inquiry to the Credential Administrator, School of Education.

COURSES FOR UNDERGRADUATES

GENERAL COURSES

These courses are open to all students. Each is introductory in the sense that prior knowledge is not assumed. The numbers are only labels; they say nothing about the level of the course. Students who want a general introduction to human behavior and culture are advised to take Anthropology 1; those who are interested in introductory courses focused on specific areas of anthropological inquiry should choose from among the courses numbered 2 through 16. A student who wants a comprehensive introduction to all four subfields of anthropology should take Anthropology 1, 2, 3, and 4.

1. Social and Cultural Anthropology—(Upper division students register in 101). A general introduction to anthropological perspectives on human behavior, thought, and institutions. Through lectures and films the course examines a wide range of human societies and introduces the assumptions and concepts anthropologists employ in examining the relationship between human nature, society, and culture. (DR:4*) or (DR:5*)
5 units, Win (G. and L. Spindler)
MTWTh 10

2. Biology and Culture in Human Evolution—(See also 182.) Lecture course on the interplay of genes and culture in the evolution of human diversity. Compares major theories relating human biology and culture and evaluates them in light of data from contemporary populations and the hominid fossil record. Topics include genetic evolution, human origins, the emergence of culture, gene-culture interactions, sickle cell disease, color terms, incest avoidance, human aggression, and Kuru. May be taken as an introduction to anthropology and human biology. No prerequisites. (DR:5)
3 or 5 units, Aut (Durham) MWF 1:15
plus discussion sections by arrangement

3. Human Prehistory—Covers aims, methods and data of prehistoric archeology. Traces the
development of human society from early hunters through late prehistoric civilizations. Examines archeology sites and remains characteristic of the stages of cultural development for selected geographical areas, emphasizing methods of data collection and analysis appropriate to each. (DR:5*)

3-5 units, Aut (J. Rick) MWF 9
plus discussion sections by arrangement

4. Language and Culture—(Same as Linguistics 45.) Lecture course on the ethnography of communication and theories of language and culture. Intensive analysis of linguistic repertoire, rules of use, ethnosemantics, and linguistic history of a single speech community. Comparison with other speech communities throughout the world. (DR:4)

4 or 5 units, (Fox) alternate years, given 1984-85

5. Biology and Evolution of Language—(Same as Human Biology 113.) Lecture course on the biology, function and evolution of the organs of speech and the brain. Topics include: non-human primate and other animal communication; non-verbal communication; the structure of language; biology and physics of speech; speech disorders; cognitive inferences from language universals and language acquisition; linguistic and biological evolution. (DR:4)

4 or 5 units, Spr (Fox) MWF 9
plus discussion sections by arrangement

6. Problems in Anthropology—A lecture course introducing students to divergent anthropological views of human nature, culture and society. Competing explanations of the incest taboo, warfare and aggression, male-female relations, initiation ceremonies, ancestor worship, and the family will be discussed. Selected ethnographic films pertaining to those topics will be shown. Optional discussion sections will be arranged. No prerequisites. (DR:5*)

not given 1983-84

8. Introduction to China—The course examines Chinese society in the late imperial period, traces the origins of its characteristic institutions, and then looks at the revolutionary changes that have transformed China in modern times. (DR:5*)

not given 1983-84

11. Sex Roles and Society—The purpose of this course is to develop an appreciation of the diversity of women’s and men’s roles, experiences and self-conceptions in a number of human societies, in order to provide a critical perspective on contemporary views of the “nature” of women and men, and to understand how women and men shape and are shaped by particular forms of social life. (DR:5)

3-5 units, Win (J. Collier) MWF 9

12. Sex and Gender—An introductory course of lectures on the cross-cultural study of sex and gender. Focuses on the cultural and psychological development of gender identity in non-western societies. Part one surveys the psychological basis of sexual behavior and reproduction in lower mammals and humans from an evolutionary perspective. Part two examines the interplay between socialization, cultural ideology, and gender roles. Part three concentrates on the formation of gender identity (masculinity and femininity) and its consequences for normal eroticism and perversion. (DR:4*)

not given 1983-84

13. Culture and History—Seminal works in social thought, cultural history, and anthropology—Benedict, Huizinga, Marx, Weber, de Tocqueville, and Freud. Problems include: relation of cultural pattern and historical process; culture and social class; change as gradual transition and revolution.

5 units (Rosaldo) alternate years, given 1984-85

15. Anthropological Perspectives on American Culture—(Upper division students register for 116.) Areas of convergence and divergence in values, life styles, and psychocultural attributes are analyzed for mainstream, minority, and variant cultural patterns in United States society. Processes of boundary maintenance and identity reference are discussed. Current social movements are placed in the perspective of counter-culturalism, marginality, and cultural change. Field studies of relevant phenomena will be encouraged. (DR:5)

3-5 units, Win (G. and L. Spindler)
MW 1:15-2:30

16. Culture and the Sea: Maritime Orientations and Adaptations in Human Societies—Introduction to maritime anthropology. The sea considered from an anthropological perspective with the purpose of learning something of humankind’s nature and mind from the diverse ways—ecological, conceptual, and symbolic—humans have coped with this challenging element. Specific topics include: early long-distance voyaging, fishing as an ecological adaptation; maritime economics and national development.

5 units, Spr (Frake) MWF 12

17. Culture and Astronomy—A cross-cultural and historical examination of a variety of astronomies focusing on the relations among conceptual systems, cultural practices, and empirical reality. Comparison of ancient Maya calendrical astronomy, Pacific Islanders’ navigational astronomy, and ancient and Medieval Western astronomy.

5 units, Aut (Fox, Frake) MW 1:15-3:05
SPECIAL UNDERGRADUATE COURSES

69. Practicum in Ethnographic Futures Research—(See 269.)

70. Linguistics Theory and Analysis—(Same as Linguistics 110.) Theoretical foundation of linguistics, with emphasis on application of theory to solution of homework problems from a variety of languages. Topics include: phonetics, phonology, morphology, syntax, semantics, pragmatics, universals, and language change. This course or its equivalent is required for many advanced courses in linguistics. Prerequisite: Linguistics 10 or consent of instructor.
4 units, Win (Numberg)

80. Human Origins—Considers evidence for the evolution of humankind from its beginnings several million years ago to the emergence of Homo sapiens. Emphasis is placed on a consideration of fossil hominid remains — from their discovery to their interpretations for elucidating human origins.
5 units, Spr (Johanson) TTh 1:15-2:45

90. Theory in Social Anthropology—Anthropological interpretations of other societies have always contained assumptions about ourselves and about "Western" societies. The object of this course is to highlight that interplay and, specifically, to consider how underlying assumptions and implicit categories have influenced the presentation of data in a set of major anthropological monographs. The course will concentrate on Karl Marx, Emile Durkheim, and Max Weber, along with a particular anthropological analysis of a nonwestern society.
5 units, Spr (Rosaldo) MWF 11

91. Archeological Field Methods—Field course involving students in actual archeological field research in the local area. The practical working methodology of the archeologist will be covered, primarily through excavation and site survey, although training in registration, preservation, and analysis of archeological remains will be included. Anthropology 191 is recommended as preparation for this course, but is not a strict prerequisite. Prerequisite: 3 or consent of instructor.
not given 1983-84

93. Pre-Field Research Seminar—Prepares students for anthropological field research in other societies and the United States. Instruction in broad range of data collection techniques including participant observation, interviewing, surveys, sampling procedures, life-histories, ethnohistory, and use of documentary materials. Also explores strategies of successful entry into the community, research ethics, interpersonal dynamics, and the reflexive aspects of fieldwork. Prerequisite: introductory course in anthropology or consent of instructor.
5 units, Spr (Staff)

94. Post-Field Research Seminar—Provides training and experience in coding, processing, and analyzing quantitative and qualitative research data. Participants are expected to complete a full-scale report on a body of field data that will normally have been collected during the preceding summer.
5 units, Aut (Skinner) MW 11-12:15

95. Honors Program—Directed independent study and honors thesis work for students admitted to this program.
any quarter (Staff) by arrangement

96. Directed Individual Study—For undergraduate students with special needs, and showing capacity to do independent work. Prerequisite: 1 or consent of instructor.
any quarter (Staff) by arrangement

COURSES FOR UNDERGRADUATES AND GRADUATES

AREA STUDIES

101. Maya Hieroglyphic Writing—Lecture course on decipherment of pre-Columbian Maya books and inscriptions. General principles of archeological decipherment. History of Mesoamerican writing. Contributions of Maya texts to modern understanding of Maya astronomy, religion, sociopolitical organization, and history. Emphasis on student participation.
5 units (Fox)
alternate years, given 1984-85

103. Peoples of Mesoamerica—Survey of the Mayas, the Aztecs and their prehistoric neighbors, of how they fared under Spanish colonial rule, and of what their descendants are like today. (May be taken in sequence with Anthropology 104.) (DR:5*)
3-5 units, Win (G. Collier) MWF 10

105. Introduction to African and Afro-American Studies—(Same as African and Afro-American Studies 105.) Examines and critiques contrasting interpretations of Africa and Afro-American social and cultural institutions: (1) African survivals in the New World; (2) New World slavery; (3) the black family; (4) the Afro-American as Artist; and (5) the Afro-American identity. Considers why interpretations developed at particular times and examines relationship between African and Afro-Amer-
ican Studies and other disciplines. No prerequisite. (DR:5*)

5 units, Aut (Gibbs, Jackson, Rampersad) MWF 11

106. Seminar on Structure and Change in Rural Latin America — (Graduate students register for Anthropology 206). Selected problems in the study of social structure and change in agrarian societies of Latin America. Among those to be considered are: changing relations between agrarian communities and complex societies of which they are a part; power and patronage; plantation systems; ethnicity and race; and peasant movements.

5 units, Aut (Siegel) W 3:15-6:05

113. Peoples of the Pacific—The role of Melanesia, Micronesia, and Polynesia in human culture history. Survey of Pacific cultures with detailed examination of selected societies. Response of Oceania to European contact and its place in the modern world.

5 units, (Frake) alternate years, given 1984-85

115. Peoples of Island Southeast Asia—Shows how the contemporary culture unity and diversity within the Southeast Asian region may be accounted for in terms of the interaction between indigenous societies and a succession of outside colonizing influences. Among topics discussed are: prehistory, the process and impact of colonization, the contrast between hill and valley peoples, subsistence modes, social organization, religion, and aesthetics. (DR:5*)

5 units, (Frake) given 1984-85

116. Anthropological Perspectives on American Culture—(See Anthropology 015.)

117. Traditional Chinese Society—Analyze the society, culture, and political economy of late traditional China to 1949. Attention is given to the nature of social change in this premodern agrarian civilization. (DR:5*)

5 units, (Skinner) not given 1983-84

118. Communist Chinese Society—Analyze sociocultural change and economic development in the People’s Republic of China, with attention to how the Chinese case relates to social science theory.

5 units, Spr (Skinner) MWF 10

119. Chicano Culture—Interdisciplinary approach to the study of Chicano life and culture. Topics will include formation of the barrio; labor conflict; folklore and beliefs; forms and figures of cultural resistance (banditos, corridos, popular leaders); patterns of immigration; stereotypes and self-images in fiction, poetry, and teatro.

5 units, (Rosaldo) not given 1983-84

121. Japanese Society and Culture—Racial, cultural, social characteristics, and background. Relationships between the Japanese and other peoples of East Asia. Opportunities for reading in special subject areas.

5 units (Befu) not given 1983-84

127. Peoples and Cultural Adaptation in Mediterranean Europe—The study of agrarian societies and cultures of Mediterranean Europe, with special emphasis on Italy, Greece, Spain and Portugal. Focus will be on ecology, land tenure and production, family and kinship, (beliefs and values). Consideration will be given to the relations between local communities and national and international forces that have historically shaped their adaptations.

5 units (Befu) given 1984-85

SOCIAL AND CULTURAL ANTHROPOLOGY

128. Ethnographic Film—(Same as Communication 115). Nature of the ethnographic film as a documentary form is examined through viewing and analysis of classical and current films; also explores uses of film and video tapes as a tool for the analysis and presentation of cognitive, social, and kinesic aspects of culture and as a vehicle for the anthropological research. Prerequisite: Anthropology 1 is recommended.

5 units, Spr (Gibbs) MF 10 and W 7:30 p.m.

129. Evolution of Mesopotamian Civilization —The evolution of the world’s first complex society and state system, the Sumerian Akkadian civilization of the Middle East in what is now Iraq. Origins of agriculture and domesticated animals; processes by which sedentary villages were transformed into urban societies and states will consider the role of stratification; bureaucracies; trade; population growth; writ-
ing systems; and militarism. Mesopotamia as a model for theoretical study of other pristine states. (DR:5)

5 units, Win (Siegel) MWF 9

131. Cultural Evolution—Analysis of the origin of human culture using evidence from primate ethnology, paleontology, archaeology and culture theory; examination of theories of cultural development from hunting-gathering economy through agriculture to industrialism, such as those of Morgan, Tyler, White, Steward, Marx, Ribeiro and others; systematic outline of processes and stages of cultural development up through modern period. not given 1983-84

133A,B,C. Ethics of Development in a Global Environment (EDGE) — (Same as Education 274A,B,C; Engineering 297A,B,C; Political Science 140A,B,C.) The EDGE seminars present a series of speakers on current development issues with emphasis on the problems of the poorer nations. Autumn Quarter speakers discuss basic world resources — energy, food, housing, population and environment — and the political development and dependencies of developing regions. Winter Quarter speakers address the international institutions and their roles: international banking, international businesses, U.S. and foreign Universities, East-West political policies, and organizations of developing countries. Spring Quarter speakers address the roles of individuals in national and international institutions dealing with the problems of developing countries.

The speakers present a wide range of political, professional, and national backgrounds and present candid and often differing points of view. The series gives students working in developing countries or in institutions dealing with developing countries a better knowledge of the challenges they face and the issues they must deal with.

One unit credit for attendance of the speaker series; three units additional credit for optional workshops treating selected issues in more depth. (Sequential registration not required.)

1 unit (lecture only) or 4 units
(plus workshop) Aut, Win, Spr
(Fagen, Fuenzalida, Lusignan, McWhorter, Siegel, Textor)
Lectures M 7:30-9:30 p.m.
Workshops by arrangement.

138. Education and Sociocultural Change—
(See 238.)

139. Seminar in Cultural Identity—Seminar investigating the nature of ethnicity, the mecha-

nisms of ethnic boundary maintenance, and the role of ethnic groups in social, cultural, and ecological systems.
5 units, (Frake) alternate years, given 1984-85

140. The Ethnography—This graduate seminar will examine carefully a number of ethnographic classics with the goal of understanding the integration of data, theory, and structure of the presentation. A range of ethnographies from different historical periods, nations, and theoretical schools will be analyzed. Prerequisite: consent of instructor. not given 1983-84

145. Women in Cities: A Cross-Cultural Perspective — A series of hypotheses about women's experiences in cities, which have emerged primarily from research in North America and Western Europe, will be critically evaluated in light of research on women in Latin American, Asian, and African cities. Topics to be covered include women and migration, changing forms of the sexual division of labor, changing family and kinship structures, women's access to 'public' space in cities, urbanism, and political activism.
5 units, Spr (Yanagisako) MWF 11

146. Urban Problems in Anthropological Perspective—A series of issues derived from current urban problems are examined from the cross-cultural perspective of anthropology. Topics include the social consequences of crowding, rural-urban migration, pre-industrial urbanism, changing family and kinship patterns, urban ethnic communities and inter-ethnic relations, urban poverty and stratification, and crime.
5 units (Yanagisako) alternate years, given 1984-85

147. Peasant Migration and Social Change—Rural-to-urban migration as indicator and consequence of social change. Examine models of migration processes; impact of policies in sending and receiving notions; motives and adaptive strategies of migrants; significance of emigration for peasant villages. Case studies from Africa, Latin America, Asia, and Europe.
3 units, Win (Siegel) MWF 11

148. Cultural Approaches to Alternative Futures — (Same as Education 287.) Seminar exploring alternative middle-range futures—of a community, a society, or the world—from an anthropological perspective. Stresses developing ability to read the futures literature critically, using explicit models and systematic data, while at the same time developing imaginative scenario-building skills. Emphasizes the change-driving power of the telemicroelectronic and biotechnical revolutions. Considers global ecological and energy constraints, and
sociopolitical imperatives. Examines particular Western and non-Western cultures in terms of their adaptive capacity or vulnerability. Addresses implications for the policy-maker, planner, and educator. (DR:5)

3-5 units, Win (Textor) WF 3:15-4:45

and by arrangement

150. Advanced Cognitive Anthropology—
(Graduate students register for 276.) This course is concerned with how people give meaning to behavior and other events they experience. The point of view is from the anthropological side of the intersection of anthropology, linguistics, cognitive psychology, and sociology thus presenting a cross-cultural perspective on the relations among knowledge, language, and social behavior.

5 units, Win (Frake) WF 2:15-3:30

152. Symbolic Anthropology—Symbolic analysis has developed on the premise that the examination of cultural meaning and phenomenological experience is essential for anthropological understanding. Recent monographs have applied symbolic approaches to topics such as history, ethnicity, politics, ritual, and social structure. The seminar will critically examine these applications and the questions they raise about the place of symbolic analysis in social inquiry. Prerequisite: Introductory course in social or cultural anthropology or consent of instructor.

not given 1983-84

154. The Anthropology of Play—(Same as Education 192.) Introductory course of lectures on anthropological perspectives on play. First half surveys the social psychological literature, for understanding the role of play in shaping cognitive development, images of adult roles, and developmental performance. An historical examination of play will identify concepts of childhood and societal correlates of varying definitions and norms of play. Second half examines play in crosscultural contexts and focus on paradigms of pretense. Final section reviews educational and social policy issues in the uses of play. (SSE)

3-5 units, Spr (Heath) TTh 2:15-4:05

156. Law and Conflict Management—Lecture course focusing on problems of order and conflict in society. Considers whether all societies have "law," and will examine the social settings of such dispute handling mechanisms as negotiation, mediation, arbitration, and adjudication. Students read ethnographic accounts of conflict management in other societies and are required to visit local courts in order to obtain first-hand knowledge of disputing in our society.

5 units, Spr (J. Collier) MWF 9

157. Law in Radically Different Cultures—
(Same as Human Biology 147 and Law 157.)

(Graduate students register for 257.) Uses American law as a benchmark to examine comparable issues in the law of the Peoples Republic of China (Eastern law), Republic of Egypt (religious law), and the Republic of Botswana (traditional law) in order to identify the historical, philosophical, social, and cultural factors which contributed to the development of different attitudes and practices regarding law. Open to law students, graduate students in other departments and to juniors and seniors. The course meets during the Law School Spring Semester from January 25 to May 14. Students must enroll for both 157A and 157B (no credit is given for 157A alone). Enroll for a total of 5 units — 3 units for one quarter and 2 units for the other quarter.

3 units, Win, Spr (Barton, Gibbs, Merryman) MWTh 2:15

164. Ecological Anthropology—(Same as Human Biology 134.) Seminar on the cultural adaptations of human populations to their environments. Evaluates major theories relating cultures and ecosystems in light of examples from diverse habitats (arctic, desert, tropical rainforest, ocean islands, mountain tops, etc.). Topics include adaptation and cultural change, optimal foraging theory, resource management, social demography and population dynamics, resource competition, warfare, and social stratification. Prerequisite: Anthropology 1, the Human Biology Core, or consent of instructor.

5 units, (Durham) alternate years, given 1984-85

165. Psychological Anthropology—An introduction to contemporary themes in the anthropological study of cultural influences on psychological development and functioning. Socialization and cognition in life-cycle adaptations to behavioral and symbolic environments are highlighted. Themes to be surveyed include: childhood and parental bonding; sex differences; cultural motivation and perception; ethno-graphic psychologies of cognition and consciousness; deviance and self-justification; and life cycle transitions. Prerequisite: Anthropology 1 and Psychology 1. (DR:4)

5 units, Spr (Herd) MWF 12

166. Culture and Madness—Introduction to anthropological perspectives on the theme of "madness" in cultural ideology and individual experience within tribal, peasant, and western cultures. Case studies are used to examine the role of sociocultural factors in psychiatric illnesses, diagnosis and healing in the following areas: symbolic group therapy, healing cults, shamanism and trance states, primitive psychosis and patterns of deviance, anxiety and the
SCHOOL OF HUMANITIES AND SCIENCES

Schizophrenias of western civilization. Models of madness are viewed in the cultural context of definitions of normal and abnormal behavior, the medical model of disease and social policies about psychiatric treatment. Prerequisite: Anthropology 1 and Psychology 1, or the instructor's consent.

5 units, Spr (Herdt) MWF 10

167. Ethnography of Communications: Research Methods—(Same as Education 337.) A research seminar designed to provide intensive preparation in ethnographic field methods for the study of communication. Following a review of earlier efforts in ethnography of communication, current research problems (determining unit of study, defining speech community, will be examined. Case studies will include: (1) selected speech events for interpreting value orientation to language and social roles (2) oral-literate continuum models, and (3) use of cognitive style theories for understanding cross-continuum models, and (3) use of cognitive style theories for understanding cross-cultural dimensions of first and second language acquisition. (SSE)

4-5 units, Win (Heath) MW 1:15-3:05

168. Medical Anthropology—Introduces relatively new field of medical anthropology. The field encompasses non-Western medical beliefs and curing systems; problems of adapting modern medicine to diverse cultures; social and cultural correlates of physical and mental health and disease (social epidemiology). Designed for non-majors in biology and medicine and social science majors with an interest in health and/or biology.

5 units, (Barnett) not given 1983-84

LINGUISTIC ANTHROPOLOGY


5 units (Fox) alternate years, given 1984-85

174. Typology and Universals of Language—(Same as Linguistics 208). The relation between typology and universals; universals in phonology, grammar and semantics; universals and linguistic change; the role of universals in overall explanatory theory in linguistics; universals research in contemporary linguistic theory. Prerequisite: 70/Linguistics 10 or consent of instructor.

alternate years, given 1984-85

177. Pidgins and Creoles—(Same as Linguistics 162.) Lecture on the formation of simplified contact languages (pidgins) and their subsequent elaboration. Emphasis on the relationship between language structure and function, Language universals, and the relevance of political power, ethnic identity, and social structure in the contact speech community. Attention given to other simplified languages and registers. Prerequisite: an introductory course in linguistics or anthropology or consent of instructor.

4 units, (Fox, Frake, Rickford) alternate years, given 1984-85

178. Historical Linguistics and Cultural History—Lecture course on basic principles of historical linguistics, with attention to cultural inferences from language distribution and classification, reconstructed protovocabulary, and loanwords or other areal influences. Topics include: the comparative method; the rate of language change; glottochronology; migration theory. Prerequisite: introductory course in linguistics, or consent of instructor.

alternate years, given 1984-85

ARCHEOLOGY AND BIOLOGICAL ANTHROPOLOGY

181. Research Seminar in Coevolution—(Same as Human Biology 114.) Seminar of the interactions of genes and culture in the evolution of human diversity. Reviews major new works relating biology and culture (e.g., sociobiology, dual inheritance theory, cultural transmission, etc.) with special emphasis on theory and supporting examples. Teams of students conduct original research projects and report to the class. Prerequisites: Anthropology 2 or the Human Biology Core, and a course in statistics.

4 units (Durham) alternate years, given 1984-85

182. Biology and Culture in Human Evolution—(See also 2.) Intended for upper division and graduate students only. Prerequisites: Anthropology 90 or consent of instructor. not given 1983-84

187. Hunter-Gatherers in Archeological Perspective—(Same as Human Biology 183.) Encompasses problems of the organization and subsistence of band-level hunter-gatherers, especially as approached through archeological investigations. Surveys modern hunter-gatherers, providing background for prehistoric groups. The archeological record of Africa, Europe, and the New World provides examples
of how archeological data is used to reconstruct the cultural systems of extinct hunter-gatherers.

5 units, Spr (J. Rick) MW 1:15-3:05

188. The Evolution of Prehistoric Civilizations—(Same as Human Biology 188.) Examines radical transitions involved in the evolution from original non-complex societies to complex state organizations. Basic problems considered include the change from food collecting to food-producing societies, the evolution of rank and stratification in society, as well as the role of trade, interaction, mobility, population growth, and ideology in the development of civilizations. Various theories of state evolution will be examined in the light of prehistoric Mesoamerican and South American complex societies. (DR:5*)

not given 1983-84

189. Peruvian Archeology—Traces development of high civilizations in Andean South America from hunter-gatherer origins to culmination in the powerful and expansive Inca empire. Examines contrasting ecologies of coast, sierra and jungle areas of early Peruvian societies of 12,000-2,000 B.C. and domestication of various indigenous plants, which provided the economic foundation for later complex societies best known for their monumental cities and beautiful ceramics and textiles. Describes this cultural evolution, and explains why and how major transitions occurred.

5 units, Spr (J. Rick) MWF 9

RESEARCH METHODS

190A,B. Data Analysis—Introduction to data analysis through theory and use of parametric and non-parametric statistics with special emphasis on applications in anthropology. Offers training in the use of the computer for data analysis. Continuous enrollment through both quarters required for credit.

5 units, Win, Spr (G. Collier) TTh 8:15-10

192A. Ethnographic Monitoring of Rapid Change I—(Same as Education 254A.) Seminar-practicum on the anthropological and empirical study of processes of rapid or sudden change (such as telemicroelectronic, biotechnical, or other technological innovation, an ecological system break, or a fundamental shift in political or managerial control) where such change is judged likely in turn to produce profound sociocultural change. The student, working alone or with a team, selects a problem, formulates it in social science terms, and receives training and systematic guidance in using appropriately adapted ethnographic techniques to carry out a fieldwork project in a local community or institution. The resulting paper assesses implications of findings for theory, policy, and education. Previous interviewing or social science background helpful but not essential. Open to graduate students, seniors, and juniors. Enrollment limited to 20.

3-5 units, Win (Textor) Th 7-10 p.m. and by arrangement

192B. Ethnographic Monitoring of Rapid Change II—(Same as Education 254B.) Continuation of Education 254A Anthropology 192A) for the student requiring additional time, training, or guidance to complete a paper, prepare it for publication, develop it into a dissertation proposal, etc.

3-5 units, Spr (Textor) W 7-10 p.m. and by arrangement

195. Museum Methods—Directed work on anthropological collections. Can be taken for one or two quarters with consent of instructor.

1-4 units, Aut, Win, Spr (Gerow) by arrangement

COURSES FOR GRADUATES AND ADVANCED UNDERGRADUATES

206. Seminar on Structure and Change in Rural Latin America—(See Anthropology 106.)

215. New Guinea Secret Societies—A seminar on the symbolic, psychosocial, and political dynamics of comparative ethnography of New Guinea. After historical and theoretical reviews of the Melanesian literature since 1900, contemporary interpretations of ritual secrecy, initiation and gender, relationships between the sexes, ritual cults and warfare and social reproduction will be considered. Case studies will involve regional analyses of the Eastern Highlands, Sepik-area systems, and Papuan Plateau. Prerequisite: consent of instructor.

5 units (Herdt) not given 1983-84

219. Comparative Social Organization of China and Japan—Seminar devoted to analyses of Chinese and Japanese societies since the 17th century. Student research papers may treat either or both of the societies and may focus on any topic of analytical concern to anthropologists and historical sociologists.

5 units, Spr (Skinner) MW 1:15-2:50

238. Education and Sociocultural Change—(Same as Education 306C.) (Undergraduates register for 138.) Utilizes a variety of theories and models to examine processes of sociocultural change worldwide, especially processes of modernization and development. Examines the effectiveness, or lack thereof, of educational
inputs in promoting sociocultural change. Considers such factors as demographic shifts, ecological system breaks, mineral and energy constraints, pollution and congestion, the potential of the tele-microelectronic and biotechnical revolutions, and culturally engendered value conflicts. Seeks to promote a non-ethnocentric, ethically aware understanding of the needs of non-Western peoples whom development and educational programs are intended to benefit. (IDE, SSE)

3-5 units, Spr (Textor) TTh 2:15-4:05
and by arrangement

243. Social Organization—Examination of theories and findings in the area of culturally defined interpersonal relations, focusing on kinship, and local group organization. Prerequisite: graduate status in anthropology or consent of instructor.

5 units, (Befu) not given 1983-84

244. Family and Kinship Organization—Seminar on the major issues anthropologists have confronted in the comparative study of family and kinship. Competing theoretical frameworks will be evaluated through an examination of such topics as descent, marriage, parenthood, domestic groups, and kinship change. Prerequisite: graduate standing in Anthropology or consent of instructor.

5 units, Win (Yanagisako) TTh 1:15-3:05

245. Linguistic Change—(Same as Linguistics 245.) The nature of linguistic change in phonology, grammar and semantics, problems of internal and comparative reconstruction and basic issues in the explanation of diachronic processes in language.

5 units, Spr (Greenberg) MW 10-11:50

246. Anthropology and History—(Same as History 349.) Seminar on cultural patterns and historical processes. Attention to historiography of oral tradition and written sources as well as research methods in social science.

5 units, Win (Jackson, Rosaldo) W 1-4

250. Nutritional Problems of Developing Nations—(Same as Food Research 250.) The various malnutrition syndromes common in developing countries will be described, with emphasis upon protein-calorie malnutrition, nutritional anemias, and vitamin A deficiency. Methods and techniques of nutritional assessment applicable for use in developing nations will be reviewed. Detailed consideration will be given to effects of malnutrition throughout the life cycle, from fetal growth to fertility, with assessment of societal cost of malnutrition and its effects on learning, productivity, and other aspects of national development. Prerequisite: permission of instructor.

5 units, Win (Arroyave) TTh 10-11:30

251. Ritual and Mind—A seminar devoted to understanding contemporary theories of ritual symbolism and individual experience. Topics to be studied: social learning, psychodynamic, semiotic, and hermeneutic theories of ritual; cognitive versus affective processes in ritual symbolism; and personal identity. Prerequisite: consent of instructor.

5 units, Spr (Collier) TTh 9-10:50

252. Religion—Readings in classical social theory (Weber, Durkheim, Freud) on the nature of religion with special emphasis on their importance for a theory of culture. Theory will be complemented by ethnography and contemporary works which continue, and further interpretation of such phenomena as religious sects, worship, rites of passage, magic, shamanism and dreaming. Prerequisite: consent of instructor.

5 units, Spr (Rosaldo) alternate years, given 1984-85

253. Stories and Culture—This course considers both the use of narrative in understanding, social practices, and problems in studying the text and context of storytelling.

5 units, Rosaldo alternate years, given 1984-85

254. Political Anthropology—Seminar focusing on theoretical approaches to the study of politics and political development in traditional societies ranging from bands to agrarian civilizations. Prerequisite: graduate status in anthropology, sociology, or political science, or consent of instructor.

5 units, Spr (J. Collier) TTh 9-10:50

255. Economic Anthropology—Seminar on the dominant issues in current attempts to analyze the economic organization of noncapitalist societies. Special attention devoted to competing theoretical approaches—particularly neoclassical, substantivist, and Marxist—to such topics as the social organization of production, the circulation of goods and services,
the generation and maintenance of economic inequality, and the encapsulation of local economic units within larger social systems.

5 units, Aut (Donham) TTh 3:15-4:50

263. Regional Systems in Agrarian Societies
Seminar devoted to the comparative analysis of the social structure and political economy of peasant-based societies. The regional-systems approach strives for holistic understanding of the larger spatial-temporal systems that envelop condition peasant livelihood and culture.

5 units, Aut (Donham) TTh 3:15-4:50

264. Advanced Ecological Anthropology
Seminar on the role of ecological models in the analysis of contemporary cultural diversity. Uses major monographs of the subfield to review early efforts linking environments and social systems (e.g., multilinear evolution, neo-functionalism, adaptive radiation) and to evaluate current theory and research trends. Case studies include: foraging patterns of hunter-gatherers, ritual regulation in highland New Guinea, kinship and land texture in Southern Mexico, demographic change in the Swiss Alps, and peasant ecology of Central America. Prerequisite: Anthropology 164 or graduate standing.

5 units, Win (Durham) TTh 10-11:50

265. Advanced Psychological Anthropology
Analysis of selected psychocultural processes, including attention to group and individual adaptations to rapid cultural change and urbanization. Prerequisite: consent of instructor.

5 units (Gibbs)
alternate years, given 1984-85

266. Cultural Transmission—(Same as Education 315).
The transmission and communication of explicit and implicit cultural assumptions in a variety of formal and informal educational contexts. The patterning of education in cross-cultural perspective, sequences of culturally constructed experiences in life careers, cultural analysis and sensitization. Attention to education in the U.S.A. and other complex societies, as well as in non-literate cultures.

3-5 units, Win (G. and L. Spindler)
T 7-10 p.m. plus by arrangement

267. Seminar in Fieldwork and Ethnography—Advanced seminar on the qualitative methods of anthropological fieldwork and the processes of doing and writing ethnography. Briefly surveys the intellectual history of theories and methods of fieldwork and ethnographic interpretation. Covers various qualitative techniques, and types of interviewing. Interpretive, ethical, and interpersonal aspects of ethnographic research and reporting are discussed and compared in both simple and complex societies.

5 units, Aut (Herdt) TTh 1:15-3:05

268. Family Ecology—Each student follows a family during the quarter, interviewing, observing, and studying them at their home and in a clinical setting. The seminar provides the student with interview and observation skills and sensitizes students to others and their reactions. Field work focuses on meaning of illness from patient’s point of view and role, responsibility, and impact of professional intervention.

5 units (Barnett and Grobstein)
not given 1983-84

269. Practicum in Ethnographic Futures Research—(Same as Education 212.) Undergraduates register for Anthropology 69. Instruction in the rationale, and guidance in the practice, of Ethnographic Futures Research (EFR), a non-directive, semi-structured, open-ended, interactive, recursive technique for eliciting from a sample of interviewees their middle-range perceived and preferred sociocultural scenarios for a given social population. EFR is (1) an auxiliary technique for research on sociocultural change (2) a means of augmenting conventional policymaking and planning approaches; and (3) an educational technique for both interviewer and interviewee. Instruction includes ways of combining EFR with conventional ethnography and other research methodologies. No prerequisites, but 148 is recommended.

3-5 units, Spr (Textor)
alternate years, given 1984-85

271. Seminar in Clinical Processes—(Same as Psychology 271.) This seminar includes practice training in clinical interviewing and case observation. It is affiliated with a psychiatric ward at the VA Hospital, where each student will conduct interviews and coordinate findings. In weekly case presentations, the seminar will focus on aspects of case formulation as well as on the goals and theories of interviewing. Students should enroll concurrently in Psychology 216. Prerequisite: Consent of the instructors.

3 units, Spr (Horowitz, Herdt) Th 1-3

275. Demographic Anthropology—Proseminar devoted to an examination of population dynamics in human societies. Includes a critical review of theories concerning the interaction between population processes and the political economy and a comparative analysis of family demography.

not given 1983-84

276. Advanced Cognitive Anthropology—(See 150.)

278. Topics in Linguistic Anthropology—Seminar devoted to intensive reading and discussion of major works on the relationship be-
between language and culture. Topics for 1983-84: Speech act theory and the ethnography of communication, with special attention to the work of Malinowski. Prerequisites: graduate status and an introductory course in linguistics, or consent of instructor.

5 units, Spr (Fox) TTh 3:15-5:05


5 units, Aut (Greenberg) TTh 10-11:50

291. Anthropological Theory in Historical Context—Seminar considers a set of problems that show the interplay between theory and historical circumstances. Among topics considered are race and culture, functionalism, societies without states, family and kinship studies, material culture, feuding and forms of warfare, structuralism, and Marxism. Prerequisite: graduate standing or consent of instructors.

5 units, Spr (Rosaldo and Yanagisako W 3:15-6

292. Dissertation Seminar—Seminar for graduate students in the process of writing dissertation and preparing for professional employment.

5 units, Aut, Win, Spr (Gibbs) F 1:15-3:05

294. Design of Field Research—A seminar treating research design and the research process, with special attention to the interrelation of both with theory and method. Consideration is also given to problems of preparing dissertation proposals and applications for research grants. Limited enrollment. Prerequisite: consent of instructor.

5 units, Spr (Frake) W 3:15-6:05

296. Research Apprenticeship—Supervised work with an individual faculty member on the students' research project. May be taken for more than one quarter.

5 units, any quarter (Staff) by arrangement

297. Directed Individual Study—Provides opportunities for advanced students to explore special areas of interest.

any quarter (Staff) by arrangement

298. Teaching Apprenticeship—Supervised experience as assistant in one undergraduate course.

5 units, any quarter (Staff) by arrangement

299. Thesis—Research in connection with the master's thesis or the doctoral dissertation.

any quarter (Staff) by arrangement

OFFERINGS AND FACILITIES

The program in Applied Physics offers to qualified students with backgrounds in physics or engineering the opportunity for graduate course work and research in those areas of physics which may be relevant to technical applications, and to natural phenomena. These areas include solid state, superconductivity, quantum electronics, space science, astrophysics, and physics of biological macromolecules. Student research is supervised by the faculty members listed above and also by various members of other departments such as Physics, Materials Science and Electrical Engineering, who are engaged in related research fields. Research activities are carried out in the Department of Applied Physics, the Ginzton Laboratory, the Stanford Electronics Laboratories, the Center for Space Science and Astrophysics, the Center for Materials Research, and the Stanford Synchrotron Radiation Laboratory.

The number of graduate students admitted to Applied Physics is limited. Applications should be received by January 15, 1984. Graduate students may normally enter the department only at the beginning of Autumn Quarter.

GRADUATE PROGRAMS

Admission requirements for graduate work in Applied Physics include a bachelor's degree in physics or an equivalent engineering degree. Students entering the programs from an engi-
neering curriculum should expect to spend at least an additional quarter of study acquiring the background to meet the requirements for advanced degrees in Applied Physics.

The courses are listed under several categories: 1) General; 2) Astrophysics; 3) Condensed Matter Physics; 4) Quantum Electronics, Optics, and Acoustics. These reflect major programs for graduate study. From time to time, "Special Topics" courses are offered to emphasize new developments in the various research areas.

The University's basic requirements for the master's degree are discussed in the "Degrees" section in this bulletin. Thirty-six units, of which at least 9 units must be graduate level courses, in applied physics, physics, engineering, and mathematics are the minimum requirements for the degree. A recommended program consists of the following:

1. Courses in physics and mathematics to overcome deficiencies, if any, in undergraduate preparation.
2. Basic Graduate Courses.
   a) Mathematical Physics—2 quarters (6 units).
   b) Electrodynamics—2 quarters (6 units).
      (Physics 220, 221)
   c) Quantum Mechanics—2 quarters (6 units).
      (Physics 230, 231, 232, 330, 331, 332, 340, Electrical Engineering 324)
   d) Laboratory—1 quarter (3 units).
      (Applied Physics 356, 358A, 358B, Physics 200, 201, Electrical Engineering 245)
3. Additional courses in science and/or engineering but not including Directed Study (Applied Physics 290) to complete the requirement of 36 units.
4. A grade average of B is required.

If a student is admitted to the Master of Science Program only but later wishes to change to the Ph.D. Program, the student must apply to the department's Admissions Committee. There are no departmental or University examinations, and a thesis is not required.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the doctorate (residence, dissertation, examination, etc.) are discussed in the "Degrees" section in this bulletin. The program leading to a Ph.D. in Applied Physics consists of:

1. Course Work
2. Research
3. A Departmental Oral Examination
4. A Research Progress Report
5. A University Oral Examination
6. A Dissertation

1. Course Work
   a) Courses in physics and mathematics to overcome deficiencies, if any, in undergraduate preparation.
   b) Basic graduate courses.
      2) Electrodynamics—2 quarters (Physics 220, 221)
      3) Quantum Mechanics—3 quarters (Physics 230, 231, 232, 330, 331, 332, 340, Electrical Engineering 324)
      4) Laboratory—1 quarter (Applied Physics 356, 358A, 358B, Physics 200, 201, Electrical Engineering 245)
      c) Twenty-four units of additional courses in science and/or engineering, not including Directed Study (Applied Physics 290) and Dissertation Research (Applied Physics 300).
   d) A grade average of 3.0 or better is required.

For students entering with a Master of Science degree, the course work requirements (Item 1) are modified as follows:

Item "1b" may be partially or totally satisfied with equivalent courses taken elsewhere.

The requirements under "1c" are reduced to 18 units.

2. Research may be conducted under the supervision of a member of the Applied Physics faculty, appropriate faculty from other departments, or certain senior research associates in University laboratories.

3. Departmental Oral Examination. Must be passed by the end of the 6th quarter of registration, counting quarters of 9 units or more, excluding summers. The examination consists of a seminar on a suitable subject delivered by the student before the faculty academic advisor (or a suitable substitute), the research advisor and one other member of the faculty selected by the department.

4. Research Progress Report. Before the end of the Autumn Quarter of the fourth year, the student will arrange to give an oral research progress report of approximately
45 minutes duration (including presentation and questioning) to the Ph.D. Reading Committee.

5. The University Ph.D. Examination will consist of a public seminar in defense of the dissertation, followed by private questioning of the candidate by the University Examining Committee.

6. The dissertation must be approved and signed by the Ph.D. Reading Committee.

ASTRONOMY, ASTROPHYSICS, AND SPACE SCIENCE

Applied Physics students may specialize in one of the above fields. Courses relevant to these studies are offered in Applied Physics and other departments. For further information, please see Courses and Degrees entries on "Astronomy Course Program," and "Center for Space Science and Astrophysics."

ASSISTANTSHIPS

Research assistantships are available. Applications for financial aid are included in the admission packet received from the Graduate Admissions Office.

COURSES

GENERAL

03A,B. Breakthroughs and Inventions in Science and Technology—(Enroll in Freshman Seminar 03A,B.) (See "Freshman-Sophomore Program" section of this bulletin.)

Aut (Cutler)

10. Physics and Technology—For nonscience majors. Provides an opportunity for nonscience majors to enhance their "literacy" about science (specifically physics) and technology. Through the use of case studies, several scientific/technological issues of contemporary interest are addressed; the interactions between science and technology are illustrated; and a broad exposure to the facts, concepts and paradigms of physics is acquired. Course includes both lectures and discussion groups. No prerequisites.

(DR:8)

3 units, Aut (Quate) given 1984-85

130. Introductory Biophysics—Designed for undergraduate and graduate students who wish to learn about the physical basis underlying selected topics in contemporary molecular biology. 3-dimensional structure of macromolecules—x-ray diffraction and electron microscopy. Elementary statistical mechanics of conformational changes in biopolymers—proteins and lipids. Kinetic theory—mobility, diffusion, enzyme reactions. Passive and active transport through membranes—ionophores, channels and receptors. Physics of nerve impulse propagation. Prerequisites: Biology 21, Chemistry 30 series, Physics 50 series, or equivalents.

3 units, Spr (Doniach) MWF 9

215. Computer Methods for Physicists and Engineers—Provides a survey of numerical tools useful for graduate students. Some knowledge of FORTRAN is assumed. Polynomial fitting, least squares, fast Fourier transform, digital filtering; numerical integration; Monte Carlo methods; transcendental equations; matrix techniques; singular value decomposition; ordinary and partial differential equations; nonlinear optimization; introduction to string processing. Prerequisite: Mathematics 113 or 130 or equivalent.

3 units, Win (Doniach) TTh 11-12:15

232. 233. Atomic and Molecular Physics—A systematic development of the structure and interactions of atoms and molecules based on quantum mechanical methods and concepts. Topics will include Dirac, Pauli, and Schroedinger formulations, multiplet structure by Racah methods, Hartree-Fock calculations, hyperfine couplings, group theory, vibrational-rotational structure, molecular orbitals, ligand-field theory as well as the physical content of various experimental methods. Prerequisite: Physics 132 or equivalent

232. 3 units, Win (Weissbluth) TTh 11-12:15

233. 3 units, Spr (Weissbluth) TTh 11-12:15

245. Wave Measurement Techniques—(Enroll in Electrical Engineering 245.)

3 units, Spr (Kino)

290. Directed Studies in Applied Physics—Special studies under the direction of a faculty member for which academic credit may properly be allowed. Such studies may include laboratory work or directed reading.

any quarter (Staff) by arrangement

300. Dissertation Research

any quarter (Staff) by arrangement

photo and electron ionization, Saha equilibrium, autoionization, electron ion recombination-radiative, three body, and dielectronic.

3 units, Aut (Harris) alternate years, given 1984-85

350A. Thin Film Technology—Survey of state-of-the-art techniques for thin film synthesis and processing. Review of the various methods for depositing thin films, followed by techniques used for patterning them and modifying their properties. The physical principles involved in each process are given in order to ascertain the fundamental properties and limits of each technique. All methods discussed in the context of making new devices and/or using them to study interesting physical phenomena, as illustrated by examples from recent literature.

3 units, Aut (de Lozanne) MWF 1:15

ASTROPHYSICS

Applied Physics 15 and Physics 15 (see Astronomy Course Program listing) are addressed to students not majoring in the sciences. They are taught in different quarters by different instructors but are closely related in topic. Students are advised against taking more than one of the courses.

15. The Nature of the Universe—Course is intended to familiarize undergraduates, without scientific background, with the structure, origin and evolution of our universe. Describes our growing knowledge of the objects which make up the universe: galaxies, stars, planets, etc. Discussion of some enigmas of modern astronomy, such as quasars, X-ray sources, black holes, and pulsars. Presentation will be non-mathematical. Opportunities for telescopic observations. (DR:7)

3 units, Win (Walker) TTh 2:15-3:30
plus one hour discussion by arrangement

15A. Cosmic Horizons—(Enroll in Physics 15.) Spr (Susskind)

50. Astronomy Laboratory and Observational Astronomy—(Enroll in Astronomy 50.)
3 units, Aut, Sum (Walker)

100. Introduction to Observational Astronomy and Astronomy Laboratory—Provides the student of physical science or engineering with an introduction to observational techniques in astronomy. Emphasis on measurement of fundamental astronomical parameters such as distance, temperature, mass and composition of stars. One 2-hour lecture and one night of observation at the Stanford Student Observatory where students will use the 16-inch telescope. Limited enrollment. Prerequisites: one year of physics or concurrent registration in Physics 25, 57 or 63; and consent of instructor.

4 units, Spr (Walker) M 3:15-5, lab by arrangement

110. Introduction to Stellar and Galactic Astrophysics—Physics of the sun. Evolution and death of stars. White dwarfs, novae, planetary nebulae, supernovae, neutron stars, pulsars, binary stars, X-ray stars and black holes. Galactic structure: interstellar medium, molecular clouds, HI and HII regions, star formation and element abundances. Prerequisite: calculus and one year of college physics at the level of the Physics 50 series or equivalent.

3 units, Aut (Petrosian, Walker) TTh 2:15-3:30

111. Extragalactic Astrophysics and Cosmology—Basic observational data on distances and the distribution of matter in the universe: galaxies, clusters and superclusters of galaxies. Electromagnetic radiation from galaxies and quasars and the background radiation at radio, infrared and X-ray frequencies. Introduction to cosmology, models of the universe and their evolution. The Big Bang and the physics processes in the first three minutes. Prerequisite: calculus and one year of college physics at the level of the Physics 50 series or equivalent.

3 units, Win (Petrosian) TTh 2:15-3:30

190A,B,C. Independent Study In Astrophysics and Honors Thesis—(Enroll in Astronomy 190A,B,C.)

Aut, Win, Spr (Staff)

356. Astrophysics Laboratory—Combined seminar and laboratory course which allows the student to investigate the fundamental observational basis of physical models of astronomical objects. The observational component of the course makes use of the 16-inch telescope at the Stanford Observatory, and ancillary photometric and spectroscopic instrumentation. Emphasis placed on spectroscopic and photometric observation of main sequence, post-main sequence, and variable stars. Limited enrollment. Prerequisite: consent of instructor.

3 units, Sum (Walker) alternate years, given 1984-85

radiation: electromagnetic, plasma, magnetoplasma and energetic particles. Prerequisite: Physics 132 and 221, or equivalents.
3 units, Aut (Sturrock) MW 2:15-3:30 alternate years, given 1983-84

362. Physical Processes in Stars—Astronomical data on stars and star clusters; classification; Hertzsprung-Russell diagram. Equations of hydrostatic equilibrium and energy transport; equation of state for normal and degenerate matter; opacity; nuclear and neutrino processes. Stellar evolution from main sequence to white dwarfs, neutron stars and black holes. Prerequisites: Physics 220 or equivalent, or consent of instructor. (Physics 132 desirable.)
3 units, Spr (Petrosian) alternate years, given 1984-85

364. Plasma Physics—Brief review of concepts of collision-free plasmas, followed by more extensive review of the properties of the partially ionized plasmas: electromagnetic waves, MHD waves; configuration instabilities, velocity-space instabilities; kinetic equations and transport properties; radiation. Applications drawn from geophysics, astrophysics and the fusion program. Prerequisite: Physics 220 or equivalent. Prior participation in Electrical Engineering 356 advantageous.
3 units, Spr (Sturrock) MW 2:15-3:30 alternate years, given 1983-84

366. Cosmology and Extragalactic Astrophysics—Discussion of basic observational data and theories of the structure and evolution of the universe, with emphasis on the physical processes in the early phases of the big bang universe. Observational properties and theoretical models of galaxies and galactic activity and of quasars, with emphasis on nonthermal processes. Prerequisites: Physics 221 or equivalent.
3 units, Win (Petrosian) alternate years, given 1984-85

380. Astrophysics Seminars—(Enroll in Astronomy 380.) Seminars on current topics in astrophysics. Topics include interstellar medium and star formation, peculiar stars, pulsars, neutron stars, supernovae and binary x-ray sources, cosmic rays, active galactic nuclei, and x-ray and EUV astronomy. Prerequisite: consent of instructor.
3 units, Spr (Beasley, White) alternate years, given 1983-84

380C. Experimental Techniques in Space Astronomy—(Enroll in Astronomy 380C.)
3 units, Spr (Walker)

380H. Topics in High-Energy Astrophysics—(Enroll in Astronomy 380H.)
3 units, Win (Sturrock) alternate years, given 1983-84
results in the theory and experiments of electronic conduction and superconductivity in disordered and lower dimensional materials. Topics include percolation, localization, Josephson coupling and macroscopic quantum tunneling. Additional topics in Josephson junction arrays and the nonlinear dynamics of Josephson junctions also discussed.

3 units, Aut (Beasley, Doniach, Huberman) TTh 1:15

385B. Topic to be announced.
3 units, Win (Staff)

390. Condensed Matter Physics Seminar—(Same as Electrical Engineering 320.) Discussion of current research and literature in condensed matter physics is offered by faculty, students and outside specialists.
1 unit, Aut, Win, Spr (Geballe, Spicer) Th 4:15

QUANTUM ELECTRONICS—OPTICS-ACOUSTICS

161. Intermediate Optics—(Enroll in Physics 161.)
3 units, Aut (Schawlow)

231. Lasers—(Enroll in Electrical Engineering 231.)
3 units, Aut (Siegman)

239A. Lasers—(Enroll in Electrical Engineering 232.)
3 units, Aut (Siegman)

3 units, Aut (Auld) alternate years, given 1983-84

3 units, Spr (Auld) alternate years, given 1984-85

324. Applications of Quantum Theory—(Enroll in Electrical Engineering 324.)
3 units, Spr alternate years, given 1984-85

346A. Introduction to Nonlinear Optics—(Enroll in Electrical Engineering 346A.)
3 units, Spr (Harris)

346B. Nonlinear Optics—(Enroll in Electrical Engineering 346B.)
3 units, Aut (Harris) alternate years, given 1983-84

347. The Fourier Transform and Its Applications—(Enroll in Electrical Engineering 261.)
3 units, Aut (Bracewell, Staff) Spr (Buneman)

348. Introduction to Fourier Optics—(Enroll in Electrical Engineering 366.)
3 units, Win (Macovski)

349. Two Dimensional Imaging—(Enroll in Electrical Engineering 262.)
3 units, Win (Bracewell)

358A. Quantum Electronics Laboratory I—Combined lecture and laboratory course emphasizing laser theory and device operation. The lasers studied include He Ne, Argon ion, Nd: YAG, CO2, and dye. The topics discussed are properties of lasers, laser theory, Gaussian beam and laser cavities, modulation and Q-switching and interferometry. Experiments are performed with emphasis on laser device properties. Limited enrollment. Prerequisites: Electrical Engineering 231 and 232 or consent of instructor.
3 units, Win (Byer)

358B. Quantum Electronics Laboratory II—Combined lecture and laboratory course emphasizing laser interaction with matter. The lasers are considered as a source for optical experiments which include laser modulators, propagation in anisotropic crystals, harmonic generation, Raman, Brillouin and parametric scattering and acousto-optic interactions. Optical pumping atomic and molecular spectroscopy experiments using tumble dye and parametric sources are also possible. Limited enrollment. Prerequisites: 358A or Electrical Engineering 231 and 232, or consent of instructor.
3 units, Spr (Byer)

395. Experimental Techniques in Lasers and Optics—Weekly meetings with student and staff presentations to discuss experimental methods and practical topics in lasers, linear and nonlinear optics, laboratory techniques and related topics in electronics.
1 unit, Aut, Win, Spr (Siegman) M 4:15
230 SCHOOL OF HUMANITIES AND SCIENCES

431. Quantum Electronics—(Enroll in Electrical Engineering 431.)
3 units, Spr (Siegman) alternate years, given 1983-84

ART

Emeritus: Isabelle K. Raubitschek (Associate Professor)
Chairman: Lorenz Eitner
Principal Advisor to Undergraduate Studio Majors: Fristina Branch
Principal Advisor to Undergraduate Art History Majors: Albert Elsen
Chairman of Graduate Program in Studio Art: Keith Boyle
Director of Graduate Studies in Art History: Suzanne Lewis

Professors: Keith Boyle (Painting, on leave Autumn), Elliot W. Eisner (Art Education), Lorenz Eitner (18th-19th century French art), Albert Elsen (Mid-19th -20th century European art, American art since 1940), Matthew S. Kahn (Design), Frank Lobdell (Painting, on leave Autumn), Dwight C. Miller (Baroque art), Nathan Oliveira (Painting/Printmaking), Michael Sullivan (Chinese art, on leave)

Associate Professors: Wanda Corn (American art, on leave Winter and Spring), Suzanne Lewis (Medieval art), Richard Randell (Sculpture), Paul V. Turner (Architectural History, on leave Autumn)

Assistant Professors: Kristina Branch (Painting/Drawing); John-David P. LaPlante (Indian art), Jody Maxmin (Ancient art), Melinda Takeuchi (Japanese art, on leave Autumn, Winter)

Senior Lecturer: Laura Volkerding (Photography)
Lecturer: Joel Leivick (Photography)
Affiliated Professor: John H. Merryman (Art and Law)

OFFERINGS AND FACILITIES

The department offers courses of study in three areas: (1) in the history of art; (2) in the practice of drawing, painting, sculpture, design, printmaking, and photography; and (3) in art education. The undergraduate program of the department is designed to introduce students to the humanistic study of the visual arts. The courses are intended to increase the students' understanding of the meaning and purpose of the arts, of their historical development, their role in society, and their relationship to such other humanistic disciplines as literature, music, and philosophy. The work in classroom and studio is designed to intensify the students' visual perception of the formal and expressive means of art and to encourage insight into a variety of technical processes. The collections of the Stanford Museum and the exhibitions program of the Stanford Gallery supplement the regular academic program of the department.

PROGRAMS OF STUDY

Undergraduates may major in Art History or the Practice of Art (Studio). A freshman or sophomore intending to major in one of these areas should consult with an advisor appointed by the department in order to plan his or her course of study.

Graduate programs are offered in Art History, Studio (including Product Design), and Art Education.

All graduate students are required, whether they are receiving financial aid or not, to take an active part in the practical work of the department/museum as part of their requirements for the degree. This work, which may include classroom duties as course assistants, is to be determined in consultation with their advisers.

During the first two years of their resident graduate work at Stanford, students are required to live in the immediate proximity of the University. Exceptions may be granted only on the basis of a petition formally submitted to the chairman of the department.

HISTORY OF ART

BACHELOR OF ARTS

The major program in the history of art must include the following:

1. 8 units from the following: Art 1, Art 2, Art 3, Art 5 and Art 10
2. 40 units in art history courses above the 100 level, including one seminar or colloquium. To insure that majors have a broad foundation in art history, they are required to take the 40 units in art history above the 100 level in at least four of the six following areas: oriental, ancient, medieval, renaissance, baroque and modern. This distribution still permits the student to take several courses in an area of particular interest.
3. Total units: 48. All required coursework, including collateral requirements, must be taken for a grade, and may not be taken pass/no credit. University units earned by placement tests or advanced placement work in secondary school will not be counted within the 48 units.
4. Collateral Requirements: Each undergrad-
uate major in the history of art shall take at least one year of beginning French or German or Italian, or present proof of reading ability in one of these languages. Students who intend to apply for graduate school in art history should become proficient in two of the foregoing languages, one of which should be German. It is recommended that students who intend to apply to graduate school in oriental art should take first year Chinese or Japanese. Each undergraduate major shall take History 1, 2, 3. Students may opt for Classics 102 and History 65, or History 91, 92, instead of two courses in the History 1, 2, 3 sequence.

5. Recommended Courses (but which do not count toward the major): Art 40, 51 or 52 or 53 and 70.

MASTER OF ARTS

The Department of Art offers the Master of Arts and the Doctor of Philosophy degrees. The Master of Arts degree is normally granted as a step toward eventual fulfillment of requirements for the Doctor of Philosophy. The department does not admit students who wish to work only toward the Master of Arts degree.

The University's basic requirements for the master's degree are set forth in the "Degrees" section in this bulletin. The following are departmental requirements:

**Admission to Candidacy**—Completion of the University's requirements for a Bachelor of Arts degree in the history of art, or an approximately equivalent training, is required of students entering a program of study for the Master of Arts. After acceptance and before beginning the program, students shall take a preliminary counseling test to determine the degree of the students' previous preparation. The students will be required to remedy deficiencies indicated by this test.

**Recommendation for the Degree**—To be recommended to the University Committee on Graduate Studies for the degree of Master of Arts in the history of art, the student must have satisfied the following requirements:

1. Completion of a minimum of three full quarters of graduate work in residence or its equivalent at this University.
2. Completion of a total of at least 36 units of graduate work in the history of art in courses at the 200 level. Students will also be required to take a seminar in art historiography and methods of research.
3. Reading knowledge of two foreign languages, preferably German and French or Italian. Students of oriental art will be required to demonstrate competence in one oriental language (equivalent to three years of study) and reading knowledge of a second.

4. Submission of two from among the term papers written during the year, for consideration by the faculty.
5. Demonstration to the faculty, by course work and/or examination, that the student has adequate knowledge of the major areas of the history of art.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the degree of Doctor of Philosophy are set forth in the "Degrees" section in this bulletin.

**Admission to Candidacy**—The graduate student does not become a formal candidate for the Ph. D. degree until he or she has fully satisfied all the requirements which govern the A.M. program in the history of art (see above), and has been accepted as a candidate by the University Committee on Graduate Studies. Immediately upon acceptance of a student into the doctoral program, a committee of at least three art historians shall be formed which shall take responsibility for advising and evaluating the student through the obtaining of the degree. It shall be left to the discretion of the committee whether or not the student will take examinations to test competence in the major field. The committee shall also decide on the type of examination if one is required. The committee shall also pass on the candidate's satisfying of the language requirements.

The principal thesis advisor shall be the committee chairman. It is the responsibility of the incoming student to contact his or her advisors before registration in order to be interviewed and counseled on a program of course work.

Having satisfied all preliminary requirements, the candidate will submit a concise written statement of his or her dissertation topic to the department. Departmental approval of the projected dissertation is necessary for admission to candidacy for the Ph.D. degree.

**Residence**—In order to be eligible for the doctoral degree, the student must have completed three years of full-time graduate work in the history of art and must have spent at least one of them in residence at Stanford.

**Collateral Studies**—The student should be prepared to take 15 units in one or, at most, two supporting fields of study (such as history, literature, classics, anthropology, or philosophy), determined in consultation with the departmental advisors. In cases where the students' field of study requires competence in Greek and Latin or a third European language, or in the languages, institutions, thought and literature of the Far East, the permitted collateral units for the Ph.D. in art history will be increased, with the advisor's approval in each case, to 24 or 26 (excluding first year Chinese and Japanese).
Dissertation—A senior member of the department will act as the student’s dissertation advisor and as chairman of his or her dissertation committee. The final draft of the dissertation must be in the advisor’s hands at least four weeks before the University deadline in the quarter during which the candidate expects to receive his or her degree. Dissertations may not be submitted during the Summer Quarter. The dissertation must be completed within five years from the date of the student’s acceptance to candidacy for the Ph.D. degree. A candidate taking more than five years will be required to reinstate his or her candidacy.

Oral Examination—The oral examination is taken after completion of the dissertation, and its acceptance by a majority of the committee, including the principal advisor. It serves primarily as a defense of the dissertation, over a wider field.

Ph.D. Minor—For a minor in Art History, a candidate is required to complete 24 units of graduate level art history courses (200 level or above), in consultation with a departmental advisor.

PRACTICE OF ART (STUDIO)

BACHELOR OF ARTS

The major program in the studio area must total 65 units. Students may major in one of five areas: painting/drawing, sculpture, printmaking, design, or photography.

REQUIREMENTS FOR PAINTING/DRAWING:

Art 40, 51 or 52 or 53, 60
Art 140, 141, 142 (These drawing classes need not be taken in sequence. Any of the drawing classes may be taken concurrently with Art 145. Painting I)
18 units of painting courses
12 or more units of the modern art series (Art 120A through Art 121B)
Total Units Required: 48

REQUIREMENTS FOR SCULPTURE:

Art 40, 51 or 52 or 53, 60, 70
Art 140, 141, or 142 (Two quarters required)
18 units of sculpture courses
12 units of modern art series (Art 120A through Art 121B)
Total Units Required: 48

REQUIREMENTS FOR MONOTYPE:

Art 40, 51 or 52 or 53, 60, 70
Art 140, 141, 142 (These drawing classes need not be taken in sequence. Any of the drawing classes may be taken con-
making, sculpture, photography and product or graphic design.

Graduate Program in Painting, Sculpture, Printmaking, and Photography—Provides an environment sympathetic to the needs of advanced students who are ready to involve themselves fully in these areas. Participants are chosen for the program on the basis of work which shows artistic individuality, motivated by the students' own goals and principles, and which indicates an ability to work without further need of close faculty supervision.

The Graduate Program in Design—Focuses on mature study in an area of design largely defined by the student's own interest. Master's projects have involved urban design, transportation, recreation, film animation, housing, seating, medical and therapeutic facilities, musical instruments, informational systems, and a great many other areas. The graduate program is structured to balance independent concentration with rich utilization of the University and the community, and personal interaction with the students and faculty of the Graduate Design Program.

Working jointly, the Departments of Art and Mechanical Engineering offer graduate degrees in the fields of product and visual design. A large new physical environment, the Design Yard, provides professional caliber studio space for each graduate student and well-equipped shops. Flexible programs may include graduate courses in fields ranging from graphic design to engineering design, typography to biotechnology, marketing to micro-computers. The program centers on a master's project and may also include work in advanced art and design. Cross-disciplinary interaction is encouraged by a four-person graduate design faculty.

A Master of Arts degree in Design is offered to qualified students who prefer to participate in the graduate program for only one year.

Admission to candidacy for the degree of Master of Fine Arts is based on:
1. The equivalent of a Bachelor of Arts degree in art at this University.
2. A letter grade average of "B-" in at least 65 units of undergraduate work in art.
3. Formal admission to candidacy granted by the University Committee on Graduate Studies.
4. Portfolio Specifications
   a. Painting and Sculpture: six or more slides of painting or sculpture and six or more slides of drawings. No actual work will be accepted.
   b. Printmaking: six or more slides of prints and six or more slides of drawing. Actual prints will be accepted only if candidates can arrange for delivery and pick up.
   c. Photography: twelve or more photographs.

5. Applications and portfolios for the studio program must be submitted by January 15. They will be reviewed in February. Students accepted are admitted for the beginning of the following Autumn Quarter. No applicants for mid-year entrance will be considered.

The requirements for the degree of Master of Fine Arts in painting, sculpture, printmaking and photography are:
1. Completion of a minimum of two years (six full quarters) of graduate work in residence or its equivalent at this University.
2. First year graduate students are required to complete nine units for the seminar, nine units of individual study with the faculty, and eighteen units of work in their chosen field. After successfully completing the first year of study, students enter their second year on terminal graduate registration and continue to participate in the seminars and study with the faculty.
3. Students must participate in a weekly seminar in which their work is criticized and discussed in detail.

The requirements for the degree of Master of Fine Arts in design are:
1. Completion of a minimum to two years (six full quarters) of graduate work in residence or its equivalent at this University.
2. First year graduate students are required to complete 54 units of coursework chosen in consultation with an advisor. At least 18 of the 54 units must be in Art 360A, B, C and Mechanical Engineering 211A, B, C.
3. Students must participate in a weekly seminar in which their work is criticized and discussed in detail.

The studio faculty reserves the right to make use of graduate painting, sculpture, lithographs and photographs in exhibitions serving the interests of the Graduate Program.

ART EDUCATION

MASTER OF ARTS IN TEACHING

The degree of Master of Arts in Teaching is offered by this department and the School of Education for teachers who wish further to
strengthen their academic preparation. The candidate must have a teaching credential or relevant teaching experience. The program consists of a minimum of 25 units in the teaching field and 12 units in the School of Education. Detailed requirements are outlined in the section “School of Education” in this bulletin.

DOCTOR OF EDUCATION
AND DOCTOR OF PHILOSOPHY IN EDUCATION

In cooperation with the School of Education the department offers work leading to the Ed.D. and Ph.D. degrees with a concentration in Art Education. Consult the section on “Graduate Degrees” listed in the “School of Education” section in this bulletin. Complete information concerning these degrees may be secured from the Office of the Dean of the School of Education.

TEACHING CREDENTIAL
(SINGLE SUBJECT—SECONDARY)

A program leading to a Master of Arts degree with a specialization in art education and/or including a California Teaching Credential in art is offered in art education by the School of Education. This program is available to students who have majored in art at the undergraduate level who have had no teaching experience, and who wish to become teachers of art at the elementary or secondary levels. For details with respect to this program consult the “Teaching Credential Program” listed in the “School of Education” section in this bulletin.

COURSES IN HISTORY OF ART

BASIC COURSES

1. Introduction to Art—A topical introduction to the history and appreciation of architecture, sculpture, and painting. (DR:2)
   4 units, Aut (Elsen) given each year

2. Ideas and Forms in Asian Art—To introduce the religious and philosophical ideas and social attitudes of India, China and Japan and to show how they are expressed in the architecture, painting, sculpture of the Orient and in such art forms as garden designing. (DR:2*)
   4 units (Sullivan) not given 1982-83

3. Introduction to the History of Architecture—A selective survey of Western architecture from antiquity to the 20th century. In each period, specific buildings and historical issues are examined, as well as more general principles relevant to the study of architecture. (DR:2)
   4 units, (Turner)

4. Theme and Style in Japanese Art—Designed as a broad overview of Japanese artistic traditions, this course selects from the great masterpieces of Japanese art from pre-history to the present and examines them in terms of the interplay between Japanese and Chinese cultural traditions. Material includes temples, castles, teahouses, painting, sculpture, garden design and ceramics. Undergraduate lecture; no prerequisites. (DR:2*)
   4 units (Takeuchi) not given 1983-84

5. Introduction to Ancient and Medieval Art—The formation of the Classical tradition in Ancient Greece and Rome and its transformations in the Middle Ages. (DR:2)
   4 units, Win (Maxmin) given 1983-84

10. Introduction to Art, Renaissance to Modern: Important Events, Issues and Personalities in European Art—Main currents in the history of Western art from the Renaissance to the present. (DR:2)
   4 units, Win (Miller) given 1983-84

The emphasis in 20, 21 and 22 is upon the international relationships between the various kingdoms and empires of Asia. The dynamic interchange of ideas and styles begetting in turn reactions or modifications will indicate the rich inter-cultural nature of Asian Art.

There are no prerequisites for these courses. Although there is naturally an advantage to taking them in sequence, it is not required.

20. Introduction to the Art of Asia (to 600 A.D.)—India, China and Japan from the beginnings of civilization through the 6th century A.D. (DR:2)
   4 units, Aut (LaPlante) given each year

21. Introduction to the Art of Asia (7th Century—13th Century)—The art of India, South East Asia, China and Japan from the 7th century A.D. to the Mongol invasion in the 13th century. (DR:2)
   4 units, Win (LaPlante) given each year

22. Introduction to the Art of Asia (14th Century to the Present)—Moghuls, Mongols and Shoguns; the art of Asia from the 14th century onward. (DR:2)
   4 units, Spr (LaPlante) given each year

65. Medieval Culture and Society—(Same as Medieval Studies 65.) (DR:2)
   5 units, Win (Ferruolo and Lewis) given 1983-84

INTERMEDIATE COURSES

100A. Ancient Art I—Archaic and early Classical Greek Art. A selective survey of the art
and architecture of Greece from Protogeometric beginnings to the height of the Early Classical period. (DR:2)

4 units, Aut (Maxmin) given 1983-84

100B. Ancient Art II—Classical, 4th Century and Hellenistic Art, with special emphasis given to the formation, in the 5th century, of the classical ideal, and to its development in the centuries that followed. (DR:2)

4 units, Spr (Maxmin) given 1983-84

100C. Ancient Art III—Roman art. A survey of the art of Rome, from the Etruscans to the Late Empire. (DR:2)

4 units, Spr (Maxmin) given 1984-85

100D. Ancient Art IV—The art of archaic Athens, with emphasis upon the development of sculpture, vase painting and architecture in the 6th century B.C.

4 units (Maxmin) not given 1983-84

102. Ancient Art V: Greek Vase Painting—(Same as Classics 120.) An introduction to the study of Greek vases and their painters, with special attention given to the masters of Athenian black and red-figure.

4 units, Aut (Maxmin) given 1983-84

103. Byzantine Art—Art and architecture of the Byzantine Empire from the founding of Constantinople (330) to the Turkish Conquest (1452), centered on patterns of imperial patronage.

4 units, (Lewis) not given 1983-84

104. Early Medieval Art—Development of formal and iconographical traditions in art and architecture under the patronage of major church and state institutions in Western Europe from the 4th through the 11th centuries.

4 units (Lewis) not given 1983-84

104A. Medieval Manuscript Illumination—An introduction to the study of the illustrated medieval book, its technical, stylistic and iconographical aspects, as well as problems of patronage and usage (May be taken as a sequel to English 209).

4 units (Lewis) not given 1983-84

105. Medieval France—Art and architecture from the First Crusade (1095) in major monastic centers, through the formation and flowering of Gothic art at Chartres, Paris, Amiens and Reims, up to the reign of Charles V (1375). (DR:2)

4 units, Aut (Lewis) given 1984-85

105A. Medieval Britain—Art and architecture in England from the Early Saxon and Celtic period through Gothic in the 13th-15th century. (DR:2)

4 units, Aut (Lewis) given 1983-84

107. Medieval Architecture—Development of functional and symbolic structures within the context of major medieval institutions and patronage: monasteries, castles, cathedrals and towns of Western Europe. (DR:2)

4 units, Spr (Lewis) given 1984-85

108. 15th Century Netherlandish Painting—Rediscovery of the visual world in the 15th century in the art of France and the Low Countries: from Van Eyck to Bosch. (DR:2)

4 units, Spr (Lewis) given 1983-84

109. Medieval Russian Art and Architecture—(Same as Slavic Languages 143.) Emergence of a Muscovite Russian "national" style based on Byzantine and Kievan Rus' cultures, European and Oriental Influences, native traditions and regional schools, 11th-17th centuries.

4 units, Spr (Kollman) given 1983-84

110A. Renaissance Art I.

4 units, not given 1983-84

110B. Renaissance Art II.

4 units, not given 1983-84

110C. Renaissance Art III.

4 units, not given 1983-84

115A. Artistic Culture in Italy During the 17th Century: Caravaggio, Bernini, Borromini, and their Contemporaries—Important developments in painting with emphasis on Rome and Bologna; major trends of style and problems of iconography. (DR:2)

4 units, (Miller)

115B. 17th Century Art in the Low Countries: The Age of Rubens and Rembrandt—Major artistic developments in the Low Countries during the seventeenth century focused on the great personalities and important episodes during this period. The question of the artist's position in his society will serve as the basic point of departure. (DR:2)

4 units, Aut (Miller) given 1983-84


4 units, Win (Miller) given 1983-84

116A. Masterpieces and Monuments of the Baroque Age. (DR:2)

4 units, (Miller) not given 1983-84

120A. Modern Art I—Rococo to Revolution—Main currents in European art in the periods of the Enlightenment and Neoclassicism, Watteau, Boucher, Tiepolo, Chardin, Hogarth, Greuze, Fragonard, Robert, Piranesi, and early works of David, Goya, and Blake. (DR:2)

4 units, Win (Eitner) given 1983-84

120B. Modern Art II—Romanticism and Naturalism—Main currents in European art in
the time of the Napoleonic Wars, the Restoration, and the era of middle class dominance. The later works of David, Goya, and Blake; the German romantics; Ingres, Gericault, Delacroix, and the landscape art of Turner, Constable. (DR:2)

4 units, Aut (Eitner) given 1984-85

120C. Modern Art III—Realism and Impressionism—The origins of Impressionism in mid-nineteenth century realist art and in the work of the Barbizon School. The masters of Impressionism, particularly Monet and Renoir, are dealt with in detail, as well as the painters, such as Manet and Degas, who shared some of their goals and interests, without fully identifying themselves with Impressionism. (DR:2)

4 units, Aut (Eitner) given 1983-84

120D. Modern Art IV—Alternatives to Impressionism — European art 1880-1900, Cezanne, VanGogh, Seurat, Gauguin, Symbolism, Lautrec, Ensor, Munch. (DR:2)

4 units, Win (Elsen) given 1983-84

121A. Modern Art V— Twentieth Century Painting I, 1900-1920— Fauvism, Matisse, German and Austrian Expressionism, Picasso, and Cubism, Orphism, Futurism, and Abstraction. (DR:2)

4 units, Spr (Elsen) given 1984-85

121B. Modern Art VI— Twentieth Century Painting II, 1920-1960— Dada, Surrealism and Abstract Expressionism. (DR:2)

4 units, Spr (Elmen) given 1984-85

123. Rodin—The art of Rodin and its relation to the time in which he lived. The course lectures are supplemented by sessions in the Stanford University Museum of Art’s collection of Rodin’s art and the Legion of Honor Collection in San Francisco.

4 units, (Elsen) not given 1983-84

123A. The First Fifty Years of Modern European Sculpture— Covers the period from the late 19th century to the end of the Second World War and includes the work of Rodin, Degas, Matisse, Maillol, Brancusi, Duchamp-Villon Picasso, Boccioni, Lipchitz, Arp, Giacometti, Gonzalez and Henry Moore.

4 units, (Elsen) not given 1983-84

123B. Modern Sculpture in Europe and America, 1945-1970— A survey and analysis of the major achievements by the principal sculptors in this period: Picasso, Moore, Giacometti, Miro, Caro, David Smith, Calder, Noguchi, Segal, Oldenburg, Christo.

4 units (Elsen) not given 1983-84

124. Picasso—This course will be given either as a colloquium or lecture course depending upon enrollment.

4 units, Spr (Elsen) given 1983-84

125A. Indian Painting—The major expressions of painting in India beginning with the Buddhist period as seen in the wall paintings of the Ajanta Cave Temples and tracing the changes in style until the introduction of papermaking in the 16th century which permits the full bloom of the well-known Moghul and Rajput Schools of the 16th through the 18th centuries.

4 units, Win (LaPlante) given 1983-84

125B. The Art of India.

4 units (LaPlante) not given 1983-84

125C. The Art and Architecture of Moghul India.

4 units (LaPlante) not given 1983-84

126A. Introduction to Chinese Art. (DR:2*)

4 units (Sullivan) not given 1983-84

126B Introduction to Chinese Painting. (DR:2*)

4 units (Sullivan) not given 1983-84

126E. The Meeting of Eastern and Western Art—The interaction between the art of the Far East, Europe, and America from the sixteenth century to the present day. (DR:2)

4 units (Sullivan) not given 1983-84

128A. Ritual Bronzes of Ancient China.

4 units (LaPlante) not given 1983-84

128B. Chinese Ceramics.

4 units, Aut (LaPlante) given 1983-84

128C. Buddhist Art in Asia.

4 units (LaPlante) not given 1983-84


4 units, Spr (LaPlante) given 1983-84

128E. Japanese Ceramics.

4 units (LaPlante) not given 1983-84

129A. Arts of Japan I—General introduction to the important historical developments in Japanese art from prehistory to the 14th century: the evolution of prehistoric ceramics, the great tombs and their contents, the introduction of Buddhism from China and its revolutionary effect on Japanese art and culture, the glittering arts of the age of courtly splendor, and the rise of samurai culture. No prerequisites.

4 units (Takeuchi) given 1984-85

129B. Arts of Japan II—A broad survey of the highlights of Japanese art from the 14th century to the present: the medieval Zen monastery and its attendant arts of painting, architecture and garden design, the decorative programs of the mighty castles, changes in patronage and the secularization of the opulent pre-modern era, and Japan’s response to the West. No prerequisites.

4 units, Spr (Takeuchi) given 1983-84
129C. A survey of Japanese Painting—An introduction to the richness and diversity of Japanese Painting from the 8th century to the present. No prerequisites.
4 units (Takeuchi) not given 1983-84

129G. Japanese Buddhist Art—A history of the development of Buddhist art from its introduction in the 8th century through the 18th century.
4 units (Takeuchi) not given 1983-84

4 units, Win (W. Corn) given 1984-85

130A. American Art in the Gilded Age, 1860-1900—A close study of Homer, Eakins, Chase, Ryder, Whistler, Sargent, Cassatt, and the American Impressionists. In addition, discussion of the wealthy tastemakers of the day, the history of museums and art schools, and the changes in artists' patterns of travel and education. (DR:2)
4 units, Spr (W. Corn) given 1984-85

130B. Paris and New York: Transatlantic Exchange in Early Modernism—The study of artistic and cultural exchange between Paris and New York in the early decades of the 20th century. Discuss the Franco-American circles around Gertrude Stein, Alfred Stieglitz and Walter Arensberg, as well as movements such as Cubism, Expressionism and Dadaism. (DR:2)
4 units, Win (W. Corn) given 1983-84

130C. American Art in the 1930s—Special attention paid to government patronage of the arts during the New Deal, to the rise of the short-lived Regionalist movement, to American Scene painting, and to Depression era photography. (DR:2)
4 units, Spr (W. Corn) given 1983-84

130D. American Art after World War II—A study of contemporary art as it developed in New York and on the West coast after the war. Focuses on the Abstract Expressionists and Pop artists in New York, and on the Assemblagists, Bay Area figurative and Funk artists on the West coast.
4 units, Aut (W. Corn) given 1983-84

130E. The Poet and the Artist in American Modernism—(Same as English 269C.) An interdisciplinary study of the friendships, changes, and common concerns of writers and artists in the early modern period. Course focuses on the writings of Pound, Williams, Stevens, Cummings, Crane, Anderson and the art of the Stieglitz circle, Joseph Stella, Demuth, Sheeler and Murphy.
5 units, (W. Corn and A. Gelpi) not given 1983-84

4 units, (Turner) not given 1983-84

175A,B. Modern Architecture I, II—A two-quarter course tracing the development, largely in Europe, which led to the present state of architecture and urbanism. Emphasis on the designer's responses to new materials, technology and environmental conditions.
4 units Win, Spr (Turner) given 1983-84

176. American Architecture and Urbanism—The development of architecture and city planning in the United States since colonial times, concentrating on those characteristics and problems which are distinctly American.
4 units, (Turner) not given 1983-84

ADVANCED UNDERGRADUATE AND GRADUATE COURSES

4 units, Aut, Win, Spr (Maxmin) given 1983-84

201. Colloquium: The Development of Attic Black-Figure Painting.
4 units, Spr (Maxmin) given 1983-84

202. Studies on Greek Vase Painting.
4 units, Aut (Maxmin) given 1983-84

203. Studies on Byzantine Art.
4 units (Lewis) not given 1983-84

204. Studies on Early Medieval Art.
4 units (Lewis) not given 1983-84

204A. Studies on Medieval Manuscript Illumination.
4 units (Lewis) not given 1983-84

205. Studies on Medieval France.
4 units, Aut (Lewis) given 1984-85

205A. Studies on Medieval Britain.
4 units, Aut (Lewis) given 1983-84
4 units, Spr (Lewis) given 1983-84

206A. Colloquium on the Romance of the Rose: Text and Image—(Same as French 218 and Medieval Studies 165.) An interdisciplinary approach to one of the most popular secular works of the High Middle Ages in English Translation. An exploration of how literature and art are uniquely joined together in illuminated manuscripts of the French romance, to reveal changing perceptions of meaning by succeeding generations of medieval readers, from the late 13th through the 15th century.
5 units, Aut (Cazelles and Lewis) given 1983-84

206A. Colloquium on Chartres Cathedral.
4 units, Win (Lewis) given 1983-84

207. Studies on Medieval Architecture.
4 units, Spr (Lewis) given 1984-85

208. 15th Century Studies on Netherlandish Painting.
4 units, Spr (Lewis) given 1984-85

209. Studies on Medieval Russian Art and Architecture—(Same as Slavic Languages 143.)
4 units, Spr (Kollmann) given 1983-84

210A,B,C. Studies on Renaissance Art I, II, III.
4 units each, not given 1983-84

214A,B,C. Seminars on Renaissance Art.
4 units each, not given 1983-84

215A. Studies on Artistic Culture in Italy During the 17th Century: Caravaggio, Bernini, Borromini, and Their Contemporaries.
4 units (Miller) not given 1983-84

215B. Studies on 17th Century Art in the Low Countries: The Age of Rubens and Rembrandt.
4 units, Aut (Miller) given 1983-84

4 units, Win (Miller) given 1983-84

216A. Studies on Great Masterpieces and Monuments of the Baroque Age.
4 units (Miller) not given 1983-84

217. Connoisseurship in 17th Century Italian Drawings.
4 units (Miller) not given 1983-84

218. Colloquium on Art in 18th Century European Culture—A study of some of the principal artifacts of 18th century artistic culture: the Garden, the Palace, 18th century collecting, practical aesthetics and fashions of taste.
4 units, Aut (Miller) given 1983-84

219. Colloquium on Political Ideology in 17th Century European Art in Court and Church—Monarchical eulogy and related political allegory; the art of religious propaganda of the age of the Counter-Reformation.
4 units (Miller) not given 1983-84

219A. Colloquium on Caravaggio and the Artistic Culture of the Caravagisti.
4 units (Miller) not given 1983-84

4 units, Aut, Win, Spr (Eitner, Elsen) given 1983-84 and 1984-85

221. Seminar on 19th Century Art.
4 units, Spr (Eitner) given 1983-84

221A. Studies on 20th Century Painting From 1900-1920.
4 units, Win (Elsen) given 1984-85

221B. Studies on 20th Century Painting From 1920-1960.
4 units, Spr (Elsen) given 1984-85

223. Studies on Rodin.
4 units, (Elsen) not given 1983-84

223A. Studies on the First 50 Years of Modern European Sculpture
4 units, (Elsen) not given 1983-84

4 units (Elsen) not given 1983-84

223C. Seminar on Late 19th Century Art.
4 units (Elsen) not given 1983-84

4 units (Elsen) not given 1983-84

224. Picasso.
4 units, Spr (Elsen) given 1983-84

225A. Studies on Indian Painting.
4 units, Win (LaPlante) given 1983-84

225B. Studies on the Art of India.
4 units, (LaPlante) not given 1983-84

225C. Studies on the Art and Architecture of Moghul India.
4 units (LaPlante) not given 1983-84

226A. Studies on Chinese Art.
4 units (Sullivan) not given 1983-84

226B. Studies on Chinese Painting.
4 units (Sullivan) not given 1983-84

226C. Studies on Meeting of Eastern and Western Art.
4 units (Sullivan) not given 1983-84

227A,B. Seminar on Chinese Art.
4 units (Sullivan) not given 1983-84
Seminar on Far Eastern Art.
4 units (Sullivan) not given 1983-84

Studies on Ritual Bronzes of Ancient China.
4 units (LaPlante) not given 1983-84

Studies on Chinese Ceramics.
4 units, Aut (LaPlante) given 1983-84

Studies on Buddhist Art in Asia.
4 units (LaPlante) not given 1983-84

Studies on the Architecture and Gardens of Japan.
4 units, Spr (LaPlante) given 1983-84

Studies on Japanese Ceramics.
4 units (LaPlante) not given 1983-84

Studies on the Arts of Japan I.
4 units (Takeuchi)

Studies on the Arts of Japan II.
4 units, Spr (Takeuchi) given 1983-84

Studies on Japanese Painting.
4 units (Takeuchi) not given 1983-84

Seminar on Japanese Art.
4 units (Takeuchi) not given 1983-84

Colloquium: Japanese Woodblock Prints.—Aspects of the history, technique and connoisseurship of the Japanese print, including early Buddhist examples of the medieval period, the great flowering of ukiyoe ("pictures of the floating world") during the great age of urban culture, and the modern day "creative print" movement. Undergraduate colloquium; no prerequisites.
4 units (Takeuchi) not given 1983-84

Colloquium: Japanese Art in the Zen Tradition—Aspects of the Zen-related arts which flourished from the 14th to 16th centuries, declined, and were revived in the 18th and 19th centuries. Undergraduate colloquium; no prerequisites.
4 units (Takeuchi) not given 1983-84

Studies on Japanese Buddhist Art
4 units (Takeuchi)

Colloquium: Art, Culture and Society in Tokugawa Japan—An investigation of the interaction between social change, culture and the visual arts in Tokugawa Japan. The course is interdisciplinary, focusing on how certain basic human issues — the relation of man to nature, the tension between individual and society, the ultimate purpose of existence — were dealt with in art and formal thought.
4 units (Duus and Takeuchi) not given 1983-84

Colloquium: Japanese Painting in the 18th Century.—An investigation of the established traditions, of the factors behind the unprecedented appearance of new styles and artistic revivals, and of the extraordinary number of "eccentric" painters during this fertile epoch of Japanese painting. Undergraduate colloquium; no prerequisites.
4 units, Spr (Takeuchi) given 1983-84

Studies on American Art Before the Civil War, 1670-1860.
4 units, Win (W. Corn) given 1984-85

Studies on American Art in the Gilded Age, 1860-1900.
4 units, Spr (W. Corn) given 1984-85

4 units, Win (W. Corn) given 1983-84

Studies on American Art in the 1930s.
4 units, Spr (W. Corn) given 1983-84

Studies on American Art After World War II.
4 units, Aut (W. Corn) given 1983-84

Studies on the Poet and the Artist in American Modernism.
4 units (W. Corn and A. Gelpi) not given 1983-84

Seminar: Winslow Homer.
4 units, Aut (W. Corn) given 1983-84

Undergraduate Seminar: Photographs as Historical Documents—(Same as American Studies 220.)
5 units, Spr (J. Corn and W. Corn) given 1983-84

Seminar on American Sculpture, 1800-1945.
4 units (W. Corn) not given 1983-84

Colloquium on the History of Photography—Readings on the history and criticism of photography combined with a close study of works in Bay Area collections.
4 units, Spr (W. Corn) given 1984-85

4 units, Win (W. Corn) given 1983-84

Proseminar on Art Historiography and Research Methods—Introduction to the major methods and approaches developed by modern schools of art historical research through discussion and comparative analysis of selected readings.
4 units, Win (Lewis) given 1984-85

Art History Bibliography and Library Methods—An introduction to important reference works in art and architectural history. Familiarity with this material will be encouraged through the frequent assignment of relevant bibliographical problems. A working read-
ing knowledge of German, French and Italian is assumed. Primarily for art history graduate students, although junior or senior undergraduate majors who plan to continue in art history on the graduate level may enroll with the consent of the instructor.

4 units, Aut (Ross) given 1983-84

238A,B. Art and the Law—Selected problems at the intersection of law and the visual arts (painting, sculpture, and graphic art) including; the protection of national art treasures and the international traffic in them; art forgery and its control; the artist’s “droit de suite” and “droit moral” and attempts to establish their equivalent in this country; legal relations between artists, dealers, museums, collectors, and auction houses; the work of “Volunteer Lawyers for the Arts” (a voluntary legal services organization); etc. Course is restricted to graduate students in law, business and art history. Undergraduate senior art history majors need approval of the instructor.

2 units, Win (Elsen, Merryman)
3 units, Spr, given 1983-84

239. Colloquium: The Artist From Antiquity to the Present—Extensive readings and discussion of important developments in the history of the artist’s profession. Enrollment restricted to twelve with instructor’s approval. Chiefly for art history majors. Recommended prerequisites: 1 or 5 and 10.

4 units, Spr (Elsen) given 1983-84

any quarter (Staff) by arrangement

241. Basic Drawing—Basic drawing concepts introduced through charcoal.
3 units, Aut, Win, Spr (Staff)

251. Clay Modeling: The Head—Study of the figure tradition in sculpture with emphasis on modeling the human head in clay.
3 units, Aut, Win (Randett)

252. Clay Modeling: The Figure—Study of the figure tradition in sculpture with emphasis on modeling the human figure in clay.
3 units, Aut, Win (Randett)

253. Introduction to Abstraction—Figure and non-figure constructions in various materials with study and practice of sculpture deriving from the first half of the 20th century, and consideration of concepts involved in the beginnings of abstraction.
3 units, Spr (Randell)

280. Seminar on 20th Century Urbanism—(Same as Urban Studies 189.)
4 units, Spr (Stout and Turner) given 1983-84

295. Teaching and Professional Work Experience.
4 units, Aut (Elsen) given 1983-84

any quarter (Staff) by arrangement

301. Master’s Thesis: Art History.
any quarter (Staff) by arrangement

any quarter (Staff) by arrangement

RELATED COURSES
Topography and Monuments of Greece — See Classics 108.
Roman Art and Architecture—See Classics 106.
City of Athens — See Classics 109.

COURSES IN PRACTICE OF ART (STUDIO)

All courses listed below in practice of art (studio) will be offered in 1983-84.

274. Studies on Baroque Architecture.
4 units (Turner) not given 1983-84

275A,B. Studies in Modern Architecture I, II.
4 units Win, Spr (Turner) given 1983-84

4 units (Turner) not given 1983-84

277. Seminar on Modern Architecture: Le Corbusier—(Prior consent of instructor required.)
4 units (Turner) not given 1983-84

278. Seminar on American Architecture: The Design of the American College Campus—(Prior consent of instructor required.)
4 units (Turner) not given 1983-84

279. Seminar on Frank Lloyd Wright—(Prior consent of instructor required.)
4 units, Win (Turner) given 1983-84

50. Basic Drawing—Basic drawing concepts introduced through charcoal.
3 units, Aut, Win, Spr (Staff)

51. Clay Modeling: The Head—Study of the figure tradition in sculpture with emphasis on modeling the human head in clay.
3 units, Aut, Win, Spr (Randell)

52. Clay Modeling: The Figure—Study of the figure tradition in sculpture with emphasis on modeling the human figure in clay.
3 units, Aut, Win (Randell)

53. Introduction to Abstraction—Figure and non-figure constructions in various materials with study and practice of sculpture deriving from the first half of the 20th century, and consideration of concepts involved in the beginnings of abstraction.
3 units, Spr (Randell)

60K,L. Basic Design—Introduction to visual language and media, and their applications to
communication and environment. Two- and three-dimensional projects.

3 units, Aut, Win, Spr (Kahn and Lynch)

70. Basic Photography—Introduction to basic camera and laboratory techniques. Class time used for lecture and discussion, viewing of slides and some field work. Viewing sessions in the Stanford Museum and Art Gallery scheduled according to current exhibitions. A 35mm camera is required.

3 units, Aut, Win, Spr (Kahn and Lynch)

INTERMEDIATE COURSES

140. Drawing I — Fundamentals of composition in black and white. Emphasis on the visual aspects of specific objects drawn separately and in a still-life context using charcoal. This course is recommended as the beginning drawing class for studio art majors. No prerequisites.

3 units, Aut, Win, Spr (Staff)

141. Drawing II — Intermediate/advanced drawing and composition. Prerequisite: 40 or 140, or consent of instructor. May be repeated for credit.

3 units, Aut, Win, Spr (Staff)

142. Drawing III — Advanced drawing. Emphasis on student initiative in respect to composition, color, and use of a variety of drawing materials. Work from imagination, still life, and model. Prerequisite: 40 or 140, or consent of instructor. May be repeated for credit.

3 or more units, Aut, Win, Spr (Staff)

145. Painting I—Introduction to painting procedure. Still life and landscape studies in oil. Prerequisite: 40 or 140, or consent of instructor. May be repeated for credit.

3 units, Aut, Win, Spr (Staff)

146. Painting II—Beginning and intermediate painting. Extended problems in pictorial organization and content, with stress on oil painting. Prerequisite: 40 or 140, or consent of instructor. May be repeated for credit.

4 units, Aut, Win, Spr (Staff)

147. Painting III—Advanced painting with emphasis on the individual point of view. Prerequisite: Three quarters of 145, 146, or equivalent, or consent of instructor.

3 or more units, Aut, Win, Spr (Staff)

148. Monotype—Introduction to print-making using monotype, a graphic art medium which was used by such artists as Blake, Degas, Gauguin, Pendergast, and many others. Visits to the Achenbach Foundation collection and the Editions Press in San Francisco, and the Stanford Museum will supplement this course. Prerequisite: 40 or 140. May be repeated for credit.

3 units, Aut, Win, Spr (Oliveira)

153. Recent Sculpture Concepts and Projects — Study and practice will be concerned with the art of recent decades with special emphasis on current post-abstract procedures. Various materials and non-materials will be utilized. Prerequisites: any one of the following: 40, 51 or 52 or 53, 60 or 70.

3 units, Win, Spr (Randall)

160K. Design I—Intermediate Design—Comprehensive design assignments in diverse media with emphasis on the relationship between professional design problems and their underlying elements and procedures. Prerequisite: 60.

3 or more units, Aut, Win or Spr (Kahn)

161. Design II—Type and Symbol Design—An introduction to the principles of type and symbol design, emphasizing conceptual thinking. Prerequisite: 60.

3 units, Aut

162. Design III—Typographic Design—An introduction to typography, emphasizing the expressive use of type. Prerequisite: 161.

3 units, Win

164. Color—Comprehensive study in the theories and practice of color. Emphasis is on working with color in a variety of media. Prerequisite: 60.

3 units, Spr

166. Silkscreen Process/Textiles — Design projects in pattern as it applies to cloth, paper and other surface materials. Production emphasis is on the silkscreen printing process. Prerequisite: 160 or 161.

3 or more units, Aut (Kahn)

167. Metalsmithing—Projects in jewelry and small utilitarian objects. Emphasis on design and craftsmanship in metal construction and lost wax casting. Prerequisite: 162.

3 or more units, Win (Kahn)

170. Intermediate Photography — Students will individually pursue a topic of their own definition. Class sessions will meet for individual and group critiques, lab demonstration and discussions, some led by students.

3 units, Aut, Win, Spr (Leivick and Volkerding)

172. Non-Silver Processes—This course is concerned primarily with technical procedures and will investigate the uses of primitive and handmade emulsions. Prerequisite: 70, 170, 270 or consent of the instructor. Class limited to 10 students; priority will be given to advanced students.

3 units, Aut (Leivick)
173. Photography Abroad — Students may register for 1, 2 or 3 units of photography while enrolled in an overseas program. Additional units may be taken for lab work upon return to Stanford campus. Consent of instructor required prior to going overseas.
  Aut, Win, Spr (levick and Volkerding)

ADVANCED UNDERGRADUATE AND GRADUATE COURSES

241. Advanced Drawing and Painting Criticism I — Prerequisite: at least two quarters of painting or drawing.
  Aut, Win, Spr (Oliveira) by arrangement

242. Advanced Drawing and Painting Criticism II — Prerequisite: at least two quarters of painting or drawing.
  Aut, Win, Spr (Boyle) by arrangement

243. Advanced Drawing and Painting Criticism III.
  Aut, Win, Spr (Lobdell) by arrangement

244. Advanced Drawing and Painting Criticism IV.
  Aut, Win, Spr (Branch) by arrangement

245. Undergraduate Seminar in Studio Art.
  2 units, Win, Spr (Lobdell)

  Aut, Win, Spr (Staff) by arrangement

248. Advanced Monotype — Continuation of monotype, dealing with advanced technical and aesthetic problems in the medium. Prerequisite: 148.
  3 or more units, Aut, Win, Spr (Oliveira)

249. Individual Work: Lithography. Consent of the instructor required. Prerequisite: beginning lithography.
  any quarter (Oliveira) by arrangement

  any quarter (Randell) by arrangement

256. Individual Work: Design.
  any quarter (Kahn) by arrangement

261. Advanced Design I — Advanced Graphic Design — Design experiences in a wide range of media for communication utilizing a combination of typographic material and images. Prerequisite: any two design courses above 160.
  3 or more units, Spr

262. Advanced Design II — Graphic Organization — Design experiences in visual communication through analytical approaches of visual problem solving.
  3 or more units, Win

264. Advanced Color.
  3 units, Spr

268. Design Synthesis—Mature semi-elective problems in composite and multi-media design areas. Prerequisite: any two design courses above 160.
  3 or more units, Spr (Kahn)

269. Advanced Creative Studies—Evening seminar based upon elective design projects in areas of individual specialization. Consent of instructor required.
  3 or more units, Aut, Win, Spr (Kahn)

270. Advanced Photography.
  Aut, Spr (Volkerding) by arrangement

271. Directed Advanced Photography: The View Camera, Its Uses and Techniques — This course is designed for the serious student of photography who wishes to gain greater control and refine his skill in image-making. 4 x 5 view cameras are provided. Class limited to six students.
  3 units, Win (Leivick and Volkerding)

272. Individual Work: Photography
  any quarter (Leivick and Volkerding) by arrangement

  Aut, Win, Spr (Boyle) by arrangement

342. M.F.A. Project (Studio).
  any quarter (Staff) by arrangement

360A,B,C. Master's Project (Seminar): Design.
  Aut, Win, Spr (Kahn) by arrangement

RELATED COURSES

Philosophy of Design—See Mechanical Engineering 214.

Visual Thinking—See Mechanical Engineering 101.

Human Values in Design—See Mechanical Engineering 115A.

COURSES IN ART EDUCATION

Artistic Development of the Child—(Enroll in Education 219.)
  4 units, Win (Eisner) MW

Seminar for Doctoral Students in Art Education—(Enroll in Education 461.)
  2-5 units, Spr (Eisner) T

SCHOOL OF HUMANITIES AND SCIENCES
The Department of Asian Languages offers courses in the languages, cultures, and literatures of China and Japan. The department accepts candidates for the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy in Chinese or Japanese. It also gives a minor in Chinese or Japanese language and literature for the degree of Doctor of Philosophy.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The degree of Bachelor of Arts is granted both in Chinese and in Japanese. The following courses must be completed:

1. Concentration in Chinese: AL 91-93, C113, AL131, 132, 133, and two other content courses dealing with China at the 100 level, as approved by the Undergraduate Advisor.

2. Concentration in Japanese: AL 91-93, J103, AL136, 137, 138, and two other content courses dealing with Japan at the 100 level, as approved by the Undergraduate Advisor.

These requirements are in addition to the University's basic requirement for the bachelor's degree. Letter grades are mandatory for all required courses.

HONORS PROGRAM IN ASIAN LANGUAGES

Majors with an overall letter-grade average of 3.5 may apply for the Honors Program by submitting a senior thesis proposal to the Honors Committee during the Spring or Winter Quarter of the junior year; the proposal will include a thesis outline, a list of all relevant courses the student has taken or plans to take, a skeleton reading list including a work or works in Chinese or Japanese, and the name of a faculty member who has agreed to act as Honors Supervisor.

If the proposal is approved, research and writing will begin in the Spring Quarter of the junior year, and for the first two quarters will take the form of directed reading with the chosen supervisor; the finished essay (normally about 15,000 words) will be submitted to the committee no later than the end of the Winter Quarter in the senior year. From ten to fifteen units of credit will be granted for the finished thesis.

EAST ASIAN STUDIES THEME HOUSE

EAST House, located at Governor's Corner on campus, is an undergraduate residence
which houses sixty students and offers them a wide variety of opportunities to expand their knowledge, understanding, and appreciation of China and Japan. Assignment is made through the regular undergraduate housing draw.

ADMISSION TO GRADUATE STUDY

All students contemplating application for admission to graduate study must have a creditable undergraduate record at Stanford or elsewhere. The applicant need not have majored in Chinese or Japanese as an undergraduate, but must have had the equivalent of at least three years' training in the language in which he or she intends to specialize, and must also demonstrate a command of English adequate for the pursuit of graduate study. Applicants should not wish merely to acquire or improve language skills but to pursue study in one of the following fields: Chinese history (premodern), Chinese linguistics, Chinese literature, Chinese philosophy, Japanese cultural history, Japanese literature.

GRADUATE PROGRAMS

MASTER OF ARTS

The degree of Master of Arts is granted in Chinese and in Japanese. The normal length of study for the degree is two years.

Applicants who wish to obtain the A. M. only but do not intend to proceed to the Ph. D. will only be considered if no financial aid is requested.

Students who wish to spend their first year of graduate study at the Taipei or Tokyo Center must obtain departmental approval first.

Candidates for the degree must be in residence at Stanford in California during the final quarter of registration.

A thesis or an annotated translation of a text of suitable literary or historical worth is required for the A.M. degree. Under special circumstances, a paper approved by the Graduate Advisor may be substituted.

The University's basic requirements for the master's degree are given in the section "Degrees" in this bulletin. Departmental requirements are set forth below.

MASTER OF ARTS: CHINESE

The candidate must:

1. Meet the department's requirements for the Bachelor of Arts in Chinese or their equivalent.

2. Complete the following course work: 103, 201, 202, 223, 299; four courses in Chinese numbered between 241 and 292; and two courses on the upper division or graduate level in fields such as Chinese anthropology, art, history, philosophy, and politics, as approved by the Graduate Advisor in consultation with the student's individual advisor. Students may be exempted from 101, 102, 103 and 221, 222, 223 by passing examinations to demonstrate that they have attained equivalent language competence. Letter grades are mandatory for all required courses.

MASTER OF ARTS: JAPANESE

The candidate must:

1. Meet the department's requirements for the Bachelor of Arts in Japanese or their equivalent.

2. Complete the following course work: 201, 202, 213, 248, 299; four courses in Japanese numbered between 255 and 297; and two courses in such fields as Japanese anthropology, art, history, politics, and religion, as approved by the Graduate Advisor in consultation with the student's individual advisor. Students may be exempted from 211, 212, 213 and 246, 247, 248 by passing examinations to demonstrate that they have attained equivalent language competence. Letter grades are mandatory for all required courses.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree is granted in Chinese and in Japanese. Candidates for the degree are expected to acquire a thorough familiarity with Chinese or Japanese literature, an adequate command of both languages, and a comprehensive knowledge of East Asian history, social institutions, and thought. The University's basic requirements for the doctorate are given in the "Degrees" section in this bulletin. Departmental requirements are set forth below.

Admission to Candidacy—Students admitted with A.B. only will be evaluated by the graduate faculty during the Autumn Quarter of their second year at Stanford. The evaluation will be based on written work and at least a portion of the A.M. thesis or translation. If the faculty has serious doubts about a student's ability to work for the Ph.D., this will be conveyed to the student. During the subsequent Spring Quarter, the faculty will formally decide whether a student should be admitted to candidacy for the Ph. D. or be terminated. In the case of a student who already has an A. M. in Chinese or Japanese when admitted to the department, the evaluation will take place in the Spring.
Quarter of the student’s first year. If a student goes to the Taipei or Tokyo Center during his or her first two years, the department will consider requesting the Dean of Graduate Studies for approval of an exception to the rule that qualification procedure must take place during the student’s first two years. The timing of the evaluation of a student admitted with an A.M. in Asian Studies will be decided on an individual basis.

Admission to candidacy does not mean that the student has fulfilled all requirements for the degree except the dissertation, but that the departmental faculty considers the student qualified to pursue a program of study leading to the Ph.D. and that, subject to continued satisfactory progress, the student’s status in this department is secure.

A candidate must fulfill the following requirements for the Ph.D.

1. He or she must demonstrate a reading knowledge of French, German, or another European language approved by the Graduate Advisor before completing the A.M. degree.

2. He or she must complete two seminars at the 300 level. These seminars must be in different subjects.

3. He or she must pass an examination in the supporting Asian language. A candidate whose field is Chinese will be examined on his or her ability to read modern Japanese works relevant to his or her field of study. This requirement may be met by completing Japanese 103. A candidate whose field is Japanese will be examined on ability to read classical Chinese works relevant to his or her field of study. This requirement may be met either by completing Chinese 113 or by taking Japanese 250 and subsequently passing a test on the prescribed reading list in Kambun.

4. He or she must pass a set of four comprehensive written examinations. One of these will test the candidate’s methodological competence in a discipline. The remaining three fields are to be chosen, with the approval of the Graduate Advisor in consultation with the student’s individual advisor, from the following: Chinese literature, Chinese history, Chinese philosophy, Chinese linguistics, Chinese religion, Chinese art, Japanese literature, Japanese history, Japanese religion, Japanese art, and Japanese anthropology.

University Oral Examination—General regulations governing the oral examination will be found in the section “Degrees” in this bulletin. The candidate will be examined on questions related to his or her dissertation, after acceptable parts thereof have been completed in draft form.

Dissertation—The candidate will write a dissertation demonstrating ability to undertake original research based on primary materials in Chinese or Japanese.

Minor for the Degree of Doctor of Philosophy—A student taking a minor in Asian languages shall complete at least 30 units of work within the department to be chosen in consultation with a departmental advisor. He or she must elect either Chinese 201-202 or Japanese 201-202 unless the department is satisfied that work done elsewhere has provided similar training. He or she must also pass a written examination in the Chinese or Japanese language.

Special Programs for the Degree of Doctor of Philosophy—Properly qualified students may plan special interdepartmental programs in the Asian field for the degree of Doctor of Philosophy. See the section “Graduate Division Special Programs” in this bulletin.

SPECIAL OPPORTUNITIES FOR STUDY ABROAD

Attention is called to the programs of the Inter-University Program for Chinese Language Study in Taipei and the Inter-University Center for Japanese Studies in Tokyo (both of which are administered by Stanford University). They are described elsewhere in this bulletin.

Special attention is called to the Exchange Program recently established with the Chinese Department at Beijing University in Beijing. All those interested in the program should see the chairman of the department early in the academic year.

SUMMER PROGRAM OF INTENSIVE LANGUAGE COURSES

A ten-week program, which begins at the same time as the University’s general summer program and continues two weeks beyond it, is held each summer. Intensive instruction is offered, on three different levels, in both Chinese and Japanese. The intensive courses provide the equivalent in instruction to regular academic-year courses. (See courses Chinese 5, 25, 105, Japanese 5, 25, and 105 as described below.) For detailed information about these and other aspects of the summer program, apply directly to the Department of Asian Languages, preferably before the end of the preceding Winter Quarter.
COURSES NOT REQUIRING KNOWLEDGE OF AN ASIAN LANGUAGE

46. Introduction to Chinese Philosophy — (Same as Philosophy 46.) The history of Chinese philosophy to 200 B.C., together with a brief introduction to Classical Chinese as used by early philosophers. 
4 units, Win (Nivison) MTWTh 10

91. Traditional East Asian Civilization — (Same as History 91 and Humanities 91.) An introduction to the development of civilization in China and Japan from earliest times to the spread of Buddhism. Lectures and discussions will cover political institutions, social and political ideas, religious currents, and artistic and literary trends. Intended for the nonspecialist. (DR:3)
5 units, Aut (Lyell, Van Slyke and Staff) MTWThF 10

92. Traditional East Asian Civilization — (Same as History 92 and Humanities 92.) A continuation of 91 covering the period down to 1700. (DR:2)
5 units, Win (Duus, Hare, and Staff) MTWThF 10

93. Modern East Asian Civilization — (Same as History 93 and Humanities 93.) A continuation of 92 covering the period from initial Western contacts down to the present. (DR:5)
5 units, Spr (Duus and Staff) MTWThF 10

110. Japanese-Western Literary and Cultural Interaction—Discussion of cross-literary and cross-cultural topics, such as haiku in English, Marxism in Japanese prose fiction, and Zen in American literature. (DR:2*)
3 units, Win (Ueda) M 2:15-4:05

114. Haiku—Reading and discussion of representative Japanese haiku from the 16th to the present. Works of Bashö, Buson, Issa and other poets will be treated in English translation. Students will exchange their interpretations of individual poems in class, collectively trying to reach for the ultimate meaning of each. Aspects of traditional Japanese aesthetics will be touched on in the course of discussions. (DR:2*)
3 units, Aut (Ueda) given 1984-85

125. Japanese Culture Through Novels and Films—(Same as Anthropology 125.) Explorations of Japanese social structure (family, socialization, community, work, etc.) and cultural values through novels (in translation) by leading writers (Mishima, Natsume, Tanizaki, etc.) and feature length films by well known directors (Kurosawa, Ozu, etc.). The course will focus on the individual in the social and cultural setting of modern, changing Japan.
5 units, Spr (Befu) given 1984-85

131. Chinese Poetry and Drama in Translation—Readings in traditional Chinese poetry and drama with emphasis on genre, theme, and style. (DR:2*)
4 units, Aut (Liu) MWF 11

132. Chinese Fiction in Translation—A survey of Chinese prose fiction from early times to the late Ch'ing period, with emphasis on literary and thematic discussions of major representative works available in English translation. (Students who need to take this course to fulfill requirements may take 176 instead.) (DR:2*)
4 units, Win (Wang) MWF 11

133. Modern Chinese Literature in Translation—Readings in representative twentieth-century works of fiction, drama, and poetry in translation. (DR:2*)
4 units, Spr (Lyell) MWF 11

136. Early Japanese Literature in Translation—An introduction to the major works of prose and poetry from the Nara through the Kamakura periods (c. 700-1300). (DR:2*)
4 units, Aut (Hare) MWF 1:15

137. Japanese Literature in Translation—The Middle Period—An introduction to the major works in prose, poetry, and the theater from the Muromachi through the Tokugawa periods (1330-1818). (DR:2*)
4 units, Win (Matisoff) MWF 1:15

138. Modern Japanese Literature in Translation—An introductory course in Japanese poetry, drama, and fiction since 1818. Authors considered will include Tanizaki, Kawabata, Mishima, and many others. Knowledge of premodern Japanese literature not required. (DR:2*)
4 units, Spr (Ueda) MWF 1:15

144. Confucianism Since Wang Yang-ming— (Same as Philosophy 124 and Religious Studies 154.) History of Confucian moral philosophy in China and Japan since the death of Wang Yang-ming in 1529.
4 units, Spr (Nivison) TTh 2:15-4:05

152. Nomad Empires of Inner Asia—(Same as History 195.) Inner Asia as an arena of conflict between agricultural and nomadic societies and the traces of cultural diffusion. (DR:5*)
5 units, Spr (Dien) given 1984-85

154 (254). Undergraduate Colloquium: The Middle Period in Chinese History—(Same as History 294/394.) This course will deal with the material culture of medieval China as a source of information about central social, political and economic developments of the time. Compari-
156. China from Earliest Times to the 9th Century — (Same as History 192A). Geo-historical origins to the Tang period: the first 4,000 years of social formations and historical transformations of ancient and early medieval China.  
5 units, Aut (Dien and Kahn)  
MTWThF 11

161. The Occult Tradition in Ancient China — The history of occult belief and practice to 600 A.D. Lectures trace the development and efflorescence of divinatory arts, alchemy, medicine, and other esoteric sciences, with emphasis on the relationship between religion, magic, and science.  
4 units, Spr (Harper) TTh 11-12:15

176. Chinese Myths, Legends, and Folktales — A general survey of their respective forms and contents and their significance in the study of Chinese culture in general and Chinese literature in particular. (DR:2*)  
4 units, Win (Wang) given 1984-85

177 (277). Classic Japan — This course will survey the cultural achievements of Heian (794-1185) Japan. The Tale of Genji, Japan’s greatest work of prose fiction, will provide a central focus of attention, but students will also be introduced to the visual arts, music, and poetry of the age. The religious and historical background of the period will also be discussed. (Graduate students may register under 277, in which case they will be required to do additional readings in Japanese.) (DR:2*)  
4 units, Spr (Harper) TTh 11-12:15

178 (278). Japanese poetry from Manyōshū to Shinkokinshū (759-1206) — An introduction to classical Japanese poetry from the earliest times to the early 13th century using English translations of major poems for detailed study. (Graduate students may register under 278, in which case they will be required to do additional readings in Japanese.) (DR:2*)  
4 units, Spr (Hare) given 1984-85

179 (279). Classical Japanese Drama — The development of Japanese drama from early religious ritual forms through no, puppet theatre and kabuki. Readings will include works in translation from several genres with the greatest emphasis given to no. Plays will be analyzed both as dramatic literature and in terms of performance. Video tapes and short films will be used extensively to supplement lectures. (Graduate students may register under 279, in which case they will be required to do additional readings in Japanese.) (DR:2*)  
4 units, Spr (Matisoff) MWF 1:15

181 (281). Japanese Women Writers — This course examines social and cultural factors affecting the preeminence of Japanese women’s writing in the classical period, its decline in medieval and early modern Japan, and its reappearance in the modern period. Analysis of classical and modern literary works which will be read in translation. (Graduate students may register under 281 in which case they will be required to do additional readings in Japanese.) (DR:2*)  
4 units, Spr (Matisoff) given 1984-85

195 (295). Modern Intellectuals in Japanese Literature — A study of modern Japanese novels that deal with problems of a modern intellectual. The novels, read in English translation, will include Kawabata’s Snow Country, Tanizaki’s The Key, Mishima’s Confessions of a Mask, and others.  
3 units, Aut (Ueda) given 1984-85

197 (297). Images of Women in Modern Japanese Literature — A study of modern Japanese novels that feature women performing various social roles. The novels, read in English translation, will include Wild Geese by Ogai, The Setting Sun by Dazai, After the Banquet by Mishima, The Woman in the Dunes by Abe, and others. (Advanced students may register under 297 in which case they will be required to do additional readings in Japanese. See Japanese 297.) (DR:2*)  
3 units, Aut (Ueda) M 2:15-4:05

254. Graduate Colloquium: The Middle Period in Chinese History — (See 154 and same as History 294/394 with additional work required.)  
5 units, Win (Dien) M 2:15-4:05
Prefer Nettles, and Mishima’s The Temple of the Golden Pavilion.
5 units, Win (Ueda) given 1984-85

255B. Chinese and Western Theories of Literature—Study of traditional Chinese theories of literature in comparison with Western ones. Seminar with limited enrollment. (Graduate students in Chinese may enroll in this seminar in lieu of 361 and will be required to read original texts.)
5 units, Win (Liu) given 1984-85

COURSES IN CHINESE
1, 2, 3. First-Year Modern Chinese—Conversation, grammar, reading, elementary composition. Daily sections may be set at the beginning of the quarter to suit schedule requirements.

1. 5 units, Aut (Kao and Shou)
   Section 1 MTWThF 9
   Section 2 MTWThF 10
   Section 3 MTWThF 1:15

2. 5 units, Win (Kao and Shou)
   Section 1 MTWThF 9
   Section 2 MTWThF 10
   Section 3 MTWThF 1:15

3. 5 units, Spr (Kao and Shou)
   Section 1 MTWThF 9
   Section 2 MTWThF 10
   Section 3 MTWThF 1:15

5. Intensive First-Year Modern Chinese—Equivalent to 1, 2, and 3 combined.
12 units, Sum (Staff) MTWThF 8-12

21, 22, 23. Second-Year Modern Chinese—Further study in grammar, reading, conversation, composition. Prerequisite: 3 or equivalent.

21. 5 units, Aut (Chuang) MTWThF 9
22. 5 units, Win (Chuang) MTWThF 9
23. 5 units, Spr (Chuang) MTWThF 9

25. Intensive Second-Year Modern Chinese—Equivalent to 21, 22, 23 combined. Prerequisite: 3 or equivalent.
12 units, Sum (Staff) MTWThF 8-12

27, 28, 29. Intermediate Conversation—Prerequisite: 3 or consent of instructor.

27. 2 units, Aut (Shou) TTh 11
28. 2 units, Win (Shou) TTh 11
29. 2 units, Spr (Shou) TTh 11

51. Chinese Calligraphy—Practice in writing Chinese characters with a brush and learning different scripts. Prerequisite: Chinese 3, Japanese 3, or equivalent.
1 to 2 units, Spr (Chuang) TTh 1:15

101, 102, 103. Third-Year Chinese (Modern)—An introduction (using annotated texts) to newspapers, documents, and belles-lettres. Prerequisite: 23 or equivalent.

101. 5 units, Aut (Chuang) MTWThF 11
102. 5 units, Win (Lyell) MTWThF 11
103. 5 units, Spr (Chuang) MTWThF 11

105. Intensive Modern Chinese—Equivalent to 101, 102, 103 combined. Prerequisite: 23 or equivalent.
12 units, Sum (Staff) MTWThF 9-12

111, 112, 113. Third-Year Chinese (Classical)—Prerequisite: 23 or equivalent.

111. 5 units, Aut (Kao) by arrangement
112. 5 units, Win (Kao) by arrangement
113. 5 units, Spr (Kao) by arrangement

121, 122, 123. Advanced Conversation—Prerequisite: 23 or equivalent.

121. 2 units, Aut (Chuang) W 2:15-4:05
122. 2 units, Win (Chuang) W 2:15-4:05
123. 2 units, Spr (Chuang) W 2:15-4:05

131, 132, 133. Business Chinese — Prerequisite: 23 or equivalent.

131. 2 units, Aut (Kao and Staff) by arrangement
132. 2 units, Win (Kao and Staff) by arrangement
133. 2 units, Spr (Kao and Staff) by arrangement

199. Individual Reading in Chinese—(Asian Languages majors only). Prerequisite: 103 or consent of instructor.
4 units, Aut, Win, Spr (Staff) by arrangement

GRADUATE

200. Directed Reading in Chinese—Prerequisite: 213 or 223 or consent of instructor.
units to be arranged, Aut, Win, Spr (Staff) by arrangement

201, 202. Proseminar — Research methods in Chinese studies. Prerequisite: 113 or equivalent.

201. 5 units, Aut (Dien) W 2:15-4:05
202. 5 units, Win (Dien) W 2:15-4:05

221, 222, 223. Advanced Classical Chinese—Prerequisite: 113 or equivalent.

221. Philosophical Texts.
5 units, Aut (Nivison) MWF 11

222. Historical Narration.
5 units, Win (Dien) MWF 1:15

223. Literary Essays.
5 units, Spr (Liu) MWF 11
241, 242, 243. Modern Chinese Literature—Introduction through the use of annotated texts to: short story, essay, poem, play, and novel. Prerequisite: 103 or 113.

241. Short Story. (DR:2*)
5 units, Aut (Lyell) MWF 9

242. Essay. (DR:2*)
5 units, Win (Lyell and Staff) MWF 11

243. Novel. (DR:2*)
5 units, Spr (Lyell) MWF 9

260. Chinese Poetry (I)—Selected readings from the Book of Poetry (Shih-ching; ca. 11th-6th centuries B.C.) with emphasis on critical analysis. Prerequisite: 223 or consent of instructor.
4 units, Aut (Liu) given 1984-85

261. Chinese Poetry (II)—Selected readings in Han, Wei, and Six Dynasties poetry (2nd century B.C.-6th century A.D.), with emphasis on critical analysis. Prerequisite: 260 or consent of instructor.
4 units, Win (Liu) given 1984-85

262. Chinese Poetry (III)—Selected readings in T'ang and Sung poetry (7th-13th centuries A.D.) with emphasis on critical analysis. Prerequisite: 261 or consent of instructor.
4 units, Spr (Liu) given 1984-85

263. T'ang and Sung Lyrics—Selected readings in the songs (tu'lu) of the T'ang, Five Dynasties, and Sung periods (8th-13th centuries A.D.), with emphasis on critical analysis. Prerequisite: 262 or consent of instructor.
4 units, Aut (Liu) MWF 10

264. Yuan and Ming Songs—Selected readings in the songs (san-ch'u) of the Yuan and Ming periods (13th-17th centuries A.D.), with emphasis on critical analysis. Prerequisite: 263 or consent of instructor.
4 units, Win (Liu) MWF 10

265. Chinese Critical Texts—Readings in traditional Chinese literary criticism. Prerequisite: 223 or consent of instructor.
4 units, Win (Liu) MWF 11

271, 272. Traditional Chinese Fiction—Selected readings in short stories and longer works of fiction from early times to late Ch'ing. Prerequisite: 113 or consent of instructor.
4 units, Win (Harper) TTh 11-12:15

273. Chinese Drama—Selected readings in dramatic works of the Yuan, Ming, and Ch'ing periods, with emphasis on literary rather than theatrical qualities. Prerequisite: 113 or consent of instructor.
4 units, Spr (Wang) TTh 11-12:15

291. The Structure of Modern Chinese—(Same as Linguistics 288.) Prerequisite: 23 or equivalent. Recommended: a general introductory course in linguistics.
4 units, Spr (Kao) by arrangement

292. The Chinese Language and Current Linguistic Theories—(Same as Linguistics 289.) Prerequisite: 103 or equivalent. Recommended: a general introductory course in linguistics.
4 units, Spr (Kao) given 1984-85

299. Master's Thesis or Translation.
A total of 5 units, which may be taken in one or more quarters, Aut, Win, Spr (Staff) by arrangement

321. Seminar on Archaic Inscriptions—Bone and Bronze Inscriptions—Shang and Early Chou—May be repeated for credit.
5 units, Spr (Nivison) M 2:15-4:05

331. Seminar in Confucian Ethics.
5 units, Win (Nivison) T 2:15-4:05

334. Seminar in Modern Chinese Literature
—May be repeated for credit. Prerequisite: 243 or consent of instructor.
5 units, Win (Lyell) TTh 1:15

351. Seminar in Chinese Traditional Historiography—May be repeated for credit.
5 units, Spr (Dien) given 1984-85

361. Seminar in Chinese Literary Criticism—May be repeated for credit. Prerequisite: 265 or consent of instructor.
5 units, Spr (Liu) T 2:15-4:05

371. Seminar in Chinese Narrative —Thorough studies of individual texts with emphasis on theoretical applications. May be repeated for credit. Prerequisite: 272 or consent of instructor.
5 units, Aut (Wang) given 1984-85

399. Dissertation.
(Staff) by arrangement

400. Advanced Language Training—Open only to students in the Taipei Program. For more information, see the description under “Inter-University Program for Chinese Language Studies in Taipei.” The course is offered on a Pass/No Credit basis.
15 units per quarter (Staff)

COURSES IN JAPANESE
1,2,3. First-Year Modern Japanese—Conversation, grammar, reading, elementary composition. Students may attend any convenient daily section.
1. 5 units, Aut (Sakamoto, Nebrig)
   Section 1 MTWThF 9
   Section 2 MTWThF 1:15
   Section 3 MTWThF 3:15
### 2. Intensive First-Year Modern Japanese—
Equivalent to 1, 2, and 3 combined.
12 units, Sum (Staff) MTWThF 8-12

### 21, 22, 23. Second-Year Modern Japanese —
Further instruction and practice in conversation, grammar, reading, and composition. Prerequisite: 3 or equivalent.
- 21. 5 units, Aut (Kubota) MTWThF 9
- 22. 5 units, Win (Kubota) MTWThF 9
- 23. 5 units, Spr (Kubota) MTWThF 9

### 25. Intensive Second-Year Modern Japanese—
Equivalent to 21, 22, and 23 combined. Prerequisite: 3 or equivalent.
12 units, Sum (Staff) MTWThF 8-12

### 27, 28, 29. Conversation I—Prerequisite: 3 or consent of instructor.
- 27. 2 units, Aut (Sakamoto) TTh 1:15
- 28. 2 units, Win (Sakamoto) TTh 1:15
- 29. 2 units, Spr (Sakamoto) TTh 1:15

### 51. Japanese Calligraphy (Pen-ji Santai)—
Practice in writing Japanese kana and kanji, beginning with a ball-point pen or a felt pen and advancing to use of a brush. Prerequisite: Chinese 3, Japanese 3 or equivalent.
1-2 units, Spr (Kubota) Th 3:15-4:30

### 101, 102, 103. Modern Written Japanese —
Reading texts representative of various modern written styles. Prerequisite: 23 or equivalent.
- 101. 5 units, Aut (Kubota) MWF 11-12:15
- 102. 5 units, Win (Kubota) MWF 11-12:15
- 103. 5 units, Spr (Kubota) MWF 11-12:15

### 105. Intensive Modern Written Japanese —
Equivalent to 101, 102, and 103 combined. Prerequisite: 23 or equivalent.
12 units, Sum (Staff) MTWThF 9-12

### 121, 122, 123. Conversation II—Prerequisite: 23 or consent of instructor.
- 121. 2 units, Aut (Kubota) TTh 1:15
- 122. 2 units, Win (Kubota) TTh 1:15
- 123. 2 units, Spr (Kubota) TTh 1:15

### 199. Individual Reading in Japanese—(Asian Languages majors only.) Prerequisite: 103 or consent of instructor.
4 units, Aut, Win, Spr (Staff) by arrangement

### 200. Directed Reading in Japanese—Prerequisite: 213 or consent of instructor.
units to be arranged,
Aut, Win, Spr (Staff) by arrangement

### 201, 202. Proseminar—Bibliography and research methods in Japanese studies. Prerequisite: 103 or equivalent.
- 201. 5 units, Aut (Matisoff) W 2:15-4:05
- 202. 5 units, Win (Hare) W 2:15-4:05

### 211, 212, 213. Advanced Modern Japanese—
Readings in modern Japanese scholarly, journalistic and literary prose. Each quarter may be taken separately. Prerequisite: 103 or equivalent.
- 211. Essays and Scholarly Articles.
  5 units, Aut (Matisoff) MWF 11
- 212. Newspaper Articles.
  5 units, Win (Matisoff) MWF 11
- 213. Fiction.
  5 units, Spr (Matisoff) MWF 11

### 246, 247, 248. Introduction to Classical Japanese—
The basic principles of the classical literary language. The first quarter concentrates on basic grammar and vocabulary, while the subsequent quarters involve reading in progressively more difficult texts from the Nara through Tokugawa periods. Prerequisite: 103 or equivalent.
- 246. 5 units, Aut (Hare) by arrangement
- 247. 5 units, Win (Hare) by arrangement
- 248. 5 units, Spr (Hare) by arrangement

### 250. Introduction to Kambun—Selected readings from a variety of Japanese works written in Kambun, ranging from Kaifūsō to Yoshida Shōin’s diary. Offered when there is sufficient demand.
4 units, Spr (Ueda) MW 2:15-3:30

### 251. Graduate Seminar: Japanese Historical Texts—(Same as History 498.) Medieval historical sources and research methods. The reading of documents in Kambun will be introduced.
5 units, Win (Mass) given 1984-85

### 256. Readings in Japanese Culture—Reading and discussion of articles on the identity of Japanese culture. The articles will be chosen from the works of prominent essayists, social critics, anthropologists, sociologists, and scholars in a wide variety of other fields.
4 units, Aut (Ueda) given 1984-85

### 277. Classic Japan — (Same as 177 with additional work requiring knowledge of the language.)
4 units, Spr (Hare) given 1984-85

### 278. Japanese Poetry from Manyōshū to Shinkokinshū (759-1206)—(Same as 178 with addi-
tional readings in the original Japanese.) Prerequisite: 247 or equivalent.
4 units, Spr (Hare) given 1984-85

279. Classical Japanese Drama—(Same as 179 with additional work requiring knowledge of the language. Prerequisite: 247 or equivalent.)
4 units, Spr (Matisoff) MWF 1:15

281. Japanese Women Writers — (Same as 181 with additional work requiring knowledge of the language.)
4 units, Spr (Matisoff) given 1984-85

282. Japanese Popular Religious Literature—(Same as 182 with additional work requiring knowledge of the language.)
4 units, Aut (Matisoff) given 1984-85

294. Major Haiku Poets — Reading and discussion of selected haiku by Bashō, Buson, Issa and others. Prerequisite: 103 or equivalent.
4 units, Aut (Ueda) TTh 2:15-3:30

295. Modern Intellectuals in Japanese Literature—(Same as 195 with additional work requiring knowledge of the language.)
4 units, Aut (Ueda) given 1984-85

296. Readings in Modern Japanese Literature—Reading and discussion of works selected from contemporary authors. Prerequisite: 213 or equivalent. May be repeated for credit.
4 units, Win (Ueda) TTh 2:15-3:30

297. Images of Women in Modern Japanese Literature—(Same as 197 with an extra class meeting and additional work requiring knowledge of the language.)
4 units, Aut (Ueda) M 2:15-4:05 and Th 1:15-2:05

298. Translation Workshop—Discussion of problems involved in translating Japanese into English. Each student is expected to produce an original translation of a literary or documentary work from his or her major field of interest.
4 units, Spr (Ueda) given 1984-85

299. Master’s Thesis or Translation—A total of 5 units, which may be taken in one or more quarters.
Aut, Win, Spr (Staff) by arrangement

396. Seminar in Modern Japanese Literature—Study of selected works by modern novelists.
5 units, Win (Ueda) given 1984-85

399. Dissertation.
(Staff) by arrangement

400. Advanced Language Training—Open only to students at the Tokyo Center. For more information, see the program description under “Inter-University Center for Japanese Studies in Tokyo.” The course is offered on a Pass/No Credit basis.
15 units per quarter, (Staff)
Astronomy courses numbered 100-199 serve the student interested in an initial scientific study of astronomy.

The courses numbered 200 and above are for graduate students and advanced undergraduates, subject to prior approval by the course instructor.

UNDERGRADUATE PROGRAMS

The University does not offer a separate undergraduate major in astronomy. Students who intend to pursue graduate study in astronomy or space science are encouraged to major in physics, following the advanced sequence if possible, or in electrical engineering if the student has a strongly developed interest in radio-science. The course descriptions for these basic studies are listed under the appropriate department sections. Students desiring guidance in developing an astronomy oriented course of study should contact the Chairman of the Astronomy Program Committee. The following courses are suitable for undergraduates interested in astronomy and are recommended to students considering advanced study in astronomy: 100—Introduction to Observational Astronomy and Astronomy Laboratory; 106—Planetary Exploration; 110—Introduction to Stellar and Galactic Astrophysics; 111—Extragalactic Astrophysics and Cosmology. Students planning study in astronomy beyond the B.S. are urged to consider an undergraduate thesis (Astronomy 190).

GRADUATE PROGRAMS

Graduate programs in astronomy and astrophysics and related topics are carried out in the departments of Aeronautics and Astronautics, Applied Physics, Electrical Engineering, and Physics. Students should consult the course listings, degree requirements, and research programs of these departments for more detailed information. Opportunities for research at the graduate level are available within the Center for Space Science and Astrophysics which is described in this bulletin.

The following courses are recommended for students planning to conduct research in astronomy and astrophysics: 356—Astrophysics Laboratory; 360—Solar Physics; 362—Physical Processes in Stars; 364—Plasma Physics; 366—Cosmology and Extragalactic Astrophysics; 222, 368, 369—Gravitation. A graduate seminar (Astronomy 380) is often given on a topic of current interest in astronomy or astrophysics.

Students interested in the research programs involving spacecraft studies of the planets, their satellites, and their near-space environments should consider the following courses: 195—Physics of Planetary Interiors; 227—Atmospheric and Space Physics; 279A—Space Mechanics; 279B—Advanced Space Mechanics; 279C—Optimal Space Trajectories; 348—Ionospheric Processes; 350—Radioscience Seminar; 352—Wave Propagation in the Ionosphere and Magnetosphere; 354—Introduction to Radio Wave Scattering; 359—Remote Probing of Atmospheric Environment; 392—Ionospheric Physics.

COURSES

15. Topics in Modern Astronomy—The following two courses are addressed to students not majoring in the sciences. They are taught in different quarters by different instructors but are related in topic. Students are advised against taking more than one of the courses.

15A. The Nature of the Universe—(Enroll in Applied Physics 15.) This course is intended to familiarize undergraduates, without scientific background with the structure, origin and evolution of our universe. It will describe our growing knowledge of the objects which make up the universe; galaxies, stars, planets, etc. Some enigmas of modern astronomy, such as quasars, X-ray sources, black holes, and pulsars will also be discussed. Presentation will be non-mathematical. Opportunities for telescopic observations. No prerequisites. (DR:7) 3 units, Win (Walker)

15B. Cosmic Horizons—(Enroll in Physics 15.) This course proposes to familiarize the non-science student with modern cosmology. After discussing the physical laws that govern the universe, its evolution will be traced from the initial primeval fireball, through the formation of galaxies, stars, and planets to the development of life. Exotic astronomical objects, such as quasars, pulsars, and black holes will also be discussed. No prerequisites, but some algebra will be used.

3 units, Spr (Susskind)

50. Astronomy Laboratory and Observational Astronomy—Theory and use of an optical telescope and the interpretation of basic observational data to determine the physical properties of planets, stars, and galactic systems. The course consists of individual observations with a 16-inch Cassegrainian telescope supplemented by lectures which will include discussions of basic observational techniques, astronomical catalogs and coordinate systems, and the relat-
tion of observations to astrophysical models.

3 units, Aut, Sum (Walker) lecture M 4:15, laboratory by arrangement

100. Introduction to Observational Astronomy and Astronomy Laboratory — (Enroll in Applied Physics 100.) Provides the student of physical science or engineering with an introduction to observational techniques in astronomy. Emphasis on measurement of fundamental astronomical parameters such as distance, temperature, mass and composition of stars. One 2-hour lecture and one night of observation at the Stanford Student Observatory where students will use the 16-inch telescope. Limited enrollment. Prerequisites: one year of physics or concurrent registration in Physics 25, 57 or 63; consent of instructor.

4 units, Spr (Walker)

106. Planetary Exploration—(Enroll in Electrical Engineering 106.) Analysis and description of characteristics of the planets, their satellites, and near space environments, with emphasis on recent work using space probe, radio and radar methods of exploration. Comparative properties of the terrestrial and Jovian planets; planetary atmospheres, surfaces, interiors; rings of Saturn; planetary and satellite orbits and spacecraft trajectories, orbital perturbations; properties of the interplanetary gas, dust, comets, and meteorites. Origin and evolution of planetary systems. Remote sensing from spacecraft at radio, infra-red, light, and ultraviolet wavelengths. U.S. and Soviet space programs and their comparative engineering and scientific aspects. Prerequisites: one year of college engineering, mathematics, or physics.

3 units, Spr (Eshleman)


3 units, Aut (Petrosian and Walker)

111. Extragalactic Astrophysics and Cosmology—(Enroll in Applied Physics 111.) Basic observational data on distances and the distribution of matter in the universe: galaxies, clusters and superclusters of galaxies. Electromagnetic radiation from galaxies and quasars and the background radiation at radio, infrared and X-ray frequencies. Introduction to cosmology, models of the universe and their evolution. The Big Bang and the physical processes in the first three minutes. Prerequisite: calculus and one year of college physics at the level of the Physics 50 series or equivalent.

3 units, Win (Petrosian)

190A,B,C. Independent Study in Astrophysics and Honors Thesis—Students enrolled in this course will undertake a detailed study of a selected problem in astrophysics with an individual faculty member or with several faculty members. While not all projects will require 3 quarters, the sequence outlined below is intended to suggest a format which most projects are expected to follow. Projects may commence in any quarter.

190A. Selection of the Problem—During this quarter the student should select the problem to be studied and develop the theoretical apparatus or initial interpretation of observational data required for the study of the selected problem. Students will be asked to prepare a detailed description of the problem and its background and a comprehensive discussion of the work planned in the subsequent two quarters.

1-9 units, Aut (Staff) by arrangement

190B. Continuation of Project—During this quarter the student should substantially complete the required computations or data analysis for the research project selected.

1-9 units, Win (Staff) by arrangement

190C. Completion of the Project—During this quarter the student should complete the research project and write a detailed paper presenting the methods used and results of the research program.

1-9 units, Spr (Staff) by arrangement


3 units, Spr (Sleep)

222. Classical Gravitation—(Enroll in Physics 222.)

3 units, Spr (Staff)

227. Atmospheric and Space Physics—(Enroll in Aeronautics and Astronautics 227.)

3 units, Spr (Spreiter)

alternate years, given 1984-85

279A. Space Mechanics—(Enroll in Aeronautics and Astronautics 279A.)

3 units, Win (DeBra)

279B. Advanced Space Mechanics—(Enroll in Aeronautics and Astronautics 279B.)

3 units, Spr (Breakwell)

279C. Optimal Space Trajectories—(Enroll in Aeronautics and Astronautics 279C.)

3 units, Spr (Breakwell)

alternate years, given 1984-85
**SCHOOL OF HUMANITIES AND SCIENCES**

**ATHLETICS, PHYSICAL EDUCATION, AND RECREATION**

Beginning 1983-84 the School of Humanities and Sciences has responsibility for the Athletics, Physical Education, and Recreation Department credit curriculum. For the department listing, please see "Athletics, Physical Education, and Recreation" under the section "Other Departments, Institutes and Programs" in this bulletin.

**BIOLOGICAL SCIENCES**


*Chairman:* Philip C. Hanawalt

*Associate Chairman:* Robert D. Simoni

*Director of Graduate Studies:* Corey S. Goodman

*Director of Undergraduate Studies:* Patricia P. Jones


*Associate Professors:* H. Craig Heller, Corey S. Goodman, Patricia P. Jones, Stuart H. Thompson, Virginia Walbot, Ward B. Watt, Eduardo G. Zeiger

*Assistant Professors:* Mark W. Denny, William F. Gilly, Sharon R. Long, Richard Scheller. *By Courtesy:* Joseph A. Berry, Margaret S. Race, William F. Thompson

*Professor (Research):* Donald H. Perkel

*Senior Lecturer:* Charles H. Baxter

*Directors of Systematic Collections:* Paul R. Ehrlich (Entomological Collections), John H. Thomas (Dudley Herbarium)
OFFERINGS AND FACILITIES

The department of Biological Sciences comprises facilities and personnel housed in Herrin Laboratories, Herrin Hall, and the Jasper Ridge Biological Preserve on the main campus; and at the Hopkins Marine Station in Pacific Grove on Monterey Bay.

The department provides: (1) courses designed for the general student; (2) a major program leading to the degree of Bachelor of Science; (3) a program leading to the Master of Science degree, designed for students not intending to proceed to the Ph.D. degree in Biological Sciences at Stanford; and (4) various programs leading to the degree of Doctor of Philosophy.

The Jasper Ridge Biological Preserve is a 1,200-acre natural area containing an unusual diversity of plant communities. The preserve is managed solely for teaching and research purposes, and is available to investigators from various institutions. Many classes use the preserve. Stanford-based research at Jasper Ridge presently concentrates on physiological, ecological and population studies.

Special laboratory facilities for marine research are described in the Hopkins Marine Station Bulletin.

The department's large collections of plants (Dudley Herbarium), fishes, reptiles, and amphibians, as well as smaller collections of birds, mammals, and invertebrates are now housed at the California Academy of Sciences in San Francisco, where they, as well as the other extensive collections of the Academy, are available to those interested in the systematics of these groups. Entomological collections, restricted to those being used in particular research projects, are housed in the Herrin Laboratories. No general collections are maintained except for teaching purposes.

The Falconer Biology Library in Herrin Hall contains over 1600 current subscriptions and back sets of journals, and an extensive collection of monographs and reference works. A specialized library is maintained at the Hopkins Marine Station.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

UNDERGRADUATE ADVISING

Most members of the biology faculty are available for advising. The Student Affairs Office maintains a current list of faculty advisors, their advising schedule, and relevant guidelines.

The Student Affairs Office is prepared to answer questions on administrative matters, such as requirements for the major, eligibility of courses as electives, necessity for petition, and the like. Academic advising is provided by members of the faculty, on such matters as choice of courses and career plans. The Biology Bridge is a student-operated adjunct to departmental advising.

Each declared major in biology is expected to select a regular advisor at an early date. The resultant continuity of academic advice is likely to be particularly advantageous to students who anticipate applying to medical school or graduate school, enrolling in the honors or terminal program, taking courses at Hopkins Marine Station, or attending one of the overseas campuses.

COURSE REQUIREMENTS

Candidates for the degree of Bachelor of Science must complete:

(1) Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology 40</td>
<td>5</td>
</tr>
<tr>
<td>Biology 41</td>
<td>4</td>
</tr>
<tr>
<td>Biology 42</td>
<td>4</td>
</tr>
<tr>
<td>Biology 43</td>
<td>4</td>
</tr>
<tr>
<td>Biology 44XY</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
</tr>
</tbody>
</table>

(2) Elective Courses

<table>
<thead>
<tr>
<th>Electives</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Core and Electives</td>
<td>41</td>
</tr>
</tbody>
</table>

All biology majors are required to take a minimum of two courses from faculty members in the department.

Elective courses may be selected from the offerings in the Department of Biological Sciences and from a list of courses in other departments. This list may be obtained from the Student Affairs Office. In completing the elective course requirement, a biology major must take approved elective courses from at least three faculty members.

Not more than 10 units from a single faculty member or in a single specialized field from "in-depth" courses, such as 175H, 178, 199, 199H, may be applied toward the total number (41) of required biology units.

(3) Cognate Courses

Required courses in cognate fields include:

(a) Introductory, organic, and physical chemistry, with laboratory
(b) A half year (two quarters) of General Physics
(c) Mathematics through Calculus
(d) One additional course in Mathematics, Statistics, or Computer Science

It is expected that many students will meet a portion of these requirements by advanced placement on the basis of their high school education. The following Stanford courses fulfill these requirements:
(a) Chemistry 31, 33, 35, 36, 131, 130 or 132, 135
(b) Mathematics 19, 20, 21, or 41, 42
(c) Physics 21, 22, 23 24 or 51, 53, 55
(d) Mathematics 44 or beyond; or
   Biology 141, Psychology 60, or Statistics 60 or beyond; or
   Computer Science 105 or 106

Physics 29 is not required by this department because it overlaps required courses in chemistry. Students should be aware, however, that many graduate schools and professional schools (e.g., Medicine and Education) have a requirement for a "year of general physics with laboratory." Biology majors are therefore advised to take the yearlong Physics sequence Physics 21, 22, 23, 24, 25, 26, (or Physics 51, 53, 54, 55, 56, 57, 58). It is recommended that students intending to do graduate work in Biological Sciences acquire reading ability in an appropriate modern foreign language.

In addition to the mathematics requirement, it is recommended that students take at least one additional course in statistics and probability.

### TYPICAL SCHEDULE FOR A FOUR-YEAR MINIMUM PROGRAM

#### FIRST YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 31, 33, 35, 36</td>
<td></td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Math 19, 20, 21, Calculus and Analytic Geometry</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Writing &amp; Distribution Requirements or Electives</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>15</td>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>

#### SECOND YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology 40, Principles of Biology</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Biology 41, Principles of Biology</td>
<td>—</td>
<td>4</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Biology 42 and 43, Principles of Biology</td>
<td>—</td>
<td>—</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Biology 44, Core Experimental Laboratory</td>
<td>—</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Chem. 131, 130 or 132, 135, Organic &amp; Physical Chemistry</td>
<td>8</td>
<td>3</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Writing &amp; Distribution Requirements or Electives</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>16</td>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>

#### THIRD YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 21, 22, 23, 24 Introductory Physics</td>
<td>4</td>
<td>4</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Distribution Requirements or Electives</td>
<td>11</td>
<td>11</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

#### FOURTH YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
<td></td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

### HONORS PROGRAM IN BIOLOGICAL SCIENCES

An Honors Program in Biological Sciences is open to a limited number of qualified undergraduate majors. The aim of the program is to aid students to gain independence of thought and a more professional approach to biological problems. Emphasis will be placed on the importance of original ideas in research rather than on the mastery of established facts. Satisfactory completion of the honors program as well as completion of all requirements for the B.S. in Biological Sciences, with a minimum letter grade equivalent of 3.0 in biology core, electives, and cognate courses, leads to graduation with "Departmental Honors." This designation appears on the student's transcript and in the Commencement Program. An Honors notation is made on the student's diploma. (See Biology 199 under "Courses.")

### PREMEDICAL, PREDENTAL, AND PREPARAMEDICAL REQUIREMENTS

It is recommended that premedical, pre-dental, and preparamedical students who are not biology majors take at least the following courses in biology: 40, 41, 42, 43, 44XY, 110, 110L and (for those students applying to medical schools which explicitly require a course in embryology or developmental biology) 107 or 108, and such additions or substitutes as may be recommended by Stanford's Premedical Advising Office (Academic Information Center, Old Union).

### TRANSFER STUDENTS

Transfer students should be aware that the curricula in biology and chemistry differ in important respects from those at many other institutions. For example, a yearlong course in general biology may be equivalent to only a portion or more of the core curriculum in biology. Only rarely does a transfer student have the equivalent of Biology 44XY. With respect to chemistry, after a year's course in general chemistry at most institutions, a student is required to complete Chemistry 33, 35, 131, 130 or 132, and 135 at Stanford. After a year's course in organic chemistry, Chemistry 130 or 132, and 135 are required. Transfer units are not lost, but are applied to requirements other than core curriculum and cognate course requirements. All transfer courses intended to fulfill major requirements must be evaluated on Course Equivalence Forms (available from the Student Affairs Office.)
GRADUATE PROGRAMS

MASTER OF ARTS
IN TEACHING

The degree of Master of Arts in Teaching is offered jointly by this department and the School of Education. The degree is intended for candidates who have a teaching credential and who wish further to strengthen their academic preparation. The program consists of a minimum of 25 units in the teaching field and 12 units in the School of Education. Detailed requirements for the course are outlined in the School of Education section or may be obtained from the Credential Administrator, School of Education.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the School of Education section of this bulletin or address inquiry to the Credential Administrator, School of Education.

MASTER OF SCIENCE

The Department of Biological Sciences at Stanford University offers a program leading to the master's degree. The program is designed for those students whose professional goals will be served by advanced study in biology in a research oriented department. Requirements for the degree include one year (three academic quarters) of registration, during which 45 units of credit are earned. At least 33 units must be completed in a combination of biology and cognate courses, of which at least 24 must be in biological sciences or authorized biology equivalent courses. Students must take 9 of these 24 units in biology courses rather than out-of-department equivalents. No financial support derived from Stanford University funds is available for either tuition or living expenses associated with the master's program. Appropriate application materials for the program can be obtained from the Graduate Admissions Office. The deadline for receipt of applications with all supporting materials is June 1. A more detailed description of the master's degree program may be obtained from the Student Affairs Office of the department.

DOCTOR OF PHILOSOPHY

Preparation for Graduate Study—Students seeking entrance to graduate study in biology ordinarily will have the equivalent of an undergraduate major in biology at Stanford (See above). However, students from other disciplines, particularly the physical sciences, are encouraged to apply for graduate work in the Biological Sciences. Such students will be advised at the time of initial registration as to how they should complete their background training during the first year of graduate study. In addition to the usual basic undergraduate courses in biology, it is recommended that preparation for graduate work include courses in chemistry through organic chemistry, general physics and mathematics through calculus. Reading knowledge of a foreign language is recommended.

Application, Admission, and Financial Aid—Prospective graduate students should apply formally through the Graduate Admissions Office, which will submit their names to the department for approval when application requirements are completed. The deadline for receipt of applications with all supporting materials is January 15.

An applicant must file a report of scores on the aptitude tests and the advanced biology test of the Graduate Record Examination as part of the application. It is strongly recommended that the GRE be taken in October so that scores will be available when applications are evaluated.

It should be noted that, due to a high level of applications to graduate study, competition for admission has become keen and that in recent years it has been possible to act favorably upon less than ten per cent of applications received. For that reason it seems prudent to advise that only well-qualified students apply for admission. All admitted students are normally offered financial support in the form of Biology Fellowships or Graduate Research Assistantships. Such awards are for one year and are renewable as funds permit, assuming continuing excellent performance. It is current policy not to offer financial support from University-derived funds beyond the fourth year of graduate study. Qualified applicants are urged to take the initiative in applying for predoctoral national fellowships in open competition, especially those from the National Science Foundation, and to consult their Financial Aid Officers for information and applications.

Students who have had their undergraduate training in biology at Stanford are ordinarily encouraged to undertake graduate study elsewhere to ensure breadth of experience. Printed information regarding choice of a graduate school can be obtained from the Biology Bridge Office of the department.

An admitted applicant is required to conform to the requirements of the University as outlined in the "Degrees" section in this bulletin and to the department requirements stated below.

Courses Required of all Ph.D. Candidates—Each student must take at least three units of
work as a graduate under each of four or more Stanford faculty members. Course work to be taken will be determined in consultation with an advising committee. All first year graduate students in the Ph.D. program are required to take 1-3 units of 301 each quarter of the first year with the Biology faculty.

Teaching Experience and Training are part of the graduate curriculum. Each student assists in teaching eight units, usually during the first year in residence. This normally involves two afternoons a week for four quarters and assignments are made in consultation with the students. At least four of the required eight units must be served in the core laboratory courses 44X or 44Y. Graduate students with departmental support are called upon to teach one-fourth time (2 units per year) in each of the 2nd, 3rd, and 4th years. Students on non-University fellowships or grants are not required to carry out this additional teaching.

Graduate Seminars, devoted to the discussion of current literature and research in particular fields of biology, are an important means of attaining professional perspective and competence. These seminars are presented under individual course listings or as announced by the various research groups.

The Biology Seminar meets on most Monday afternoons at 4:15. Topics of current biological interest are presented by speakers from Stanford and from other institutions, and are announced in the weekly Campus Report. Graduate students are expected to attend.

The Advising Committee—At the time of admission, each incoming graduate student is assigned an advising committee consisting of three faculty members. The advising committee meets with each student directly after arrival to plan an integrated first year program, taking into due consideration the student's needs in the area of specialization, and his or her deficiencies both in the specialty and outside. At the end of Spring Quarter of the first year, the advising committee meets with the student to plan academic aspects of the second year, and to select a dissertation committee, and then reports to the departmental faculty on the student's progress. The advising committee continues to function until a dissertation committee (including the prospective major professor) has been chosen. This choice should be completed no later than the beginning of the second year. The prospective major professor should ordinarily be a member of the Department of Biological Sciences (either regular or by courtesy). Choice of a major professor elsewhere in the University requires special permission of the Chairman of the Department and the Director of Graduate Studies.

The Dissertation Committee and the Departmental Oral Examination—No later than the end of the Winter Quarter of the second year, the student, in consultation with the dissertation committee, submits a dissertation proposal describing the area of specialization and a general outline of proposed research. The student then takes an oral examination from the dissertation committee on the proposed dissertation and on the area of specialization. Passing the oral examination automatically leads to departmental certification for admission to candidacy. If the oral examination is not passed, it may be retaken no later than five days before the end of the next Spring Quarter (second year). The dissertation committee will remain active for advice and guidance during the remainder of a student's graduate training, including the period of dissertation preparation and oral defense. Work should be planned so as to complete the entire Ph.D. program within four years.

Language Requirement—A reading knowledge of a modern scientific language (ordinarily French or German) is recommended at the time of entry. If an entering student is deficient, the advising committee and the student should carefully weigh the value of language study vs. other needs, and decide whether further study of a foreign language should be undertaken.

Residency Requirement—A minimum of three years (nine quarters) of full-time graduate registration is required of each candidate. The department normally accepts only full-time students for study leading to the Ph.D. However, it recognizes that because of family and child-bearing responsibilities, military or alternative service obligations, or other personal reasons, students may wish at various times to interrupt their graduate education or to pursue their studies on a half-time basis. The department is willing to undertake such arrangements, which can include partial stipends if the student is being supported from departmental funds.

Dissertation—A contribution to knowledge which is the result of independent work, expressed in satisfactory form. Abstracts of Ph.D. theses are published in Dissertation Abstracts.

The Oral Examination—This consists of a formal seminar open to the public, followed by a closed session of questioning. This examination is taken after the dissertation is completed in draft form and approved by all members of the Reading Committee.

COURSES

Additional courses not listed here are frequently offered in the areas of their special research competence by selected postdoctoral
INTRODUCTORY COURSES

40, 41, 42, 43. Principles of Biology—A comprehensive study of the principles of modern biology. These courses should be taken in sequence, although not necessarily in the same year. Prerequisites for 41, 42, 43: Chemistry 31, 33, 35, 131, Mathematics 19, 20, and 21 or 41 and 42.

40. Evolutionary Biology—Study of basic unifying themes in biology from a modern evolutionary perspective. Major sections of the course will be: an introduction to the chemical basis of living structure and function; the principles and mechanisms of heredity; neo-Darwinian concepts of the operation of natural selection including the origins of life, the genetics of natural populations, and the origins of diverse species; and the nature of ecological interactions at population and community levels. This course begins the core sequence in Biological Sciences, but may also be taken by non-majors interested in a first course in biological concepts. Some previous experience with chemistry will be very helpful, but supplementary material will be provided to assist those without such experience. (DR:7)

5 units, Aut (Watt) TWThF 9
Discussions (Staff)
M 1:15-3:05, M 3:15-5:05, M 7:30-9:20
p.m., T 1:15-3:05, T 3:15-5:05,
W 1:15-3:05, W 3:15-5:05, W 7:30-9:20
p.m., Th 1:15-3:05, Th 3:15-5:05

41. Biochemistry and Molecular Biology—Intermediate level course dealing with Biochemistry and Molecular Genetics. Topics will include structure of cellular macromolecules, proteins, lipids, carbohydrates, nucleic acids, structure and function of enzymes, enzyme kinetics, energy metabolism, photosynthesis, intermediary metabolism and regulation of metabolism, hormonal control of enzyme activity, genome structure, procaryotic genetics, gene transfer mechanisms, genome replication, DNA repair, genetic fine structure, mutagenesis, protein synthesis, genetic code, regulation of gene expression, recombinant DNA techniques, regulation of gene expression in eucaryotes. (DR:7)

4 units, Win (Simoni, Yanofsky, Long)
MTWTh lecture, F discussion 10

42. Cell and Developmental Biology—Intermediate level course covering the cellular, developmental, and molecular biology of eukaryotes. Topics will include the structure and function of organelles, chromosome structure and replication, the cell cycle, regulation of eukaryotic gene expression, and basic concepts in determination, differentiation, and morphogenesis. (DR:7)

4 units, Spr (Goodman, Jones, Schimke)
MTWTh lecture, F discussion 11

43. Organismal Biology—Intermediate level survey of the structure and function of organs and organ systems of plants and animals. Examination of the physico-chemical principles underlying the exchanges of mass and energy between organisms and their environments. Then the organ and organ system adaptations which have evolved in response of these principles will be discussed. A major theme will be the mechanisms by which the functions of each system are controlled and regulated. (DR:7)

2 units, Spr (Heller, Ray) MTWTh lecture, F discussion 9

44. Core Experimental Laboratory—The intent of these laboratory exercises is to familiarize the students with an experimental approach to biology and to provide a working familiarity with some of the organisms, phenomena, techniques, and equipment described in various lecture courses in biology. The laboratory continues through two quarters and consists of 18 laboratory weeks, including a discussion section each week. The course is designed to be taken concurrently with or subsequent to Biology 40, 41, 42, 43. Biology 44X and 44Y are required for a major in Biology. Prerequisites: Chemistry 31, 33, 35, 36. Grading is mandatory Pass/No Credit.

44X. 3 units, Win (Day, Redfield, Green)
Labs TWTh 1:15-5:05
TWTh 2:15, 4:15, 7 pm, F 2:15

44Y. 3 units, Spr (Day Redfield, Green)
Discussions (Staff)
Labs TWTh 1:15-5:05
TWTh 2:15, 4:15, 7 pm, F 2:15

45. Research Biology—This course is designed to allow students who have taken Biology 44X and 44Y to pursue specific experiments in greater detail. This is also designed as a possible entry into an honors project.

3-5 units, Aut (Woodward)
discussion Th 2-4 or by arrangement
given 1984-85

51. Scientific Philosophy and Bioethics—The philosophy of science is analyzed from various perspectives (e.g., philosophy, science, politics, society). These perspectives are treated from historical as well as contemporary considerations. Much of the emphasis leans toward analyses of bioethical controversies and how these relate to the philosophy and practice of science today. (DR:3)

3 units, Aut (Woodward) MWF 1:15
given 1984-85
UPPER DIVISION COURSES

Prerequisites: The upper-division course descriptions refer to prerequisite courses from the core sequence by their new numbers. For students who took the core courses prior to 1980-81, the following equivalencies pertain: 40 is equivalent to former 1 and 23; 41 is equivalent to the former 21; 42 is a new course; 43 is equivalent to the former 22; and 44 XY is the equivalent of the former 24 YZ.

100H. Marine Algae—See Hopkins Marine Station.

101. Biology for Humanists—A course intended for majors in the humanities and social sciences. Topics to include a history of contemporary ideas in biology, the analysis of scientific writing, some epistemological and moral issues associated with biological research, and a study of economic and political forces affecting the direction of biological research. The coverage of the history of ideas in biology will present sufficient contemporary scientific material so that the course can be counted towards the distribution requirement in science for non-science majors. The objective of the course is to present the pursuit of biological research as a human activity. (DR:7) 3 units, Aut (Staff) TTh 11

102. Biology of Marine Communities—Treats a set of marine communities by considering (1) physical environment, (2) resident species, (3) their biology and interactions, (4) population and community structure and dynamics, (5) selected topics related to these communities. Primary focus on local coastal communities; provides a background in the natural history of marine systems as well as the issues confronted by marine research. Prerequisites: Biology 40 or its equivalent. 3 units, Win (Baxter) MT 3:15-4:30 alternate years, given 1984-85

105H. Subtidal Communities—See Hopkins Marine Station.

107. Cell Development and Morphogenesis—A study of those theories which account for the progression of the cell through its cycle and for the progression of the embryo through its development. The still unsolved problems of the origin of form and pattern are addressed from a biophysical perspective. Prerequisites: 41 and 42, or equivalent. An interest in college physics and/or mathematics is helpful. 3 units, Spr (Green) MWF 10

108. Organismal Development—A study of those processes responsible for development of multicellular organisms. Morphogenesis, cytodifferentiation, growth control, and regulatory phenomena will be discussed. Prerequisite: Biology core, or Human Biology core. 3 units, Spr (Wessells) MWF 9

110. Vertebrate Biology—Structure, function, behavior, and evolution of vertebrates. Prerequisites: Biology core, or Human Biology core. 3 units, Aut (Wessells) MWF 9

110H. Vertebrate Biology Laboratory—Honors section designed for students seriously interested in morphology-physiology. Pass/No Credit only. Prerequisite: Consent of instructor. 3 units, Aut (Porzig, Wessells) TTh 1:15-4:05.

110L. Vertebrate Biology Laboratory—Dissection of selected vertebrates. Pass/No Credit only. Prerequisites: same as for 110. 3 units, Aut (Porzig, Wessells) labs. T/Th 1:15-5:05; W 7-11 p.m.

111H. Marine Invertebrates—See Hopkins Marine Station.

112H. Marine Invertebrates—See Hopkins Marine Station.

113H. Introduction to Oceanic Biology—See Hopkins Marine Station.

118H. Experimental Studies in Neurobiology and Behavior—See Hopkins Marine Station.

120. General Botany—The diversity of plant groups is considered, plus a brief introduction to the structure, development, physiology, and ecology of higher plants. Prerequisite: 40. 5 units, Aut (Fultz, Holm, Long, Mooney, Ray, and Thomas) MWF 11, lab T or W 2:15-5:05 discussion Th or F 2:15-3:05

124. Plant Adaptation—The physiological ecology of plants of diverse environments. Prerequisites: 40 and 43, or consent of instructor. 4 units, Win (Mooney) TTh 11; field trips by arrangement, alternate years, given 1984-85

125. Ecosystems of California—Principles of ecosystem function with emphasis on vegetation components and on California systems. Prerequisite: 40, or Human Biology 4A. 4 units, Win (Mooney) TTh 11; field trips by arrangement, alternate years, given 1983-84

127. Plants and the Fossil Record—A survey of plant life through the ages with emphasis on the emergence and evolution of major groups of vascular plants and the development of major floristic provinces. 3 units, Win (Page) TTh 2:15-4:05

128. Systematics and Ecology of Vascular Plants—Lectures, laboratory, field studies. Prerequisite: consent of instructor. (DR:7)
4 or 5 units, Spr (Thomas) WF 1:15
lab WF 2:15-5:05
field trips by arrangement

130A. Algae/130B. Fungi—An introduction to these groups, their ecological significance and utilization in studying cell and developmental biological problems. Lectures, laboratories, and field trips. Prerequisite: 40 or equivalent.
4 units, A & B given alternate years
130A. Spr (Fultz) MWF 10,
lab T 1:15-4:05 given 1984-85
130B. Win (Fultz) MWF 10,
lab M 1:15-4:05 given 1983-84

131. Mosses and Ferns—Structure, development, evolutionary relationships of mosses and ferns. Lectures, laboratories, and field trips. Prerequisite: 40, 43, or consent of instructor.
5 units, Aut (Thomas) WF 2:15-5:05,
alternate years, given 1984-85

132. Seed Plants—Structure, development, evolutionary relationships of seed plants. Lectures, laboratories, and field trips. Prerequisites: 40, 43, or consent of instructor.
5 units, Spr (Holm) TTh 1:15-2:05,
lab TTh 2:15-5:05
alternate years, given 1984-85

133. Plants and Civilization—Discussion of the economic uses of plants and plant substances. Food, fiber, medicinal, and structural uses will be considered from a biological and ecological point of view. Lectures and demonstrations. Prerequisites: Biology or Human Biology core, or consent of instructor.
4 units, Win (Holm, Thomas)

134. Seminar on Replication of Nucleic Acids—Modes of replication and their control in prokaryotic and eukaryotic systems. Critical review of current literature. Prerequisite: 41 and/or consent of instructor.
3 units, Aut (Hanawalt) TTh 4:15-5:30,
alternate years, given 1984-85

135. Seminar on Developmental Genetics—Genetic expression and its developmental basis, especially in such representative organisms as Drosophila, mice, and men. Prerequisites: 40, 42 or consent of instructor.
3 units, Spr (Center) Th 7-9
alternate years, given 1984-85

136. Biological Clocks—Comparative physiology of innate circadian, circa-tidal, circa-lunar and circa-annual rhythmicity in organisms (unicellulars, plants, and animals). Oscillatory pacemakers that drive these rhythms function as "clocks" which the organism uses (1) to measure environmental time, and (2) to organize an internal temporal order in its physiological processes. Circadian system in Drosophila is analyzed in detail as a model that clarifies a wide range of phenomena in other organisms including man. Specific attention to (1) the role of circadian clocks in animal navigation and the time-measurement in photoperiodic phenomena, (2) recent progress in the localization of circadian pacemakers in the nervous system, and (3) current knowledge of the genetics and molecular basis of the pacemaker.
3 units, Win (Pittendrigh) MT 3-4

137. Maize Genetics—Discussion of modern techniques in maize genetics and of phenomena such as controlling elements, paramutation and cytoplasmic inheritance. Practical experience in setting up a field experiment, planting seed, tagging plants, and plant maintenance. Field projects may be continued over the summer as 199 or 300. Prerequisites: 166 or 167, or consent of instructor.
2-3 units, Spr (Walbot) by arrangement

137H. Biomechanics—See Hopkins Marine Station.

140. Highlights in Photobiology—Basic principles of the action of light upon biological systems. Lectures and student reports on special topics including: photosynthesis, photoperiodism, phototropism, vision, photoinactivation and recovery. Prerequisites: 40, 41, 42, 43.
3 units, Win (Briggs and Hanawalt) TTh 11,
alternate years, given 1984-85

141. Biostatistics—An introduction to the statistical analysis of biological data. Lectures, discussion and student exercises.
3 units, Aut (Feldman) MWF 3:15-4:05

142. Computational and Mathematical Models of Biological Systems—Mathematical frameworks and computer techniques for constructing dynamic models of biological systems. Deterministic and stochastic models; continuous-time and event-centered simulation techniques; matrix applications; parameter estimation, sensitivity calculations, and validation of models. Examples from population dynamics, enzyme kinetics, physiological regulatory systems, neural systems, and other areas of biology. Individual term projects drawn from student's field of special interest. Prerequisites: Biology core, calculus, probability or statistics, basics of computer programming, and consent of instructor.
3 units, Win (Perkel) by arrangement

151. Plant-Microbe Interactions—A study emphasizing genetics and biochemistry of important microbial interactions with plants. In-
includes the basics of plant pathology, proceeding to a detailed treatment of several important fungal and bacterial and viral pathogens. Critically examines unifying theories such as the gene-for-gene hypothesis and discusses experimental methods being used in molecular studies of pathogenicity and resistance. The Agrobacterium-Rhizobium group of pathogens and symbionts are studied in detail, especially the role of plasmids in controlling the association and the use of genetics and molecular techniques to analyze plant-bacterial interactions.

1-3 units, Spr (Long) by arrangement

153. Introductory Neurobiology—(Same as Psychology 107.) A survey of neural mechanisms and interactions underlying behavior. Prerequisites: 42 and 43, or Psychology 1, or consent of instructor.

4 units, Aut (Wine) TTh 1:15-2:30

154. Cellular and Molecular Neurobiology—A study of the function of the nervous system at the cellular and molecular level. Discussion of membrane biophysics, synaptic transmission, biochemistry and molecular genetics of neuronal function, and their relationship to behavior and learning. Prerequisites: 42 and 150 (Same as Psychology 107), or consent of instructor.

3 units, Win (Scheller, Goodman) MWF 10

155. Developmental Neurobiology—(Formerly 109.) A study of the development of the nervous system at the cellular and molecular level. Discussion of axon guidance and cell migration, neuronal determination and lineage, and synaptogenesis and selective pruning. Prerequisites: 42 and 150 (Same as Psychology 107), or consent of instructor.

4 units, Win (Goodman, Scheller) MWF 10

156. Plant Physiology—Principal functions of green plants, including photosynthesis, gas exchange, water and nutrient transport, mineral metabolism, growth, and environmental responses. Prerequisites: 41, 42, 43, or equivalent, and introductory organic chemistry or biochemistry.

4 units, Win (Ray) MWF 10

160H. Problems in Subtidal Ecology—See Hopkins Marine Station.

161. Topics in Evolutionary Biology—Current methods of approach to such evolutionary subjects as tempo and mode, origin of major categories, cytogentetics, hybridization, Polyploidy, and apomixis. Lectures, discussion, and library research. Prerequisites: 40, 42, 43.

3 units, Spr (Holm) by arrangement alternate years, given 1984-85

162. Biogeography—Survey of major principles of ecological and historical geography of plants and animals. Prerequisite: 40.

3 units, Aut (Holm) TTh 11

164. Animal Behavior: Neurobiological Aspects—Ethological viewpoints of behavior will be presented, with an emphasis on recent advances in understanding their physiological substrates. Prerequisites: 43 or Psychology 107, or consent of instructor.

4 units, Win (Wine) TTh 1:15-2:30 alternate years, given 1983-84


3 units, Aut (Heller) MWF 8, alternate years, given 1983-84

165H. Experimental Neurobiology — See Hopkins Marine Station.

166. Genetics (Eukaryotes)—The principles of genetics as developed in and applied to studies of eukaryotic organisms. Emphasis will be placed on the transmission of genetic factors. Prerequisite: 40 or consent of instructor.

3 units, Win (Regnery) MWF 11

167. Genetics (Prokaryotes)—Continuation of 166 with emphasis on prokaryotes. Basic genetic principles applied to bacteria and viruses. Methods of genetic mapping; correlation of genetic and physical structure; mechanism of recombination. Prerequisite: 166.

3 units, Spr (Campbell) MWF 11

168. Vegetation and Fire—An examination of the past and present role of fire in the evolution and maintenance of vegetation types, with particular reference to the diverse California flora. Prerequisite: consent of instructor.

3 units, Aut (Thomas) Th 2:15-4:05; field trips by arrangement, alternate years, given 1984-85

170. Microscopy for Biologists—A broad survey of the methods which use light and other radiation (electrons, X-rays) for the analysis of cells in biological and medical research. Topics range from cell sorters and holography through polarized light and electron microscopy. The lectures cover the physical principles (presented primarily at the graphical level of high school physics). The laboratory involves partial construction and extensive use of pertinent instruments. Campus laboratories, developing ad-
175H. Problems in Marine Biology—See Hopkins Marine Station.

177. Animal Locomotion—Introduction to the mechanisms and energetics of animal locomotion. Subjects include: ciliary flagellar locomotion, terrestrial locomotion (crawling, walking, running), swimming in fish and cephalopods, flight in insects and birds and the cost of locomotion. Basic principles of the fluid and solid mechanisms relevant to the study of locomotion are presented. Intended for graduate students and upper level undergraduates with a solid background in zoology. A knowledge of vertebrate and invertebrate anatomy, calculus, and introductory physics helpful, but not required.

3 units, Win (Denny) MT
alternate years, given 1983-84

178. Biology of Natural Populations—Introduction to independent study of natural populations. Jasper Ridge serves as an outdoor laboratory for course. Prerequisite: consent of instructor.

10 units, Spr (Mooney) by arrangement,
alternate years, given 1984-85

182. Empirical Population Genetics—The results of experimental field and human population genetics studies will be discussed. Relationship to theory introduced.

3 units, Aut (Feldman) MWF 1:15,
alternate years, given 1984-85

184. Biology of Insects—An introduction to the functional biology of insects. Insect anatomy, biochemistry, behavior, ecology, physiology and systematics will be considered, as well as more specialized topics intended to illustrate or emphasize unusual features of insects which make them attractive as objects of research. Lab sometimes meets for the full time as a lab or field exercise, and at other times only for the first hour as a lecture-discussion. Prerequisites: 40, 41, 42, 43, or consent of instructor.

3-5 units, Spr (Watt) MWF 11
lab T 1:15-5:05,
alternate years, given 1984-85

185. Coevolution—Evolutionary interactions among different kinds of organisms—plants and herbivores, models and mimics, predators and prey, parasites and hosts, etc. Emphasis will be on the importance of these interactions in understanding problems of community structure and human ecology. Lectures, discussion and library research. Prerequisites: 40 or Human Biology 3A and consent of instructor.

3 units, Spr (Ehrlich) M 2:15-4:05,
alternate years, given 1984-85

186. Advanced Topics in Geographical Ecology—Will deal in depth with the biogeography and ecology of specific regions or special habitats. The subject matter will vary from year to year and the course may be repeated for credit. Prerequisite: 40 or Human Biology 3A.

3 units, Spr (Ehrlich, Holm) M 2:15-4:05,
alternate years, given 1983-84

186H. Experimental Intertidal Ecology—See Hopkins Marine Station.

187. Topics in Epizootiology—Lectures, discussions, and readings on the effects of particular diseases on infra-human animal populations. Prerequisite: 40 or consent of instructor.

3 units, Spr (Regnery) TTh 10

190. Population Biology of Butterflies—Lectures will focus on field studies of the dynamics and genetics of butterfly populations, life histories, and resource utilization. Also covered will be the evolution and taxonomy of this group of insects which has become a key research tool in population biology. Lab will include field work on *Euphydryas* populations now under study, both on campus and elsewhere in California. Prerequisites: 40 and consent of instructor.

3-5 units, Spr (Ehrlich) W 2:15-4:05
plus lab by arrangement

195. Applied Ecology—Independent studies at the Jasper Ridge Biological Preserve. Directed research on the application of ecological principles to the management of natural systems. Prerequisite: consent of instructor.

1-3 units, Aut, Win, Spr (Ehrlich, Feldman, Holm, Mooney, Roughgarden, Thomas) by arrangement

199. Special Problems—Individual study on research or directed reading undertaken by arrangement with biology department instructor. Successful completion of a minimum of 10 units of “Special Problems” shall be applied towards graduation with Departmental Honors. Entry into the Honors Program requires submission of a petition to the Committee on Undergraduate Studies. Forms are available in the departmental Student Affairs Office. Units taken in another numbered research course in biology may be counted toward this minimum by arrangement between the student and the course instructor and with approval of the Committee on Undergraduate Studies upon written recommendation by the instructor to the Committee on a form provided. An essay based on the research in each course taken for Honors must be presented to and accepted by both the research director and the department. The essay, to be submitted in duplicate, will be deposited in the departmental Library and in
GRADUATE COURSES

205. DNA Repair and Mutagenesis—Interactions of mutagens and carcinogens with DNA. Response of living systems to damaged genetic material, including molecular mechanisms for DNA repair. Enzymology of DNA modification and repair. Inducible repair responses and "error-prone" mechanisms. Human hereditary deficiencies in DNA repair. Relationships of DNA repair and mutagenesis to carcinogenesis. Prerequisite: 41 and/or consent of instructor.
3 units, Spr (Hanawalt, Friedberg, K.C. Smith) TTh 1:15, alternate years, given 1983-84

211. Advanced Topics in Membrane Biochemistry—Structure, function, and biosynthesis of cellular membranes and organelles. The course will be based on the current literature and will require extensive student participation. Prerequisites: Biochemistry 200-201 or equivalent experience in biochemistry and molecular biology, as well as consent of instructors.
4 units, Aut (Rothman, Simoni) TTh 10-12 alternate years, given 1983-84

213. Viruses—Principles of virus growth, genetics, architecture and assembly. Relation of temperate viruses and other epimembic to the host cell. Prerequisite: 41.
3 units, Win (Campbell) MWF 9

215. Biochemical Evolution—Lectures and discussion periods covering biochemical viewpoints on diverse aspects of the evolutionary process. Topics will include, but not be limited to: prebiotic biochemistry and the origins of life; adaptive organization of metabolism; enzyme polymorphisms and other biochemical aspects of population genetics; "macromolecular phylogeny" and "protein clocks." Prerequisites: 40, 41, 42, 43, or substantial equivalents.
3 units, Spr (Watt) MWF 9, alternate years, given 1983-84

222. Cellular Electrobiology: Control of Function by Membrane Voltage—(Same as Neurobiology 222.) Designed to provide an in-depth exposure to contemporary ideas in cellular electrophysiology. Involves lectures, student presentation of research papers and laboratory work. Voltage-control of function in nerve and muscle cells covered in considerable detail, with emphasis on gating currents and single-channel currents. Use of membrane voltage by other cell types and processes also surveyed. Final three-four weeks of the course devoted to laboratory work on one or two marine invertebrate preparations in which electricity plays an "unconventional," perhaps little understood, but biologically important role. Prerequisite: 118H, 153, Neurobiology 200 or equivalent.
5 units, Win (Gilly) by arrangement

228. Advanced Plant Systematics—A study of selected families of flowering plants with particular attention to phylogenetic relationships. Prerequisite: consent of instructor.
4 units, Aut, Win, Spr (Thomas, Holm) by arrangement

230. Topics in Immunology—A lecture and student discussion course for graduate and advanced undergraduate students. Introduction to the basic elements of the immune system: structure and functions of antibody molecules; cellular basis for immunity and its regulation; genetics of immune responsiveness; molecular biology of antibody genes. Prerequisites: 41, 42, and Biochemistry 200 (can be taken concurrently) or consent of instructor.
3 units, Aut (Jones) MWF 10 given 1984-85

242. Developmental Genetics—Role of genes during organismal development. Past topics have included controlling elements, control of plant shape, and the genetics of pigment disposition.
1-3 units, Spr (Walbot) M 2:15 alternate years, given 1984-85

248. Regulatory Biochemistry in Higher Eukaryotes—A lecture and student discussion course on various aspects of the regulation of protein synthesis and degradation in higher organisms, with special emphasis on molecular mechanisms involved in developmental processes and actions of hormones. Prerequisites: 252 desirable but not necessary; Biochemistry 201 and 202.
4 units, Win (Schimke) TTh 11 plus 1 hour by arrangement alternate years, given 1984-85

250. Molecular Biophysics—Physical biochemistry and physical approaches to biological problems at the molecular level. Lectures include discussion of macromolecular structure and intermolecular interactions, physical methods for characterizing proteins and nucleic acids, the interaction of electromagnetic radiation with biological molecules, isotopic tracer techniques, and classical physics of cellular
processes. Open to qualified advanced students upon consent of instructor.

4 units, Aut (Hanawalt, Jardetzky, Staff)  
TTh 10 and Th 1:15-3:05  
alternate years, given 1983-84

252. Gene Action—Lectures and student seminars on various aspects of gene structure and function and regulation of gene expression in prokaryotes. Prerequisite: Biochemistry 201 and consent of instructor.  
3 units, Spr (Yanofsky) TTh 9-10:30  
alternate years, given 1984-85

263. Regulatory Physiology—Lectures, student presentations, and discussion on organism systems' physiology. The course will be based largely on recent research literature and will stress mechanisms of control and regulation. The specific topics covered will change from year to year. Prerequisite: 43, or an equivalent course in animal physiology.  
3 units, Win (Heller) TTh 11

283. Theoretical Population Genetics—A detailed survey of models in population genetics to include aspects of selection, random drift, gene linkage, migration, and inbreeding. The influence of these on evolution of gene frequencies and chromosome structure is analyzed and some data evaluated. Prerequisite: consent of instructor.  
3 units, Aut (Fieldman) MWF 3:15,  
alternate years, given 1983-84

3 units, Aut (Roughgarden) TTh 11  
alternate years, given 1983-84

286H. Theoretical Ecology—See Hopkins Marine Station.

300. Research.  
(Staff) by arrangement

300H. Research—See Hopkins Marine Station.

300X. Research—(Same as 300.) To be used for out-of-department instructors.

301. Current Topics in Biology—Lectures in the areas of current research interests of the faculty. Enrollment is limited to Biology Ph.D. students in their first year of graduate study.  
1-3 units, Aut, Win, Spr (Staff)  
by arrangement

302. Seminar in Plant Ecology — Discussions of current research in plant ecology. Prerequisite: consent of instructor.  
1 to 3 units, Aut, Win, Spr (Mooney)  
by arrangement

307. Seminar in Neurobiology—Literature and research review of selected topics in cellular, molecular, and developmental neurobiology. Prerequisite: consent of instructor.  
1-3 units, Aut, Win, Spr (Goodman, Scheller, Wine) by arrangement

315. Seminar in Biochemical Evolution—Literature review and discussion of current topics in biochemical evolution and molecular evolutionary genetics. Prerequisite: consent of instructor.  
1-3 units, Aut, Win, Spr (Watt)  
by arrangement

335. Seminar in Immunobiology and Immunogenetics—Literature review of current topics in immunology. Prerequisite: consent of instructor.  
1-3 units, Aut, Win, Spr (Jones)  
by arrangement

339. Biochemistry of Plant Structure and Function—Selected topics in plant biochemistry, including structure and synthesis of the cell wall, pathways for assimilation of nutrients, secondary metabolism, mechanism of photosynthesis, and biosynthesis of hormones and pigments. Prerequisite: consent of instructor.  
1-3 units, Win (Long, Walbot, Ray, Grossman, Fultz)  
alternate years, given 1984-85

341. Plant Developmental Genetics—Discussion of the use of plant mutants to understand physiological and developmental processes. Topics include: mutants of hormone action and synthesis, controlling elements of maize and other plants, mutators, temperature sensitive alleles, control of greening and pigment biosynthesis, and control of plant growth and form. Prerequisite: consent of instructor.  
1-3 units, Spr (Walbot, Ray, Long, Grossman, Thompson) by arrangement  
alternate years, given 1984-85

342. Plant Molecular Biology: Nuclear Genomes and Pathogens—Discussion of current research in plant molecular biology relating to nuclear genes (excepting those involved in organelle function) and to pathogens. Topics include: viroids, RNA and DNA viruses, Agrobacterium and Rhizobium infections, seed storage protein genes, heat and anaerobic shock genes, chromatin structure, genome organization, and transposable elements.  
1-3 units, Aut (Long, Thompson, Walbot, Ray) alternate years, given 1984-85
343. Molecular Biology or Plant Organelles—Discussion of major research topics in the area of plant organelle molecular biology. Subjects will include: organelle genome organization; organelle gene expression in development, in particular the response of chloroplast genes to light; nuclear genes and gene products relating to organelle function; transport of molecules across organelle membranes.

1-3 units, Aut (Walbot, Grossman, Thompson, Long)
alternate years, given 1983-84

344. Environmental Control of Photosynthesis—Examines control of photosynthetic process by factors of the physical environment. Lectures, discussions, seminars, and directed readings. Emphasis on mechanistic basis for physiological responses, and where possible on developing quantitative models relating whole leaf responses to biochemical and biophysical properties that can be measured independently. The responses and adaptations of plants to specific environmental constraints (e.g. extremes of temperature, light intensity, drought, salinity or pollutants), and the question of optimizing plant functions (e.g. stomatal control, protein allocation or other physiological functions) to particular environmental constraints are considered. Course intended primarily for graduate students in physiological plant ecology and plant physiology.

1 unit (Berry)
alternate years, given 1984-85

345. Seminar in Genetics and Molecular Biology—Enrollment limited to graduate students directly associated with departmental research groups in genetics or molecular biology.

1 unit, Aut, Win, Spr (Campbell, Hanawalt, Long, Perkins, Simoni, Walbot, Woodward, Yanofsky) by arrangement

346. Seminar in Regulatory Biology—Literature review of elected topics in eukaryote regulatory biology. Prerequisite: consent of instructor.

1 to 3 units, Aut, Win, Spr (Schimke) T 12-1

349. Seminar in Population Ecology of Insects—Prerequisite: consent of instructor.

1-3 units, Aut, Win, Spr (Ehrlich, Holm) by arrangement

350. Seminar in Biophysics.

1 unit, Aut, Win, Spr (Staff) by arrangement

352. Seminar in Developmental Biology—Literature and research review of selected topics in development. Prerequisite: consent of instructor.

1 to 3 units, Aut, Win, Spr (Green, Wessells) by arrangement

354. Seminar in Population Biology — Prerequisite: consent of instructor.

1 to 3 units, Aut, Win, Spr (Ehrlich, Feldman, Holm, Mooney, Roughgarden, Thomas, Watt) by arrangement

383. Seminar in Population Genetics—Literature review and research discussion of current problems in the theory and practice of population genetics. Student participation required. Prerequisite: consent of instructor.

1 to 3 units, Aut, Win, Spr (Feldman) by arrangement

384. Seminar in Population Ecology—Discussions of recent and classical research papers in ecology, and presentation of work in progress by seminar participants. Prerequisite: consent of instructor.

1 to 3 units, Spr, (Roughgarden) by arrangement

DIVISION OF MARINE BIOLOGY
HOPKINS MARINE STATION


Director: Colin S. Pittendrigh

Professors: David Epel, Daniel Mazia, Colin S. Pittendrigh, Jonathan Roughgarden

Assistant Professors: Mark W. Denny, William F. Gilly, Stuart H. Thompson

Senior Lecturer: Charles H. Baxter

The Hopkins Marine Station is situated at Pacific Grove, on the south side of Monterey Bay, 90 miles from the main University campus at Palo Alto. The ground area comprises about eleven acres, consisting of the main portion of Cabrillo Point, and including a sheltered landing place and storage for small boats. Buildings include the Lawrence Blinks Laboratory, the Alexander Agassiz Laboratory, the Jacques Loeb Laboratory, the Monterey Boat Works, which houses the C. B. vanNiel Library, SCUBA diving facilities and the Walter K. Fisher Laboratory. The 15,000 volume library subscribes to approximately 450 journals, and its collections are particularly good in marine biology, oceanography, microbiology, and embryology.

The Station is open during the entire year and maintains a permanent staff of resident investigators and technical assistants; this staff is increased by visiting faculty members, especially
during the summer. There are facilities for visiting investigators and for elementary and advanced instruction in biology. For further information, see the Hopkins Marine Station Bulletin, or write Hopkins Marine Station, Pacific Grove, CA 93950.

AUTUMN, WINTER, AND SPRING QUARTER COURSES

118H. Experimental Studies in Neurobiology and Behavior—A comparative and general approach to animal behavior and its physiological base. Animal behavior will be examined from simple to complex systems. Behaviors will be studied in field and lab and looked at for their potential as systems, to study interesting questions relating to mechanism of function. A comparative approach to cellular and organismal neurophysiology is emphasized. Examples drawn from several invertebrate phyla and from the vertebrates, emphasize the diversity of adaptive solutions to similar problems. Study of this diversity enables generation of some general rules of neuronal organization and the beginning of an understanding of the relationship between the behavioral competence of an animal and the level of sophistication evident in its nervous system. Course is intended for juniors and seniors with the biology core and some advanced courses as background. Designed to involve students in several small and one major research experience.

15 units, Aut (Thompson, Baxter, Pittendrigh) by arrangement

175H. Problems in Marine Biology—Lectures, laboratory work, field studies, and individual problems. The course is designed primarily to give advanced undergraduates an opportunity to engage in research. Students will spend the entire Spring Quarter in residence at the Marine Station, Pacific Grove. For further description see Hopkins Marine Station Bulletin. Prerequisites: junior or senior standing in biology and permission of instructors.

15 units, Spr (Baxter, Epel, Gilly, Denny) MTWThF 8-5

186H. Experimental Intertidal Ecology—A course intended for advanced undergraduates interested in participating in ecological research. Purpose is to develop and test ecological theory that pertains to the marine rocky intertidal ecosystem. Students and course faculty work together in seminars and in the field in the context of an on-going research program in the rocky intertidal zone at Hopkins. Organisms and habitats of the intertidal zone, reading and discussion of current journal articles, elements of computer programming in Pascal, and basic statistical methods for data analysis. Additional topics will be added each year according to the interests of the participants.

15 units, Win (Baxter, Roughgarden) by arrangement alternate years, given 1983-84

199H. Special Problems—Properly qualified undergraduate students may undertake individual work in the fields indicated under course 300H, listed below. Such studies are intended to give the serious student experience in biological research. Preference is given to Stanford students who have already completed Biology 175 and wish to continue their studies, and to Stanford biology students enrolled in the Co-terminal M.S. Program. Arrangements must be made by consultation or correspondence.

(Staff) by arrangement

300H. Research—Graduate study involving original work may be undertaken with members of the staff in the fields indicated below.


M. Denny: Biomechanics—The mechanical properties of biological materials and their consequences for animal size, shape and performance.

D. Epel: Developmental Biology—Physiology and regulation of early embryonic development.

W. Gilly: Neurophysiology—Control of membrane sodium channels.

D. Mazia: Cell Reproduction—Mitosis, cell division and cell cycles in eggs of marine invertebrates.

C. Pittendrigh: Biological Clocks—The comparative physiology of circadian and other biological clocks.

J. Roughgarden: Theoretical ecology.

S. Thompson: Neurophysiology—Neuronal control of behavior and mechanisms of ion permeation in membranes.

SUMMER QUARTER COURSES

The summer program is open to all advanced undergraduate, graduate, postdoctoral students and teachers whose biological background, teaching or research activities can benefit from a summer's study of marine life. Application blanks may be obtained by writing directly to the Academic Secretary, Hopkins Marine Station, Pacific Grove, CA 93950. Com-
completed applications should be submitted by March 31. Applications received later are considered if space is still available in classes.

The Summer Quarter is divided into two terms of five weeks each. Those courses requiring the lower tides of early summer are scheduled in the first term. It is possible to register for either term, or for the full quarter.

Although some classes meet only on alternate days, the majority meet daily for formal work, and in all classes the laboratories are open all week long and most students spend part of their few "off" days in the laboratory or library. For this reason, registration is possible for only one course during each five week session.

**FIRST TERM**

**100H. Marine Algae**—An introduction to the marine algae of the Pacific Coast with emphasis on morphology and taxonomy; field work will introduce marine algal ecology. Lectures, laboratory, and field studies will concentrate on the conspicuous benthic algae, with some work on major phytoplankton groups. Individual research problems are encouraged. Prerequisite: elementary botany or general biology.

6 units (Staff) MWF

**105H. Subtidal Communities**—Lectures, laboratory, and field trips treating shallow water marine communities. Emphasis will be on local habitats and the course will introduce physical environmental parameters, community composition, aspects of the biology of constituent species and methods for subtidal studies. Prerequisites: SCUBA certification SCUBA equipment, ocean diving experience, and some background in biology.

6 units (Staff) by arrangement

**111H. Marine Invertebrates**—Survey of the lower marine invertebrates, echinoderms, and protochordates. Emphasis is placed on basic body plan, functional anatomy, pattern of development, higher classification, and phylogenetic relationships, rather than on detailed morphology and species identification. Prerequisite: at least two courses in zoology. Preference is given to students registering for both 111H and 112H.

6 units (Baxter) by arrangement

**112H. Marine Invertebrates**—Continuation of 111H, covering the molluscs, annelids, arthropods, and allied lesser phyla. While the two courses form a continuous sequence, either half may be taken separately when space permits. Prerequisites: same as for 111H, preferably also 111H.

6 units (Baxter) by arrangement

**113H. Introduction to Oceanic Biology**—Introduction to the ocean as an environment; to its major categories of inhabitants, producer and consumer, benthic and pelagic, invertebrate and vertebrate; and to the functioning of the oceanic ecosystem. Prerequisite: introductory biology or general zoology.

6 units (Staff) MWF

**127H. Cell Biology of Early Development**—This five-week workshop centers on cellular phenomena seen during early embryonic development, such as properties of sperm and egg, fertilization, mitosis and cell division, early morphogenesis of the embryo and determination and polarity. Gametes of marine organisms will be utilized, emphasizing experimentation and observation of living cells, including their microscopy, micromanipulation and chemistry. The course is at the post-graduate level but advanced undergraduates will be considered.

6 units (Epel, Mazia) by arrangement

**165H. Experimental Neurobiology**—An intensive laboratory and lecture course in cellular and organismal neurophysiology. Lectures emphasize:

(a) cellular processes such as membrane excitability, synaptic transmission, neuronal metabolism, and neuropharmacology.

(b) the organization of sensory, motor, and integrative systems.

In addition, supplemental lectures deal with practical matters concerning modern techniques and data analysis. The laboratory is the center of the course. It offers experience with several marine invertebrate preparations and with a wide range of investigative techniques. This course is offered to advanced undergraduates, graduate students and postdoctoral students. Previous exposure to neurobiology is suggested.

6 units (Thompson) by arrangement

**199H. Special Problems (See above, Autumn, Winter, and Spring Quarters.)**

**300H. Research**—(See above, Autumn, Winter, and Spring Quarters.)

**SECOND TERM**

**112H. Marine Invertebrates**—Continuation of 111H, covering the molluscs, annelids, arthropods, and allied lesser phyla. While the two courses form a continuous sequence, either half may be taken separately when space permits. Prerequisites: same as for 111H, preferably also 111H.

6 units (Baxter) by arrangement

**113H. Introduction to Oceanic Biology**—Introduction to the ocean as an environment; to its major categories of inhabitants, producer and consumer, benthic and pelagic, invertebrate and vertebrate; and to the functioning of the oceanic ecosystem. Prerequisite: introductory biology or general zoology.

6 units (Staff) MWF

**137H. Biomechanics**—Introduction to the mechanical design of organisms. Presents the basic theory of fluid and solid mechanics and explores the applications of theory to understanding the evolved design of materials, structures, and whole organisms. Laboratory work includes familiarization with the various techniques of biomechanics; students are responsible for completing individual research projects. Prerequisites: background in invertebrate zoology or algology helpful, basic physics and calculus helpful but not essential.

6 units (Denny) by arrangement
160H. Problems in Subtidal Ecology—Group and individual studies on problems in autecology and synecology selected from local subtidal communities. Participants will normally be continuing from the first term, 105H Subtidal Communities, but some may substitute equivalent background. The course is intended for students seriously interested in designing and carrying out research studies in the SCUBA zone.

6 units (Staff) by arrangement

199H. Special Problems—(See above, Autumn, Winter and Spring Quarters.)

286H. Theoretical Ecology—Graduate course in theoretical ecology with special reference to models of processes in the marine environment. Beginning topics include techniques for the analysis of the local stability of equilibria, and computer programming in Pascal, with emphasis on the definition of data structures, and in the 8080/Z80 assembly language for microcomputers using the CPM operating system. Biological topics include the analysis of the climate space of an organism, simple optimal foraging strategies, elementary population theory, time-series analysis and fluctuating environments, the transport equation as a model for the dynamics of the “gaps” in continuous cover, dynamics of space-limited recruitment, growth and mortality with application to “fouling” populations, the dynamics of a regional population incorporating pelagic larval dispersal, optimal marine life history strategies, abiotic disturbances and population dynamics, and conditions for coexistence of competing species with pelagic larval dispersal.

6 units (Roughgarden) by arrangement alternate years, given 1984-85

300H. Research—(See above, Autumn, Winter, and Spring Quarters.)

BIOPHYSICS PROGRAM

For information, see listing under Dean of Graduate Studies and Research section of this bulletin.

COMMITTEE ON BLACK PERFORMING ARTS

Director: Sandra L. Richards (Drama)
Committee in Charge: Kennell Jackson (African & Afro-American Studies and History), Halifu Osumare (Dance), John Rickford (Linguistics), James Cadena (Row Housing), Leslie Bennett, Jeanette Pitts, Daniel Coles (Student Representatives)

The Committee on Black Performing Arts is an interdisciplinary program supporting the presence of Black art forms at Stanford. Starting as a student project in 1968, the committee has operated as an official university program since 1970. The committee serves three major functions: (1) liaison with departments in hiring faculty and devising courses in Black performing arts; (2) producer of shows in dance, drama and music; and (3) resource for student organizations promoting artistic expression in the Black community. Through the cooperation of the departments, students are able to take relevant courses in dance, drama, music, and literature. While the offerings do not constitute the base for an academic major, students are able to concentrate studies in Black performing arts as part of the A.B. major in African and Afro-American Studies.

COURSES

Students are advised to consult the Time Schedule each quarter to note changes.

5. Introduction to Black American Drama—(Enroll in Drama 005.) Introductory course tracing the development of Black Drama in the United States; its literature and performing companies from 1955-1969.

4 units, Aut (Richards) alternate years, given 1983-84

29. Theater Performance: Acting—(Enroll in Drama 029) Students who have been cast in committee productions may receive credit for their participation as actors.

1-3 units, Aut, Win, Spr (Richards)

39. Theater Performance: Crew—(Enroll in Drama 039.) Students may receive credit for the participation in the design and technical areas of committee productions.

1-5 units, Aut, Win, Spr (Richards)

59A,B,C. Dance Theater Production—(Enroll in African & Afro-American Studies 059.) Students may receive credit for technical and dance performance in committee productions.

1-5 units, Aut, Win, Spr (Osumare)

73. Afro-American Jazz Dance I—(Enroll in Athletics 073.) Introduction to jazz dance based on techniques from African and Caribbean dance styles. Includes historical information and the Afro-American influence on American jazz dance.

1 unit, Aut, Win, Spr (Osumare)

74. Afro-American Jazz Dance II—(Enroll in Athletics 074.) Intermediate class emphasizing the Afro-American contribution to American jazz dance. Focus on rhythmic vitality, move-
ment isolation and performance techniques. Prerequisite: consent of instructor.
1 unit, Aut, Win, Spr (Osumare)

82A,B,C. Gospel Choir Workshop—(Enroll in African and Afro-American Studies 082A, B, C.) The study and practice of gospel music. Includes regular rehearsals and performances. Credit can be given for organizational service with written reports describing the progress of the quarter. Maximum of 10 units may be applied towards the AAAS Major.
1-3 units, Aut, Win, Spr (Staff)

85. Black English—(Enroll in Linguistics 85.) Survey of the features of the English vernacular spoken by Black Americans, especially in big city settings, and its relation to the creole English dialects spoken on the South Carolina Sea Island ("Gullah"), in the Caribbean, and West Africa. The expressive uses of Black English will also be considered, and its educational implications will be explored.
4 units, Aut (Rickford)

105. Introduction to African & Afro-American Studies—(Enroll in African & Afro-American Studies 105.) Lecture course introducing African and Afro-American Studies as an interdisciplinary field by exploring contrasting and contradictory interpretations of several key, representative aspects of African and Afro-American social and cultural institutions. Topics include retained Africanisms, slavery, the Black family, Afro-American artists, and Afro-American identity.
5 units, Aut (Staff)

150. Contemporary Black Playwrights—(Enroll in Drama 150.) Study of 20th century Black playwrights including Richard Wright, Ntozake Shange, Athol Fugard, Derek Walcott.
4 units, (Richards)
alternate years, given 1984-85

161A. The Afro-American Novel—By reading a range of Afro-American novels, by both men and women, in historical context, examine ways in which Afro-American writers have used and adapted the novel genre to interpret various aspects of the Afro-American experience.
5 units, Aut (Drake)

162F. Modern Literature of the Caribbean—(Enroll in English 162F.) An introduction to modern Caribbean literature, in historical context, with particular attention to recurrent themes addressed by Caribbean-American experience, including colonialism, immigration form African and Asia, and the relationship between literature and such social and cultural expressions as Rastafariansim, Reggae and calypso.
5 units (Drake)

166. Modern Literature in English from Africa—(Enroll in English 166.) Through an examination of modern writing in English form Africa, the course will explore recurrent concerns of African writers, including the colonial and post-colonial experience, situations of cultural and political conflict especially in Southern Africa, and changes in traditional culture.
5 units (Drake)

CHEMISTRY*


Chairman: John I. Brauman


By Courtesy: Michel J. Boudart, Robert J. Madix

Associate Professors: Steven G. Boxer, Michael D. Fayer, Keith O. Hodgson, Wray H. Huestis, Paul A. Wender

Assistant Professors: Nathan S. Lewis, Michael C. Pirrung

ENTRANCE PREPARATION

Students who intend to major in chemistry are expected to offer entrance credit in the preparatory subjects of chemistry, physics, and mathematics (including algebra and plane trigonometry). Those who do not have entrance credit or equivalent training in the foregoing subjects, particularly mathematics, may experience some difficulty in meeting the department requirements for graduation in four years, especially if they expect to pursue a program leading to professional certification by the American Chemical Society or to the B.S. degree with Honors. A year or more of secondary school preparation in German is desirable.

Advanced placement in chemistry courses, based on the College Board Advanced Placement Examination, is not available.

* The curriculum leading to the B.S. degree in Chemical Engineering is described elsewhere in this bulletin.
UNDERGRADUATE PROGRANS

BACHELOR OF SCIENCE

MINIMUM REQUIREMENTS

University writing and distribution requirements: Mathematics 19, 20, 21, 22, 23, or 41, 42, 43; Physics 51, 53, 54, 55, 56, 57, 58; Chemistry 31, 33, 35, 36, 131, 132, 133, 134, 151, 153, 171, 173, 174, 175, 176. In addition, a reading knowledge of scientific German is strongly recommended. Chemistry 133 is offered as staffing permits. In years when it is not offered, students may petition to substitute other courses relevant to their programs in consultation with their faculty advisors. Pre-medical students majoring in chemistry may substitute Physics 21, 22, 23, 24, 25, 26 for Physics 51-58 provided they also complete Biology 40, 41, 42, 43. Students interested in attending overseas campuses should consult their advisors as early as possible in order to avoid scheduling problems. Note that it is particularly convenient to attend an overseas campus during spring and summer of the second year, since the courses listed in these quarters may be delayed to subsequent years without disadvantage. No required course may be taken on a Pass/No Credit basis.

AMERICAN CHEMICAL SOCIETY
CERTIFICATION

Students who wish to be certified as having met the minimum requirements of the American Chemical Society for professional training must complete, in addition to the above requirements, at least six units from Chemistry 136 and/or 190; and at least three additional units from one of the following: Chemistry 136, any chemistry course numbered above 200 for which permission to register had been granted by the instructor; Biochemistry 200; or an advanced course in mathematics or physics. A reading knowledge of scientific German or Russian is strongly recommended.

HONORS PROGRAM IN CHEMISTRY

A limited number of undergraduates may be admitted to the Chemistry Honors Program at the beginning of the senior year. Those completing the program satisfactorily will receive the degree of Bachelor of Science in Chemistry with Honors.

To be admitted to the program, the student must have a grade average of at least B in all course work in the University. In addition to the minimum requirements for the B.S. degree, the student must complete nine units of Chemistry 190 to be taken three units per quarter for three quarters; and nine additional units from Chemistry 221, 223, 225, 227, 251, 253, 255, 271, 273, 275, Biochemistry 200, 201, Mathematics 130, 131, 132, physics lecture courses numbered 100 and higher, Geology 278, or other advanced courses approved by the student's advisor and the supervisor of his or her work in Chemistry 190. An overall 3.3 average in mathematics, physics and chemistry is required for graduation with honors.

Students who wish to be admitted to the Honors Program should register in the department office at the beginning of their senior year. Those who do not meet all of the above formal requirements, may petition the department for admission.

TYPICAL SCHEDULE FOR FOUR-YEAR PROGRAM

FIRST YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 31.</td>
<td>Chemical Principles</td>
<td>4</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Chem. 33.</td>
<td>Structure and Reactivity</td>
<td>—</td>
<td>4</td>
<td>—</td>
</tr>
<tr>
<td>Chem. 35.</td>
<td>Monofunctional Compounds</td>
<td>—</td>
<td>4</td>
<td>—</td>
</tr>
<tr>
<td>Chem. 36.</td>
<td>Chemical Separations</td>
<td>—</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Writing Requirement</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>German 1, 2, 3. First-Year German</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Math. 19, 20, 21. Calculus and Analytic Geometry</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

SECOND YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 131.</td>
<td>Polyfunctional Compounds</td>
<td>3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Chem. 132.</td>
<td>Qualitative Organic Analysis</td>
<td>5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Chem. 133.</td>
<td>Special Topics in Organic Chemistry</td>
<td>—</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>Chem. 134.</td>
<td>Theory and Practice of Quantitative Chemistry</td>
<td>—</td>
<td>4</td>
<td>—</td>
</tr>
<tr>
<td>Chem. 136.</td>
<td>Synthesis Laboratory</td>
<td>—</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>Math. 22, 23. Analytic Geometry and Calculus</td>
<td>3</td>
<td>3</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Physics 51, 53-54. Mechanics, Sound, Electricity</td>
<td>—</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Electives (see Note 1 below)</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
<td>17</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

THIRD YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 171, 173, 175.</td>
<td>Physical Chemistry</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 174, 176. Physical Chemistry Laboratory</td>
<td>—</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Chem. 151, 153. Inorganic Chemistry</td>
<td>—</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Physics 55-56, 57-58. Light, Heat, Atomic Physics</td>
<td>5</td>
<td>4</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Electives (see Note 1 below)</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>15</td>
<td>16</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

FOURTH YEAR

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives (see Note 1)</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
Note 1.—Elective courses must be used to complete the University Writing, Distribution and Language Requirements. They may also be used to broaden the student's background in science and non-science areas and to provide an opportunity for advanced study in chemistry. Courses offered by other departments that may be of interest to chemistry majors include: Chem. Engr. 20, 120, 130; Econ. 1; English 191; Math 44, 106, 113, 130, 131, 132; Physics 110, 111, 132; Stat. 40, 110, 116; Geol. 1, 278; Engr. 50; Appl. Earth Sci. 105; Mat. Sci. and Engr. 50; Med. Micro. 101; Biol. Sci. 40, 41, 42, 43; Biochem. 200, 201; Comp. Sci. 106, 135; Civil Engr. 170, 175, 276A.

TEACHING CREDENTIALS

The requirements for certification to teach chemistry in the secondary schools of California may be ascertained by consulting the section on credentials under “School of Education” in this bulletin and the Credential Administrator of the School of Education.

GRADUATE PROGRAMS

GENERAL REQUIREMENTS

Qualifying examinations are given prior to the first week of the Autumn Quarter and in the first week of the Winter Quarter. Each new graduate student must take these examinations on entrance. Satisfactory performance is required for permission to begin thesis research and to continue work for an advanced degree. Students on full time fellowships may complete all requirements for the Ph.D. degree in 9 quarters. Students on research or teaching assistantships may complete their requirements in 3 to 4 calendar years. Students who do not complete the requirements for an advanced degree within six years after entrance as a graduate student must repeat and pass the qualifying examinations and must meet any other requirements established by the faculty before the degree will be granted.

Candidates for advanced degrees must have a minimum grade average of B for all chemistry lecture courses as well as for all courses taken during graduate study. Required courses may not be taken under the pass/no credit option. All students are expected to give full time to their graduate work once they have begun thesis research. All prospective Ph.D. candidates, regardless of the source of their financial support, are required to gain teaching experience as an integral part of their graduate training. During the period in which a thesis is being read by members of the staff, candidates must be available for personal consultation until the thesis has had final departmental approval.

addition to departmental requirements, candidates for advanced degrees must meet the general University regulations as stated in the "Degrees" section in this bulletin.

QUALIFYING EXAMINATIONS

These examinations will consist of three written exams of two hours duration each in the fields of inorganic, organic, and physical chemistry, and will cover such material as ordinarily is given in a rigorous one-year undergraduate course in each of these subjects. Students majoring in biophysical chemistry must pass examinations in physical chemistry, biophysical chemistry, and either organic or inorganic chemistry. Students who fail to pass these examinations in the Autumn will be advised to repeat them during the first week of the Winter Quarter. All qualifying examinations will be given September 23, 24, 1983 and all must be taken at this time.

MASTER OF SCIENCE

All applicants for the degree of Master of Science in Chemistry are required to complete, in addition to the requirements for the bachelor's degree, a minimum of 39 units of work. Of the 39 units approximately two-thirds must be in the department and must include at least 12 units of advanced course work in chemistry exclusive of the thesis. Of the 12 units, at least three units must be from Chemistry 221, 223, 225, 251, 253, 255, 271, 273, or 275.

MASTER OF ARTS IN TEACHING (CHEMISTRY)

In cooperation with the School of Education, the department offers a program leading to a degree, Master of Arts in Teaching (Chemistry). This degree is intended for candidates who have a teaching credential and who wish to strengthen further their academic preparation. The program consists of a minimum of 25 units in the teaching field and 12 units in the School of Education. Detailed requirements are outlined in this bulletin under “School of Education, the Master of Arts in Teaching.”

DOCTOR OF PHILOSOPHY

The graduate student does not become a formal candidate for the Ph.D. degree until he or she has passed the department qualifying and language examinations and has been admitted to candidacy by the University Committee on the Graduate Division. Filing for admission to candidacy for the Ph.D. degree must be done before June of the second year of graduate registration. The foreign language requirement for the Ph.D. in organic chemistry ordinarily
All students majoring in *inorganic chemistry* are required to take: (1) Chemistry 221, 223 and 225 during the first year, irrespective of background; those who fail to make a grade average of at least B in these three courses may not become candidates for the Ph.D. degree in organic chemistry; (2) take Chemistry 271 (or be exempted therefrom by passing special examinations administered by the professor in charge of this course); (3) take Chemistry 233 in the second and third year (3 units); (4) take Chemistry 227 or an approved substitute; and (5) take two additional courses (at least six units) of advanced lecture courses outside of the field of organic chemistry.

All students majoring in *organic chemistry* are required to take: (1) Chemistry 271, 273, and 275 (or be exempted therefrom by passing special examinations administered by the professors in charge of these courses); (2) two courses from Chemistry 251, 253, or 255; (3) Chemistry 221 or 223 or 225; and (4) two additional courses (at least six units) of approved advanced lecture courses.

All students majoring in *physical chemistry* are required to take: (1) Chemistry 271, 273, and 275 (or be exempted therefrom by passing special examinations administered by the professors in charge of these courses) during the first year, irrespective of background; those who fail to make a grade average of at least B in these courses may not become candidates for the Ph.D. degree in physical chemistry; (2) six units of advanced lecture courses in physical chemistry, biophysical chemistry, or inorganic chemistry; (3) Chemistry 221, or 223, or 225; and (4) two additional courses (at least six units) of advanced lecture courses outside of the fields of biophysical chemistry, physical chemistry, and inorganic chemistry.

All students majoring in *biophysical chemistry* are required to take: (1) Chemistry 221 and 271 (or be exempted therefrom by passing special examinations by the professors of the courses); (2) Chemistry 287, 289, 291 and 293; and (3) two additional courses (at least six units) of advanced lecture courses in fields appropriate to their research interests to be chosen in consultation with their research supervisors.

Students with an exceptionally strong background in physics and mathematics may, upon special arrangements, pursue a program of studies in *chemical physics*.

Before a candidate may request scheduling of the University oral examination, clearance must be obtained from the major professor and the chairman of the Department Graduate Study Committee. Conditions that must be fulfilled before clearance is granted vary with the different divisions of the department and may be ascertained by consulting the chairman of the Committee.

It is the policy of the department to encourage and support in every possible way the pursuit of research and of other work along advanced lines by qualified students. Information concerning staff members with lists of their recent research publications will be found in the *Directory of Graduate Research* published by the American Chemical Society.

**PhD MINOR IN CHEMISTRY**

Candidates for the degree of Doctor of Philosophy in other departments who wish a minor in chemistry must complete with a grade average of "B" or better, 12 units of chemistry courses more advanced than those that meet the minimum requirements for a bachelor's degree in chemistry.

**FELLOWSHIPS AND SCHOLARSHIPS**

In addition to the University fellowships and scholarships that are open to properly qualified students, there are at present several departmental fellowships in chemistry. The *Edward Curtis Franklin Fellowship*, *James W. McBain Memorial Fellowship*, *Frederick P. Whitaker Fellowship*, *William H. and Myrtle B. Sloan Scholarship*, *David L. and Lavinia E. Sloan Scholarship*, *Curtis Franklin Fellowship*, *William H. and Myrtle B. Sloan Scholarship*, *Robert M. and Katherine Eastman Kodak Scholarships*, and the *Edward Curtis Franklin Fellowship*, *James W. McBain Memorial Scholarship*, *John Maxon Stillman Scholarship*, and the *Robert M. and Katherine F. Loeser Scholarship* are granted only to graduate students. The *William H. Nichols Scholarships* are open to graduates and undergraduates; the *Frank Gard Scholarship* and *Eastman Kodak Scholarships* are available to undergraduates only.

There also are teaching assistantships and research assistantships open to advanced students. Application forms for fellowships, scholarships, and teaching assistantships may be obtained from the Department of Chemistry.
COURSES

Note—Laboratory fees required in laboratory courses, against which charges are made for breakage, are a minimum of $30 per quarter.

UNDERGRADUATE COURSES

30. Introduction to Chemistry—For students with no high school chemistry preparation. Introduction to chemical principles: moles, valence, stoichiometry, definitions.
   3 units, Aut (Koenig) TTh 1:15-2:30

31. Chemical Principles—Preparation for chemistry, chemical engineering, medicine, biochemistry, biology, and related fields. Atomic and molecular orbital theory, periodicity, bonding properties of matter, stoichiometry. Prerequisite: high school algebra; high school chemistry and physics desirable. (DR:7)
   4 units, Aut (Boxer, Lewis) lec (1) MWF 9; lec (2) MWF 11, one recitation by arrangement
   4 units, Win (Roberts) MWF 1:15

32. Structure and Reactivity—Organic chemistry, functional groups, hydrocarbons, stereochemistry, thermochemistry, kinetics, chemical equilibria. Prerequisite: 31. Pre-register in Chemistry Department. (DR:7)
   4 units, Win (Kluge, Wender) lec (1) MWF 9; lec (2) MWF 11, one recitation by arrangement
   4 units, Spr (van Tamelen, Pirrung) lec (1) MWF 9; lec (2) TTh 11-12:15; one recitation section by arrangement

33. Chemical Separations—Techniques for separations of compounds; distillation, crystallization, extraction, and various chromatographic procedures. The lecture will treat the theory while the laboratory will provide practice. Prerequisites: 33 and concurrent or previous enrollment in 35. Pre-register in Chemistry Department.
   3 units, Spr (van Tamelen) lab M 2:15-6:05, or T,W,Th or F 1:15-5:05

130. Theory and Practice of Identification—Lectures on theory and interpretation of ultraviolet, infrared, nuclear magnetic resonance and mass spectral data. Laboratory involves identification of unknowns and components of a mixture using derivatives and spectra. For students in biomedical sciences. (Chemistry majors take 132.) Prerequisites: 35, 36 and concurrent registration in 131.
   4 units, Aut (Staff, Pirrung) lec (1) TTh 8 lab M,T,W, or Th 1:15-5:05

131. Organic Polyfunctional Compounds—This course covers the chemistry of aromatic compounds, polysaccharides, amino acids, proteins, natural products, dyes, purines, pyrimidines, nucleic acids and polymers. Prerequisite: 35.
   3 units, Aut (Hodgson) lec TTh 11-12:15
   3 units, Win (Collman) TTh 1:15-2:30

132. Qualitative Organic Analysis—Separation of mixtures of organic compounds and identification of the components using rational synthesis and analysis of spectral data. Required for and limited to chemistry majors; others may be admitted with consent of instructor. Prerequisites: 35, 36 and concurrent registration in 131.
   5 units, Aut (Staff, Pirrung) lec (1) TTh 9 plus lab MW 1:15-5:05
   or TTh 1:15-5:05

   3 units, Win (Staff) MWF 11
   not given 1983-84

134. Theory and Practice of Quantitative Chemistry—The course will deal with the theory and practice of quantitative analysis. Methods considered will include gravimetric, volumetric, spectrophotometric, and electrometric. Prerequisite: 132.
   5 units, Win (Lewis) lec TTh 9 plus lec F 1:15
   lab MW 1:15-4:05; or TTh 1:15-4:05

135. Physical Chemical Principles—Terminal physical chemistry for non-chemistry majors. Emphasis is on those portions of physical chemistry most useful for students of the life sciences. Introduction to chemical thermodynamics, heterogeneous equilibria, thermodynamics of solutions, electrolytes, chemical kinetics, macromolecular solutions and colloidal dispersions. Prerequisites: 31 and calculus.
   3 units, Win (Brauman, Huestis) lec (1) TTh 11-12:15,
   lec. (2) 1:15-2:30

136. Synthesis Laboratory—Advanced synthetic methods in organic and inorganic laboratory chemistry.
   3 units, Spr (van Tamelen) lab MW or TTh 1:15-5
   not given 1983-84
137A. Biosocial Aspects of Birth Control—(Same as Human Biology 150A.) Problems of introducing a new, practical birth control method involve legal, political, cultural and economic factors in addition to purely biological ones. Course deals with a critical evaluation of logistic aspects of human fertility control. For further details see Human Biology 150A. Limited to 45 students with at least junior standing. Complete application for admission in Human Biology office.

6 units, (Djerassi) TTh 1:15-4:05 alternate years, given 1984-85

137B. Biosocial Aspects of Birth Control—(Same as Human Biology 150B.) Selected students from 137A will be encouraged to continue with field work dealing with task force topics completed in 137A. Prerequisite: 137A.

1-6 units, Spr (Djerassi) TTh 1:15-4:05 alternate years, given 1984-85

139. Pest Control—Technical and Policy Aspects—(Same as Human Biology 152.) Course focuses on technical, operational and policy issues of pest control in agriculture and public health. History of chemical pest control, present research on biorational alternatives with special emphasis on recent developments in insect endocrinology and pheromones; economic and political factors that affect pest control practices; measuring the costs and benefits of chemical controls; impact of regulation on the development of new technology in private and public sectors. For further details see Human Biology 152. Limited to 25 students with at least junior standing. Prerequisites: Chemistry 33 and/or 35 or consent of instructor. Preregistration prior to Winter Quarter is essential using special preregistration forms available from the Human Biology or Chemistry Department offices.

5 units, Win (Djerassi) TTh 1:15-4:05

151. Inorganic Chemistry I—Systematic introduction to theories of electronic structure, stereochemistry, and symmetry properties of inorganic and organometallic molecules. Topics will include ionic and covalent interactions, electron-deficient bonding, and elementary ligand field and molecular orbital theories. Emphasis will be placed on the chemistry of the metallic elements. Prerequisites: 35 and 171.

3 units, Win (Hodgson) MW 1:15-2:30

153. Inorganic Chemistry II—A systematic presentation of the theoretical aspects of inorganic chemistry. Group theory, many electron atomic theory, molecular orbital theory, emphasizing general concepts and group theory, ligand field theory, application of physical methods to predict the geometry, magnetism and electronic spectra of transition metal complexes, and theoretical aspects of electron transfer reactions. Prerequisites: 151 and 173.

3 units, Spr (Solomon) MWF 10

171. Physical Chemistry—Chemical thermodynamics: fundamental principles, Gibbsian equations, equilibrium conditions, phase rule, systematic deduction of equations, gases, solutions. Prerequisites: 35, Mathematics 19, 20, 21 (or equivalent) and Physics 51, 53, 54 and previous or concurrent registration in Physics 55 (or Physics 21, 23, 29 in the case of premedical students majoring in chemistry; see under "Minimum Requirements").

3 units, Aut (Andersen) MWF 11

173. Physical Chemistry—Introduction to quantum chemistry: basic principles of wave mechanics, the harmonic oscillator, the rigid rotator, infrared and microwave spectroscopy, the hydrogen atom, atomic structure, molecular structure, valence theory.

3 units, Win (Boxer) MWF 11

174. Physical Chemistry Laboratory—Use of chemical instrumentation to study fundamental areas of physical chemical concern. Lectures will present an introduction to spectroscopy using group theory. Experiments include rotational-vibrational, laser Raman, and visible spectroscopy; x-ray diffraction; and an introduction to integrated circuit electronics. An understanding of the theory relevant to each experiment is emphasized. Prerequisites: 134 and previous or concurrent enrollment in 173. Familiarity with linear algebra on at least the level of Mathematics 113S is strongly encouraged.

3 units, Win (Zare) lec TTh 10 lab MW 2:35-5:25 or TF 1:15-4:05


3 units, Spr (Fecora) MWF 11

176. Physical Chemistry Laboratory—Continuation of Chemistry 174, with focus on time-dependent and spin processes. Experiments include gas-phase kinetics, fluorimetry, nuclear magnetic resonance spectroscopy, and electron paramagnetic resonance spectroscopy. Prerequisites: 174 and previous or concurrent enrollment in 175.

3 units, Spr (McConnell) lec TTh 10 lab T 1:15-4:05 or W 1:15-4:05
Chemistry and the Life Sciences in Historical and Philosophical Perspective—(Enroll in Values, Technology, Science, and Society, VTSS 145.) Traces the development of some selected problems involving interrelations between chemically and biologically based sciences and society.

4 units, Win (Clayton)

GRADUATE COURSES

Undergraduates may register for chemistry courses numbered 200 and above only if admitted to the Honors Program or if special permission has been granted by the instructor.


3 units, Aut (Huestis) TTh 9-10:3

223. Advanced Organic Chemistry—Continuation of 221 with emphasis on physical methods. Prerequisite: 221 or consent of instructor.

3 units, Win (Staff) MWF 10

225. Advanced Organic Chemistry—Continuation of 223: Organic reactions, new synthetic methods, conformational analysis, and exercises in the syntheses of complex molecules. Prerequisite: 223 or consent of instructor.

3 units, Spr (Wender) MW 10:30-12

227. Selected Topics in Organic Chemistry—May be repeated for credit. Possible topics include synthetic organic chemistry, photochemistry, inorganic-organic chemistry, bioorganic chemistry, reaction mechanisms, stereochemistry, structural chemistry of organic and biological molecules. Prerequisite: 225 or consent of instructor.

3 units, Aut (Staff) MWF 9, not given 1983-84

229. Organic Chemistry Seminar—Attendance required of all graduate students majoring in organic chemistry.

1 unit, Aut, Win, Spr (Brauman) W 4

233. Creativity in Organic Chemistry—The art of formulating, writing, and orally defending a research progress report will be practiced and criticized with the student using his own research as a vehicle. Required of all 2nd and 3rd year Ph.D. candidates. Winter and spring: the art of formulating, writing, and orally defending an original research proposal will be practiced and criticized.

1 unit, Aut, Win, Spr (Brauman) by arrangement

251. Selected Topics in Advanced Inorganic Chemistry—May be repeated for credit. Prerequisite: one year of physical chemistry.

3 units, Aut, or Win, or Spr (Staff) TTh 11, not given 1983-84

253. Advanced Inorganic Chemistry—Physical-inorganic and bioinorganic chemistry for inorganic chemists. Introduction to metalloenzymes as unique inorganic complexes, review of ligand field theory and its applications to spectroscopic and magnetic techniques, and an overview of metalloenzymes containing copper, iron, and molybdenum active sites. No backgroud in biochemistry is necessary, however, group theory and a basic understanding of quantum mechanics and molecular orbital theory will be assumed.

3 units, Win (Solomon) TTh 11-12:15


3 units, Spr (Collman) TTh 9-11

257. Research Proposals in Inorganic Chemistry—Research progress reports (Autumn Quarter) and research proposals (Winter and Spring Quarters) will be presented in oral and written form. Writing ability and oral defense will be criticized as well as scientific content. Required of all second-year inorganic students.

1 unit, Aut, Win, Spr (Taube) by arrangement

259. Inorganic Chemistry Seminar—Attendance required of all graduate students majoring in inorganic chemistry.

1 unit, Aut, Win, Spr (Taube) T 4

271. Advanced Physical Chemistry—Principles of quantum mechanics. General formulation, mathematical methods, and elementary applications of quantum theory to the structure of atoms and molecules, including variational procedures, perturbation theory, operator and matrix methods, theory of angular momentum, and elements of the electronic structure of atoms. Prerequisite: 175.

3 units, Aut (Pecora) MWF 10

273. Advanced Physical Chemistry—Molecular spectroscopy and molecular structure. Examination of the experimental and theoretical basis for various models of molecular structure; review of quantum theory of atomic
and molecular structure. Born-Oppenheimer approximation, molecular energy levels, interaction of radiation with matter, microwave, infrared, and ultraviolet spectroscopy of molecules. Also, special topics to be chosen according to the interests of the students and instructor; e.g. scattering of light by fluids, correlation function methods, spectra of molecules in solution, Mossbauer spectroscopy, magnetic resonance, Raman spectroscopy. Prerequisite: 271.

3 units, Win (Zare) MWF 9

275. Advanced Physical Chemistry—Basic principles and methods of statistical mechanics from the ensemble point of view; statistical thermodynamics, heat capacities of solids and polyatomic gases, chemical equilibria, equations of state of fluids, phase transitions. Prerequisite: 271.

3 units, Spr (Andersen) TTh 11-12:15

277. Selected Topics in Physical Chemistry—May be repeated for credit. Possible topics include structure elucidation using diffraction techniques, advanced statistical mechanics, crystal field theory, advanced quantum mechanics, magnetic relaxation, advanced thermodynamics, chemical applications of group theory. Prerequisite: 275 or consent of instructor.

3 units, Spr (Ross) by arrangement

283. Research Proposals in Physical Chemistry—Students will present research proposals and progress reports on their research in physical chemistry, using oral and written forms. Topics may be drawn from the student's research or a related area in physical chemistry. Written form, oral presentation and scientific merit will be evaluated. May be required of 2nd- and 3rd-year graduate students at the discretion of the research advisor.

1 unit, Aut, Win, Spr (Staff) by arrangement

287. Biophysical Chemistry—Covers theoretical and experimental aspects of biophysical phenomena with emphasis on membrane biophysics and membrane biology. Minimal prerequisites are previous or concurrent registration in 171 and 173, or the equivalent.

3 units, Spr (McConnell) MWF 9

289. Biophysical Chemistry—Experimental methods in biophysics. Emphasis will be placed on spectroscopic techniques including magnetic resonance and optical methods. Prerequisite: Chemistry 287.

3 units, Win (McConnell) MWF 9, given 1983-84

291. Biophysical Chemistry—Special topics in biophysical chemistry. Minimal prerequisites are previous or concurrent registration in Chemistry 171 and 173, or the equivalent.

3 units, Spr (McConnell) TTh 10, not given 1983-84

293. Structural Inorganic Chemistry—Structural biophysical chemistry. X-ray crystallography and related techniques as used in biophysical research. Other topics include electron and optical microscopy and neutron diffraction. Prerequisite: Chemistry 291 or consent of instructor.

3 units, Spr (Hodgson) TTh 10, alternate years, given 1984-85

297. Biophysical Chemistry—Physical-inorganic and bioinorganic chemistry for inorganic chemists. Introduction to metalloenzymes as unique inorganic complexes, review of ligand field theory and its applications to spectroscopic and magnetic techniques, and an overview of metalloenzymes containing copper, iron, and molybdenum active sites. No background in biochemistry is necessary, however, group theory and a basic understanding of quantum mechanics and molecular orbital theory will be assumed.

3 units, (Solomon) TTh 11-12:15

299. Teaching of Chemistry—Techniques of teaching chemistry by means of lectures and laboratories. All teaching assistants in chemistry are required to register for this course.

1-3 units, Aut, Win, Spr (Staff) by arrangement

300. Department Seminar—Attendance is required of all graduate students, and all undergraduates registered for 190.

1 unit, Aut, Win, Spr (Zare) Th 4

301. Research in Chemistry—Research seminars and directed reading dealing with newly developing areas in chemistry and experimental techniques. Open to qualified graduate students with the consent of the major professor. May be repeated for credit. Registration required of all graduate students who have passed the qualifying examination.

2 units, Aut, Win, Spr (Staff) by arrangement

RESEARCH AND SPECIAL ADVANCED WORK

190. Introduction to Methods of Investigation—For general character and scope, see 200, below. Limited to undergraduate students admitted under the Honors Program or by special arrangement with a member of the teaching staff. Concurrent attendance in 300 required.

(Staff) by arrangement

200. Research and Special Advanced Work—Properly qualified students are encouraged to
undertake research, or other advanced laboratory work along lines not covered by courses already listed, under direction of any member of teaching staff with whom arrangement is made. For all such research and special work, students will register for 200 (or 190 if in undergraduate standing), giving name of staff member under whom work is carried on and number of units agreed upon.

(Staff) by arrangement

CHICANO FELLOWS PROGRAM

Recognition of the growing social importance and size of the Mexican-origin population of the United States has led many leading American universities to establish Chicano study programs. Since 1971 the School of Humanities and Sciences at Stanford has affirmed the educational necessity of providing academic opportunities for undergraduates to learn about Chicano society and culture by sponsoring the Chicano Fellows Program.

Since its inception the Chicano Fellows Program has had a dual purpose: to offer a selection of courses on the Chicano experience in this country; and to provide a teaching development opportunity to advanced Stanford graduate students. Each year the Program offers courses designed specially for undergraduates which are taught by graduate fellows in various disciplines. These offerings are often innovative and experimental; they are usually given as seminars rather than as lecture courses.

With the addition of a visiting faculty as a new feature of the Chicano Fellows Program in 1982-83, the instructional offerings of the Program have been significantly strengthened and enhanced. In 1983-84, as in the previous year, a scholar of outstanding national reputation will be appointed to teach a total of three courses of special interest to students wanting to develop a scholarly understanding of the nation's second largest minority, a minority that within the next few decades is projected to become the majority population in several states including California.

The Programs annual offerings supplement and complement a small selection of outstanding courses on diverse aspects of Chicano society and culture taught by regular members of the Stanford faculty. Listed below are upper-division courses open to both undergraduate and graduate students which are offered in the departments of Spanish and Portuguese, English, Anthropology, and History.

Information of course offerings within this new study area is available from the Administrative Assistant of the Chicano Fellows Program (497-3495). Students should check with the Administrative Assistant for information on the Program's offerings in particular because these courses are accredited after the Stanford University Bulletin goes to press and therefore do not appear below.

PROGRAM COURSES

For the 1983-84 Chicano Fellows Course Bulletin, please check with Administrative Assistant, Chicano Fellows Program, Bldg. 590, Rm. C (The Nitery).

103. Towards a Definition of Chicano Aesthetics: A Research Seminar on Chicano Art and Literature—What can be called "Chicano Aesthetics" will be examined in its many manifestations through several Chicano artistic and literary expressions. The course will be conducted as a research seminar in which teams of students will develop different projects dealing with a specific literary genre, art medium or related facet.

3 units, Spr (Alarcon)

173. Chicano English—Course will provide a review of the literature regarding Chicano English and an examination of the basic phonological, syntactic, morphological and semantic descriptions of Chicano English. In addition, the course will explore attitudes of Chicanos and non-Chicanos to Chicano English and its relation, as nonstandard variety, to Standard English. The social and educational implications of a widespread Chicano English dialect will be emphasized.

3 units, Spr (Sanchez)

186. Chicano Bibliography: Information Sources and Search Strategies—An introduction to the fundamentals of library research methods for the study of the historical experience and contemporary condition of the Chicano/Mexicano population in the United States. This is a class on Chicano bibliography that will include the study and use of standard library resources as well as subject specialized information sources. This class is designed to help the student studying the Chicano experience to develop search strategies for locating diverse types of information and resources related to their specific interests.

3 units, Aut (Trujillo)

3 units, Aut course to be arranged, offered by visiting faculty

Win, Spr (Staff)
DEPARTMENTAL COURSES

For (DR) information, see the respective departments.

119. Chicano Culture—Interdisciplinary approach to the study of Chicano life and culture. Topics will include formation of the barrio; labor conflict; folklore and beliefs; forms and figures of cultural resistance (bandits, corridos, popular leaders) patterns of immigration; stereotypes and self-images in fiction, poetry, and theatre.

(Rosaldo) not given 1983-84

ENGLISH

162B. Chicano Literature: Creative Writing for Bilingual Students—(Same as Spanish 162B.)
5 units, (Islas) not given 1983-84

FRESHMAN SEMINAR

21. Hispanic-American Novelists—Introduction to some of the major novels of Hispanic American writers; Gabriel Garcia Marquez, Mario Vargas Llosa, Carlos Fuentes, Juan Rulfo, Ron Arias, and Rudolfo Anaya.
5 units, Aut (Islas) T 7-10 pm

HISTORY

152B. U.S. Urban Life and Culture.
5 units, Win (Camarillo)

262A. Ethnicity in American Cities Past and Present.
5 units, Spr (Camarillo)

SPANISH

130B. Mexican and Chicano Cultural Readings—Introduction to literary texts with a focus on the Mexican-Chicano heritage. Readings and topics emphasize conversation and composition.
3-5 units, Aut (Aparicio and Ybarra-Frausto)

290. Introduction to Chicano Literature—Study of selected works by major Chicano writers of the 20th century, including poetry, fiction, and drama. General introduction to questions of genre and textural interpretation with emphasis on the socio-historical and cultural context of Chicano literature.
3-5 units, Win (Ybarra-Frausto)

385. Chicano Theatre—Study of the contemporary Chicano theatre movement, with an emphasis on the idea of popular theatre. Course will focus on Teatro Campesino and Teatro de la Esperanza.
3-5 units, (Ybarra-Frausto) given 1984-85

CLASSICS

Emeriti: Lionel Pearson, Antony E. Raubitschek (Professors)
Chairman: Marsh H. McCall, Jr.
Professors: Edward Courtney, Mark W. Edwards, Edwin M. Good (Religious Studies and, by courtesy, Classics), Michael H. Jameson (Classics and, by courtesy, History), Marsh H. McCall, Jr., Julius Moravcsik (Philosophy and, by courtesy, Classics), Susan M. Treggiari (Classics and, by courtesy, History)
Associate Professors: N. Gregson Davis (Classics and Comparative Literature), Andrew M. Devine, Susan A. Stephens, Michael Wigodsky
Assistant Professors: Wilbur Knorr (History of Science), Sabine G. MacCormack (Classics and History), Jody Maxmin (Art History and Classics), Mark H. Munn, Bruce B. Rostenstock, John J. Winkler
Professor (Teaching): Edward W. Spofford
Lecturer: Robert Hamerton-Kelly (Classics and Religious Studies)
Bonsall Visiting Professor: R. R. Bolgar (Winter)
Webster Visiting Professor: David Furley (Spring)

OFFERINGS

The Department of Classics offers work in the Greek and Latin languages and literatures (both in the original languages and in translation), in Greek and Roman history, in ancient philosophy, and in classical art and archaeology. The wide selection of non-language courses (see "General Courses" below) is intended both for those who currently are taking a Western Culture sequence and for those who have already taken one and who desire more thorough knowledge of various aspects of the ancient world.

The major in Classics affords an opportunity for the student to develop three things: a competence in the classical languages, an appreciation, comprehension, and enjoyment of classical literature, and an understanding of the history and culture of the ancient world. The department is interested both in students who wish to do their major work in Classics and in students who wish to relate classics to work in such other departments as English, Philosophy, History, and the Modern Languages.

Normally students who major in Classics go on to careers in law, medicine, or business. Some students may elect to go on to graduate work, with a goal of teaching Classics.
DISTRIBUTION REQUIREMENTS

For those students who have matriculated before Autumn 1980, many courses in the department fulfill the distribution requirement in humanities, and a number of them also fulfill the requirement in social sciences. Students are recommended to choose courses to fulfill the requirements from those which have a common theme. Suggested themes are:


2. The literature, art and life of ancient Rome: Classics (code 378) 008, 009, 011, 172; Ancient History (code 371) 102, 103; Ancient Art (code 372) 014, 020, 106, 100C.


For those matriculating in Autumn 1980 or later, see the “Degrees” section of this bulletin for explanation of new distribution requirements.

ADMISSION TO THE DEPARTMENT

Those who are considering a major in Classics (Latin and Greek) should enroll in the department as early as possible, since at least three years of work in Latin or Greek or both will generally be required of them, and those with no previous knowledge of Latin (or Greek) should begin the study of the language in their freshman year, or as early as possible in their sophomore year. Prospective majors in Classical Studies should normally enroll not later than the beginning of their junior year, but are urged to discuss their plans with a member of the department as early as possible.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The degree of Bachelor of Arts with a major in Classics may be taken in the following alternative ways:

1. Greek and Latin.
2. Greek or Latin.

More detailed descriptions of the requirements follow. All major students will be assigned a departmental advisor, who will help them prepare a program of study; they should discuss their program with the advisor at regular intervals.

1. Greek and Latin. At least 27 units in Greek courses and the same number in Latin, all at the 100 level or higher. Credit towards the major for second-year courses (101, 102, 103) will be accepted only with the approval of the Undergraduate Studies Committee. If possible, students should complete the sequence of third-year courses (111, 112, 113) before taking courses in the fourth-year sequences (141-3, 151-3, 161-3, offered in successive years), and they should include some work in Greek or Latin Style and Syntax (Greek or Latin 175). In addition, they should do some work in ancient history or art or some other aspect of classical civilization to make up a minimum of 60 units. A semester at the Rome Classical Center and a summer at Stanford-in-Greece are strongly advised.

This is the most exacting course of study in the department, and it is normally elected by those students preparing to go on to graduate work in classics. It is particularly recommended for students with good preparation in secondary school, but it is within the range of those who have had no previous training in one of the languages (Greek or Latin), if the elementary work is completed in the freshman or sophomore year, thus leaving time for the six courses at the level of 100 or above.

2. Greek or Latin.

a) Greek: at least 55 units, including a minimum of 31 units in Greek courses at the 100 level or higher (one course of which should be Greek Style and Syntax), 2 courses in ancient history, and a course in ancient art or archaeology. The introductory sequence (1, 2, 3, or 51, 52) or one 100-level course in Latin is highly recommended. The remaining courses to make up the total may be chosen from other departmental courses or (with permission of the advisor) from relevant courses in other departments (such as Art, Philosophy, Humanities, or modern languages). (Beginning courses in Greek, if required, may be counted towards the total of 55 units.) A summer at Stanford-in-Greece is strongly recommended. (See “Note 1” below.)

b) Latin: at least 55 units, including a minimum of 31 units in Latin courses at the 100 level or higher (one course of which should be Latin Style and Syntax), two courses in ancient history, and a course in
ancient art or archaeology. The introductory sequence (1, 2, 3, or 51, 52) or one 100-level course in Greek is highly recommended. The remaining courses to make up the total may be chosen from other departmental courses or (with permission of the advisor) from relevant courses in other departments (such as Art, Philosophy, Humanities, or modern languages). (Beginning courses in Latin, if required, may be counted towards the total of 55 units.) A semester at the Rome Classical Center is strongly recommended. (See "Note 1" below.)

3. Classical Studies. This major is recommended for students who wish to study the classical civilizations in depth as part of their general educational experience, but do not have perhaps the time or the background to study the languages to the extent required by the major in Classics. The required minor is intended to assist students in relating their work in classics to particular aspects of modern civilization. This major is particularly suitable for students who think of proceeding to law, business, or medical school, or to graduate work in history, archaeology, or comparative literature. It is not suitable for those who may wish to teach Latin or Greek in high school or college, as the language work is insufficient for this purpose. Additional language work would be necessary before entering graduate school in classics. Requirement: 55 units made up of:

a) 40 units in the major, including (1) at least two courses in Latin or Greek at the 100 level or higher; or one course in one of the languages at the 100 level or higher, plus the 1, 2, 3, or 51, 52 series in the other language; (2) at least one course in the department from each of the following groups: literature; philosophy and political theory; ancient history; religion and mythology; art and archaeology: In some cases courses in other departments may be substituted, with permission of the Undergraduate Studies Committee.

b) A minor consisting of not less than 15 units in a relevant minor field outside the department; such fields might include not only other humanities subjects but also anthropology, psychology, sociology, political science, or a combination of such courses agreed upon with the advisor. This requirement is waived if the student completes a second major program, but in this case 55 units of Classics courses (or approved equivalents) must be completed for the major. A summer at Stanford-in-Greece is strongly recommended, or a semester at the Rome Classical Center.

Note 1. University units earned by placement tests or advanced placement work in secondary school will not be counted towards any major program in the department, and work done in other universities or colleges will be subject to departmental evaluation.

Note 2. A letter grade is required in all courses taken for the major.

Note 3. Students who are contemplating graduate work in classics, or a professional career as teachers of Greek and Latin, might suitably follow either of the first two programs, 1 or 2. Program 3 covers a wider field, and may be recommended particularly to students who look towards graduate work in other humanitarian subjects, e.g., History, Philosophy, or some field of literature other than the classical.

HONORS PROGRAM IN CLASSICS

Students who wish to be considered for Honors in Classics must complete the bachelor's degree program in Greek and Latin (program 1 above). In addition, at the beginning of their senior year they must submit to the department a proposal for an Honors Essay of about 25-30 pages, which should normally arise from the subject-matter of a previously taken course. If the proposal is approved, the student will take Greek or Latin 199 during the senior year for 5 units of credit and write the essay under the supervision of a member of the department. Honors will be awarded on the basis of the essay and the student's entire program in the department.

HONORS PROGRAM IN HUMANITIES

For majors in Classics with appropriate interests, an Honors Program in Humanities is offered, a description of which will be found under "Humanities Special Programs."

ROME CLASSICAL CENTER

Classics majors are strongly urged to attend the Intercollegiate Classical Center at Rome. The Center is managed by Stanford University for about 50 constituent colleges and universities including Stanford. It is open to Stanford majors in Classics, History, and Art History (see the Center brochure). All courses given in the Center receive full credit at Stanford and may be applied to the respective major.

All students interested in this program should consult the chairman of the department.

STANFORD IN GREECE

The Classics Department prepares and assists qualified students to study in Greece in
the summer, both at the American School of Classical Studies and in programs operated by Stanford. Students who are not Classics majors are eligible, and all students should take preparatory courses in the fields of Greek archaeology, art, history, and language (including modern Greek). Those interested should see the Chairman of the Classics Department early in the academic year.

**GRADUATE PROGRAMS**

**MASTER OF ARTS**

Students who have completed an undergraduate major in Classics (Greek and/or Latin) or its equivalent may be accepted as candidates for the degree of Master of Arts in Classics, Greek, or Latin, and may expect to complete the program in twelve months (usually 3 quarters of course work plus 3 months study for the thesis or examination). Students without an undergraduate major in Classics may also be accepted as candidates, though they may require a longer period of study before completing the requirements for the degree. These requirements are:

1. Satisfactory demonstration of competence in Greek and/or Latin composition.
2. Attainment of a standard of scholarship such as would normally be reached by three quarters of study in the department after fulfilling the requirements for an undergraduate major in the department. This would normally mean the completion of at least 18 units of graduate courses and 18 units of work at the 140 level or above.
3. The satisfactory completion of one Greek course at the 100 level (if the undergraduate major has been Latin) or one Latin course at the 100 level (if the undergraduate major has been Greek).
4. The passing of an examination testing the candidate’s ability to translate into English from a selected list of Greek and/or Latin authors.
5. The writing of a thesis, or the passing of an examination on a particular author or topic.
6. A reading knowledge of French or German.

Students who are candidates for the Ph.D. degree may also (on the recommendation of the department) become candidates for the A.M. degree. In their case requirement 5 above will be waived provided that they have completed some work beyond the course requirements listed under 2 and 3 above.

**DOCTOR OF PHILOSOPHY**

University regulations regarding admission and application for candidacy are discussed in the “Degrees” section of this bulletin.

All candidates for the Ph.D. degree in Classics must fulfill the following requirements:

1. They must complete at least three years (nine quarters) of full-time work, or equivalent, in study beyond the bachelor’s degree. This must include the first-year graduate program (unless the student is exempted by examination) and normally at least 12 graduate seminars acceptable to the department, in addition to the doctoral dissertation. At least three consecutive quarters of graduate work and the final units of credit in the program must be taken at Stanford.

More detailed information on the Advanced Degree Program is available in mimeographed form in the Classics Department Office.

2. Candidates will be required to pass examinations as follows:
   a) Reading examinations in French and German. In some circumstances Italian may be substituted for French.
   b) Translation examinations into English from Greek and Latin authors included in an approved list (drawn up by the department and available from the departmental secretary).
   c) Three general written examinations; a supplementary general oral examination; one special author and one special field examination.
   d) An oral examination on the candidate’s dissertation subject and on two special topics, such as selected authors or selected aspects of Greek or Latin literature, linguistics, history, archaeology, linguistics, history, archaeology, philosophy, epigraphy, papyrology, or paleography.

3. The examinations in translation from Greek and Latin authors will normally be taken in the Autumn Quarter of the second year of graduate work, the general written and oral examinations in the Autumn Quarter of the third year, the special author and field examinations in the Winter and Spring Quarter of the third year, the dissertation oral examination during the fourth year. The period between the translation and general examinations will be devoted largely to seminar work and to an intensive preparation for the latter examinations, during the course of which candidates will be expected to make full use of relevant secondary material in modern languages. They should therefore plan to satisfy the requirements in French and German as soon as possible, preferably
before the time of the translation examinations. Except in very special circumstances they will not be allowed to take the general examinations until the modern language requirements have been successfully completed.

4. Each candidate (not later than the end of the third year) should submit to the chairman of the department a statement of his or her dissertation topic as approved by his or her dissertation committee. This committee will normally be appointed (for each candidate) by the chairman of the department at least one quarter before the student's dissertation topic is due to be submitted. At the same time or earlier a member of the department will be appointed as the candidate's advisor and will thereafter supervise the candidate's writing of the dissertation. An acceptable dissertation must be a genuine contribution to classical scholarship and must be written in an acceptable style. All theses are to be written in English.

5. All students are required to undertake the equivalent of three one-quarter courses of teaching under the supervision of the department.

Ph.D. MINOR IN CLASSICS

The department recommends for a graduate minor at least 18 units in Latin or Greek at the 100 level or above, and at least one course at the graduate (200) level.

CLASSICS AND A MINOR FIELD

The Ph.D. in Classics may be combined with a minor in another field, such as Anthropology, History, Humanities (see below), Indo-European Linguistics (see below), or Philosophy. The requirements for the minor field vary, but might be expected to involve about six graduate-level courses in the field and one written examination, plus a portion of the University oral exam. Such a program would be expected to take five years. The department encourages such programs for especially able and well-prepared students, and will normally be able to offer one fellowship each year to support a student in the fifth year of a combined program. The following timetable would be typical for a five-year program:

1st Year: Course work, almost entirely in Classics. One translation exam possibly taken in June. One or both modern language exams taken.

2nd Year: Course work, both in Classics and the minor field. Translation exams completed. French and German exams completed.

3rd Year: Course work, both in Classics and the minor field. General examinations in Classics taken in September. Special exams in Classics taken.

4th Year: Remaining course work, both in Classics and the minor field. General examination in the minor field. Preparation for dissertation.

5th Year: Dissertation. University oral examination.

GRADUATE PROGRAM IN INDO-EUROPEAN STUDIES

This program is administered by the Classics Department, and may be taken as a supplement to a Classics Ph.D. program. It involves work in general Indo-European and a language of specialization. Interested students should contact Professor Devine of the Classics Department.

GRADUATE PROGRAM IN HUMANITIES

The Department of Classics participates in the Graduate Program in Humanities leading to the joint Ph.D. degree in Classics and Humanities. For a description of that program see the section "Humanities Special Programs" in this bulletin.

COMPARATIVE LITERATURE

The Classics Department cooperates closely with the Graduate Program in Comparative Literature. Interested students should consult the chairman of the department.

COURSES IN GREEK

INTRODUCTORY COURSES

Students with no previous experience may begin the study of Greek with either Greek 1 or Greek 51. The series 1, 2, 3 begins in Autumn Quarter (5 units a quarter); the series 51, 52 begins in Winter Quarter (6 units a quarter) and is intended to cover the same ground at a more rapid pace, so that the series 101, 102, 103 forms a sequel equally to Greek 3 and Greek 52. During the first year some Xenophon or Plato will be read, so as to prepare the student in the following year for further reading of Plato, Euripides, and Homer. These courses all form part of a series, but qualified students may be admitted to the class in winter or spring by consent of the instructor.

Students who have done previous work elsewhere in Greek should consult the department's undergraduate advisor to determine what course they are qualified to enter.

Students whose major work is in another department and who wish to fulfill a depart-
mental foreign language requirement by taking Greek should consult their departmental advisors to determine what courses will be required, but most departments will be satisfied if part of the series 101, 102, 103 is completed.

1. First-Year Greek—For beginners.
   5 units, Aut (Winkler) MTWF 9

2. First-Year Greek—Continuation of 1.
   5 units, Win (Winkler) MTWF 9

3. First-Year Greek—Continuation of 2.
   5 units, Spr (Staff) MTWF 9

51. First-Year Greek—Accelerated course. Completion of Greek 51 and 52 fulfills (DR:4).
   6 units, Win (Raubitschek) MTWThF 1:15

52. First-Year Greek—Continuation of 51. Completion of Greek 51 and 52 fulfills (DR:4).
   6 units, Spr (Raubitschek) MTWThF 1:15

The intensive Greek course (Greek 10) offered in Summer Quarter also prepares students to enter Greek 101 in Autumn Quarter.

INTERMEDIATE COURSES

101. Second-Year Greek—Reading of selections from Plato. (DR:2)
   5 units, Aut (McCall) MWF
   with review session by arrangement

102. Second-Year Greek—Euripides, one play. (DR:2)
   5 units, Win (Knorr)

103. Second-Year Greek—Homer, Odyssey. (DR:2)
   5 units, Spr (Stephens)

   3 units, Spr (Hamerton-Kelly)

111. Sophocles—One play. (DR:2)
   4 units, Aut, (Staff)

112. Herodotus and Xenophon.
   4 units, Aut, given 1984-85

ADVANCED COURSES

162. Aeschylus.
   4 units, Win (Edwards)

163. Thucydides.
   4 units, Spr (Munn)

160. Individual Work.
   by arrangement

176. Senior Seminar.
   4-5 units, by arrangement

199. Undergraduate Thesis.
   by arrangement

The sequence of authors in undergraduate courses is intended to provide an initial acquaintance with the best of classical literature, and to meet each student's level of competence in the language. Modifications may be made to suit the needs and interest of each class.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

175. Greek Style and Syntax—This course is designed to teach some of the nuances of Greek syntax and style. Classes will be devoted to stylistic analysis of selected prose authors, techniques of sight-translation, and the writing of idiomatic Greek prose. The course is designed for the major, but all students enrolled in Greek language courses are encouraged to take Greek 175 as soon as possible after the completion of 103.
   4 units, Aut (Jameson)

GRADUATE COURSES

201. Introduction to Classical Scholarship.
   1 unit, Aut, Win, Spr (Wigodsky and Staff)

202. Tutorial in Greek Poetry.
   3 units, Aut, Win (Raubitschek, Winkler)

205. Greek Language and Style.
   3 units, Win, Spr (Raubitschek, Stephens)

The above courses are offered every year. Other courses alternate or vary from year to year. In 1982-83 there were literary seminars in the following authors or topics: Herodotus, Hellenistic Poetry, Ancient Rhetoric and Literary Criticism, Presocratic Philosophy. The following courses and seminars will be offered in 1983-84. See also seminars listed under Latin, Literature, Philosophy, Ancient History, Religion and Mythology, Art and Archaeology, Indo-European Linguistics, and History of Science.

217. Sophocles.
   5 units, Spr (McCall)

226. Introduction to Papyrology.
   5 units, Aut (Stephens)

   5 units, Aut (Winkler)

251. Greek Epigrams.
   5 units, Spr (Raubitschek)

252. Homer.
   5 units, Win (Edwards)

260. Directed Reading.
   by arrangement

270. Greek Prose or Verse Composition.
   by arrangement

Note: Some of the courses listed above may be continued in the following quarter by arrangement with the instructor. This will usually re-
quire the writing of an extended research paper based on work directly related to the course.

COURSES IN LATIN

INTRODUCTORY COURSES

Students with no previous experience may begin the study of Latin with either Latin 1 or Latin 51. The series 1, 2, 3 begins in Autumn Quarter (5 units a quarter), the series 51, 52 begins in Winter Quarter (6 units a quarter) and is intended to cover the same ground at a more rapid pace, so that the series 101, 102, 103 forms a sequel equally to Latin 3 and Latin 52. During the first year some Caesar or other simple Latin prose will be read so as to prepare the students in the following year for Cicero, Virgil, Ovid, and other authors. These courses all form part of a series, but qualified students may be admitted to the class in winter or spring by consent of the instructor.

Students whose major work is in another department and who wish to fulfill a departmental foreign language requirement by taking Latin should consult their departmental advisors to determine what courses will be required, but most departments will be satisfied if part of the series 101, 102, 103 is completed.

1. First-Year Latin—For beginners. 5 units, Aut (Staff) MTWF 9
2. First-Year Latin—Continuation of 1. 5 units, Win (Staff) MTWF 9
3. First-Year Latin—Continuation of 2. 5 units, Spr (Staff) MTWF 9

51. First-Year Latin—Accelerated course. Completion of Latin 51 and 52 fulfills (DR:4). 6 units, Win (Devine) MTWThF 1:15
52. First-Year Latin—Continuation of 51. Completion of Latin 51 and 52 fulfills (DR:4). 6 units, Spr (Devine) MTWThF 1:15

The intensive Latin course (Latin 10) offered in Summer Quarter also prepares students to enter Latin 101 in Autumn Quarter.

INTERMEDIATE COURSES

Students will be admitted to these courses by completing Latin 3 or Latin 52 or on the basis of previous work done in secondary school or elsewhere. Usually two years of secondary school Latin qualifies a student for 101, three or four years for 111. New students should determine for which course they are best fitted by taking the Latin placement examination, which is set every autumn in orientation week, or by consultation with the department’s undergraduate advisor.

101. Second-Year Latin—Poetry and Prose of the Republic. (DR:2) 5 units, Aut (Treggiari) MWF with review session by arrangement
102. Second-Year Latin—The age of Nero. (DR:2) 5 units, Win (Courtney) MWF with review session by arrangement
103. Second-Year Latin—Selections from Virgil, Aeneid. (DR:2) 5 units, Spr (Staff) MWF with review session by arrangement
111. Horace, Odes. (DR:2) 4 units, Aut (Spofford) MWF
118. Post-Classical Latin—(Same as English 208.) Careful reading of Latin texts of graded difficulty, beginning with the Vulgate Bible, working through various patristic writings and medieval literature toward Latin of the Renaissance. 4 units, Win (MacCormack)

ADVANCED COURSES

161. Lucretius. 4 units, Win (Wigodsky)
163. Tacitus. 4 units, Spr (Courtney)
160. Individual Work. by arrangement
176. Senior Seminar. 4-5 units, by arrangement
199. Undergraduate Thesis. by arrangement

The sequence of authors in undergraduate courses is intended to provide an initial acquaintance with the best of classical literature, and to meet each student’s level of competence in the language. Modifications may be made to suit the needs and interest of each class.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

175. Latin Style and Syntax—This course is designed to teach some of the nuances of Latin syntax and style. Classes will be devoted to stylistic analysis of selected prose authors, the techniques of sight-translation, and the writing of idiomatic Latin prose. The course is designed for the major, but all students enrolled in Latin language courses are encouraged to take Latin 175 as soon as possible after the completion of 103. 4 units, Aut (Devine)
GRADUATE COURSES

201. Introduction to Classical Scholarship.
  1 unit, Aut, Win, Spr (Wigodsky and Staff)

  3 units, Aut, Win (Courtney, Wigodsky)

205. Latin Language and Style.
  3 units, Win, Spr (Courtney, Wigodsky)

The above courses are offered every year. Other courses alternate or vary from year to year. In 1982-83 there were literary seminars in the following authors or topics: Varro and Vergil’s Georgics, Epicurean Theology, Ancient Rhetoric and Literary Criticism. The following courses and seminars will be offered in 1983-84. See also seminars listed under Greek, Literature, Philosophy, Ancient History, Religion, and Mythology, Art and Archaeology, Indo-European Linguistics, and History of Science.

214. Horace and Greek Lyric Poetry.
  5 units, Win (Davis)

218. Vergil, Aeneid.
  5 units, Aut (Wigodsky)

227. Catullus 61-68.
  5 units, Spr (Courtney)

244. Cicero’s Letters and Contemporary Society.
  5 units, Win (Treggiari)

260. Directed Reading
  by arrangement

270. Latin Prose or Verse Composition
  by arrangement

Note: Some of the above courses may be continued in the following quarter by arrangement with the instructor. This will usually require the writing of an extended research paper based on work directly related to the course.

COURSES IN HEBREW

For courses in Hebrew, see Linguistics.

COURSES IN MODERN GREEK

31. Beginning Modern Greek.
  3 units, Spr (Prionas)

See also the Linguistics Department’s Special Language Program for other courses in Modern Greek.

GENERAL COURSES

No knowledge of Greek or Latin is required for these courses. Most of them are suitable both for those who have taken a Western Culture sequence and desire more thorough knowledge of some aspects of the ancient world, and for those who are currently enrolled in the Western Culture Program.

LITERATURE

11. Age of Heroes—This course will study the heroic epics of Greece (Homer), Mesopotamia (Gilgamesh), England (Beowulf) and France (Roland) and discuss their common features, the oral techniques used in composition, the narrative style, and the ethical values presented. Comparisons will be made with written epics such as Virgil’s Aeneid and later works. (DR:2)
  3-4 units, Spr (Edwards)

12. Greek Tragedy: Aeschylus, Sophocles, Euripides—(Same as Drama 151.) (DR:2)
  4-5 units, Win (McCall)

21. Romantic Comedy and Popular Fiction: Euripides to Shakespeare—This course studies the experimental plays of Euripides and Shakespeare, explores their background in ancient and renaissance novels and folk tales. A wide selection of tale-types is introduced from collections such as the 1,001 Nights, which students practice by telling in class. (DR:2)
  4 units, Spr (Winkler)

135. Classical Conventions in European Lyric—Analysis of several important “topoi” of European Lyric and their classical antecedents. Prerequisite: reading knowledge of one foreign language.
  4 units, given 1984-85

160. Individual Work.
  by arrangement

172. Classical Influences in Modern Literature—Themes from classical myth and history in selected Renaissance and later writers; parallel readings from ancient literature.
  3-4 units, given 1984-85

174. The Classical Tradition in European Literature.
  4 units, Win (Bolgar)

280. History of Rhetoric and Writing in the Middle Ages and Renaissance.
  5 units, Win (Bolgar)

PHILOSOPHY AND POLITICAL THEORY

3. Democracy and Imperialism—In one century Athens developed from an ordinary Greek city-state, just freed from dictatorship, into the leader of an offensive coalition of Greek states against Persia, and finally into the ruler of a reluctant empire. Another bloc, this time the oligarchical states, formed around Sparta and Corinth, and after a long war Athens was de-
This course will study, mainly in translated original sources, the development and interrelationships of democracy and imperialism, with the purpose of identifying the universal principles involved. (DR:3)

3 units, given 1984-85

8. Classical Politics—Lectures on the political philosophy of Plato and Aristotle and on their impact on political theory and practice in antiquity and in modern times. Reading of Plato's Republic, Aristotle's Politics, and related texts. (DR:3)

3 units, given 1984-85

9. Women in the Ancient World—Identifies the image of the female in ancient myth and religion, and discusses the actual status of women at various periods of antiquity. In addition to ancient literature, readings include some modern feminist studies.

3 units, Win (Stephens)

165. Hellenistic Philosophy—(Same as Philosophy 113.) The Epicurean and Stoic philosophers and their influence in Rome: the philosophical writings of Cicero and Seneca.

3-4 units, Spr (Wigodsky)

See also Philosophy 100, 111, 112, 211, 212.

ANCIENT HISTORY

These courses are accepted by the History Department for credit toward a major in History.

101. History of Greece—A survey of the history of ancient Greece from the Bronze Age through the Age of Pericles down to the death of Alexander the Great (323 B.C.). (DR:5)

4-5 units, Aut (Jameson) MTWTh

102. Greek and Roman History from Alexander to Caesar—A survey of the Mediterranean world from Alexander the Great to Julius Caesar (ca. 340-30 B.C.), including brief treatment of earlier Roman history from the foundation of Rome (ca. 750 B.C.); emphasis on the Hellenistic monarchies and the Roman Republic. (DR:5)

4-5 units, Win (Treggiari) MTWTh

103. History of the Roman Empire—A survey of the Roman Empire from its beginnings under Augustus through its consolidation and later crises to its transformation under Constantine into the Christian Roman Empire of the early Middle Ages (ca. 30 B.C.-330 A.D.). (DR:5)

4-5 units, Spr (Treggiari) MTWTh

107. Sailing to Byzantium: The Mediterranean World from Constantine to Leo III (312-717 AD)—(Same as History 112A.) The period marks a turning point in world history. The statecraft, religion and philosophy of imperial Rome were transformed by Christianity. In 330, Constantine founded Constantinople which for centuries was to be the capital of a Christian Roman empire. Meanwhile, Germanic invaders settled in Western Europe and later the Arabs and Islam came to dominate the Middle East. Reading will focus on original sources. (DR:5)

5 units, Win (MacCormack)

160. Individual Work in Ancient History.

By arrangement

181. Roman Society in the Age of Cicero and Augustus—(Same as History 206B.) A discussion of the social structure, institutions, and mores of a pivotal and well-documented period of Roman history. Topics will include the composition and life-styles of the senatorial class; slaves, freedmen, and the lower classes; the 'network' systems of clientela and amicitia; marriage and concubinage. Students will exploit the available sources: contemporary letters, speeches and poetry, later literary works, inscriptions, and juristic writings.

4 units, Spr (Treggiari)

See also History 212A.

(Courses at the 200 level are mainly for graduate students.)

244. Cicero's Letters and Contemporary Society.

5 units, Win (Treggiari)

251. Greek Epigrams.

5 units, Spr (Raubitschek)

261. Individual Work in Greek History.

By arrangement

262. Individual Work in Roman History.

By arrangement

RELIGION AND MYTHOLOGY

18. Greek Mythology—Topics will include Cosmology, the Herakles legend, the Underworld, Platonic myth-making, modern survivals, and the nature of myth itself. Readings will be supplemented with material drawn from Greek art and modern Greek folklore. (DR:3)

3-4 units, Aut (Rosenstock)

63. Comparative Mythology: Topics from Greek and Roman, Near-Eastern and African Culture.

3-4 units, given 1984-85

117. Greek Religion and Society—The origins and development of Greek religious phenomena from Mycenae to Byzantium. (DR:5)

3-4 units, given 1984-85


5 units, Aut (Winkler)
ART AND ARCHAEOLOGY

See also Art 005, 100 A, B, C, D, 201.

14. Classical Athletics — A study of the origins and the history of competitive sport in the ancient world, from the funeral games for Patroclus (Homer) to the chariot races in the Hippodrome of Constantinople, based on the literary and monumental evidence. Attention will be paid to the spirit of competition apart from athletics. Lectures (illustrated) and discussion groups. No prerequisites. (DR:5)

3 units, Win (Raubitschek)

20. Introduction to Classical Archaeology— Traces the history of archaeological exploration in Italy, Greece, and the Near East, starting with the artistic and intellectual inspiration of Classical antiquities during the Renaissance, describing major expeditions of discovery, the unearthing of previously unknown civilizations, and the development of modern techniques of excavation. Highlights great moments of discovery and decipherment, and surveys the present state of archaeological research in the centers of Classical and Near Eastern civilizations.

4 units, Aut (Munn)

106. Roman Art and Archaeology.

4 units, given 1984-85

108. Topography and Monuments of Greece.

3-4 units, Win (Munn)

109. The City of Athens— The history and archaeology of ancient Athens from the Bronze Age to the Roman period, focusing on the city in the time of Pericles and Socrates.

3-4 units, given 1984-85

119. Human Settlement and Landscape in the Aegean— (Same as Geology 119.) Lectures, seminars, and readings on the relations between civilization and landscape from the Old Stone Age to the present day, with emphasis on Greece. No prerequisites; the course is open to all undergraduates.

3 units, not given 1983-84

Field Research Program— It is expected that undergraduates who complete this course satisfactorily will be candidates for participation in a summer field program involving archaeological and geological research in Greece. The program is part of Stanford in Greece and is made possible by the Stanford on the Aegean fund. Participation is open to majors in all fields. For further information, please consult M. H. Jameson, Classics, or Tj. van Andel, Geology.

120. Greek Vase-Painting— (Same as Art 102.) A survey of Greek vases and their painters from the Protogeometric period onwards. Special attention will be given to the masters of Athenian black-figure and red-figure painting, and to the problems involved in distinguishing individual hands.

4 units, Aut (Maxmin)

127. Archaeological Practicum.

2 units, Aut, Win, Spr (Raubitschek, Munn) F 2:15-4:05

160. Individual Work in Human Settlement and Landscape in the Aegean.

by arrangement

(Courses at the 200 level are mainly for graduate students.)

260. Individual Work in Human Settlement in Landscape in the Aegean.

by arrangement

266. Problems in Archaeology: History from Archaeology.

5 units, Spr (Munn)

INDO-EUROPEAN LINGUISTICS

25. Greek and Latin Words in Medical Terminology— Study of the Greek and Latin roots of modern scientific vocabulary and of the origins and development of the English language. No foreign language required; recommended especially for pre-medical students.

3 units, Spr (Devine) MW 2:15

153. Introduction to Indo-European Linguistics— (Same as 253.) Prerequisite: some knowledge of Latin.

4 units, Aut (Devine) given 1984-85

221. Greek and Latin Phonetics.

5 units, Aut (Devine)


3 units, (Devine) by arrangement

253. Introduction to Indo-European Linguistics— (Same as 153, with extra work for graduate credit.)

5 units, Aut (Devine) given 1984-85

PROGRAM IN THE HISTORY OF SCIENCE

The Classics Department participates in the History of Science Program. For a description of the program see the section "History of Science Program" in this bulletin.

138A,B,C. Introduction to Cosmology— (Same as History of Science 138 A,B,C and Philosophy 138 A,B,C.) A three-quarter sequence on the history of the exact sciences, with special emphasis on the field of cosmology. Technical aspects of the classical theories (Ptolemaic and Copernican), including mathematics, astronomy, physics, and chemical theory, together with the more speculative aspects in natural philosophy and theology.
Completion of Classics 138A and 138B fulfills (DR:3) and (DR:6).

138A. Ancient Period.
4 units, Aut (Knorr) MWF 1:15

138B. Middle Ages to Newton.
4 units, Win (Knorr) MWF 1:15

138C. Newton to Einstein.
4 units, Spr (Knorr) TTh 1-2:10

238. Seminar in the History of Science.
Spr (Knorr) by arrangement

COMMUNICATION

Emeriti: Nathan Maccoby, Wilbur Schramm (Professors), Julian Blaustein (Adjunct Professor), Jules Dundes (Lecturer)
Chairman: Elie Abel
Director, Institute for Communication Research: Steven H. Chaffee
Director, John S. Knight Professional Journalism Fellowship Program: Lyle M. Nelson.
Managing Director: Harry N. Press
Director, Film and TV Production Center: Julian Blaustein


Associate Professors: William J. Paisley, Donald F. Roberts
Assistant Professor: Bella Mody

Professors (Teaching): Ronald Alexander (on leave Autumn and Winter), Marion Lewenstein

Assistant Professor (Teaching): Kristine Samuelson

Adjunct Professor: Julian Blaustein

Lecturers: Jules Dundes, Stephen E. Longstreth, Harry Press

Consulting Professor: Edwin B. Parker

The Department of Communication engages in research in communication and offers curricula leading to the A.B., A.M. and Ph.D. degrees. The Master of Arts degree prepares students for careers in print and broadcast journalism or documentary film or fiction screenwriting, or in applied communication research. The Ph.D. degree leads to careers in teaching and research or other related specialties. The Institute for Communication Research is the research arm of the department and offers research experience to advanced Ph.D. students.

The John S. Knight Professional Journalism Fellowship Program brings promising mid-career journalists to study at the University in a non-degree program. Twelve U.S. journalists are joined by five "International Fellows" sponsored by Reuters and The German Marshall Fund.

ADMISSION

All prospective undergraduate students should write the University's Office of Admissions.

All prospective graduate students should write to the Graduate Admissions Office, Stanford University, Stanford, California 94305.

The department requires that applicants for graduate admission include verbal and quantitative scores from the Graduate Record Examination (area scores are optional). This test requirement may be waived after written petition to the department only in exceptional circumstances when the applicant is prevented from taking the tests.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Undergraduate students must complete Communication 1 before they are accepted as a major. They normally should enroll in the department during either their sophomore or junior year.

A student planning a major in Communication is strongly urged, in consultation with the advisor, to select appropriate courses in humanities, social sciences, and natural sciences. Most commonly, majors take elective courses in anthropology, computer science, economics, English, history, political science, psychology, sociology and statistics and in such interdepartmental studies as American Studies, Urban Affairs, Human Biology, and African and Afro-American Studies.

One department degree program is offered, within which a student may choose to concentrate in: (a) the general study of communication and the mass media from a social science perspective; (b) the study of print and broadcast journalism; or (c) the study of film. The undergraduate major is considered a preprofessional program and is designed to provide a variety of offerings within the department combined with a flexible program of breadth and depth in courses outside the department. The burden of program development rests with students in consultation with their advisor.

To be recommended for the Bachelor of Arts degree in Communication, the students must
take at least 40 and may not count more than 50 units towards the A.B. degree within the department except with the prior written consent of their advisors. No more than 12 units of transfer credit or summer session credit may be applied to the departmental requirement. The student must also meet University distribution, writing and language requirements and complete a unified program of advanced courses (100 level or above), totaling at least 20 units, in another department, an interdepartmental program, an interdisciplinary honors program, but not in a second or co-equal major. Studio, performance or language courses may not be used to fulfill this requirement.

As part of the 40 to 50 units students take within the department, they must complete Communication 1 and one of the following sequences:

1. Students concentrating in the communication science sequence must complete:
   a) Communication 1
   b) One writing course from the journalism sequence, preferably Communication 100
   c) One course from Communication 101, 140, 141, 149, 176, 180, 196
   d) Communication 104
   e) Psychology 60, Statistics 60, or Statistics 70
   f) Three courses from the social science sequence (numbered 151 through 170, or others by arrangement with advisor)

2. Students concentrating in the film sequence must complete:
   a) Communication 1
   b) Two courses from Communication 101, 141, 180
   c) One course from the Communication social science sequence numbered 151 through 170
   d) One course from the journalism sequence, preferably 100
   e) Communication 149
   f) Communication 112 and 113

3. Students concentrating in the print and broadcast journalism sequence must complete:
   a) Communication 1
   b) Communication 140
   c) Communication 149
   d) One course from the communication social science sequence (numbered 151 through 170)
   e) Communication 100
   f) Communication 175
   g) Either Communication 107 and an additional specialized writing course or Communication 142A and B

An alternative degree is a Bachelor of Arts degree in Communication: Social Sciences. Requirements for this degree are a total of 40 to 50 units in Communication courses as specified in (1) above and 20 units of advanced courses in one or more other social science departments.

Students electing Communication as a secondary major must declare with the department.

Courses required to fulfill departmental requirements must be taken for letter grade unless offered only Pass/No Credit.

**GRADUATE PROGRAMS**

**MASTER OF ARTS**

The Master of Arts degree is awarded by the department in the fields of Journalism, Film, Broadcasting, and Applied Communication Research. The Master of Arts programs are terminal degree programs designed to train practitioners. Students interested in doctoral programs are evaluated for admission on different criteria, and students who complete the A.M. degree and who desire application to the Ph.D. program must file a new application for admission. They will be considered together with all other doctoral applicants. Requirements for the A.M. are as follows:

1. The candidate must earn at least 45 units in graduate residence at Stanford: candidates must be enrolled as a major in the department for at least two quarters; they must maintain a high academic performance during their entire program of study. At least 20 of the 45 units must be in courses numbered 200 or higher, and the other units in courses numbered 100 to 199. An independent project (on occasion a thesis) under the direction of a major professor must be undertaken. Three to six hours of credit in independent study may be applied to this requirement. A report of the project must be made to the professor directing the independent study. Completion of the entire program normally takes three to five quarters depending on the nature of the independent project, although it is typical that film students spend some longer time, depending on the complexity of their film project. Students in the fiction screenwriting sequence are required to submit a script within two years of completion of coursework. Students who have completed the courses and residence requirements may register as terminal graduate students.

2. A unified program of advanced course work is to be arranged with the approval of the advisor. This includes appropriate grounding in research methodology and communication theory and training in one or more communication media. Students with insufficient undergraduate background in the
appropriate social sciences may be required to take Communication 203 or another Communication Theory or Research Methods course.

3. Students in Film may concentrate in either documentary production and writing or fiction screenwriting. The documentary film production and writing sequence requires Communication 223A,B,C and 224A,B,C. The fiction screenwriting sequence requires Communication 211A,B,C and 212A,B,C. Courses in film aesthetics, history and criticism are also available. All students may select, in consultation with their advisors, other courses within or outside the department. The graduate seminar, Communication 208A, B, and C is required of all film students and is available to broadcast students.

Note: While the department maintains film production facilities for teaching and research purposes, the costs of supplies and processing services are the responsibility of the student. These costs currently approximate $2,500 for the three quarters.

4. Students in the Print and Broadcast Journalism master's program are required to take: Communication 200, 220, 240, 242A, 249, 275, and 290. Students emphasizing print will take Communication 207; students emphasizing broadcasting will take Communication 242B. Students with undergraduate journalism training or media experience should check with their advisors to determine which of the above departmental courses could be replaced with electives.

5. The master's program in applied communication research is a terminal program intended to train communication research practitioners in such fields of application as communication and national development, health communication, communication campaign planning and evaluation and communication and children. This is a quantitatively oriented curriculum that emphasizes the application of communication theory and research to the solution of practical problems. The program consists of a core curriculum in theory and methodology (Statistics or Psychology 60, Communication 206, 252, 267, 268, 253), an applications course in the specific area of the student's interest (Communication and Development, Health Communication, Communication and Children), directed study in applications of communication theory and research methodology, and an A.M. project.

DOCTOR OF PHILOSOPHY

The department offers the Doctor of Philosophy in Communication Theory and Research. Since the program's goal is to train communication scientists, the program is quantitative and behavioral in nature. All students are required to complete a core program in communication theory and research, research methodology, and statistics. Subsequent to completion of the core program, students may emphasize such areas as attitude formation and change, communication and children, communication and development, communication and health, public affairs communication, or information sciences. Regardless of the area of specialization, the Ph.D. program is designed primarily for persons interested in teaching and research careers or policy formation positions.

The Ph.D. program is designed to encompass four years of graduate study (subsequent to completion of the A.B. degree) during which, in addition to fulfilling University residence requirements, Ph.D. candidates are required to:

1. Satisfactorily complete all departmental course requirements.

2A. Pass general preliminary examinations by the beginning of the second academic year of study and specialization examinations by the completion of the third academic year of study.

2B. By the end of the second year, a student is expected to complete departmental qualifying examinations and the first-year research project, after which the student must apply to the University for candidacy.

3. Demonstrate proficiency in tools required in area of specialization. Chosen with the advice of the faculty, such tools may include foreign languages, statistics, computer programming, etc.

4. Complete both a master's research project (first-year project) and a pre-dissertation research project (second-year project).

5. Teach or assist in teaching at least two courses.

6. Have at least one year of work experience in the mass media or in another activity relevant to the area of specialization, prior to writing the dissertation.

7. Complete a dissertation satisfactory to an advisory committee of three or more faculty members and to the University Committee on the Graduate Division.

8. Pass the University oral examination, which may be either a comprehensive covering the same area as the written specialization examination or a defense of the dissertation.

Because the multidisciplinary nature of the department makes it possible for the Ph.D.
student to emphasize one of several areas of communication study, there tend to be several “typical” programs of course work followed by various students depending on their area of specialization. Generally, the variation in course programs tends to occur after the first year of graduate study, the first year primarily being devoted to basic “core” courses required of all students.

The department requires that all Ph.D. students fulfill the following course requirements:

A. Communication 311A: Theory of Communication I
B. Communication 311B: Theory of Communication II
C. Communication 313: Computer Analysis of Communication Research Data
D. Communication 317: Doctoral Research Methods I
E. Communication 318: Doctoral Research Methods II
F. Communication 319: Doctoral Research Methods III

One of the following, two-quarter statistics sequences (to be completed by the end of Winter Quarter in the first year):

A. Psychology 60: Statistical Methods
Psychology 151: Statistical Methodology
B. Statistics 160: Introduction to Statistical Methods I
Statistics 161: Introduction to Statistical Methods II
C. Education 250A: Statistical Analysis in Educational Research
Education 205B: Statistical Analysis in Educational Research
D. Any two equivalent courses

Students must also complete a third course which will advance their knowledge in a broad area of statistics, preferably in analysis of variance or multivariate analysis. Each of the following courses would satisfy the requirement:

A. Psychology 152: Analysis of Data
B. Statistics 201: Introduction to Data Analysis
C. Statistics 205: Introduction to Nonparametric Statistics
D. Statistics 206: Applied Multivariate Analysis
E. Education 250C: Statistical Analysis in Educational Research II
F. Education 250D: Statistical Analysis in Educational Research
G. Any equivalent course agreed to by the department

In addition, students must complete a minimum of four other advanced Communication Theory courses (numbered 320 and higher). Specification of these courses depends on (a) individual student needs in order to prepare for preliminary and area examinations, and (b) the requirements of the particular area of emphasis chosen by the student. In rare instances, Ph.D. level courses from other departments may be substituted for part of this requirement. They should be chosen in consultation with the advisor.

Finally, students must complete:

A. Communication 397: First-year Research Project
B. Communication 398: Pre-dissertation Research Project

Depending on the area of Communication study the student chooses to emphasize, additional courses are selected, with the assistance of the advisor, from within the department’s offerings and from other University departments. Requirements vary depending on the area emphasized.

Ph.D. candidacy expires five years after admission to candidacy by the University Committee on the Graduate Division. Reapplication will require reexamination.

Other programs leading toward the Ph.D. and involving communication may be pursued in the Graduate Division Special Programs. These are individually planned for unusually well-qualified students.

**Ph.D. MINOR IN COMMUNICATION**

Candidates for the degree of Doctor of Philosophy in other departments who elect a minor in Communication will be required to complete a minimum of 20 units of graduate courses in the Communication department, including a total of three theory or research methods courses, and will be examined by a representative of this department. The balance among communication theory, methods, and applications courses will be determined by the candidate and his or her senior advisor.

**THE INSTITUTE FOR COMMUNICATION RESEARCH**

The Institute for Communication Research operates as an office of project research for the faculties of the Department of Communication and other departments, on grants from foundations, communication media, and other agencies, on government grants and contracts, and on its own funds. Research assistantships are often available to qualified Ph.D. students in Communication. Among the qualifications which will be highly valued in applicants are high scholarship, training in the behavioral sciences (including training in statistics and research methodology), and training for or experi-
ence with the mass media. For further information write to the director.

MASS MEDIA INSTITUTE

During the Summer Quarter, the Department of Communication conducts a series of 8 week-long workshop production courses in Film, Television and Journalism. These are designed as pre-professional training courses, and are open to students with junior or higher standing at Stanford and other colleges and universities. Additional courses dealing with Film Aesthetics, Broadcast Writing, Magazine Writing, Public Broadcasting, Mass Media Law, Broadcast Management and Mass Communications in Society are also offered. Stanford undergraduates may apply a maximum of 12 units to their Communication major requirements.

Information about the Mass Media Institute may be obtained by writing to Jules Dundes, Director, Mass Media Institute, Department of Communication, Stanford University, Stanford, CA 94305.

COURSES PRIMARILY FOR UNDERGRADUATES

1. Mass Communication and Society—An introduction to human communication theory and to mass communication and its effect on society; the responsibility and ethics of the press; the role of economics and government regulation in determining what the consumer of mass media messages receives. Open to non-majors. (DR:5)

5 units, Aut (Rogers) MWF 9 plus sections by arrangement

100. Editorial Techniques I—A reporting and writing course emphasizing various forms of journalism: news, interpretation, features, opinion. Detailed criticism of writing. Prerequisite: typing speed of 35 words a minute.

5 units, Aut (Lewenstein, Staff)
MW 2:15-3:05, TTh 1:15-2:05, TTh 11 and workshop
Th 2:15-4:05
Win (Staff)
Spr (Staff)
Sum (Staff)
plus weekly two-hour workshop by arrangement

101. Film Aesthetics—(Graduate students register for 201.) A theoretical, historical examination of the nature of the film medium. Attention is given to the problems of aesthetics and communication from the viewpoints of the practitioner, the critic, and the audience.

4 units, Spr (Breitrose) TTh 1:15-2:05; evening screenings by arrangement
3 units, Sum (Staff)

103. Precision Journalism—(Graduate students register for 203.) A practicum in the use of social science techniques by journalists as a means for accurate reporting about social and political trends. Class project will involve doing a public opinion survey and/or content analysis of public documents. The data will be used to write a series of in-depth news stories. Non-majors may opt to use the data to write a final paper.

4 units, Win (Staff) MWF 10-11

104A. Broadcast Documentary Writing—The specialized craft of writing documentary programming for television and radio broadcast.

3 units, Sum (Mayes)

104B. Broadcast Writing—Suitable for news reporters, television and radio commentators, broadcast talks, script writers.

3 units, Sum (Mayes)

106. Communication Research Methods—Formulation of research problems, research design, sampling, data collection, and analysis. A variety of studies will be critically evaluated. The class will design and conduct a small communication study.

4 units, Win (Paisley) T 2:15-5:05

107. Editorial Techniques II—Copy editing, headline writing, news display, and picture cropping. With laboratory that includes editing copy. Associated Press, news evaluation and page make-up. Prerequisite: 100.

2 units, Win (McIntyre)

112. Writing for the Visual Media—Emphasis is placed on conceptualizing and executing film ideas in a series of short exercises, as well as on preproduction for films to be made in Comm. 113. To be taken concurrently with Comm. 113. Prerequisite: consent of instructor.

5 units, Win (Samuelson) TTh 10-12
Spr (Samuelson) MW 10-12

113. Visual and Aural Communication Techniques—An investigation of the techniques of cinematography and sound from the standpoint of the communication of ideas. Students will produce short exercises and a short film. The course is designed mainly for undergraduates. Prerequisites: 112 and consent of instructor.

5 units, Win (Longstreth) MW 10-12, Spr (Alexander) TTh 10-12 and tutorials by arrangement

115. Ethnographic Film—(Same as Anthropology 128.) Nature of the ethnographic film as a documentary form is examined through viewing and analysis of classical and current films; also explores uses of film and video tape as a tool for
the analysis and presentation of cognitive, social and kinesic aspects of culture and as a vehicle for the anthropological research.

5 units, Spr (Gibbs) MF 10
and W 7:30 p.m.

121S. The New Technologies—An examination of technological, institutional and societal aspects of the new technologies: CATV, direct broadcast satellites, videotapes and video disk, text handling and information management.

3 units, Sum (Kaufman)

125. Problems of the Mass Media—(Graduate students register for 225.) Visiting lecturer series. Prerequisite: any other Communication course. May be repeated once for credit.

1 unit, Aut (Nelson) T 4:15-5:05

131. Media Ethics and Responsibilities — (Graduate students register for 231.) An examination of the performance of the various media of mass communication in the light of ethical standards, employing case studies, text, and discussion sessions. In addition to media ethics, the course deals with such current media problems as the dwindling of the journalistic channels, the changing roles of the media, media accountability, and the relationships between government and the media.

4 units, Win (Rivers) TTh 11

139. Literature of the Press—Readings from the writings of journalists — about their lives, about their work. Several basic readings for all students; additional readings by individual students for the purpose of leading seminar discussions. Ideas to be discussed: journalist in historical perspective; journalist as initiator or follower of political and social trends; journalist as propagandist; journalist as mediator of popular culture. Enrollment limited to 15.

4 units, given 1984-85

140. History of American Journalism — (Graduate students register for 240.) Evolution of the democratic mass media in their social, political, economic, technological and professional aspects, with special attention to coverage of specialized phenomena such as women, minorities, science, courts and others.

4 units, Win (Lewenstein)

141. History of Film — (Graduate students register for 241.) Studies in the development of the motion picture as an art form and a means of communication. Lab: Screenings of films announced in class.

4 units, Win (Staff) MW 3:15-5:30
plus evening film showings

142A. Broadcast Journalism I—Writing, production and direction of radio and TV news. Prerequisites: 100 and consent of the instructor.

5 units, Aut (Vale) MW 11 and lab by arrangement

142B. Broadcast Journalism II — Writing, production, and direction of radio and TV news. Prerequisites: 100 and consent of the instructor.

5 units, Win (Vale) MW 11
and lab by arrangement

142C. Broadcasting in America—(Graduate students register for 242C.) The development of American broadcasting and its contemporary problems.

4 units, Spr (Vale) MWF 11

149. Communication Law—(Graduate students register for 249.) (Same as Law 149.) This course introduces non-law students to mass communication law and policy, especially legal issues of importance to journalists; access to the media, libel, privacy, shield laws, trial coverage, censorship, obscenity, pornography and antitrust cases. The course will also be concerned with the regulation of the tele-communications industry by the FCC.

5 units, Aut (Trice)

150. Magazine Writing—(Graduate students register for 250.) Practice in writing magazine articles, with emphasis on marketing manuscripts. Conferences. Prerequisite: 100.

4 units, Spr (Rivers) TTh 11
3 units, Sum (Staff)

155. Women and the Mass Media—This course will examine images of women in media and audience effects of media stereotyping. Employment practices and opportunities as well as strategies for dealing with media institutions will be discussed. Not offered every year.

4 units, Spr (Staff)

156. Scientific and Technical Communication —(Graduate students register for 256.) How scientific findings and technological innovations are communicated to scientists and technologists, policy makers, legislators, professionals (e.g., in medicine), and the public at large. This overview of the communication systems of science and technology covers both “horizontal” and “vertical” flows of information as affected by economic, political, social and psychological factors. (DR:5)

3 units, Win (Paisley)

157. Public Information Programs— (Graduate students register for 257.) Emphasizing health information programs and their effects on public knowledge, attitude, and behavior, this course also examines information programs concerned with energy conservation, environmental protection, educational and occupational opportunity, consumerism, etc. The
interplay of research and fieldwork will be analyzed in case studies of successful programs.

3 units, Aut (Paisley) MW 11-12

158. Organizational Communication—(Graduate students register for 258.) Interpersonal and organization factors affecting communication efficiency in organizations. Topics include information processing, motivation, leadership styles, environmental uncertainty, and communication networks.

3 units, Spr (Staff) given 1984-85

159. Communication Network Analysis—See 259. May be taken by undergraduates with consent of instructor.

160. Seminar: Media and Politics—(Same as Political Science 194D.) Examines the links between mass media and government, on the one hand, and between media and the individual citizen, on the other. Via an examination of the relevant literature, questions of the role of the “organization” of the media in the formation of “news,” “biases,” and the “effects” of media on individual “agenda,” attitudes and behaviors will be explored.

5 units, Win (Brody, Chaffee) T 2:15-4:05

161. Diffusion of Innovations—(Same as Values, Technology, Science and Society 172.) (Graduate students register for 267.) Course takes multidisciplinary approach to diffusion in business, education, law, government and consumer groups. Emphasis is on role of communication in spread of new technology, new ideas, and new values among individuals, within organizations, and among organizations in the U.S. and abroad. Special emphasis upon computer related innovations, energy conservation innovations and on scaling down in a limited-growth future.

3-4 units, Spr (Rogers) TTh 11-1

162. Formative Research for Message Design—(Graduate students register for 268.) Focuses on low-cost research methods for the systematic design of persuasive messages. Lectures and weekly assignments deal with setting behavioral objectives, identification of audience characteristics, assessment of information needs, selection of instructional strategy, production of draft messages, pre-testing of draft messages, utilization of messages, and feedback systems design.

3 units, Spr (Mody) TTh 3:15-5:05

163. Interactive Communication Technologies—Surveys the development of videotext, teletext, interactive cable, and microcomputers as communication systems and tools. Analyzes technological, social, economic, and political effects. Compares the American experience with European and Japanese experience.

4 units, Spr (Paisley, Rogers) by arrangement

170. Communication and Children I—(Graduate students register for 270.) How children come to use the mass media, what information they obtain from the media, and how their behavior is influenced by the media. Prerequisite: Communication 1 or equivalent. (DR:4)

4 units, Win (Roberts) TTh 10-11:50

171. Communication and Children II—(Graduate students register for 271.) Continuation of 170. Open to a limited number of students by consent of instructor.

3 units, Spr (Roberts) TTh 10-11:50

175. Reporting of Public Affairs—Coverage of traditional news beats, such as police, city hall, education and courts as well as issue-oriented coverage of policy area beats. Prerequisite: 100.

5 units, Win (Rivers) TTh 2:15-4:05

176. International Communication: Structures and Issues—(Graduate students register for 276.) Comparative survey of different national media systems and the policy issues arising from the existing imbalances between developed and developing countries. This seminar examines the new technologies that have transformed the global flows of news, economic data, cultural and technical information. Prerequisite: Communication 1. Seniors and graduate students in communication and international relations have first priority, with permission of instructor.

4 units, Aut (Abel) W 9-11

177. Specialized Workshops—(Graduate students register for 277.) One or more classes will be offered in specializations such as Science Writing, Sports Writing, or other areas. These classes will be organized around writing projects oriented toward the field of specialization. Consult the Time Schedule for specific course offerings each term.

177A. Specialized Workshops—Analyzing the News—(Graduate students register for 277A.) Thrust of seminar is to learn how the news analyst functions, whether writing editorials, broadcast commentaries or background articles. Students will try their hands at all these forms, designed to clarify public events rather than to exhort. Open to seniors and graduate students, with instructor’s permission.

4 units, Spr (Abel) MW 11

177B. Specialized Workshop—Science Writing. (Graduate students register for 277B.)

4 units, Spr (Abel) MW 1:15-3:05

177C. Specialized Workshop—In Depth Reporting—(Graduate students register for
This course will be the study and practice of reporting that involves researching, organizing, and writing about subjects for which information is not readily available. Students will write investigative stories.

4 units, Spr given 1984-85

178. Media Management—Designed to acquaint students with the management and financial aspects of media organizations. Topics: capital investment decisions; circulation and audience-share planning; advertising strategies; personnel management; new technologies and their influence on business decisions; financial controls and promotion. Students examine the interplay between editorial and business decisions.

4 units, Spr (Lewenstein)

180. Film Criticism—(Graduate students register for 280.) An attempt to develop a critical view of film. Readings and discussion will consider models of artistic and literary criticism as points of comparison. The student will be introduced to journalistic, psychoanalytical, Marxist, structuralist and semiological approaches. Weekly reviews will stress the meaning of the films and a lucid writing style. Prerequisites: 100 and 101, or 141.

4 units, Spr (Breitrose) given 1984-85

185. Internship Experience—Professional experience in the media. Open only to Communication majors.

0 units for graduate students

1-4 units for undergraduate students

Aut, Win, Spr (Lewenstein)

by arrangement

190. Film Criticism—(Graduate students register for 280.) An attempt to develop a critical view of film. Readings and discussion will consider models of artistic and literary criticism as points of comparison. The student will be introduced to journalistic, psychoanalytical, Marxist, structuralist and semiological approaches. Weekly reviews will stress the meaning of the films and a lucid writing style. Prerequisites: 100 and 101, or 141.

4 units, Spr (Lewenstein)

180. Film Criticism— (Graduate students register for 280.) An attempt to develop a critical view of film. Readings and discussion will consider models of artistic and literary criticism as points of comparison. The student will be introduced to journalistic, psychoanalytical, Marxist, structuralist and semiological approaches. Weekly reviews will stress the meaning of the films and a lucid writing style. Prerequisites: 100 and 101, or 141.

4 units, Spr (Breitrose) given 1984-85

185. Internship Experience—Professional experience in the media. Open only to Communication majors.

0 units for graduate students

1-4 units for undergraduate students

Aut, Win, Spr (Lewenstein)

by arrangement

199. Individual Work—Major students with high academic standing are permitted to undertake individual work.

1-4 units, any quarter (Staff)

by arrangement

COURSES PRIMARILY FOR A.M. STUDENTS

200. Editorial Techniques I—A reporting and writing course emphasizing various forms of journalism: news, interpretation, features, opinion. Detailed criticism of writing. Prerequisite: typing speed of 35 words a minute. For graduate students.

5 units, Aut (McIntyre) TTh 9-10

plus weekly two-hour workshop

by arrangement

200S. Basic Film Production—Introduction to film writing and production techniques, covering the basics of cinematography, sound and editing.

9 units, Sum (Alexander)

201. Film Aesthetics—Graduate section. See 101.

203. Precision Journalism—Graduate section. See 103.

206. Communication Research Methods—Graduate (M.A.) section, see 106.

207. Editorial Techniques II: Journalism Editing — Graduate section.

Aut (Steiner)

208A. Seminar in Film and Broadcasting I—Limited to Film and Broadcasting A.M. students.

1 unit, Aut (Breitrose) given 1984-85

208B. Seminar in Film and Broadcasting II—Limited to Film and Broadcasting A.M. students.

1 unit, Win (Breitrose), given 1984-85

208C. Seminar in Film and Broadcasting III—Limited to Film and Broadcasting A.M. students.

1 unit, Spr (Breitrose) M 4:15-6

209S. Broadcasting News Workshop—Production and direction of news and documentary television programs. Prerequisite: consent of instructor.

9 units, Sum (Hewitt)

210S. Television Production Workshop—Studies in television production theory and techniques in both studio and remote locations. Mini-documentaries, public service programs, and program promotion are emphasized.

9 units, Sum (Sood)

211A. Screenwriting I—Introduction, through reading, discussions, and assignments, to screen and television writing. To be taken concurrently with 212A. Admission by application to the master's program.

5 units, Aut (Blaustein) TTh 2:15-4:05

211B. Screenwriting II—Development of material to form the basis of a full screenplay to be written for 211C. Follows 211A, which is a prerequisite. To be taken concurrently with 212B.

5 units, Win (Blaustein) TTh 2:15-4:05

211C. Screenwriting III—Divided between seminar in more advanced writing and individual work with instructor on student's script. Prerequisites: 211B and consent of instructor.

5 units, Spr (Blaustein) MW 2:15-4:05

212A. Script Analysis I—First of one-year series required for master's in screenplays to implement the work in the 211 series. Both adaptations and original material will be used, and there will be screenings of films based on several of the scripts. To be taken concurrently with 211A. Admission by application to the master's program.

5 units, Aut (Blaustein) W 10-11:50, W 1:15-3:05
212B. Script Analysis II—Continuation of 212A, which is a prerequisite.
  5 units, Win (Blaustein) MW 2:15-4:05

212C. Script Analysis III—Continuation of 212B, which is a prerequisite.
  5 units, Spr (Blaustein) TTh 2:15-4:05

213. Seminar: Drama on Stage and Screen—
  (Same as Drama 352A.)
  5 units, Spr (Esslin) MW 10-12

220. Mass Media in Society—The nature and
  social responsibilities of the media, the structure of the industry, and problems and issues in
  the mass media. Primarily for A.M. students.
  4 units, Aut (Staff) TTh 10-11:50
  3 units, Sum (Dundes) MWF 11

222. Documentary Film—Analysis of the tech-
  niques and strategies of films designed to effect
  attitudinal and behavioral change. Prerequisite:
  Consent of instructor.
  4 units, Spr (Staff) given 1984-85

223A. Documentary Writing I—Emphasis is
  placed on conceptualizing and executing ideas
  for the production work done jointly with 224A
  as well as on preproduction for that work. The
  course will include some introductory writing
  assignments. To be taken concurrently with
  224A. Open to graduates only. Prerequisite:
  Consent of instructor.
  5 units, Aut (Samuelson) TTh 10-11:50

223B. Documentary Writing II—Form and
  style in the construction of fiction and non-
  fiction scripts. Much attention will be given to
  script for the film to be made jointly with 224B
  and 224C. Writing assignments will aim at pre-
  paring the student for a full script to be written
  for 223C. To be taken concurrently with 224B.
  Prerequisite: Consent of instructor.
  5 units, Win (Samuelson) 10-11:50

223C. Documentary Writing III—Course
  divided between seminar in more advanced
  writing and individual work with instructor on
  student’s script. Time will also be devoted to
  problems revealed by work on productions for
  224C. To be taken concurrently with 224C.
  Prerequisite: Consent of instructor.
  5 units, Spr (Samuelson) TTh 10-11:50

224A. Film Production I—First quarter of a
  three quarter sequence leading to professional
  training in motion picture production. Super 8
  exercises and a short 16 mm non-synchronous
  film with sound track comprising narration,
  music and sound effects. Prerequisite: Concur-
  rent registration in 223A.
  5 units, Aut (Longstreth)  
  and tutorials by arrangement

224B. Film Production II—Produce a short
  16mm film in color utilizing synchronous-
  sound. Project will be carried through post-
  production to an answer print. Prerequisites:
  successful completion of 223A and 224A and
  concurrent registration in 223B.
  5 units, Win (Longstreth)  
  MW 10-11:50

224C. Film Production III—Final quarter of
  professional training in motion picture produc-
  tion. A five minute, 16 mm film utilizing all
  skills acquired in 224A and 224B. Prerequisites:
  Successful completion of 224B and concurrent
  registration in 223C.
  5 units, Spr (Alexander)  
  MW 10-11:50

225. Problems of the Mass Media—Graduate
  section. See 125.

230. International Telecommunication Agree-
  ments—(Same as Engineering 205.) Examination
  of the International Telecommunication
  Union (ITU) as a model for worldwide collabora-
  tion in resource allocation, standardization, and
  planning of services. Interdisciplinary focus on
  outcomes achieved by voluntary agreement.
  Case studies of ITU action, particularly in new
  services. Lectures and study projects.
  3 units, Sum (Wallenstein) W 7-9 p.m.

231. Media Ethics and Responsibilities —
  Graduate section. See 131.

240. History of American Journalism —
  Graduate section. See 140.

241. History of Film — Graduate section. See
  141.

242A. Broadcast Journalism I—Writing, de-
  livery and direction of radio and TV news.
  Prerequisites: 200 and consent of instructor.
  4 units, Aut (Staff) TTh 10-11:50

242B. Broadcast Journalism II—Writing,
  direction and production of radio and television
  news. Prerequisites: 243A, and consent of in-
  structor.
  4 units, Win (Staff) TTh 1:15-3:05

242C. Broadcasting in America — Graduate
  section. See 142C.

249. Communication Law — Graduate
  section. See 149.

250. Magazine Writing — Graduate section. See
  150.

251. Communication and Development—Re-
  quired for master’s students specializing in
  Communication and National Development. A
  critical review of the literature on the causes of
  underdevelopment, the nature of development
  planning, and the potential and practice of mass
298  SCHOOL OF HUMANITIES  
AND SCIENCES

media in Third World countries as a tool of transformation.
3-5 units, Spr (Rogers) TTh 3:15-5:05

252. Communication Theory and Social Change—This course is required for the Applied Communication Research A.M. program. Surveys theories of communication process and effects and applies them to real-life problems of social change.
3-5 units, Aut (Roberts) TTh 10-11:50

253. Evaluation Research Methods—(Same as Education 214.) Nature of summative and formative evaluation and evaluation designs, problems of field work, construction of instruments, questions of methodology, data analysis, and utilization of results. Prerequisites: basic statistics, Communication 204 (or equivalents).
3-5 units Spr (Chaffee) TTh 10-11:50

256. Scientific and Technical Communication — Graduate section. See 156.

257. Public Information Programs — Graduate section. See 157.

258. Organizational Communication — Graduate section. See 158.

259. Communication Network Analysis — Describes (1) the process through which interpersonal communication networks influence individual behavior in voting, consumer purchases, and occupational choice, and (2) who is linked to whom in networks. Presents methodologies for network analysis, based upon a convergence model of communication.
4 units, Spr (Rogers) MWF 9

given 1984-85


268. Formative Research for Message Design — Graduate section. See 168.

269. Interactive Communication Technologies—See 169.

270. Communication and Children I — Graduate section. See 170.

271. Communication and Children II — Graduate section. See 171.

273. Communication and Health—Seminar on campaigns designed to change information attitudes and behavior with particular reference to health. Designed for graduate students in Communication. For others, consent of instructor. Not taught every year. Consult Time Schedule.
4 units, Win (Staff) by arrangement

275. Reporting of Public Affairs—Coverage of traditional news beats, such as police, city hall, education and courts as well as issue-oriented coverage of policy area beats. For graduate students. Prerequisite: 100.
5 units, Win (Levenstein) TTh 2:15-4:05


277. Specialized Workshops — Graduate sections. See 177.

277A. Specialized Workshop — Analyzing the News—Graduate section. See 177A.

277B. Specialized Workshop — Science Writing—Graduate section. See 177B.

277C. Specialized Workshop — In Depth Reporting—Graduate section. See 177C.

280. Film Criticism — Graduate section. See 180.

290. A.M. Project.
4 units, any quarter (Staff) by arrangement

298. Thesis.
6-10 units (Staff) by arrangement

299. Individual Work.
1-4 units, any quarter (Staff) by arrangement

COURSES PRIMARILY FOR Ph.D. STUDENTS

311A. Theory of Communication—Approaches to communication theory; seminar and tutorial meetings; extensive reading and papers. Required of all Communication doctoral students; others by consent of instructor.
4-5 units, Aut (Roberts) TTh 3:15-5:05

311B. Theory of Communication—Continuation of 311A. Prerequisite: 311A.
4-5 units, Win (Chaffee) TTh 1:15-3:05

313A. Introduction to the Use of the Computer—Specifically for social science data analysis. Includes a brief discussion of computing concepts, followed by use of WYLBUR and EDIT, text editors on SCIP and LOTS systems; SPSS; and data storage.
0-3 units, Aut (Staff) F 1:15-2:05

313B. Introduction to the Use of the Computer—Continuation of 313A. Prerequisite: 313A.
0-3 units, Win (Staff) F 1:15-2:05

317. Doctoral Research Methods I — Application of scientific method to communication research. Logic of inquiry; conceptualization of variables; design of experiments, quasi-experiments, and noneperiments. Previous or concurrent enrollment in statistics required.
4 units, Aut (Chaffee, Rogers) MW 3:15-5:05
318. Doctoral Research Methods II—Continuation of 317. Sampling questionnaire design, attitude scale construction, survey administration, computer analysis of data.
4 units, Win (Roberts) MW 3:15-5:05

319. Doctoral Research Methods III—Continuation of 318. Selected multivariate models of importance to communication research, non-experimental causal inference, other advanced topics in data analysis.
4 units, Spr (Paisley) MW 3:15-5:05

359. Communication Network Analysis—See 259.

370. Advanced Communication Theory and Method Seminar I—May be repeated for credit. Topic and instructor change each year. Prerequisites: 311A and 319.
3 units, Aut (Staff) by arrangement

371. Advanced Communication Theory and Method Seminar II—May be repeated for credit. Topic and instructor change each year. Prerequisite: 311A and 319.
3 units, Win (Staff) by arrangement

372. Advanced Communication Theory and Method Seminar III—May be repeated for credit. Topic and instructor change each year. Prerequisites: 311A and 319.
3 units, Spr (Staff) by arrangement

375. Communication Theory Review Seminar—Limited to Ph.D. students. Prerequisites: 311A, 311B.
3 units, Spr (Roberts) by arrangement

397. First-Year Research Project—Individual research in lieu of Master's thesis.
3-6 units, Aut, Win, Spr (Staff) by arrangement

398. Pre-Dissertation Research Project—Advanced research for Ph.D. candidates.
3-6 units, Aut, Win, Spr (Staff) by arrangement

399. Advanced Individual Work.
1-8 units, Aut, Win, Spr (Staff) by arrangement

400. Dissertation Research.
6-10 units, Aut, Win, Spr (Staff) by arrangement

---

COMPARATIVE LITERATURE

Committee in Charge: John Freccero (Chairman), Beverly Allen, John Bender, René Girard, Herbert Lindenberger, William M. Todd III, John Wang, David Wellbery

Professors: Gerald Gillespie (German Studies and Comparative Literature), David G. Halliburton (English, Comparative Literature, and Modern Thought and Literature), Herbert Lindenberger (Comparative Literature and English), James J. Y. Liu (Chinese and Comparative Literature), Charles R. Lyons (Drama and Comparative Literature), Makoto Ueda (Japanese and Comparative Literature)

Associate Professors: N. Gregson Davis (Classics and Comparative Literature), Mary Pratt (Spanish and Portuguese and Comparative Literature), William M. Todd III (Slavic and Comparative Literature)

Assistant Professors: Sandra E. Drake (English and Comparative Literature)

The interdepartmental program in Comparative Literature admits students for the Ph.D. It works toward the Ph.D. in individual language departments and, in conjunction with the Humanities Honors Program, offers a concentration in Comparative Literature for undergraduates.

UNDERGRADUATE PROGRAM

HONORS PROGRAM

The undergraduate program is designed for students who combine a strong commitment to literary study with the drive and the ability to master foreign languages. Students planning to concentrate in Comparative Literature must apply for admission to the Humanities Honors Program and for graduation with Honors in Humanities.

Freshmen and sophomores interested in the program must first consult with the Chairman of the Humanities Honors Program. Because of the rigorous language requirements the consultation should take place at the earliest opportunity, preferably during the freshman year. Students who have not started their second foreign language by the sophomore year have little chance of fulfilling the program requirements on schedule. No student may declare a major later than two weeks after the start of the junior year. After admission to the program, the student will be assigned an advisor representing the Committee on Comparative Literature.
Comparative Literature as a major is one of the options within the Humanities Honors Program major. Students in the program do not need to complete an additional major in another department but, in order to satisfy the final requirement listed below, they will normally have the equivalent of a major in a single national literature. Requirements are as follows:

1. Completion of the Western Culture Requirement—15 units, freshman year, with an average of at least B and an A- or better in at least one quarter of the sequence. Students who think that they may wish to concentrate in Comparative Literature are urged to select Comparative Literature 21, 22, 23 to fulfill the Western Culture requirement.

2. Humanities 90—5 units, sophomore year.

3. Two seminars drawn from the series Humanities 191-196, of which one must be Humanities 194.

4. At least three literature courses in a foreign language and at least one advanced course—preferably a literature course—in a second foreign language.

5. One literature course—not necessarily in the original language—drawn from a cultural tradition distant from that of the student's main areas of interest.

6. Two additional literature courses drawn from the following:
   a) Courses listed under Comparative Literature.
   b) Courses offered in translation by the foreign language departments in languages outside the student's two languages.
   c) Advanced literature courses offered at the overseas campuses.

7. Honors essay—an essay in literary criticism (2 units, spring, junior year; 5 units, autumn, 5 units, winter, senior year). A grade of at least B is required on the essay for graduation with Honors in Humanities.

8. Two courses related to the student's total program, but drawn from disciplines outside literature.

9. Course distribution should be designed in such a way that students develop an extensive background (about six courses covering a large range of periods) in a single national literature read in the original language. Students may fulfill this requirement through work either in the English department or in one of the language departments.

GRADUATE PROGRAM

DOCTOR OF PHILOSOPHY

The Ph.D. program is designed for a small group of students whose linguistic background, breadth of interest in literature, and curiosity about the problems of literary scholarship and theory (including the relation of literature to other disciplines) make this program more appropriate to their needs than the Ph.D. in one of the individual literatures. Students will take courses in at least three literatures (one of which may be English), to be studied in the original languages. The program is designed to encourage familiarity with the major approaches to literary study prevailing today.

A considerable part of a student's work will consist of individual study toward the Ph.D. examination, for which each student uses his or her own reading lists. The examination is centered not on national lines, but on the study of particular periods, genres, and problems of literary study. Students are admitted to the program as Comparative Literature Fellows on a plan which attempts to integrate their financial support and their completion of residence requirements with training as prospective university teachers. Tenure as a Fellow, assuming satisfactory academic progress, will be for a maximum of four years (graduate-level work in literature completed elsewhere being counted as part of this four-year period). The teaching requirement is the same regardless of financial support. For specific teaching requirements, see below. Although financial support is limited to four years, the time-table for the completion of requirements allows students to spread their work over five years. Students in the fifth year ordinarily apply for outside fellowships or for part-time teaching positions in the various language and literature departments at Stanford.

REQUIREMENTS

Residence—A candidate for the Ph.D. degree must complete three years (nine quarters) of full-time work, or their equivalent, in graduate study beyond the Bachelor of Arts degree. The student will be expected to offer at least 72 units of graduate work in addition to the doctoral dissertation. At least three consecutive quarters of course work must be taken at Stanford.

Languages—Students must know three foreign languages, two of them sufficiently to qualify for graduate courses in these languages and the third sufficiently to demonstrate ability to read a major author in this language. One of the three languages must be French or German, and one of the other two must be Latin (for which Greek, Chinese, or Japanese may be substituted when appropriate), if the period in
which the student concentrates is earlier than the Romantic period. Students’ language preparation must be sufficient before entrance so that they can take a graduate level course in at least one foreign language during their first year and in the second during the second year. Students must demonstrate a reading knowledge of the third foreign language no later than the beginning of the third year.

Of the three literatures in which a student takes courses, no more than two may be in the same department at Stanford. Literatures written in the same language (such as Spanish and Latin-American) are counted as one in the planning of the student’s program. One of the student’s three literatures will be designated as the primary field; the other two as secondary fields.

Teaching—All Fellows, whatever their sources of financial support, are required to do three quarters of supervised teaching at halftime and one quarter at quarter time. Comparative Literature Fellows must complete what ever pedagogy courses are required by the departments in which they teach.

Minimum Course Requirements

1. Comparative Literature 369 (Major Modern Critics) and three additional seminars (or courses that assign a long paper) of a primarily comparative nature; at least one of these additional seminars must be on literary theory or criticism.

2. At least three graduate courses in each of two literatures other than the student’s native literature.

3. A sufficient number of courses in the student’s primary field to assure his or her knowledge of the basic works in one national literature from its beginnings until the present day.

Minimum course requirements must be completed before the student is scheduled to take the University Oral Examination. These requirements are kept to a minimum so that students will have sufficient opportunity to seek out new areas of interest.

Examination—The examination will consist of three sections, the last of which will constitute the University Oral Examination. Each student’s reading lists for the examination must be approved by an examination committee. The examination will consist of the following sections, each of which takes the form of an oral colloquy between the student and a committee of faculty members with interests in the subject area of the particular section:

1. A literary genre, to consist of (a) a knowledge of a substantial number of literary works in a single genre, the list to include works from a number of centuries and from at least three national literatures and (b) a grasp of the theoretical problems involved in dealing with this genre and with the question of genre in general. This examination must be taken no later than the beginning of the student’s second year of graduate work (or the third quarter of the first year for students who enter with a year of previous graduate work).

2. Literary criticism, to consist of the exploration of a specific problem proposed and defined by the student. The problem must be sufficiently wide-ranging to demand the reading of critical texts from a variety of periods. This examination must be taken no later than the first quarter of the student’s third year of graduate work (or the third quarter of the second year for students who enter with a year of graduate work). Students may elect to take this section of the examination before the genre section, in which case it must be taken at the time designated for the latter.

3. A literary period, to consist of a knowledge of a literary period of at least a century in three or more literatures. The reading list for these two sections will cover not only the major literary texts of this period but also studies of intellectual backgrounds and modern critical discussions of the period. Students must demonstrate a grasp of how to discuss and define this period as well as the concept of periods in general. Students whose course work combines an ancient with a modern literature, have the option of dividing the period sections into two wholly separate periods. This examination, which will normally be taken during the first quarter of the student’s fourth year (or second quarter of the third year for students who enter with a year of previous graduate work), will serve as the University Oral Examination, which will also include a short section on the student’s plans for the dissertation.

Qualifying Procedures—The qualification procedures for students in Comparative Literature will take place during the quarter that the student takes the first section of the Ph.D. examination. Ordinarily this will be the beginning of the second year, but students who enter with a year of graduate work elsewhere must take the examination no later than the third quarter of the first year. Any student may elect to take the examination during the third quarter of the first year.

Students are judged qualified to proceed to the Ph.D. on the basis of this section of the Ph.D. examination as well as those other aspects of their work—for example, performance in courses, ability to do original research—that
predict strong promise for their dissertations and future careers as scholars and critics. As soon as the student has completed the qualifying procedures, the chairman will recommend him or her for admission to candidacy for the Ph.D. At this time the student will also be recommended for the A.M. in Comparative Literature if he or she has completed 36 units of work at Stanford and has not already completed an A.M. before entering the program.

Dissertation—The student will present a dissertation proposal as part of the University Oral Examination. Successful completion of the examination will constitute approval of the proposal. Members of the dissertation reading committee will ordinarily be drawn from the University Oral examining committee.

PhD MINOR IN COMPARATIVE LITERATURE

Students interested in the minor should apply for admission to the individual departments of literature. They may apply to the Committee on Comparative Literature for entrance to the minor after they have completed their first quarter of graduate work at Stanford. Requirements are as follows:

1. A knowledge of at least two foreign languages, one of them sufficient for the student to qualify for graduate-level courses in that language, the second sufficient for the student to read a major author in the original.

2. A minimum of six graduate courses, of which three must be in the department of the second literature and three in Comparative Literature, the latter to include a seminar in literary theory or criticism. At least two of the three courses in Comparative Literature should originate in a department other than the one in which the student is completing the degree. Except for students in the Asian Languages, students must choose a second literature outside the department of their major literature.

This minor is designed for students working toward the Ph.D. in the various foreign language departments. Students working toward the Ph.D. in English are directed to the program in English and Comparative Literature described among the English offerings.

COURSES

Courses primarily of a comparative nature are listed below. Check department listings for DR notations.

1. Introduction to Drama—(Enroll in Drama 1.) Introduction to major dramatic forms, concentrating on selected masterpieces in order to develop theatrical sensibility in reading dramatic texts.
   4 units, Win (Esslin)

11. The Age of Heroes—(Enroll in Classics 11.) This course will study the heroic epics of Greece (Homer), Mesopotamia (Gilgamesh), England (Beowulf), and France (Roland) and discuss their common features, the oral techniques used in composition, the narrative style, and the ethical values presented. Comparisons will be made with written epics such as Virgil’s Aeneid and later works.
   3-4 units, Spr (Edwards)

20. Romantic Comedy and Popular Fiction: Euripides to Shakespeare—(Enroll in Classics 21.) This course studies the experimental plays of Euripides and Shakespeare, explores their background in ancient and renaissance novels and folktales. A wide selection of tale-types is introduced from collections such as 1,001 Nights, which students practice by telling in class.
   4 units, Spr (Winkler)

21, 22, 23. Major Texts in Western Culture — Presentation of central issues in Western thinking and culture through the study of closely-related literary and philosophical texts. The course is not structured chronologically; rather each quarter’s syllabus is organized around a particular set of problems dominant throughout the history of western culture. Special emphasis is given to literary works. Recommended for students who have taken either world history or a survey of the humanities in secondary school. Limited to 20 freshmen per quarter.

21. The Literature of Interaction and Conflict—Conflict and concord between the individual and the world as exemplified in texts by writers such as Aeschylus, Virgil, Thomas More, and Dostoevsky. (DR:1, three-quarter sequence)
   5 units, Aut (Rosenstock)

22. The Literature of Introspection—The discovery, growth and limitations of the self as portrayed in texts by writers such as Augustine, Dante, Rousseau, and Freud. (DR:1, three-quarter sequence)
   5 units, Win (Lindenberger)

23. The Literature of Speculation—The human situation set forth in theories of ethics and knowledge and conceptions of nature and the universe, as illustrated in texts by writers such as Plato, Descartes, Goethe, and Nietzsche. (DR:1, three quarter sequence)
   5 units, Spr (Freidin)

61, 62, 63. Western Thought and Literature—An introduction to fundamental ideas of the past; lectures, discussions, reading of selected masterpieces.
61. The World of Classic Antiquity—(Enroll in Humanities Special Programs 61.) Homer, Bible, Aeschylus, Sophocles, Euripides, Plato, Aristotle, Cicero, Virgil, Seneca, Ovid.

5 units, Aut (Edwards, Staff)


5 units, Win (Evans, Staff)

63. From the Enlightenment to the Present—(Enroll in Humanities Special Programs 63.) Voltaire, Darwin, Marx, Freud, Dostoevsky, Rousseau, Conrad, Woolf, Faulkner, and selected 19th and 20th century poems.

5 units, Spr (Chase, Staff)

90. Introduction to the Humanities—(Enroll in Humanities Special Programs 90.) Basic themes and issues of the humanities as treated in important works. From various humanistic disciplines, including texts from the Western Culture courses that are re-examined in greater depth. Prerequisite: Completion of the Western Culture requirement. Honors majors given preference in enrollment.

5 units, Aut (Lindenberger)
Spr (Mueller-Vollmer)

110. Japanese-Western Literary and Cultural Interaction—(Enroll in Asian Languages 110.) Discussion of cross-literary and cross-cultural topics, such as haiku in English, Marxism in Japanese prose fiction, and Zen in American literature.

3 units, Win (Ueda)

114A. The 19th Century Novel—(Enroll in French and Italian 114A.) Treatment of the major novelists of the century from Stendhal to Zola. Study novels as works of art and for their political and social commentary. Reading and discussion in English.

4 units, Aut (Giraud)


4 units, Win (Cohn)


5 units, Win (Robinson)

151A. The Heroic Literature of Northern Europe — (Enroll in German Studies 151A.) A survey of the major heroic tales of England, Germany, and Scandinavia in translation: Beowulf, the Old English heroic fragments, the Hamlet legend, the German legends of Hildebrand, Walter, Brynhild, Dietrich, the heroic poems of the Edda, and the heroic novels of Iceland. Lectures and discussions.

3-5 units, (Andersson) given 1985-86

162F. Modern Literature of the Caribbean—(Enroll in English 162F.) An introduction to modern Caribbean literature, in historical context, with particular attention to recurrent themes addressed by Caribbean writers in defining the Caribbean-American experience, including colonialism, immigration from Africa and Asia, and the relation between literature and such social and cultural expressions as Rastafarianism, Reggae and Calypso.

5 units, Win (Drake)

163F. Modern Women Writers: Mary Wollstonecraft to Adrienne Rich—(Enroll in English 163C.) Women novelists and poets in England and America since the 1790's. Focus on women's imaginative portrayal of their situation and on their 200-year-long dialogue with one another about the possibilities for change.

5 units, Win (B. Gelpi)

163H. Contemporary Issues in Feminist Theory—(Enroll in English 163H.) From medical, legislative, social, psychological and literary perspectives, an interdisciplinary survey of current feminist theory.

5 units, Spr (Gagnier)

174. The Classical Tradition in European Literature—(Enroll in Classics 174.)

4 units, Win (Bolgar)

175. Aesthetics of Modernism—(Enroll in Philosophy 175.) Examination of prehistory and history of modern art, with special attention to painting. Emphasis on philosophical problems of interpretation created by the phenomenon of modernism. Readings from Michael Fried, Michel Foucault, Stanley Cavell, and Leonard Meyer, Clement Greenberg, Meyer Schapiro and Leo Steinberg. Course will meet during the second half of quarter; organizational meeting held at noon on first day of classes.

3 units, Win (Davidson)

194. Literature and the Humanities — (Enroll in Humanities Special Programs 194.)

5 units, Aut (Wellbery)
Spr (Pratt)


3-5 units, Spr (Aparicio)
207. Sense of Identity in Modern Women Writers—(Same as Modern Thought and Literature 207.) An examination of female writers whose sense of identity is related to their creativity, sexuality, maternity, and social class. Will include works by Simone de Beauvoir, Violette Le duc, Marguerite Duras, Sylvia Plath, Tillie Olsen, Maxine Hong Kingston, Paule Marshall, and Margaret Atwood.

5 units, Spr (M. Yalom)


4 units, Win (Freidin)

228. Nietzsche—(Enroll in Philosophy 228.) Seminar focusing on problems raised by historical and systematic intersection of two immeasurably influential figures—on the centrality of Richard Wagner’s art to all subsequent aesthetic culture, and on the centrality of Nietzsche’s thought of his ambivalent critique of Wagner. Some prior acquaintance with either Nietzsche or Wagner (however informal) must be presupposed. Texts to read include The Birth of Tragedy, Thus Spoke Zarathustra, The Genealogy of Morals, and The Wagner Case. Given in cooperation with the Humanities Center.

3 units, Aut (McNees)

230. Russian Formalism and Structuralism — (Enroll in Slavic Languages and Literatures 230.) The Russian Formalists' contribution to literary criticism and theory; the relationship of Russian Formalism to critical movements in the West; the Prague School, and the Russian Structuralists. No knowledge of Russian is required, but knowledge of Russian, French, German, or Czech is highly desirable.

4 units, (Brown) given 1984-85

235. Impressionist and Experimental Novel —(Enroll in English 235.) Critical reading of major impressionist novelists (Conrad, Woolf, Lowry, Faulkner) and innovators (Joyce, Hawkes, Garcia Márquez, Sorrentino).

5 units, Aut (Guerard)

237. Seminar on Legal and General Interpretation—(Same as Modern Thought and Literature 237.) An inquiry into what light may be shed by comparing theories of how to interpret legal texts and juristic acts (constitutions, statutes, contracts, wills, trusts) with theories of interpretation in other disciplines, including literary theory, philosophy of language, philosophical hermeneutics, history and anthropology. Given in association with the Humanities Center.

3 units, Spr (Grey)

240. Dante: Inferno—(Enroll in French and Italian 240.) A reading of Dante within the context of Medieval thought and literature.

4 units, Aut (Freccero)

241. Dante: Purgatorio—(Enroll in French and Italian 241.)

4 units, Win (Freccero)

242. Dante: Paradiso—(Enroll in French and Italian 242.)

4 units, Spr (Freccero)

241A-243A. The series is designed to acquaint students with the history of German thought from 1750 to the present and its significance for an understanding of modern culture. Authors to be studied include Herder, Hegel, Schiller, Marx, Nietzsche, Freud, Husserl, Wittgenstein, Marcuse, and Adorno. Note: This series will be given in German in alternate years (in English 1983-84).

241A. Deutsche Geistesgeschichte I—(Enroll in German Studies 241.) From Lessing to Romanticism. Delineates the conceptual field within which, from the middle to the end of the eighteenth century, the problems of human knowledge, history, the nature of man, and art were revolutionized and given a new basis. Readings and detailed interpretations of selected texts by Lessing, Kant, Herder, Schiller and Fichte. Given in English.

3-5 units, Aut (Wellbery)

242A. Deutsche Geistesgeschichte II — (Enroll in German Studies 242.) From Hegel to Nietzsche. The outlines of Hegel's phenomenology and his model of historical development as the becoming-conscious of freedom. The transformations of this model in the cultural criticism of Heine, the anthropology of Feuerbach and the dialectical materialism of Marx and Engels. Nietzsche's radical critique of the idea of the nature of man and of his historical self-actualization.

3-5 units, Win (Mueller-Vollmer)

243A. Deutsche Geistesgeschichte III — (Enroll in German Studies 243.) From Nietzsche to the present. Texts by Nietzsche, Husserl, Freud, Heidegger, Benjamin, Adorno, and Habermas with special emphasis on aesthetic problems and their relationship to social theory. This introductory course emphasizes the development of the
3-5 units, Spr (Wellbery)

247. Italy as Literary Symbol—(Enroll in French and Italian 248.) A study of the symbolic import of Italy in travel accounts and other texts from the time of Shakespeare to the 20th century. Readings include Goethe, Stendhal, and Byron.

4 units, Spr (Allen)

248. The Nineteenth Century—(Enroll in English 248.) Literature and non-fiction prose of 19th century England. In conjunction with literary texts, the work of some of the great social anatomists and planners, including Mill, Carlyle, Engels, Disraeli, Ruskin, Arnold and Wilde, are read. Focuses on politics and its corresponding styles.

5 units, Aut (Gagnier)

255A. The Nature of Literature: Japanese and Western Views—(Enroll in Asian Languages 255A.)

5 units, (Ueda) given 1984-85

255B. Chinese and Western Theories of Literature—(Enroll in Asian Languages 255B.) Study of traditional Chinese theories of literature in comparison with Western ones. Seminar with limited enrollment.

5 units, (Liu) given 1984-85

256. Contemporary Drama from 1918—(Enroll in Drama 256.)

5 units, Spr (Esslin)

263G. Feminist Literary Criticism: Theory and Practice — (Enroll in English 263G.) The development of feminist approaches to the study of literature with emphasis on the significance of feminist theory to the practice of criticism.

5 units, Aut (B. Gelpi)

275. Le Surréalisme—(Enroll in French and Italian 275.) Une définition du Surréalisme à travers les Manifestes d’André Breton. Etude de poèmes et de romans par A. Breton, Soupault, Eluard, Aragon, J. Gracq.

4 units, Win (Newman-Gordon)

280. Introduction to Chicano Literature—(Enroll in Spanish and Portuguese 280.) Study of selected works by major Chicano writers including poetry, fiction, and drama with emphasis on 20th-century literature. General introduction to questions of genre and textual interpretation, emphasis on the socio-historical and cultural context of Chicano literature.

3-5 units, Win (Ybarra-Frausto)

281. History of Rhetoric and Writing in the Middle Ages and Renaissance—(Enroll in Classics 280.)

5 units, Win (Bolgar)

284A. Joyce, Proust, Mann I — (Enroll in German Studies 284A.) Themes, structures and mythopoetic dimensions of the novel in the context of Modernism. Views on Joyce, Proust and Mann as synthesizers and interpreters of the historical situation (“decline of the West,” contending-isms, etc.), forms of consciousness (Bergson, Nietzsche, Freud, Jung, et al.) and artistic expressions (opera, painting, etc.) of their age.

3-5 units, (Gillespie) given 1984-85

285. Simone de Beauvoir—(Enroll in French and Italian 285.) A study of her fictional, philosophical, political and autobiographical writings, with stress on the radicalization of a feminine consciousness in contemporary French bourgeois society. Lectures and discussions in English; reading in French or English.

4 units, Aut (Giraud)


4 units, Aut (Saint-Amand)

289. Mythology and Christianity in Wagner and Nietzsche I & II—Attempts to answer such questions as: What does “mythological” and “Christian” signify in Warner’s musical dramas from Tannhäuser to Parsifal? Who are Siegfried and Zarathustra? Why did Nietzsche’s veneration for Wagner turn into obsessive criticism of Parsifal and everything Wagnerian? Why were Wagner and Nietzsche so highly prized by the Nazis? Judaism and Christianity as “religions of slaves.” The significance of Wagner and Nietzsche in contemporary culture.

4 units, Aut (Girard)
297B. Mythology and Christianity II: Nietzsche— (Enroll in French and Italian 297B.)
4 units, Win (Girard)

299. The Comic Doubles— (Enroll in French and Italian 298.) Twins and look-alike characters are studied in Plautus, Shakespeare, Moliere and other writers. Read and discuss various theories of laughter, including Bergson's Le Rire (in an English translation).
4 units, Spr (Girard)

300. Graduate Seminar: Theory of Narrative— (Enroll in Slavic Languages and Literatures 300.) Studies of narrative (fictional, historical, sacred) as verbal structure, representation, rhetoric, and social institution. Readings will include theoretical writings by Jakobson, Barthes, Bakhtin, Iser, Lukács, and others. Discussions will analyze these readings and relate them to selected works of Russian and European literature. A seminar for graduate and advanced undergraduate students. Pre-requisite: consent of instructor.
4-5 units (Todd) given 1985-86

300A. Graduate Seminar: Russian Literature as an Institution— (Enroll in Slavic Languages and Literatures 300A.) A study of literary production, dissemination, and reception in selected periods of Russian literature, from the Middle Ages to the present. Readings in social theory, literary criticism, and imaginative literature. Open to students without Russian only by permission of instructor.
4 units, Spr (Todd)

306. Introduction to Narrative Theory— (Enroll in Spanish and Portuguese 306.) Narrative as a form of cognition and meaning-making. Literary narrative in relation to other varieties and genres of narrative (history, autobiography, testimonial, oral anecdote, etc.). The idea of the novel as a representation. The study of literary narrative in social and historical context. Theoretical readings are combined with a study of criticism on particular literary works.
3-5 units, Aut (Pratt)

307. Semiotics, Textuality, and Deconstruction— (Enroll in Spanish and Portuguese 307.) Readings in contemporary critical theory, including Derrida, Foucault, Barthes, Kristeva, and others. Special attention will be given to the impact on textual hermeneutics of the writings of Lacan and Deleuze.
3-5 units, Spr (Cavallari)

307A. Colloquium: Major Modern Critics — (Enroll in English 307A.) A study of diverse perspectives and systems that have played a seminal role in the development of modern critical theory. Readings include Frye, Lukács, Benjamin, Auerbach, Bathes, and Derrida.
5 units, Aut (Lindenberger)

307B. Colloquium: Symbolist Poetry, French and American — (Enroll in English 307B.)
5 units, Aut (Fields)

310. Discourse and Ideology— (Enroll in Spanish and Portuguese 310.) The creation of meaning as a social process, ways in which ideology is produced, reproduced, and transformed in linguistic interaction, whether and how American competence models can interlock with theories that see language as constituting social reality and self. Readings on the concept of socially determining meaning, discursive practices in the French tradition, British empirical analyses, American sociolinguistics.
3-5 units, Win (Girard)

316A. Seminar: Studies in Romanticism— (Enroll in English 316A.) A study of the following major long poems: The Prelude, Don Juan, Prometheus Unbound, and Hyperion. The seminar stresses the role these poems have played in the development of recent critical theory.
5 units, Win (Lindenberger)

346. Poetics I: Narrative Theory and Analysis — (Enroll in German Studies 346.) This course provides a systematic introduction to the theory and analysis of narrative (Narrativik, narratology). Working from a global model of the narrative text, we shall consider such problems as: the place of narrative among other types of discourse; the logic of action and story construction; the structure of character; problems in the analysis of narrative discourse (e.g., point of view); classification of narrative texts; reading and story comprehension. We will consider the theoretical contributions of various schools, including such writers as Propp, Levi-Strauss, Greimas, Barthes, Genette, Kloepfer, Lämmert, Eco.
3-5 units, (Wellbery) given 1984-85

347. Poetics II: Theory and Analysis of the Lyric — (Enroll in German Studies 347.)
3-5 units, Win (Wellbery)

349M. Theories of the Humanities — (Enroll in German Studies 349M.) A critical investigation of major attempts to define the nature and function of the humanities and human sciences. Authors and movements to be examined: Vico, Herder and the Enlightenment; positivism and historicism; Dilthey, Weber, Cassirer; phenomenology and philosophical hermeneutics; structuralism and the Frankfurt School.
3-5 units, Win (Mueller-Vollmer)

351. Le Romantisme— (Enroll in French and Italian 351.) Poètes et romanciers romantiques:
Chateaubriand, Lamartine, Hugo, Vigny, Musset, Sand, et autres.

4 units, Aut (Weinstein)

351C. Medieval Cyclical Narrative — (Enroll in German Studies 351C.) Reading and discussion of the chief medieval cycles of England, France, and Germany centering on such figures as Alexander, Arthur, Charlemagne and Dietrich von Bern.

3-5 units, (Andersson) given 1985-86

352. Drama on Stage and Screen — (Enroll in Drama 352A.)

5 units (Esslin)

alternate years, given 1984-85

356. German Literature and Culture VI — German and European Romanticism — (Enroll in German Studies 356.) Origins and formation. The principal theoretical statements of early German romanticism in their historical and ideological setting (Fichte, A. W. and F. Schlegel, Schelling, and Novalis). Types of romantic literature by Tieck, Wackenroder, Bonaventura, Arnim, and E. T. A. Hoffman. Salient features of the European movement: Wordsworth, Blake, Coleridge, and Carlyle in England; Mme. de Staël and her group, Hugo, Nerval, and Baudelaire in France. Close attention paid to the problem of periodization and the establishing of valid criteria for the study of cross-cultural and cross-national phenomena.

3-5 units (Mueller-Vollmer) given 1984-85

360. Baudelaire—(Enroll in French and Italian 360.)

4 units, Win (Cohn)


5 units, Win (Halliburton)

371. La Grande Génération—(Enroll in French and Italian 371.) Une étude de quelques œuvres poétiques et en prose qui se situent dans la deuxième génération symboliste en France (Valéry, Claudel, Pégy, Alain-Fournier, Gide, Proust).

4 units, Win (Newman-Gordon)

376A. European Novel IV: The Realists — (Enroll in German Studies 276A.) Special attention to the longterm repercussions of Romanticism and the struggle to establish a Realist approach in fiction. Such topics as the transition from Romantic Realism to Positivism and Naturalism, the rise of the historical novel, the inroads of psycholgical Impressionism, Symbolism, and cultural development. The final list of readings (approximately 6 works) will be drawn from such writers as Balzac, Flaubert, Zola, Dostoevski, Gogol, Turgenev, Tolstoy, Meyer, Stifter, Fontane, Schnitzler, Dickens, Eliot, Trollope, Howells, Galdós.

3-5 units Win (Gillespie)


4 units, Spr (Bertrand)


3-5 units, Spr (Wellbery)

390. Théorie de la poésie—(Enroll in French and Italian 390.) Une étude de la poésie française à travers les textes et les manifestes, de la Pléiade jusqu’à nos jours.

4 units, Spr (Newman-Gordon)

392. Colloquium: Contemporary Themes in Literary Interpretation.

3 units, Aut, Win, Spr (Freccero)

394A. Poets of Infinity — (Enroll in German Studies 394A.) Hölderlin, Novalis, Keats, Baudelaire, Leopardi, and Bécquer.

3-5 units, Win (Gillespie)

---

**COMPUTER SCIENCE**

Chairman: Gene H. Golub


Associate Professors: Joseph E. Oliger, Terry Winograd

Assistant Professors: David Cheriton, Michael Genesereth, Keith A. Lantz, Douglas B. Lenat, Ernst Mayr, Robert S. Schreiber

Professors (Research): Thomas Binford, Bruce G. Buchanan, Arthur Samuel, (Emeritus), Gio Wiederhold

Senior Research Associates: Harold Brown, Barbara Hayes-Roth, Thomas C. Rindfleisch

Lecturers: Ralph Gorin, Stuart Reges

Affiliated Professors: Michael J. Flynn (Electrical Engineering), Allen M. Peterson (Elec-
OFFERINGS AND FACILITIES

A variety of computer systems are available to Stanford students. There are two large systems available to all students in the University. Most courses, including courses given by the Computer Science Department, use the Low Overhead Timesharing System (LOTS). A few courses and many sponsored research projects use the Center for Information Technology (CIT).

There are three large systems available to students of Computer Science: Score, SAIL, and SUMEX. Each of these systems is a host on the nation-wide ARPAnet computer research network; each is also a host on the experimental ethernet (SUNet) operated by the department.

Score is a DECSYSTEM-2060 running the TOPS-20 operating system. It includes 2048K words of main memory and 2.2 billion bytes of online storage. Score is predominantly used for departmental research.

SAIL is a DECsystem-1080 running the WAITS timesharing operating system. SAIL supports 64 local display consoles, plus other local and remote terminals. The SAIL facility includes two central processors, 2304K words of main memory, and 1.6 billion bytes of disk storage. SAIL includes specialized peripherals for robotics research. Among these are computer controlled television cameras, computer controlled artificial hands, and a computer controlled vehicle. SAIL is operated by the Computer Science Department. Users include members of the Electrical Engineering, Mechanical Engineering, Mathematics, and Psychology Departments.

SUMEX is a large DECSYSTEM-2060. It is a national facility owned by the National Institute of Health and managed by a national governing board. Applications of artificial intelligence to problems in medicine and biology are the prime research of this facility. Students whose research work involves such applications may be granted access to SUMEX.

The Computer Science Department also operates several Xerox Alto personal computers, linked together by the Ethernet communications network. Xerox has provided these Altos, a Dover printer, and a network file system as an equipment grant to the Computer Science Department.

The departmental policy on providing computer access to its students is flexible and evolving. At present, students in a degree program in computer science have access to the Alto computers and either Score or SAIL.

The VAX11/780 called Navajo is used for research in large-scale numerical problems and for some general departmental use. There are other VAX computers associated with specific research projects.

In addition to these systems, various other facilities are present in the department. Computer systems, a variety of Hewlett-Packard systems, and several kinds of personal work stations.

The department conducts a weekly colloquium, (Computer Science 300), presented by the staff and visiting scientists, which covers a spectrum of current topics. A lecture series (Computer Science 200) is offered during Autumn Quarter and is presented for new students at which members of the department speak informally on their research interests and their views on the nature of computer science.

GRADUATE PROGRAMS

MASTER OF SCIENCE IN COMPUTER SCIENCE

The University's basic requirements for the master's degree are discussed in the section "Degrees" in this bulletin. The department offers two distinct programs. In each of these the candidate must attain at least a 2.50 average in his or her course work and a 3.00 (B) average in courses taken in the Computer Science Department.

MASTER OF SCIENCE IN COMPUTER SCIENCE

The Computer Science Department has put into effect a new Master of Science in Computer Science program as of Spring Quarter in 1983. This new program will replace the CSCE and CSMS program. Current students, and new students admitted Autumn Quarter 1983, to either program, will be allowed to remain in the program to which they were admitted or to transfer to the new program.
Students admitted Autumn Quarter 1984, will be expected to complete the requirements of the new master’s program described in this bulletin.

Coterminal bachelor/master’s program and honors cooperative program applications for the master’s degree received after January 15 and before May 15 will be considered to fill approximately 25 percent of the positions in the program. Application forms may be obtained from the Office of Graduate Admissions or, for non-U.S. citizens, the Office of Foreign Graduate Admissions. Financial aid information will be made available upon the student’s acceptance.

PROGRAM REQUIREMENTS

1. A candidate is required to complete a course program of 42 units. At least 36 of these must be in computer science or closely related courses and these 36 units must be graded units, passed with a 3.0 average or better. The 42 units must be in upper division or graduate level courses, may not include courses listed in Requirement #2, and may include no more than 12 units from courses listed in Requirement #3. This means that students needing to take any of the courses listed in Requirement #2 or needing to take more than four of the courses listed in Requirement #3 will actually complete more than 42 units of course work in this program. Students hoping to complete the program with 42 units should already have a good background in computer science including course work or experience equivalent to all of Requirement #2 and all but four of the courses listed in Requirement #3.

2. The following prerequisite courses (for which no credit will be given) or their equivalents must be taken: C.S. 111; 108A,B; C.S. 121.

3. The following core courses or their equivalents must be taken: C.S. 142; C.S. 143; C.S. 146; C.S. 152A; C.S. 152B; C.S. 152C; C.S. 220; C.S. 221; C.S. 223; Math 120 (or Math 120S); E.E. 282. No more than 12 units from this list may be counted in the 42 units needed for Requirement #1. Courses in this requirement which are waived rather than taken are not included in the 12 units nor in the units under Requirement #1. Courses will generally be waived only on evidence that a similar course has been taken elsewhere.

4. At least 3, but no more than 6 units from the following seminars: C.S. 300; C.S. 310; C.S. 315 (E.E. 385); C.S. 345.

5. A demonstration of programming competence normally satisfied by taking some of the core courses that have project requirements of their equivalent.

6. A program of 21 units in an area of specialization. Certain approved programs are listed below. Students may propose other coherent programs that meet their goals to the M.S. committee.

a) Numerical Analysis/Scientific Computation Specialization

(1) The following courses: C.S. 137B; C.S. 137C.

(2) At least two of the following courses: C.S. 155 O.R. 152; O.R. 153, Math 116; Stat. 219; Math 220; Math 201; C.S. 227A; C.S. 227B; C.S. 227C; C.S. 234 (O.R. 241); C.S. 237A; C.S. 237B; C.S. 237C; C.S. 238A; C.S. 238B; C.S. 238C; O.R. 240.

b) Systems Specialization

(1) At least three of the following courses: C.S. 235; M.E. 235A, M.E. 254; A.A. 214A; A.A. 214B; C.E. 201; C.S. 227A; C.S. 227B; C.S. 227C; C.S. 234 (O.R. 241); C.S. 237A; C.S. 237B; C.S. 237C; C.S. 238A; C.S. 238B; C.S. 238C; O.R. 240.

(2) At least 12 units selected from the remainder of group (1) and the following courses: C.S. 242; C.S. 243; C.S. 245; C.S. 246; C.S. 267; C.S. 147; C.S. 316; C.S. 317; C.S. 318; C.S. 347; E.E. 312; E.E. 374; C.S. 343; C.S. 344; C.S. 293; E.E. 183; E.E. 288; E.E. 281; E.E. 272A; E.E. 272B.

c) Software Theory Specialization

(1) The following courses: C.S. 154; C.S. 155; C.S. 162; Stat. 116.

(2) At least 9 units from the following courses: C.S. 242; C.S. 243; C.S. 244; C.S. 246; C.S. 145; C.S. 343; C.S. 344.

d) Theoretical Computer Science Specialization

(1) The following courses: C.S. 154; C.S. 155.

(2) At least two of the following courses: C.S. 162; C.S. 163; C.S. 157.

(3) At least 9 units selected from the remainder of group (2) and the following courses: C.S. 245; C.S. 250; C.S. 254; C.S. 256; C.S. 257; C.S. 258; C.S. 262; C.S. 263A; C.S. 263B; C.S. 265; C.S. 266; C.S. 267; O.R. 340A.

MASTER OF SCIENCE IN COMPUTER SCIENCE: ARTIFICIAL INTELLIGENCE

The degree of “Master of Science in Computer Science: Artificial Intelligence” may be conferred upon students who wish to develop a
competence in the design of substantial knowledge based AI applications. The degree will be administered by the Committee for Applied Artificial Intelligence, composed of faculty and research staff of the Computer Science Department. Present members include Tom Binford, Bruce Buchanan (Chairman), Ed Feigenbaum, Mike Genesereth, and Doug Lenat.

The CS:AI program will begin in Autumn Quarter each year. Normally, a student will spend two years in the program. Each quarter the student will register half-time (9 units) and serve as a research or teaching assistant half-time (20 hours per week). The first year will involve acquiring the fundamental concepts and tools through course work and project involvement. During the second year, the student will implement and document a substantial application.

A student should indicate preference for this degree at the time of applying for admission. Admission to the CS:AI program will be limited by the amount of financial support available, and by the amount of research supervision available. To be considered for this program, an application should reach us by January 15.

The degree of "Master of Science in Computer Science: Artificial Intelligence" is intended as a terminal professional degree. Students completing this program will have no advantage over other Ph.D. applicants; admission to MS/CS:AI may negatively affect a subsequent Ph.D. application. Students planning to obtain the Ph.D. degree are strongly advised to apply directly for admission to the Ph.D. program.

**PROGRAM REQUIREMENTS**

Programs of at least 54 quarter units that meet the following guidelines will normally be approved:

1. **Core AI.** At least three AI courses (9 units): required are C.S. 222 and C.S. 223. The other courses may be chosen from C.S. 224, C.S. 275, C.S. 276, C.S. 226; or C.S. 227.

2. **Classical hardware and software (6 units):** C.S. 142 and C.S. 161 are required. Students with prior equivalent courses may choose two from the following: C.S. 211; C.S. 212; C.S. 311; E.E. 282; C.S. 143; C.S. 145; C.S. 146.

3. **Theoretical computer science (3 units):** choose one course from: C.S. 156, or C.S. 206.

4. **Practicum (27 units)** C.S. 293 or C.S. 390. A substantial AI system is implemented and documented in the second year.

5. Additional units must be in courses relevant to the project. Acceptable courses will be determined by the project supervisor, depending upon the application area of the project. Examples of courses to take outside the Computer Science Department include Physical Science, Social Science, or Mathematics.

Courses taken to satisfy guidelines (1) through (5) will normally be taken for a letter grade. As in the MS program in Computer Science Department, a 3.00 grade point average must be maintained in these courses.

CS:AI programs that deviate from one or more of the above guidelines in order to meet the valid objectives of individual students will be considered by the CS:AI Committee on an individual basis. In particular, students are not expected to take courses when they have had the equivalent subject matter previously. The student should submit a written statement of individual objectives and how the program and previous preparation meet these objectives.

A successful experience in this program is likely to require an undergraduate education in the sciences, with at least a moderate exposure to computing concepts and practice.

**DOCTOR OF PHILOSOPHY**

The University's basic requirements for the doctorate (residence, dissertation, examination, etc.), are discussed in the section "Degrees" in this bulletin. The following are departmental requirements:

1. A student should plan and successfully complete a coherent program of study covering the basic areas of computer science and related disciplines. The student's advisor has primary responsibility for the adequacy of the program which is subject to review by the Graduate Study Committee of the department.

2. Each student, to remain in the Ph.D. program, must pass a comprehensive exam covering introductory level graduate material in major areas of computer science, and thereafter apply for admission to candidacy for the Ph.D., by the end of six quarters of full-time study (excluding summers). By the end of nine quarters (excluding summers) each student should pass a qualifying exam in the general area of his or her expected dissertation. The Administrative Assistant for Academic Affairs has further details.

3. As part of the training for the Ph.D., each student is required to complete two units of teaching assistant service, one unit (10 hours per week for one quarter) being required during the first two years as evidence of satisfactory progress toward the degree. In addition, research equivalent to that nor-
mally performed by research assistants is required during one or more quarters.

4. The most important requirement for the Ph.D. degree is the dissertation. After passing the qualifying examination each student must secure the agreement of a member of the department faculty to act as the dissertation advisor. (In some cases the dissertation advisor may be in another department.) The department is currently conducting research in analysis of algorithms, complexity theory, databases, data structures, design of computer networks, graph theory, heuristic programming, measurement and performance evaluation, data bases, natural language understanding, numerical linear algebra, operating systems, optimization, partial differential equations, program verification, programming languages, reliability of computer systems, robotics, spline functions, and vision and perception.

5. Each student must pass a University Oral Examination in the form of a defense of his or her dissertation. It will usually be held after all or a substantial portion of the dissertation research has been completed.

6. The student is expected to demonstrate the ability to present scholarly material orally, both in the dissertation defense and by a lecture in a departmental seminar.

7. The dissertation must be accepted by a reading committee, composed of the principal dissertation advisor, a second member from within the department, and a third member chosen from within the university. The principal advisor and at least one of the other committee members must be Academic Council members.

PHD MINOR IN COMPUTER SCIENCE

For a minor in Computer Science a candidate is required to demonstrate a suitable level of competence in the departmental comprehensive examination. There are no specific course requirements. For further information see the Administrative Assistant for Academic Affairs.

TEACHING AND RESEARCH ASSISTANTSHIPS

There are graduate student assistantships available in the Computer Science Department. Assistants receive a tuition scholarship for up to nine units of study per quarter during the academic year, and in addition receive stipends of at least $6,552 for the nine-month year. Some may work full time in the summer for approximately $1,456 per month.

Duties in the academic year involve 20 hours of work per week. Teaching assistants help an instructor teach a course by meeting discussion sections, consulting with students, grading examinations, etc. Research assistants help senior staff members with research in computer science. Approximately two hours of the work week are spent in attendance at Computer Science Department colloquia and seminars. Nearly all teaching and research assistantships are held by Ph.D. students in the Computer Science Department. If there is an insufficient number of Ph.D. students to staff teaching and research assistantships, then such positions are open to a limited number of master's students in the department, or to students from other departments. However, master's program students (except for the Master of Science in Artificial Intelligence) should not plan on being appointed to an assistantship. Part-time course assistant positions are often available, with an associated partial tuition grant.

Students with NSF fellowships and traineeships may have the opportunity to supplement their stipends by serving as graduate student assistants.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

There are identical courses offered by Electrical Engineering some quarters. Refer to Time Schedule for department in which to register.

75. Computers and Language—(Same as Linguistics 75.) A basis for understanding computer use in dealing with language and implications of computer systems in everyday life situations. Introduces basic principles of computing and linguistics through lectures, films, discussions and demonstrations of existing systems. Term paper required. Students will not be assumed to have prior computer background. Enrollment limited.

5 units, Spr (Winograd) MWF 10

101. Computers: Their Nature, Use, and Impact—Intended to introduce students from all departments to the world of computers and their uses. Designed for nonspecialists to survey a variety of issues relating to computers. Topics include: basic concepts and vocabulary of computers and information processing; current applications of computers in education, business, music, art, medicine, science, transportation, law, law enforcement, and government; future trends in the economics of computing, technological advances, artificial intelligence; impact of computers on issues of privacy, employment, leisure, obsolescence, political and economic power, health care, and man's
image of himself. Programming is not taught in this course. Alternatives: 105A, 106. No prerequisite.

3 units, Spr (Feigenbaum) MWF 2:15

102. Programming in LISP—An introduction to the LISP language and the techniques of manipulating symbolic data, e.g. algebraic and logical expressions, graphs and computer programs. The course will consist of lectures and a progressive series of programming exercises intended to develop programming skills and familiarity with a wide range of programming tools. Emphasis will be placed on many issues of programming language implementation. Prerequisite: knowledge of a programming language other than BASIC.

3 units, Aut, Spr (Lenat) MWF 11

103. Programming in FORTRAN—An introduction to FORTRAN for students with experience in programming in a high-level programming language other than BASIC. Prerequisite: 105B, 106 or equivalent.

2 units, Aut, Win (Staff) MWF 12, first 8 weeks only

104. Programming in PASCAL—A shortened alternative to 105A and B or 106, for students with previous knowledge of computer programming. Not intended for students with a knowledge of PASCAL. Prerequisite: knowledge of a computer programming language other than BASIC.

2 units, Aut, Win (Staff) MWF 12, first 8 weeks only

105A,B. Introduction to Computers—Two-quarter sequence designed for non-technical majors to develop a working knowledge of computers as they are utilized in our society. It differs from 101 in that it requires a great deal of hands-on interaction. It is both a programming course and an issues course. Taught for students without a strong math and/or technical background. The Pascal programming language is used to introduce students to the concepts of structured programming. 105A covers the non-programming issues: fundamental terminology of computer hardware and software, the range of computer applications, and the capabilities of computers; and the programming constructs: pre-defined simple types, expressions, assignment statements, FOR loops, IF/THEN/ELSE statements, WHILE loops, PROCEDURES, VAR (reference) parameters, simple INPUT/OUTPUT, sub-ranges, and one-dimensional ARRAYS. 105B covers the non-programming issues: effective use of computers, the historical development of computer concepts, and current trends in computer science research; and the programming constructs: CASE statements, REPEAT loops, value parameters, enumerated types, RECORDs multi-dimensional ARRAYS, complex INPUT/OUTPUT, and FUNCTIONs, 105A&B together provide the same coverage of programming as 106. (Students in technical fields are encouraged to take 106.) Alternatives: 104, 106. Prerequisite: Mathematics 3 or equivalent.

105A. *3 or 4 units, Aut (Staff)
    MWF 10, 1:15
    Win (Staff)
    MWF 10, 1:15
    Spr (Staff)
    MWF 10,1:15
    Sum (Staff)
    MTWTh 10

105B. 3 units, Spr (Staff)

106. Introduction to Structured Programming—Design and construction of computer programs; use of the Pascal programming language to solve problems over a wide range of applications on a computer. Emphasis on structured problem solving, the stepwise decomposition of problems into computer programs. Topics include: pre-defined simple types, expressions, assignment statements, FOR loops, IF/THEN/ELSE statements, CASE statements, WHILE and REPEAT loops, PROCEDUREs, and FUNCTIONs, parameters, INPUT/OUTPUT, sub-range and enumerated types, simple and complex ARRAYs, and RECORDs. Covers the same programming constructs that 105A&B combined cover. 106 is faster paced and is intended for students with an aptitude for technical fields. This course is not in itself sufficient to make a student into a skilled programmer. Anyone interested in programming as part of their vocation should plan on taking at least 107 and/or 108A&B in addition. Alternates: 104, 105A&B. Prerequisite: Mathematics 3 or equivalent.

*3 or 4 units, Aut, Win, Spr (Staff) MWF 2:15
    Win (Staff) MWF 2:15
    Spr (Staff) MWF 2:15
    Sum (Staff) MTWTh 9, 11

107. Systematic Programming—Introduction to systematic program design, use of a variety of data structures, recursion, manipulation of text. Records and pointers. Notions of program correctness and testing. Modularization, portability, and good programming practice. C.S. 107 is intended as a second course in programming for the practicing scientist or engineer. Persons intending to continue their computer science education beyond programming should enroll in 108A,B instead of 107. Prerequisite:

* Normally 4 units for undergraduates, 3 units for graduate students. 104, 105B, and 106 are equivalent as prerequisites to further C.S. courses.
104, 105B, 106 or equivalent; knowledge of most of PASCAL.

3 units, Aut (Staff) MWF 2:15
Win (Staff) MWF 2:15
Spr (Staff) MWF 2:15
Sum (Staff)

108A,B. Fundamentals of Computer Science
— This two-quarter sequence is an introduction to the science that underlies computer programming, accompanied by more substantial programming problems than have been covered in earlier courses. The focus of the 108 course sequence is theoretical: the concepts of automata, formal languages, data types, recursion, logic, algorithms, and proof; these form a mathematical basis for the engineering of good computer programs. The student will write substantial computer programs that explore or exemplify these concepts. In 108A, the student will study models of data and control, and will write computer programs in Pascal that explore the use of those models. These topics include finite state machines, regular expressions, control constructs in programming languages, formal specification of control, program verification and proof techniques, efficiency analysis techniques, mathematical models of data, axiomatic descriptions, data types in programming languages, abstract data types, and non-elementary data structures such as lists and trees. In 108B, the student will study models of computation such as Turing machines, recursion and recursive algorithms, proof techniques involving recursion, efficiency analyses of recursive algorithms, and an introduction to the semantics of programming languages. Like 108A, course 108B also involves a substantial amount of programming work. Prerequisite: 105B or 106. Recommended: 107.

108A. 4 units, Aut (Staff) MWF 10 (DR:6)
Win (Reid) MWF 10

108B. 4 units, Win (Staff) MWF 10
Spr (Reid) MWF 10


3 units, Spr (Staff)


3 units, Win (Corin) TTh 11-12:15


(Also see Electrical Engineering 181.)

3 units, Aut (Staff) (Same as E.E. 181)
Win (Staff) (Enroll in E.E. 181)
Spr (Williams) (Enroll in E.E. 181)
Sum (Staff)


(Also see Electrical Engineering 181S.)

3 units, Win (Staff)
Spr (Staff)

120. Medical Computer Science—(Same as Medical Information Systems 210.) (Graduate students register for 220.) Provides an overview of medical computer science activities in both research and applied environments. Topics include office systems, hospital information systems, medical databases, pharmacy systems, laboratory systems, image analysis, EKG and EEG analysis, history taking, library systems, multiphasic health testing, medical computer-aided instruction, decision support systems.

3 units, Aut (Banks)

Win (Banks)

121A. Computer-Based Medical Decision Aids—(Same as Medical Information Systems 211A.) (Graduate students register for 221A.) Survey of representative examples from each of several major medical computing paradigms as they relate to computer-based clinical decision. Topics include: clinical algorithms; clinical databases; mathematical models of physical processes; pattern recognition; Bayesian statistics; decision analysis; artificial intelligence. No prerequisites.

3 units, Win (Shortliffe, Buchanan)

TTh 12:15

121B. Computer-Based Medical Decision Aids—(Same as Medical Information Systems 211B.) (Graduate students register for 221B.) Intended for students who have completed 121A and wish to implement some of those ideas into a computer project. No prerequisites, although some familiarity with computers and basic statistics is desirable.

2-4 units, Spr (Shortliffe, Buchanan)

TTh 12:15

135. Numerical Methods—This survey course is designed to acquaint students in science and engineering with methods and techniques for solving scientific problems of a mathematical type on digital computers. Emphasis is given to practical problems and pragmatics. Program libraries are studied and used. Problems to be discussed include interpolation and approximation of data, solution of differential equations, numerical integration, solution of linear and nonlinear systems of equations, fast Fourier transform. Pitfalls in automatic computation and their remedies are discussed. Not intended for students with further interests in Numerical Analysis. Alternate: 137A,B. Prerequisites: knowledge of FORTRAN; Mathematics 113 and 130; or equivalents.

3 units, Aut (Dahlquist) MWF 10

Sum (Staff)

137A,B,C. Numerical Analysis—This three-quarter sequence is designed to acquaint students of the mathematical and physical sciences with the derivation and analysis of methods for solving mathematical problems on digital computers. Organized so that students can take the first quarter and then either the second or third according to their interests if they wish. Fundamental concepts of numerical computation are introduced in 137A. Topics include linear systems of equations, interpolation, numerical differentiation and integration, and the solution of nonlinear equations. Material related to the analysis of structures and data is discussed in 137B. Topics include the approximation of functions, the matrix eigenvalue problem, least squares approximation and statistical computations. The simulation of systems governed by ordinary and partial differential equations is discussed in 137C. Topics include methods for the solution of both initial and boundary value problems. Finite difference, finite element and collocation methods are included. These courses include analysis of convergence and estimation of truncation and round-off errors. Assigned work includes both analytical problems and problems to be solved with the aid of a computer. 137A is prerequisite for both 137B and C. Prerequisites: 103 and 105B or 106; Mathematics 113, (C.S. 137C has the additional prerequisite of Mathematics 130); or equivalents.

137A. 3 units, Aut (Schreiber) MWF 2:15

137B. 3 units, Win (Schreiber) MWF 2:15

137C. 3 units, Spr (Oliger) MWF 2:15

142. Programming Languages—Introduction to several programming languages, such as LISP, Ada, Snobol, APL, and/or Simula. Comparison of issues in programming language design, and language features that result from them. Runtime representation of data and control constructs. Memory management issues, recursion, binding and allocation, scoring, parameter passing mechanisms, compilation vs. interpretation, modules and classes, abstract data types, exception handling. Seeral programming assignments, each in a different language, will be given; emphasis will be on proper use of the features and facilities of each language and its runtime system. Prerequisites: 107 (E.E. 180) or 108B, 111 (E.E. 181), and knowledge of Pascal.

(Also see Electrical Engineering 285.)

3 units, Aut (Reid) MWF 9

Spr (Owicki) (Enroll in E.E. 285)

143. Compilers—(Enroll in Electrical Engineering 283.) The grammars of programming languages; lexical analyzers, parsers, code emitters and interpretation; global and peephole optimization; run-time support; error management; translatory writing systems. A
3 units, Win (Hennessy)

3 units, Win (Wiederhold) MWF 11

(Also see Electrical Engineering 286.)
3 units, Aut (Lantz)
(Enroll in E.E. 286)
Win (Cheriton) TTh 1:15-2:30

147. Basic Tools in Computer System Modeling—(Enroll in Electrical Engineering 284.) Basic tools for the analysis, and preformance evaluation of computer systems. Topics include: review of probability theory; Poisson distribution; exponential distribution; transforms; Poisson process; discrete-parameter Markov chains; birth-death processes; queueing theory; network of markovian queues; elements of graph theory; graph algorithms. Prerequisite: Statistics 116.
3 units, Win (Tobagi)

148. Computer Graphics—Topics in computer graphics: display technology, transformations, graphics coordinate systems, color representation, hidden surface elimination, shading and light-source simulation, input device technology, human engineering, animation graphics, structured display files, three-dimensional representation, anti-aliasing, calligraphic and raster graphics issues. Specific implementations cited throughout. Intended for graduate students in computer science and related disciplines. Prerequisite: ability to learn and use the computer languages necessary for graphics programming.
3 units, Spr (Rubin) TTh 11-12:15

150. Introduction to Combinatorial Theory—Intended as an elementary first course in combinatorics. Topics include permutations, combinations, partitions; the principle of inclusion and exclusion; Ramsey's theorem; Burnside's lemma; Polya's counting theorem; the elementary theory of graphs and trees; flow in networks; matching problems; an introduction to matroids. Prerequisite: Mathematics 44 or equivalent.
3 units, Win (Staff) MWF 2:15

154. Formal Languages—An introduction to the basic mathematical theory underlying programming languages. Regular sets, context-free languages, deterministic context-free languages. Theory of grammars and parsing algorithms. Relevant automata theory with emphasis on applications to language translation.
3 units, Spr (Floyd) MWF 10

155. Concrete Mathematics—Finite difference calculus; manipulation of sums and products; properties of binomial coefficients, Stirling numbers, harmonic numbers, Fibonacci numbers; use of generating functions to solve recurrence relations; asymptotic expansions; analysis of algorithms. An emphasis on obtaining simple closed-form answers to problems when it is possible. Prerequisites: Mathematics 22, 42, or equivalent.
3 units, Aut (Mayr) MWF 1:15

156. Introduction to the Mathematical Theory of Computation—This course will deal with the questions, "How does one formally specify an algorithm? What problems can be solved by algorithms? How does one show that an algorithm meets its specifications?" Aspects of logic and computability theory which bear on these questions will be covered. Familiarity with mathematical reasoning is assumed.
3 units, Aut (Staff) TTh 9:30-10:45

157A. Logical Basis for Computer Programming—Introduction to the logical foundations of computer programming. An elementary exposition, from a computational point of view, of propositional logic, predicate logic, and theories with induction, including integers, strings, lists, trees, sets, bags, expressions, and substitutions. The unification algorithm and its correctness. No prerequisites.
3 units, Aut (Manna) TTh 11-12:15

157B. Deductive Systems—A continuation of CS157A. A description of formal logical systems oriented toward automated deduction and theorem proving. Special emphasis on topics relevant to the synthesis, verification, and transformation of computer programs, and to logic programming. Prerequisite: 157A.
3 units, Win (Manna) TTh 9:30-10:45

161. Introduction to Data Structures and Algorithms—Basic data structures: list structures, trees, balanced trees, hash tables, partially ordered trees, tries. Storage management: garbage collection, allocation strategies. Tech-

3 units, Aut (Ullman) MWF 3:15

162. Sorting and Searching—Design and analysis of efficient algorithms for sorting and searching large data sets. Prerequisites: 109 or 111; 155, 161.

3 units, Win (Floyd) MWF 3:15


3 units, Spr (Staff) MWF 3:15

192. Programming Service Project—Appropriate academic credit (without financial support) will be given for volunteer computer programming work of public benefit and educational value. Restricted to Computer Science students.

1-3 units, any quarter (Staff) by arrangement

193. Digital Logic Laboratory—(Enroll in Electrical Engineering 183.) Experiments in digital logic design using TTL integrated circuits, including SSI gates and flip-flops. MSI registers and ALU's and LSI memories. Choice of projects, including: basic combinational and sequential circuits, various sequential machines, D/A converters and CRT displays, integrators, arithmetic processors, rudimentary stored-program processors, game-playing machines. Prerequisites: 112 (E.E. 182) and E.E. 121 or equivalent.

3 units, Aut (Flynn) Win (Staff) Spr (Staff)

194. Microcomputer Laboratory—(Enroll in Electrical Engineering 281.) Introduction to a specific microprocessor. Lectures covering the programming and structure of a microcomputer system, accompanied by laboratory exercises. A final laboratory project is required. Prerequisites: 111S (E.E. 181S) or 111 (E.E. 181), and 112 (E.E. 182), or equivalents, and some-hands-on experience with TTL logic, such as 193 (E.E. 183) or E.E. 121.

3 units, Aut (Staff) Win (Peterson) Spr (Staff)

198. Teaching of Computer Science —Students learn how to teach other students about computers. Attend weekly meetings to discuss current problems in intro CS courses and to learn how to consult students. Students also have assigned hours at the computing center (LOTS) for consulting and run a discussion section. Prerequisite: 107 or 108A.

3 units, Aut, Win, Spr (Reges) by arrangement

199. Independent Work.

any quarter, (Staff) by arrangement

COURSES PRIMARILY FOR GRADUATE STUDENTS

There are identical courses offered by Electrical Engineering some quarters. Refer to Time Schedule for department in which to register.

200. Departmental Lecture Series—Weekly presentations by members of the department faculty, each describing informally his or her current research interests and views of computer science as a whole. Recommended for first-year Computer Science graduate students.

1 unit, Aut (Staff) Th 2:45-4

204. Problem Seminar—Solution of various problems, numeric and symbolic, on computers. Emphasis on the research paradigms of computer science and the development of algorithms that are "beautiful" from various points of view. Limited to Ph.D. degree candidates in computer science, and recommended for students beginning such a degree program.

3 units, Win (Mayr) TTh 11-12:15

206. Recursive Programming and Proving—Recursive programming using the LISP language and techniques for providing the correctness of recursive programs. Computing with symbolic expressions rather than numbers, e.g. algebraic expressions, logical expressions, patterns, graphs, and computer programs. Pattern matching and syntax directed computation. Preparation for work in artificial intelligence is emphasized. Prerequisite: 107 (E.E. 180) or 108B or equivalent ability to program.

3 units, Win (Mayr) TTh 1:15-2:30

209. Topics in Computer Science—Given only when a suitable member is available.

by arrangement

211. Logic design—Principles and techniques of logic design. Topics include combinational circuit analysis, including hazard detection, combinational circuit design including PLA
and MSI techniques as well as testing techniques, IC logic families, flip-flop properties, sequential circuit analysis and synthesis for both fundamental and pulse mode circuits, design for test-ability techniques. Prerequisites: 111 (E.E. 181) and 112 (E.E. 182) or equivalent.

(Also see Electrical Engineering 381.)
3 units, Aut (McCluskey) TTh 2:45-4
(Same as E.E. 381)
Win (McCluskey)
(Enroll in E.E. 381)

212A. Processor Design-ALU and Its Control—(Enroll in Electrical Engineering 382B.) Data representation, integers, floating point and residue representation. Bounds on arithmetic speed, algorithms for high speed addition, multiplication and division. Pipelined arithmetic. Implementation and control issues using PLA's and microprogramming control. Prerequisites: E.E. 181, 182, or equivalent.
3 units, Win (Flynn)

212B. Processor Design-Memory Hierarch and Control Unit Design—(Enroll in Electrical Engineering 382B.) Cache and main memory design, virtual storage system. Instruction decoding and timing. Pipeline execution and interlocks. Instruction set characteristics, branching, supervisory state. Recommended: E.E. 382A.
3 units, Spr (Flynn)

219. Topics in Digital Systems—Given only when a suitable faculty member is available.
by arrangement

220. Medical Computer Science—(See 120.)

221A. Computer-Based Medical Decision Aids—(See 121A.)

221B. Computer-Based Medical Decision Aids—(See 121B.)

222. Artificial Intelligence Programming—An introduction to the techniques of Artificial Intelligence Programming. Topics include propositional representation, pattern matching and unification, inference techniques, dependencies and truth maintenance, agendas, coroutines, and meta-level control of problem solving. Students will be asked to implement a simple knowledge representation system and utilize it in the construction of an expert application program. Prerequisites: 102 and 223.
2 or 3 units, Win (Genesereth)
TTh 9:30-10:45

223. Fundamentals of Artificial Intelligence—Introduction to the issues and ideas of artificial intelligence. Knowledge representation, search, problem solving, learning, and meta-level reasoning. Prerequisite: Familiarity with mathematical reasoning and computer programming.
3 units, Aut (Genesereth) MWF 1:15

224. Survey of Research Topics in Artificial Intelligence—A survey of current research in AI. The topics covered will vary from year to year. Examples or current research topics are: machine learning and discovery, speech or image or language understanding, automatic programming, formal reasoning, nonmonotonic logic, game-playing, intelligent computer assisted instruction, knowledge representation and expert systems. The course often involves distinguished outside lecturers who are specialists in these research topics. Prerequisite: 102 or equivalent.
2 units, Spr (Lenat) TTh 11-12:15

226. Epistemological Problems of Artificial Intelligence—(Same as Philosophy 326.) Formalisms for representing what general intelligence program must know about the common sense world including facts about causality, ability, knowledge and action. Modes of rigorous and conjectural reasoning, especially nonmonotonic reasoning. Approximate theories and counterfactuals. Connections with philosophy, especially philosophical logic and epistemology. Some familiarity with first order logic will be assumed.
3 units, Win (McCarthy)
alternate years, given 1984-85

227A. Introduction to Robotics and Computer Vision—(Enroll in Mechanical Engineering 219.) An introduction to the basics of robot manipulators, and a review of current applications. The following topics will be discussed in detail: kinematic structure, coordinate transformations, manipulator solutions, workspace, path selection, control and dynamics, applications locomotion.
3 units, Aut (Craig)

227B. Introduction to Robotics and Computer Vision—An introduction to robotic systems, sensing, perception, and intelligent systems. Programming systems, distributed systems, sensors, geometric modeling, simulation, planning vision sensors, industrial vision systems, applications, advanced vision systems, vision hardware and VLSI implementation.
3 units, Win (Binford) TTh 1:15-2:30

227C. Advanced Robotics—This course involves segmentation: edges, grouping, texture, statistical estimation, range, stereo, surface description, geometric reasoning, psychophysics.
3 units, Spr (Binford) TTh 1:15-2:30

228. Applying Cognitive Psychology to Computer Science—(Enroll in Psychology 267.) Prerequisite graduate standing or consent of instructor. Limited enrollment.
3 units, Spr (Moran)
229. Topics in Artificial Intelligence—Given when a suitable faculty member is available. Topics have included: automatic programming, intelligent computer aided instruction, knowledge engineering, learning, mathematical discovery, philosophical issues in A.I., and representation theory.

1-3 units, Spr (Lenat)

234. Numerical Methods of Optimization—Serves as an introduction to software and some numerical analysis aspects of algorithms used to solve unconstrained and constrained optimization problems encountered in operations research. Topics include pivotal and pricing optimization techniques in linear programming, combinatorial search procedures, shortest path and other graph and polynomial algorithms, dynamic programming from the software point of view, trade-offs between solution time and storage needs. Students are expected to program algorithms discussed in class. This course is recommended as a complement to courses like Operations Research 340A. Prerequisite: Math 113; and some knowledge of computer programming and data structures (linked lists and binary search trees).

3 units, Aut (Dantzig) TTh 9:30-10:45

235. Statistical Computing—(Same as Statistics 227.) Numerical analysis aspects of least squares, nonlinear and robust regression, random number generation and Monte Carlo, eigenvalue computations in multivariate analysis, numerical integration and computational complexity. Emphasis on computational aspects which are relevant to practical statistical problems. Prerequisites: Statistics at the level of 219-220, matrix algebra, knowledge of a programming language.

3 units, Spr (Golub) TTh 11-12:15

237A. Advanced Numerical Analysis—Approximate methods for initial value problems and initial boundary value problems for partial differential equations. Convergence and stability theory; analysis of methods; finite difference and finite element methods. Particular attention will be paid to the implementation of methods and to realistic applications. Prerequisites: 137A and 137B.

3 units, Aut (Oliger) MWF 11 alternate years, given 1983-84

237B. Advanced Numerical Analysis—Solution of linear problems: linear equations, iterative methods for large sparse systems; linear programming; linearization of nonlinear problems. Prerequisites: 137A and 137B.

3 units, Win (Wilkinson) MWF 11 alternate years, given 1983-84

237C. Advanced Numerical Analysis—Solution of boundary value problems for ordinary differential equations, and elliptic partial differential equations by finite difference and finite element methods. Particular attention will be paid to the implementation of methods and to realistic applications. Prerequisites: 137A and 137B.

3 units, Spr (Schreiber) MWF 11 alternate years, given 1983-84

238A. Advanced Topics in Numerical Analysis—Numerical approximation of functions and data, approximation theory and its applications to standard numerical analysis problems such as quadrature and the solution of differential equations. Prerequisites: 137A and 137B.

3 units, Aut (Staff) alternate years, given 1984-85

238B. Advanced Topics in Numerical Analysis—The algebraic eigenvalue problem: perturbation theory, numerical algorithms for dense and sparse matrices; error analysis; special applications; inverse problems. Prerequisites: 137A and 137C.

3 units, Win (Staff) alternate years, given 1984-85

239. Topics in Numerical Analysis—Given only when a suitable faculty member is available. by arrangement

242. Programming Language Design — (Enroll in Electrical Engineering 389.) Exposure to the problems of programming language design and their known solutions will be undertaken. Topics may include formal semantics, implementation considerations, extensibility, very high level languages, evaluation of language designs, and other timely topics. The innovative features of a variety of modern programming languages will be discussed. Prerequisite: 142 (E.E. 285).

alternate years, given 1984-85

243. Advanced Compilers — (Enroll in Electrical Engineering 383.) Lectures and discussion explore implementation issues in depth. The major focus on optimization techniques and advanced code generation. A significant project will be included. Prerequisite: 143 (E.E. 283).

3 to 6 units, Spr (Hennessy)

244. Computer Networks: Architecture and Implementation — Motivations and objectives
of computer networks; overview of network architectures; layered architectures and the ISO Reference Model; network functions Circuit-switching and packet-switching; physical layer protocols; data link protocols including HDIC and multiaccess link control. Network control, transport, and session protocols including routing, flow control; end-to-end communication and internetworking. Presentation layer protocols including virtual terminal and file transfer protocols, cryptography, and text compression. Specific examples and standards will be cited throughout the course for point-to-point, satellite, packet radio, and local networks. Prerequisite: 146 (E.E. 286) or equivalent. (Also see Electrical Engineering 384.)

3 units, Aut (Cheriton) TTh 11-12:15
Win (Tobagi)
(Enroll in E.E. 384)

245. Database System Theory—Overview of database systems; the entity-relationship model of the real world; the network data model and the DBTG proposal; the hierarchical model; the relational model; relational algebra and calculus; query languages based on algebra and calculus, such as ISBL, QUEL, SQL, and Query-by-Example; functional dependencies and their influence on database design; multivalued dependencies; query optimization; concurrent operations on the database. Query optimization and concurrency control for distributed database systems. Prerequisites: A familiarity with file organization, as in 145 (E.E. 287), and with predicate calculus, as in 156, will be assumed.

3 units, Spr (Ullman) MWF 11

246. Advanced Operating Systems—In-depth treatment of selected topics in operating system design. Emphasis will be on topics not covered in 146, such as naming and binding, protection, reliability, user interfaces, construction strategies, modeling and performance evaluation, system management, and portability. Significant project will be included. Prerequisite: 146 (E.E. 286).

3-6 units, Spr (Lantz) MWF 1:15

249. Topics in Programming Systems—Given only when a suitable faculty member is available.

by arrangement


3 units, (Staff) by arrangement


3 units, Aut (Pratt)
not given 1983-84

256. Advanced Theory of Computation—Topics in the theory of programs, including the semantics of programming languages, formalization and proof of properties of programs, modal and temporal logics of programs, and the theory of parallel programs. Prerequisite: 156 or equivalent.

3 units, Spr (Manna) TTh 9:30-10:45


3 units, Aut (Floyd) TTh 11-12:15
alternate years, given 1983-84


3 units, Win (McCarty) MWF 1:15
alternate years, given 1983-84

259. Topics in Theory of Computation—Given only when a suitable faculty member is available.

by arrangement

262. Analysis of Algorithms — An advanced course primarily for students who will be doing specialized work in the analysis of algorithms. The intent is to present each of the important paradigms used to analyze algorithms. The course studies combinatorial approaches, generating functions, techniques for exact solution of recurrences, and asymptotic methods in connection with important algorithms for sorting and searching.

3 units, Win (Yao) TTh 1:15-2:30
alternate years, given 1983-84
263A. Combinatorial Algorithms — Advanced data structures and algorithms for priority queues, path compression, minimum spanning trees, searching in graphs, strongly connected components, lowest common ancestors, planarity testing, graph isomorphism, pattern matching, shortest paths, transitive closure, boolean matrix multiplication, maximum matching and maximum network flow. Prerequisites: 161, 162, 163, or equivalents.

3 units, Win (Staff) TTh 11-12:15

263B. Combinatorial Algorithms — Scheduling, flow analysis, graph separators and applications, concentrators, boolean networks, sorting networks, computation in groups, linear and integer programming, vertex elimination and sparse systems, approximation algorithms for NP-complete problems. Prerequisites: 263A, 161, 162, 163 or equivalents.

3 units, Spr (Staff) TTh 11-12:15


3 units, Win (Papadimitriou) MW 2:15-3:30


3 units, Spr (Staff) MWF 1:15


3 units, Spr (Yao) TTh 1:15-2:30

alternate years, given 1983-84

267. VLSI Theory — Models of integrated circuits. Lower bounds on the area and time required to perform certain computations by integrated circuits. Area-efficient circuits for basic computations. Algorithms for parallel computers. VLSI design languages and their compilation. Efficiency of algorithms used in the design of integrated circuits such as wiring, simulation, design rule checking. No prerequisites. Recommended: 161, E.E. 271.

3 units, Win (Ullman) MWF 10

268. Computational Geometry — Develop skills in the design and analysis of geometric algorithms. Emphasizes the data structures of general usefulness in geometric computing and the conceptual primitives appropriate for manipulating them. Recommended: 161.

3 units, Win (Guibas) TTh 2:45-4

269. Topics in Analysis of Algorithms — Given only when a suitable faculty number is available.

by arrangement

271. Writing Seminar — (Same as Art 281.) Introduction to the basic art of written forms. The use of the pen and brush in scribal technology. Roman capitals, Humanist minuscule, Chancery cursive, and other canonical letterforms. No prerequisite. Enrollment limited to 10.

3 units, Win (Bigelow)

272. Digital Grammatography — (Same as Art 266.) The use of the computer and the hand to compose the visible word. Investigations of form, pattern, and texture using mass-produced letterforms. Emphasis on both the conceptual and perceptual bases of the literate image. Recommended: Art 161, 162, 265 or equivalent; Computer Science 105B or 106 or equivalent. Enrollment limited to 10.

3 units, Win (Bigelow)

273. Text and Image — (Same as Art 267.) Explorations in the integration of text and image. Methods of defining typographic space composed of pictorial, diagrammatic and textual elements, with the principles for their combination. Traditional publications such as books and newspapers, as well as computer graphics displays, will be examined. Some introduction to theory, such as graphic-semiology, but focus on image-making rather than image-analysis. Recommended: Art 164 or 261, and some fluency in graphic image-making.

3 units, Spr (Bigelow) TTh 9:30-10:45

275. Computational Models for the Syntax of Natural Language — (Same as Linguistics 275.) Introduction to formal systems and computer implementation for syntax. Survey of relevant material from linguistics and formal language theory. Review and discussion of past and current parsing systems. Overview of relevant aspects of the syntax of English.

3-4 units, Win (Winograd) MWF 10

alternate years, given 1983-84

276. Computational Models for the Semantics of Natural Language — (Same as Linguistics 276.) Conceptual overview of problems of meaning. Formalisms from logic, computation theory, psychology and linguistics, relevant to
computer systems for natural language. Survey and critical discussion of current research on computational approaches to natural language.

3-4 units, Win (Brachman) MWF 10
alternate years, given 1984-85

277. Topics in Computational Linguistics—
(Same as Linguistics 277.) Computational models of discourse.
3 units, Aut (Winograd) MWF 9

293. Computer Laboratory—A substantial computer program is designed and implemented. A detailed written report is required. Recommended as preparation for dissertation research. Intended for graduate students of Computer Science; consent of instructor required. Register using the section number associated with the instructor.
any quarter (Staff) by arrangement

300. Computer Science Colloquium—Presentation of current research in computer science.
1 unit, Aut, Win, Spr (Staff) T 4:15

310. Seminar on Computer Systems—(Enroll in Electrical Engineering 380.) Discussion of current research in the design, implementation, analysis, and use of computer systems ranging from integrated circuits to operating systems and programming languages.
1 unit, Aut, Win, Spr (Staff)

(Also see Electrical Engineering 282.)
3 units, Aut (Hennessy and Basket)

315. Digital Reliability Seminar — (Enroll in Electrical Engineering 385.) Student-faculty discussions of research problems in the design of reliable digital systems. Specific areas include modeling and evaluation of multiprocessor and redundant architectures as well as testing and diagnosis theories. Emphasis is placed on student presentations and Ph.D. thesis research.
(Also see Electrical Engineering 385A.)
1 to 4 units, Aut, Win, Spr (McCluskey)

316. Advanced Computer Architecture—(Enroll in Electrical Engineering 486.) Machine mapping issues, design of image machines, including addressing, name space design, operations and formats; emulation, semantics, interpreters and levels of emulation. Image machine analysis and statistical usage. Information theoretic limits and canonic interpretive program forms for high level languages. Directly Executed Language (DEL) synthesis. Prerequisites: 311 (E.E. 282) and 212 (E.E. 382).
3 units, Spr (Staff)
alternate years, given 1983-84

317. Digital Signal Processing Architecture and Circuits—(Enroll in Electrical Engineering 487.) The architecture, system design and hardware implementation of real time signal processors and digital filters. Signal processing operations including the Discrete Fourier Transform, Discrete Convolution, Cosine transform, Hadamard transform and the estimation of power spectra. Design of Finite Impulse Response and Infinite Impulse Response implementations of low pass, high pass, bandpass and all-pass filters. Applications in speech processing, image processing, communication, sonar and radar signal processing. Possibilities for LSI implementation of signal processing and digital filter computation structures will be investigated. Prerequisites: 211 (E.E. 381) and 212 (E.E. 382). Recommended: E.E. 263.
3 units, Spr (Peterson)
alternate years, given 1983-84

318. Testing Aspects of Computer Systems—
(Enroll in Electrical Engineering 488.) Fundamental principles of testing computer systems and designing systems for high reliability or availability. Failure and fault models. Deterministic and probabilistic techniques of test generation and testing. Techniques for testing memories. Designing for testability of fault-tolerant and high availability systems. Mathematical models for obtaining reliability parameters. Prerequisites: 311 (E.E. 282) and 211 (E.E. 381).
(Also see Electrical Engineering 488.)
3 units, Spr (Peterson)
alternate years, given 1984-85

319. Fault Tolerant Computing Systems —
(Enroll in Electrical Engineering 489.) Basic considerations in the design of reliable computing systems. Concurrent checking techniques. Redundancy techniques. Evaluation methods.
322  SCHOOL OF HUMANITIES
AND SCIENCES

System consideration. Examples of specific system designs. Prerequisites: 311 (E.E. 282.)
3 units, Spr (McCluskey)
alternate years, given 1983-84

320. Artificial Intelligence Seminar.
1 to 3 units, any quarter (Staff)
by arrangement

321. Seminar on Computers in Biomedical Research—(Same as Medical Information Systems 214, Electrical Engineering 306.) Seminar will survey medical computing research at Stanford and at nearby industries. Lectures will be presented by local faculty and research staff. Topics include computers in the operating room, automated interpretation of medical data, and applications of artificial intelligence and data bases to medical problems.
1 unit, Spr (Owicki, Shortliffe) T 2:45-3:45

323. Readings in Artificial Intelligence—A series of lectures and discussions on readings in all areas of artificial intelligence research. Primarily intended for students planning to take the A.I. Qualifying exam. Prerequisites: 223. and consent of instructor.
3 units, Win (Staff)
alternate years, given 1983-84

327. Robotics Seminar — Recent research in the areas of computer vision, manipulation and mobility; geometric modeling and CAD/CAM. Invited speakers will present recent results and summaries of articles from the current literature.
1 unit, Aut, Win, Spr (Binford) M 4:15

1 to 3 units, Aut, Win, Spr,
Sum (Staff)
by arrangement

343. Topics in Concurrent Programming—Current research topics in the design and verification of concurrent programs of the sort that occur in operating systems, networks, distributed systems, etc. Subjects that may be covered include programming language features, formal models, specification and verification, and system design. Prerequisite: 146 (E.E. 286).
(Also see Electrical Engineering 483.)
2 to 4 units, Win (Lantz)
alternate years, given 1984-85

344. Distributed Systems — Motivation and objectives of distributed systems; basic distributed systems architecture model; review of layered protocols; interprocess communication and synchronization; naming; protection; reliable operation, atomic transactions, multiple copy update, and error recovery; decentralized control; debugging, testing, and measurement; hardware issues. Specific implementations will be cited throughout the course. Prerequisites: 244.
3 units, Spr (Staff) MWF 2:15
alternate years, given 1983-84

345. Database Research Seminar — Presentations of current research and industrial innovation. Strong emphasis of discussion and evaluation. Topics of special interest include database models, high performance algorithms, and application of artificial intelligence techniques to large and distributed databases.
1 to 3 units, (Weiderhold) F 3:15

347. Computer Networks: Modeling and Analysis — (Enroll in Electrical Engineering 384.) Review of network functions, architecture and protocols; computer traffic characterization; resource sharing; packet-switched store-and-forward networks (e.g., ARPANET): delay analysis, network design and optimization including capacity assignment, routing and topological design; analysis of multiaccess/broadcast protocols (used in packet-switched satellite, ground radio, and local networks): fixed assignment, random access, demand assignment, adaptive strategies, stability considerations and dynamic control. Prerequisite: 147, 244.
(Also see Electrical Engineering 384.)
3 units, Spr (Tobagi)

1 to 3 units, any quarter (Staff)
by arrangement

1-3 units, by arrangement.

370. Artificial Intelligence and Language Seminar.
1-3 units, any quarter (Staff)
by arrangement.

400A. Representation, Meaning, and Inference—The problem of the formal representation of knowledge in intelligent systems is subject to two important constraints. First, a general knowledge-representation formalism must be sufficiently expressive to represent a wide variety of information about the world. A long-term goal here is the ability to represent anything that can be expressed in natural language. Second, the system must be able to draw inferences from the knowledge represented. Course will examine the knowledge representation problem from the perspective of those constraints.
Aut, (R. Moore) by arrangement
400B. Theoretical Aspects of Robot Cognition and Action—This course will review fundamental theoretical problems in the design of artifacts which sense and affect complex environments. The focus of the course will be on the use of concepts from symbolic logic and theoretical computer science to rigorously characterize the notion of a rational cognitive agent.

Win (S. Rosenschein) by arrangement

400C. The Cell Discretization Algorithm and Some Applications—The “Cell Method” of discretizing linear elliptic partial differential equations will be described. Included will be the variational framework of the method, the role of intracell basis functions and interface weight functions, the pretransformation of the discrete variables for the purpose of solution, and the ensuing adaptation of the resulting system of equations to the form required for the Preconditioned Conjugate Gradient method.

Spr (J. Greenstadt) by arrangement

The following departments offer courses that may be of special interest to students of computer science:

Behavioral Sciences.

Business—Data processing in business problems, science in management and operations research.

Economics—Statistical Methods of Econometrics.

Electrical Engineering—Information and communication theory, theory and design of systems and adaptive design, VLSI design.

Engineering Management.

Industrial Engineering.

Linguistics—Syntax, semantics, language theory.

Mathematics—Mathematical logic, recursion theory.

Operations Research—Mathematical programming.

Philosophy—Mathematical logic.

Statistics.

---

Drama

Emeriti: Wendell Cole (Professor), H. Donald Winbigler, Elisabeth Buckingham (Associate Professor); Evelyn M. Draper (Adjunct Professor); Naomi Wrage (Assistant Professor)

Chairman: Charles R. Lyons

Professors: Martin Esslin, Charles R. Lyons (Drama and Comparative Literature), Eleanor Prosser (Drama and English), Douglas A. Russell, Helen W. Schrader

Associate Professor: William S. Edelman

Assistant Professors: Sandra L. Richards (Drama and Black Performing Arts), John Wilson

Associate Professor (Teaching): Michael Ramsaur

Senior Lecturers: Patricia Ryan, Juan Valenzuela, Sheila Weber

Lecturer: David McLain

Visiting Lecturer: Geoffrey Reeves

Undergraduate Programs

Bachelor of Arts

The requirements for the degree of Bachelor of Arts with a major in Drama are planned to integrate the critical and historical study of drama with the study and experience of performance. The major provides aesthetic and critical opportunities for students to develop special aptitudes. For example, a student may elect an emphasis in acting, directing, and design. Students are encouraged to declare their major in their sophomore year.

The core program required of all majors:

1. Acting. Fundamentals of Acting: Drama 120A.

2. Literature and Criticism. Three courses to be chosen from the following: Drama 150-159. Students may substitute one course in dramatic literature at 100 level or above from another department.

3. Theatre History. History of the Theater: Drama 160 or Drama 161.

4. Design and Production. Introduction to Design and Production: Drama 30 and Drama 31; and one of the following courses: 130A, 131A, 132A, 133A.

5. Performance. Each major must complete a minimum of 8 units in laboratory courses in departmental theater productions to be divided between Drama 29 and Drama 39 with a minimum of 6 units in Drama 39; 2 units each in sets, costumes and lighting.
6. Electives: A program of 15 units of elective courses to be worked out in consultation with major advisor.
Two years of a foreign language at college level are strongly recommended.

HONORS PROGRAM IN DRAMA

For a limited number of students, the department offers a special program leading to Honors in Drama. Students accepted for this program, in addition to fulfilling the requirements for the major, will complete an honors essay, the work for which will normally begin in Spring Quarter of the junior year and be completed by the end of Winter Quarter of the senior year. To enter this program, the student must be accepted by a member of the department who will agree to advise him or her on the essay. In considering an applicant for such a project, the advisor will take into account the student's general preparation in the field of the project and will expect at least a B+ average in the student's previous work in drama.

Normally the student will prepare the Honors Essay proposal in Spring Quarter of the junior year (registering in Drama 200, "Honors Essay Proposal," 1-3 units). Upon approval of the proposal by the student's advisor and the committee on Academic Policy, the student will be formally admitted to the program and assigned a second reader. The Senior Honors Essay will be written under the guidance of the advisor during the Autumn and Winter quarters of the senior year. For each quarter, the student should register in Drama 201, "Senior Honors Essay," for 3-5 units. The essay should be completed no later than the first week of the student's last quarter before graduation. All honors projects should extend over at least two academic quarters and must receive no less than 8 units of academic credit, up to a maximum of 15 units.

Upon successful completion of the essay, candidates for Honors will be awarded "Honors," "High Honors," or "Highest Honors."

HONORS PROGRAM IN HUMANITIES

An Honors Program in Humanities is available for majors of this department who wish to supplement their departmental major by a related and carefully guided program of studies. See the section "Humanities Special Programs" for a description of the Honors Program. Students enrolled in the Honors Program in Humanities may offer Humanities 11, 62, and 63 in fulfillment of their departmental elective requirement.

GRADUATE PROGRAMS

JOINT Ph.D. IN DRAMA AND HUMANITIES

The Department of Drama participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in Drama and Humanities. For a description of that program, see the section "Humanities Special Programs."

DOCTOR OF PHILOSOPHY

All graduate study in the Department of Drama leads to the Ph.D. degree. The Ph.D. curriculum is based upon the need for integration between the critical and historical study of dramatic literature and the aesthetics of its performance. Each Ph.D. candidate is expected to function both as an artist and a scholar and perform these activities throughout his or her work in the Department of Drama. Two programs are offered: one with a concentration in criticism and direction; one in theater history and design.

Applicants for the Ph.D. program should write directly to the Department of Drama for information and applications. In addition to the required statement of purpose, all applicants must submit a statement detailing their practical theater experience and a sample of their written critical work. Applicants for the program in design and theater history must also submit a portfolio. Graduate students in the Department of Drama begin their course of studies in the Autumn Quarter of each academic year; there are no mid-year admissions. All graduate students must be degree candidates. University regulations regarding this degree are discussed in the "Degrees" section in this bulletin. The following departmental requirements are in addition to the University's basic requirements for the doctorate.

UNITS AND COURSE REQUIREMENTS

1. A minimum of 72 units of graduate courses and seminars in support of the degree in addition to the doctoral dissertation.
2. The course sequence in research and criticism (300, 301, and 302).
3. The course sequence in the history of theater and costume (160, 161, 162).
4. A minimum of four seminars in dramatic literature, theater history, or critical theory. One of the graduate seminars is to be taken outside of the Department of Drama.
5. Two years in the series in directing. Students in criticism/directing must complete the first-year and second-year workshop in directing (370A, B, C and 371A, B, C) and a third-year production project (372). Students in history/design must complete the
series of advanced design courses (330A, 330B, 330C) and a third-year in design project (331).

LANGUAGE REQUIREMENTS

The candidate must demonstrate reading knowledge of two foreign languages in both of which there is a major body of dramatic literature. The language requirement may be fulfilled in any of the following ways:

1. Achievement of a sufficiently high score (70th percentile) on the foreign language examination prepared by the Educational Testing Service. Latin and Greek are not tested by ETS.
2. A reading examination given each quarter by the various language departments, except for Latin and Greek.
3. Passage with a grade of B or higher of a course in literature numbered 100 or higher in a foreign language department at Stanford.

The requirement in one language is to be met by the end of the first year. The requirement in the other language must be met by the end of the third year.

TEACHING REQUIREMENT

Three quarters of supervised teaching at half-time and one quarter at quarter time, are a required part of the Ph.D. program. The requirement is normally met by assisting a faculty member for one quarter during the first year, by teaching two courses during the second year, and by teaching one during the third.

EXAMINATIONS

The candidate must complete four examinations, three written and one oral, by the end of Winter Quarter of the third year. Examinations are offered annually in each of the following periods of dramatic literature:

- Classical
- Medieval and Renaissance
- Neoclassical
- Romantic and early realistic
- Modern, 1870-1918
- Contemporary, 1918 to the present

Students in the criticism/directing program will be required to take the examinations in Classical, Medieval and Renaissance, and Modern drama. The fourth examination will be of the student's choice. Students in the theater history/design program will be required to take two examinations in theater history and one in design. The fourth examination will be in one of the periods of dramatic literature, the specific period to be defined in consultation with his or her advisor and approved by the departmental Graduate Study Committee. The core reading list of dramatic texts for each period is available. Each student, however, is to submit a critical bibliography to his or her advisor for approval the quarter prior to the quarter in which the examination is taken.

Students are urged to take examinations as early as possible, e.g., one in the first year, two in the second, and one in the third. At least two examinations—one written and one oral or, in exceptional circumstances, two written—must be completed by the end of the second year of residence. During the first year, the student will select one of the four examination topics on which he or she wishes to be examined orally. If the student's individual program permits, this departmental oral examination should be completed by the end of the second year, before Application for Candidacy (see below).

A University oral examination is to be taken during Autumn Quarter of the fourth year. This examination will cover (1) the field of concentration, as defined by the candidate and his or her advisor, and (2) a dissertation prospectus. Both the field of concentration and a rough draft of the prospectus must be approved by the candidate's advisor and by the departmental Graduate Study Committee by the end of Spring Quarter of the third year.

APPLICATION FOR CANDIDACY

By the end of the second year of residence, the following requirements must be completed:

1. The course sequence in research and criticism and two years of advanced directing and/or design.
2. One language.
3. At least two examinations.

Based on its evaluation of the student's progress, the Graduate Study Committee will certify the student's qualifications for candidacy. Upon favorable action, the student will file formal application for candidacy, as prescribed by the University, by the end of Spring Quarter.

DISSERTATION

Normally, this program should be completed in four years. The first year should be devoted to full-time graduate study; the second and third years to graduate study and teaching; the fourth year to writing the dissertation. Following formal admission to candidacy, the dissertation must be completed and approved with five years from the quarter in which candidacy is granted. A candidate taking more than five years will be required to re-pass the written examinations on dramatic literature.
FELLOWSHIPS

The Department of Drama awards a number of fellowships to graduate students in the Ph.D. program. Procedures for applying for financial aid are included in the admission packet. The appropriate financial aid application must be filed by January 15.

SUMMER SESSION

A special brochure is available, with full details of courses given in the summer by the Department of Drama.

INTRODUCTORY COURSES

Courses number 1 through 99 are introductory courses open to all students. Although they include basic courses required of the major, they are designed also for the student whose major is undeclared or is not in Drama.

1. Introduction to Drama—Introduction to major dramatic forms, concentrating on selected masterpieces in order to develop theatrical sensibility in reading dramatic texts. (DR:2)
   4 units, Win (Esslin) MWF 9

2. Introduction to Theatrical Style—An introductory course in the development of theatrical style and in the major periods of western culture presented through slides, lectures, and discussions. (DR:2)
   4 units, Aut (Russell) MWF 11

5. Introduction to Black American Drama—Introductory course tracing the development of Black Drama in the United States; its literature and performing companies, from 1858-1969.
   4 units, Aut (Richards) MWF 10
   alternate years, given 1983-84

20. Introduction to Acting—Exercises and improvisations to develop ease, freedom, and expressiveness on stage in preparation for the study of acting fundamentals. Sections reserved for freshmen.
   3 units, Aut, Win, Spr (Staff) MWF 1:15

   3 units Aut, Spr (Ryan) MW 8-10

27A,B,C. Movement for Actors.

27A. Basic movement knowledge and skills for the actor. Improvisation will be stressed. No prerequisites.
   3 units, Aut (Valenzuela) MWF 4-6 Beginning; TTh 4-6 Advanced

27B. Styles of theater dance in America and their techniques. Ballet, ballroom, jazz, primitive and/or ethnic, folk, and modern. Prerequisite: 27A.
   3 units, Win (Valenzuela) MW 4-1 Beginning; TTh 4-6 Advanced

27C. Emphasis on creating a role through movement, text, music (song), costume and props. Prerequisites: 27A, 27B.
   3 units, Spr (Valenzuela) MW 4-6 Beginning; TTh 4-6 Advanced

29. Theater Performance: Acting—Students who have been cast in departmental productions may receive credit for their participation as actors; one unit for Graduate Directing Workshop projects and 1-3 units for major production (the number of units to be determined by the instructor). May be repeated. No more than 10 units, however, may be counted by drama majors toward graduation requirements of 180 units. Prerequisite: consent of instructor.
   1 to 3 units, any quarter (Staff) by arrangement

30. Introduction to Theatrical Design—A lecture-laboratory course to introduce the undergraduate to the theatrical arts and crafts of stage design, costume design, and stage production.
   5 units, Spr (Staff, Russell) MWF 11
   plus lab by arrangement

31. Introduction to Stagecraft and Lighting Design—A lecture-laboratory course in practical aspects of theatrical production. Emphasis will be given to a survey of production processes and standard production techniques.
   5 units, Aut (McLain, Ramsaur) TTh 10-12

32. Costume Construction—The basic craft of planning and constructing costumes. May be repeated for credit.
   4 units, Aut (Cleveland)
   TTh 1:15-3:05 plus lab dhr

33A,B,C. Design Graphics.
   33A. 4 units, Aut (McLain) MW 10-12
   33B. 4 units, Spr (McLain) by arrangement

34. Stage Management—A project course for students who are stage managing a production, or who would like to learn the process of stage management.
   1 to 5 units, any quarter (Ramsaur)
   T 9 plus lab by arrangement

39. Theater Performance: Crew—Students may receive credit for the participation in the design and technical areas of departmental productions (set and costume construction, lighting, properties). The number of units received is determined by the instructor. Prerequisite: consent of instructor. May be repeated for credit.
   1 to 5 units, any quarter (Staff) by arrangement

59. Shakespeare—(Same as English 73.) An introduction to Shakespeare's dramatic art
65. History of American Musical Theater—A survey of the development of American musical theater as a unique and indigenous American art form. Slides, recordings, and films. 4 units Aut (Eddeleman) MWF 9

INTERMEDIATE COURSES

Courses number 100-199 are intermediate courses designed primarily for the major but open to all undergraduates who have the necessary prerequisites.

120A,B,C. Fundamentals of Acting—An introduction to the elements of self-awareness, characterization, and theatrical expression for the beginning actor. Prerequisite: sophomore standing or consent of instructor. 120A,B,C must be taken in sequence.

120A. 4 units, Aut (Ryan, Weber) TTh 10-12, TTh 1:15-3:05, MW 10-12
120B. 4 units, Win (Ryan, Weber) TTh 10-12, TTh 1:15-3:05, MW 10-12
Prerequisite: 120A or consent of instructor
120C. 4 units, Spr (Ryan, Weber) TTh 10-12 and MW 10-12
Prerequisite: 120B

121A. Acting Workshop—Training in the problems of the actor as a theatrical instrument and the extension of these techniques to the level of interpretation. May be repeated for credit. Prerequisites: 120A,B,C or consent of instructor.

121A. Advanced Scene Study.
4 units, Spr (Ryan, Weber) TTh 1:15-3:05

123. Audition Techniques.
4 units Aut (Ryan) M 2:15-5:05 alternate years, given 1983-84

124. Psychology and Drama: Identity and Role—(Same as Psychology 170.) Practicum.
3 units, Win (Ryan, Zimbardo) M 2:15-5:05

128. Theatrical Makeup.
2 units, Aut (Skriba) W 2:15-4:05

130A. Theatrical Design I—Visual analysis of historical styles as interpreted for the modern theater and developed throughout various presentational media. Specific problems in spatial perceptions and compositions and the relationship between costuming and scenic design.
4 units, Aut (Wilson) MWF 1:15
plus lab by arrangement

130B. Theatrical Design II—Advanced work in theatrical design with an emphasis on complex theatrical presentations involving new materials and visual aesthetics. Prerequisite: Drama 130A and 133.
4 units, Win (Wilson) MWF 1:15
plus lab by arrangement

131A, B, C. Lighting Design.

131A. Stage Lighting Mechanics—A lecture-lab course dealing with all practical aspects of lighting: electricity, light sources, instrumentation, control, and design process. Prerequisite: 31.
4 units, Win (Ramsaur) TTh 10-12

131B. Stage Lighting Aesthetics—A laboratory discussion course concentrating on the aesthetic principles of lighting design; interpretation, concept, process, and practice. Lighting designers for departmental one-acts, dorm shows, and community productions will be assigned from this class. Prerequisite: 131A.
4 units, Spr (Ramsaur) TTh 10-12

131C. Advanced Stage Lighting Design—The course will include projects in lighting mechanics and lighting design resolved through experimentation, class discussions and written report, and through practical application in dorm shows and other community productions. Lighting designers for major departmental productions will be assigned from this class. Prerequisite: 131A and 131B.
1-4 units, Aut, Win, Spr (Ramsaur) by arrangement

132A, B, C. Costume Design—Visual analysis of historical styles of costume design interpreted for the modern theater and developed by the student in various presentational media.

132A. Costume Design—A discussion-laboratory course in basic techniques of designing and historical stage costumes. Weekly design assignments.
4 units, Aut (Russell) T 10-12 and Th 10

132B. Costume Design—A course in the aesthetics of costume design with weekly design assignments.
4 units, Win (Russell) T 10-12 and Th 10

132C. Advanced Costume Design—Advanced design projects with an emphasis on more complex costume design problems presented weekly for analysis and discussion.
4 units, Spr (Russell) by arrangement
133A, B, C. Technical Production. Prerequisite: Drama 31.

133A. Stagecraft—A lecture-lab course in basic production practices. The student will have the opportunity to learn and practice the theory and use of standard tools and materials used in stage scenery construction.

4 units, Win (McLain) MW 10-12

and lab by arrangement

133B. Technical Production—A lecture-discussion course on the problems of realizing a scenic design, with emphasis on both standard production practices and utilization of modern technology. Prerequisite: Drama 133A.

4 units, Spr (McLain) MW 10-12

133C. Advanced Technical Production—Projects in advanced technical production practices, resolved with experimentation, drawings, and written reports. Technical directors for major departmental productions may be assigned from this class. Prerequisite: Drama 133A and 133B, or consent of instructor.

1-5 units, any quarter (McLain)

by arrangement

135. Project in Design and Technical Theater — Project in stage design, costume design, lighting design, or stage managing. Prerequisite: consent of instructor.

1-5 units, any quarter (Staff)

by arrangement

150. Contemporary Black Playwrights.

5 units, (Richards)

alternate years, given 1984-85

151. Greek Drama.—(Same as Classics 12.)

(DR:2)

5 units, Win (McCall)

152. Medieval and Renaissance Drama—

(Same as English 142.) (DR:2)

5 units (Prosser)

alternate years, given 1984-85

153. Neoclassic Drama. (DR:2)

5 units (Esslin)

alternate years, given 1984-85

154. Romantic and Early Realistic Drama.

(DR:2)

5 units (Esslin)

alternate years, given 1984-85

155. Modern Drama 1870-1918. (DR:2)

5 units, (Esslin)

alternate years, given 1984-85

156. Contemporary Drama from 1918. (DR:2)

5 units, Spr (Esslin) MWF 9

156A. A Century of Austrian Drama (1883-1983)—(Same as German 179.)

5 units, Win (Stefanek) MWF 1:15

157A. American Drama (1920-1950). (DR:2)

5 units, Win (Richards) MWF 11

157B. American Drama 1950 to Present.

5 units, Aut (Dickey) MWF 9

158. American Women Playwrights.

5 units, (Richards)

alternate years, given 1984-85

159. Shakespeare. See Drama 59.

160. History of Theater—Classical Greece to the Eighteenth Century. (DR:2)

4 units, Aut (Eddelman) MWF 10

161. History of the Theater—Nineteenth and Twentieth Centuries. (DR:2)

4 units, Win (Eddelman) MWF 9

162. History of Costume and Fashion—A lecture-survey course in the history of dress in the Western World from ancient times to the present.

4 units, Spr (Russell) MWF 11

170. Introduction to Directing—Prerequisites: 120A, B, C or consent of instructor.

4 units, Aut, Spr (Reeves) WF 10-12

190. Special Research—Individual project in the work of a playwright, period, or genre. Prerequisite: consent of instructor.

1 to 5 units, any quarter (Staff)

by arrangement


1-3 units, any quarter

by arrangement

199. Senior Honors Essay.

6-10 units (during 2 quarters)

by arrangement

ADVANCED COURSES

Courses numbered 200-299 are designed for advanced undergraduates and graduates.

235. Projects in Design and Technical Production.

1 to 5 units, any quarter (Staff)

250. Contemporary Black Playwrights.

5 units, (Richards)

alternate years, given 1984-85

251. Greek Drama. (Same as Classics 12.)

5 units, Win (McCall)

252. Medieval and Renaissance Drama.

5 units (Prosser)

alternate years, given 1984-85

253. Neoclassic Drama.

5 units (Esslin)

alternate years, given 1984-85
254. Romantic and Early Realistic Drama.
5 units (Esslin)
alternate years, given 1984-85

255. Modern Drama (1870-1918).
5 units, (Esslin)
alternate years, given 1984-85

256. Contemporary Drama from 1918.
5 units, Spr (Esslin) MWF 9

256A. A Century of Austrian Drama (1883-1983)—(Same as German 179.)
5 units, Win (Stefanek) MWF 1:15

257A. American Drama (1920-1950).
5 units, Win (Richards) MWF 11

257B. American Drama 1950 to Present.
5 units, Aut (Dickey) MWF 9

258. American Women Playwrights.
5 units, (Richards)
alternate years, given 1984-85

4 units, Aut (Eddelman) MWF 10

261. History of Theater—Nineteenth and Twentieth Centuries.
4 units, Win (Eddewman) MWF 9

262. History of Costume and Fashion.
4 units, Win (Russell) MWF 11

263. Aspects of the Social History of the Austrian Theater—(Same as German 271.)
4 units, Spr (Stefanek) MWF 10

270. Independent Project in Directing—Pre requisite: Drama 170 and approval of department of Drama curriculum and academic policy committee.
2 to 5 units, any quarter (Reeves)

by arrangement

290. Special Research—Individual project in the work of a playwright, period, or genre.
1 to 5 units, any quarter (Staff)
by arrangement

GRADUATE COURSES

Courses numbered 300 and above are primarily for graduates but are open to advanced undergraduates with permission.

300. Research Methods.
5 units, (Prosser)
alternate years, given 1984-85

301. History of Dramatic Criticism.
5 units (Lyons)
alternate years, given 1984-85

302. Contemporary Approaches to Criticism.
5 units, Win (Lyons) MW 10-12

303A,B,C. Design Workshop — Advanced course in design for the theatre.
304. Seminar in Medieval Drama.
5 units, (Prosser)
alternate years, given 1984-85

305A. 5 units, Aut (Eddelman, Ramsaur, Russell, Wilson)
by arrangement

305B. 5 units, Win (Eddelman, Ramsaur, Russell, Wilson)
by arrangement

305C. 5 units, Spr (Eddelman, Ramsaur, Russell, Wilson)
by arrangement

330. Design Project—Design of a full-length production in conjunction with directing project (Drama 372).
5 units, any quarter (Eddelman, Ramsaur, Russell, Wilson)
by arrangement

350. Seminar in Greek Drama.
5 units (Lyons)
alternate years, given 1984-85

351A. Seminar: Shakespeare and the Tragic Form.
5 units, Aut (Lyons) MW 10-12

351B. Seminar: Contemporary British Playwrights.—Pinter, Stoppard, Bond.
5 units, Win (Esslin) MW 2:15-4:05

352. Seminar: Theatre of the Absurd.
5 units, (Esslin)
alternate years, given 1984-85

352A. Drama on Stage and Screen—(Same as Communication 213.)
5 units, Spr (Esslin) MW 10-12

353. Seminar in Medieval Drama.
5 units, (Prosser)
alternate years, given 1984-85

5 units, Win (Eddelman) MW 10-12

355A. The Dream-Play in Austrian Theater from Grillparzer to Horvath—(Same as German 349S.)
5 units, Spr (Stefanek) TTh 2:15-4:05

370A,B,C. Directing Workshop I—Investigation of basic directional problems in scenes, using a multi-form theatre space, designing actor/audience relationships and composing modular scenic units. Performances limited to class. Prerequisite: consent of instructor.
370A. 5 units, Aut (Reeves)
by arrangement

370B. 5 units, Win (Staff)

370C. 5 units, Spr (Reeves)
by arrangement

371A,B,C. Directing Workshop II—Investigation of basic directorial problems in shorter
plays or act units working in a variety of styles, using a multiform theater space. Public performances.

371A. 5 units, Aut (Staff) by arrangement
371B. 5 units, Win (Reeves) by arrangement
371C. 5 units, Spr (Reeves) by arrangement

5 units, any quarter (Staff) by arrangement

390. Tutorial.
1-4 units, any quarter (Staff) by arrangement

399. Dissertation Research.
Any quarter (Staff) by arrangement

INTER-PERSONAL AND SMALL GROUP COMMUNICATION

110. Independent Study.
1 to 3 units, Aut, Win, Spr (Schrader) by arrangement

111. Exposition—Focuses on inter-personal communication in the small group.
3 units, Aut, Win (Schrader) MWF 11

113. Group Communication—Focuses on inter-personal processes of communication as they relate to inter-group experience. Prerequisite: 111 or consent of instructor.
4 units, Spr (Schrader) TTh 2:15-4:05
The Stanford National Resource East Asia Language and Area Center sponsors programs which provide opportunities for East Asian Studies faculty and students to meet and work with one another. For further information concerning East Asian Studies at Stanford, please contact the Center for East Asian Studies, Room 200, Lou Henry Hoover Building, Stanford University, Stanford, California 94305; (415) 497-3362.

UNDERGRADUATE PROGRAMS
BACHELOR OF ARTS IN EAST ASIAN STUDIES

The undergraduate major in East Asian Studies enables students who are committed to the study of China and/or Japan to design a major curriculum that combines language training and interdisciplinary coursework. The structure of the major is intended to guide the student in a course of study that provides broad exposure to China or Japan (or East Asia as a whole) through a combination of courses in several departments. The student should integrate his or her studies around a thematic or disciplinary focus.

Before declaring a major in East Asian Studies, students should consider whether it truly meets their interests and long-range academic and career plans. Alternatives include a major in Chinese or Japanese within the Department of Asian Languages, an informal concentration on China or Japan within a regular departmental major, and such other interdisciplinary majors as International Relations. The hallmarks of the East Asian Studies major are concentration on a single area of the non-Western world, interdisciplinary breadth, and flexibility of focus. These alternatives are specified not to discourage East Asian Studies majors but to ensure that their declaration represents a considered and clearheaded decision.

Potential majors must submit a written application (Student Proposal for a Major in East Asian Studies), preferably not later than the end of the first quarter of the junior year, for approval by the East Asian Studies Subcommittee on the A.B. Program.

Majors are required to complete at least 75 units of coursework treating China and/or Japan. (Courses not limited to East Asia may be counted if at least half of the course content treats China and/or Japan and if the student focuses on one or both countries in any required written work.) These units are to be distributed as follows.

1. Language: 30 units—Completion of at least first and second year courses in either Chinese or Japanese language for letter grades. Students are encouraged to undertake further language training, but additional language coursework does not count towards the requirements for the major.

2. History: 15 units—Completion of at least one of the following course sequences:
   - History 91, 92, 93 (East Asian Civilization)
   - History 192A, 192B, 192C (Chinese History)
   - History 194, 194A, 194B (Japanese History)

3. Substantive Concentration: 30 units—Completion of appropriate coursework focused on a disciplinary or topical theme that may also specify either China or Japan and a particular historical era. The concentration may not include language courses, but literature courses and additional courses in history may be counted. The concentration normally includes coursework in at least two departments. Examples of substantive concentrations include:
   - traditional Japanese civilization
   - social transformation of modern China
   - economic development in East Asia
   - political economy of postwar Japan
   - fine arts and literature in Ming-Qing China
   - culture and society of modern Japan

4. Senior Essay—Completion of a paper, approximately 25 typewritten pages in length, to be submitted as a senior essay in East Asian Studies. Insofar as possible, the essay should integrate the substantive concentration. It may be written for one of the courses offered as part of that concentration or in connection with directed individual study with the approval of the student's major advisor. In the latter case, up to 5 units of individual study may be credited toward the substantive concentration.

HONORS PROGRAM

Majors with a grade-average of 3.25 or better in all courses related to East Asia may apply for the honors program, preferably no later than the final quarter of the junior year. Application entails submitting an honors prospectus to the student's advisor for approval. Admission is granted by the Subcommittee on the A.B. Program, acting on the advisor's recommendation.

Honors requirements are satisfactory completion of (1) an honors thesis of high quality, approximately 40 typewritten pages in length, to be submitted in lieu of the senior essay otherwise required for the major, (2) 5-10 units of directed individual study in connection with the thesis project, and (3) one advanced-level colloquium or seminar treating China, Japan, or both.
The Director of the Center serves as faculty advisor to all students. Other members of the area studies, and a disciplinary concentration. combining language training, interdisciplinary allow students a great deal of flexibility in Asian Studies.

are strongly advised to plan for professional preparation for work in many professions; they training in addition to the A.M. degree in East government service. However, career-oriented connection with a career in nonacademic fields prefer to work, or students who wish to gain a strong background in East Asian Studies in such as business, law, education, journalism, or strongly encouraged to continue language study or take before completing other requirements are enrolled.

The basic requirements for the A.M. degree in East Asian Studies are as follows:

**Language Requirement**—The student must complete the equivalent of the first three years of language training in Chinese or Japanese. Students entering the program without any language preparation should complete 30 units of Chinese or Japanese (first- and second-year) within the first year of residence at Stanford. This may necessitate completion of a summer language program. Language courses taken at Stanford must be for letter grades.

The language requirement may be satisfied in part or in full by receiving credit for courses taken at other institutions. Students who fulfill the minimum three-year language requirement before completing other requirements are encouraged to continue language study or take courses in which Chinese or Japanese are used for as long as they are in the program. Language courses completed in addition to the third-year level may be applied to the Area Studies Courses requirement discussed below.

Students in the A.M. program are eligible to apply for the Inter-University Language Programs in Taipei and Tokyo. Work completed in one of these programs may be counted toward completion of the A.M. degree's language requirement. Students may also petition to have this work counted for a maximum of three out of the nine area courses required for the degree. For further information see the sections on the "Center for Research in International Studies in this bulletin.

**Area Course Requirement**—Students must complete a minimum of nine courses (numbered 100 or above) related to East Asia beyond the courses used to fulfill the third-year level language requirement. Three core courses must...
be within a single department; of these, one
must be a seminar in which a research paper on
China or Japan is written. The six additional
area courses may be taken in departments of the
students' choosing. Some theory-oriented or
methodological courses may be used to meet part
of these requirements provided they are
demonstrably useful for understanding East
Asian problems. Except in unusual circum-
stances, credit toward the area course require-
ment will not be given for courses taken prior to
entering the A.M. program. Students in this
program may, however, take courses for ex-
change credit at the University of California,
Berkeley with the approval of their advisor and
the Dean of Graduate Studies.

JOINT DEGREE PROGRAMS

East Asian Studies and Law—This joint pro-
gram grants an A.M. degree in East Asian
Studies and a Doctor of Jurisprudence (J.D.)
degree. It is designed to train students inter-
ested in a career in teaching, research, or the
practice of law related to East Asian legal affairs.
Interested students must apply separately to
the East Asian Studies A.M. Program and to the
Stanford School of Law and be accepted by
both. Completion of this combined course of
study requires approximately four academic
years depending upon the student's back-
ground and level of training in Chinese or
Japanese

East Asian Studies and Education—This
joint program grants an A.M. degree in East
Asian Studies and a secondary school teaching
credential in social studies. To be eligible for
this program, students should apply first to the
A.M. program in East Asian Studies and then
apply to the Stanford Teacher Education Pro-
gram during their first year at Stanford. Com-
pletion of this program requires two years in-
cluding at least one summer of study when
beginning the education component of the pro-
gram.

DUAL DEGREE PROGRAMS

Qualified graduate students may apply for
A.M. degrees within the Food Research Insti-
tute and the Medical School.

A Master of Arts degree may be awarded by
the Food Research Institute to students who
complete 25 units of work in the Institute with
an average grade of B or better; and who com-
plete at least 45 units of approved work in
courses numbered 100 or above with an average
grade of B or better. The master's program of
course work is designed at the outset of the
program to equip students with specific skills
and is not encouraged for those desiring a Ph.D.
from the Food Research Institute. Applications
should be made to the Chairman, Graduate
Instruction Committee, Food Research Insti-
tute.

DOCTORAL PROGRAMS

Stanford does not offer a Ph.D. in East Asian
Studies. However, there are more than a
hundred doctoral students in various depart-
ments and schools of the University with a
specialization on China or Japan. The depart-
ments which offer an East Asian concentration
are: Anthropology, Art, Asian Languages, Com-
paative Literature, Economics, History, Lin-
guistics, Philosophy, Political Science, and
Religious Studies. It is also possible to speci-
alize in East Asia within some of the doctoral
programs of the professional schools of Busi-
ness, Education, and Law, and the Food
Research Institute. Inquiries about these doc-
toal programs should be directed to the indi-
vidual department or school concerned.

FINANCIAL AID

Graduate students specializing in East Asia
may apply for University Fellowships at the
time of their initial applications for admission.
Students in A.M. or Ph.D. programs who plan
to work in Chinese or Japanese language or
language-related area courses may be eligible
for National Resource Fellowships (formerly
Foreign Language and Area Studies (FLAS)
Fellowships) and are encouraged to apply for
these fellowships at the time of their application
to Stanford. For further information about NRF
Fellowships, contact Center for Research in
COURSES

The courses listed below all deal primarily with China and/or Japan. There are many other theoretical and methodological courses within the various departments at Stanford which are taught by faculty who are East Asian specialists; these courses often have a substantial East Asian component and may be found under the departmental listings in this catalog. For a fuller description of the courses below, also refer to the individual departmental listings.

ANTHROPOLOGY

008. Introduction to China.
   5 units (Wolf)

   5 units, (Skinner)

118. Communist Chinese Society
   5 units, Spr (Skinner) MWF 10

121. Japanese Society and Culture.
   5 units, (Befu)

   5 units (Befu)

125. Japanese Culture Through Novels and Films—(Same as Asian Languages 125.)
   5 units (Befu)

138(238). Education and Sociocultural Change—(Same as Education 306C.)
   3-5 units, Spr (Textor) TTh 2:15-4:05

157(257). Law in Radically Different Cultures.
   3 units, Win, Spr (Barton, Gibbs, Merryman) MTTh 2:15

   5 units, Spr (Skinner) MW 1:15-2:15

ART

2. Ideas and Forms in Asian Art.
   4 units, (Sullivan)

4. Theme and Style in Japanese Art—(Graduate students get permission of instructor.)
   4 units (Takeuchi)

20. Introduction to the Art of Asia—(to 600 A.D.).
   4 units, Aut (La Plante) TTh 11-12:15

   4 units, Win (La Plante) TTh 11-12:15

22. Introduction to the Art of Asia (14th Century Onward).
   4 units, Spr (La Plante) TTh 11-12:15

125A(225A). Indian Painting.
   4 units, Win (La Plante)

125B(225B). The Art of India.
   4 units, (La Plante)

125C(225C). The Art and Architecture of Moghul India.
   4 units, (La Plante)

126A(226A). Introduction to Chinese Art.
   4 units (Sullivan)

126B(226B). Introduction to Chinese Painting.
   4 units (Sullivan)

126E(226E). The Meeting of Eastern and Western Art.
   4 units (Sullivan)

128A(228A). Ritual Bronzes of Ancient China.
   4 units (La Plante)

128B(228B). Chinese Ceramics.
   4 units, Aut (La Plante) M 2:15-4:05

128C(228C). Buddhist Art in Asia.
   4 units, (La Plante)

   4 units, Spr (La Plante) M 2:15-4:05

   4 units (La Plante)

129A(229A). Arts of Japan I.
   4 units (Takeuchi)

129B(229B). Arts of Japan II.
   4 units, Spr (Takeuchi) MW 1-2:15

   4 units (Takeuchi)

   4 units, Win (Takeuchi)

   4 units (Takeuchi)

   4 units, Aut (Takeuchi)

   4 units, (Sullivan)

227C. Seminar on Far Eastern Art.
   4 units (Sullivan)

229D. Seminar: Japanese Art—Prerequisite Art 129B or 129C.
   4 units (Takeuchi)
EAST ASIAN STUDIES 335

4 units, Spr (Takeuchi)

ASIAN LANGUAGES
COURSES NOT REQUIRING KNOWLEDGE OF AN ASIAN LANGUAGE

46. Introduction to Chinese Philosophy — (Same as Philosophy 46.)  
4 units, Win (Nivison) MTWTh 10

91. Traditional East Asian Civilization — (Same as History 91 and Humanities 91.)  
5 units, Win (Van Slyke, Lyell and Staff) MTWThF 10

92. Traditional East Asian Civilization — (Same as History 92 and Humanities 92.)  
5 units, Win (Duus, Hare, and Staff) MTWThF 10

93. Modern East Asian Civilization — (Same as History 93 and Humanities 93.)  
5 units, Win (Duus and Staff) MTWThF 10

110. Japanese-Western Literary and Cultural Interaction.  
3 units, Win (Ueda) M 2:15-4:05

114. Haiku.  
3 units, Aut (Ueda) given 1984-85

125. Japanese Culture through Novels and Films — (Same as Anthropology 125.)  
5 units (Befu) given 1984-85

131. Chinese Poetry and Drama in Translation.  
4 units, Aut (Liu) MWF 11

4 units, Win (Wang) MWF 11

133. Modern Chinese Literature in Translation.  
4 units, Spr (Lyell) MWF 11

4 units, Aut (Hare) MWF 1:15

4 units, Win (Matisoff) MWF 1:15

4 units, Spr (Ueda) MWF 1:15

144. Confucianism Since Wang Yang-ming — (Same as Philosophy 124 and Religious Studies 154.)  
4-5 units, Spr (Nivison) TTh 2:15-4:05

159. Nomad Empires of Inner Asia — (Same as History 195.)  
5 units, Spr (Dien) given 1984-85

154(254). Undergraduate/Graduate Colloquium: The Middle Period in Chinese History — (Same as History 294/394.)  
5 units, Win (Dien) M 2:15-4:05

156. China from Earliest Times to the 9th Century — (Same as History 192A.)  
5 units, Aut (Dien and Kahn) MTWThF 11

161. The Occult Tradition in Ancient China.  
4 units, Spr (Harper) TTh 11-12:15

4 units, Win (Wang) given 1984-85

177(277). Classic Japan.  
4 units, Spr (Hare) given 1984-85

4 units, Spr (Hare) given 1984-85

4 units, Spr (Matisoff) MWF 1:15

4 units, Spr (Matisoff) given 1984-85

4 units, Aut (Matisoff) given 1984-85

3 units, Aut (Ueda) given 1984-85

197(297). Images of Women in Modern Japanese Literature.  
4 units, Aut (Ueda) M 2:15-4:05

254. Graduate Colloquium: The Middle Period in Chinese History — (Same as 154 and History 294.)  
5 units, Win (Dien) M 2:15-4:05

255A. The Nature of Literature: Japanese and Western Views — (Same as Comparative Literature 255A.)  
5 units, Win (Ueda) given 1984-85

255B. Chinese and Western Theories of Literature — (Same as Comparative Literature 255B.)  
5 units, Win (Liu) given 1984-85

COURSES IN CHINESE

1, 2, 3. First-Year Modern Chinese.  
1. 5 units, Aut (Kao, Shou)  
Section 1 MTWThF 9  
Section 2 MTWThF 10  
Section 3 MTWThF 1:15

2. 5 units, Win (Kao, Shou)  
Section 1 MTWThF 9  
Section 2 MTWThF 10  
Section 3 MTWThF 1:15
### SCHOOL OF HUMANITIES AND SCIENCES

#### 3. 5 units, Spr (Kao, Shou)
- **Section 1** MTWThF 9
- **Section 2** MTWThF 10
- **Section 3** MTWThF 1:15

#### 5. Intensive First-Year Modern Chinese.
- **3.5 units, Spr (Kao, Shou)**
- **Section 1** MTWThF 9
- **Section 2** MTWThF 10
- **Section 3** MTWThF 1:15

#### 21, 22, 23. Second-Year Modern Chinese.
- **21. 5 units, Aut (Chuang)** MTWThF 9
- **22. 5 units, Win (Chuang)** MTWThF 9
- **23. 5 units, Spr (Chuang)** MTWThF 9

- **12 units, Spr (Staff)** MTWThF 9-12

#### 51. Chinese Calligraphy.
- **1-2 units, Spr (Chuang)** TTh 1:15

#### ADVANCED

101, 102, 103. Third-Year Chinese (Modern).
- **101. 5 units, Aut (Chuang)** MTWThF 11
- **102. 5 units, Win (Lyell)** MTWThF 11
- **103. 5 units, Spr (Chuang)** MTWThF 11

105. Intensive Modern Chinese.
- **12 units, Sum (Staff)** MTWThF 9-12

- **111. 5 units, Aut (Kao)** by arrangement
- **112. 5 units, Win (Kao)** by arrangement
- **113. 5 units, Spr (Kao)** by arrangement

121, 122, 123. Advanced Conversation.
- **121. 2 units, Aut (Chuang) W 2:15-4:05**
- **122. 2 units, Win (Chuang) W 2:15-4:05**
- **123. 2 units, Spr (Chuang) W 2:15-4:05**

- **131. 2 units, Aut (Kao and Staff)** by arrangement
- **132. 2 units, Win (Kao and Staff)** by arrangement
- **133. 2 units Spr (Kao and Staff)** by arrangement

199. Individual Reading in Chinese.
- **4 units, Aut, Win, Spr (Staff)** by arrangement

#### GRADUATE

200. Directed Reading in Chinese.
- **Number of units to be arranged, Aut, Win, Spr (Staff)** by arrangement

201, 202. Proseminar.
- **201. 5 units, Aut (Dien) W 2:15-4:05**
- **202. 5 units, Win (Dien) W 2:15-4:05**

221, 222, 223. Advanced Classical Chinese.
- **221. Philosophical Texts. 5 units, Aut (Nivison) MWF 11**
- **222. Historical Narration. 5 units, Win (Dien) MWF 1:15**

223. Literary Essays.
- **5 units, Spr (Liu) MWF 11**

- **241. Short Story. 5 units, Aut (Lyell) MWF 9**
- **242. Essay. 5 units, Win (Lyell and Staff) MWF 11**
- **243. Novel. 5 units, Spr (Lyell) MWF 9**

- **4 units, Aut (Liu) given 1984-85**

261. Chinese Poetry (II).
- **4 units, Win (Liu) given 1984-85**

262. Chinese Poetry (III).
- **4 units, Spr (Liu) given 1984-85**

263. T’ang and Sung Lyrics.
- **4 units, Aut (Liu) MWF 10**

264. Yuan and Ming Songs.
- **4 units, Win (Liu) MWF 10**

- **4 units, Win (Liu) MWF 11**

- **271. 4 units, Win (Harper) TTh 11:12:15**
- **272. 4 units, Spr (Wang) TTh 11:12:15**

273. Chinese Drama.
- **4 units, Spr (Wang) given 1984-85**

291. The Structure of Modern Chinese.
- **4 units, Spr (Kao)** by arrangement

- **4 units, Spr (Kao)** by arrangement

299. Translation.
- **5 units (Staff)** by arrangement

321. Seminar on Archaic Inscriptions—Bone and bronze inscriptions.
- **5 units, Spr (Nivison) M 2:15-4:05**

331. Seminar in Confucian Ethics—(Same as Religious Studies 331.)
- **5 units, Win (Nivison) T 2:15-4:05**

334. Seminar in Modern Chinese Literature.
- **5 units, Win (Lyell) TTh 1:15**

351. Seminar in Chinese Traditional Historiography.
- **5 units, Spr (Dien) given 1984-85**

361. Seminar in Chinese Literary Criticism.
- **5 units, Spr (Liu) T 2:15-4:05**

- **5 units, Aut (Wang) given 1984-85**
1,2,3. First-Year Modern Japanese.
1. 5 units, Aut (Sakamoto, Nebrig)
   Section 1 MTWThF 9
   Section 2 MTWThF 1:15
   Section 3 MTWThF 3:15
2. 5 units, Win (Sakamoto, Nebrig)
   Section 1 MTWThF 9
   Section 2 MTWThF 1:15
   Section 3 MTWThF 3:15
3. 5 units, Spr (Sakamoto, Nebrig)
   Section 1 MTWThF 9
   Section 2 MTWThF 1:15
   Section 3 MTWThF 3:15

   12 units, Sum (Staff) MTWThF 8-12

21. 5 units, Aut (Kubota) MTWThF 9
22. 5 units, Win (Kubota) MTWThF 9
23. 5 units, Spr (Kubota) MTWThF 9

   12 units, Sum (Staff) MTWThF 8-12

27,28,29. Conversation I.
27. 2 units, Aut (Sakamoto) TTh 1:15
28. 2 units, Win (Sakamoto) TTh 1:15
29. 2 units, Spr (Sakamoto) TTh 1:15

51. Japanese Calligraphy (Pen-ji Santai).
   1-2 units, Spr (Kubota) Th 3:15-4:30

ADVANCED
101,102,103. Modern Written Japanese.
101. 5 units, Aut (Kubota) MWF 11-12:15
102. 5 units, Win (Kubota) MWF 11-12:15
103. 5 units, Spr (Kubota) MWF 11-12:15

   12 units, Sum (Staff) MTWThF 9-12

121,122,123. Conversation II.
121. 2 units, Aut (Kubota) TTh 1:15
122. 2 units, Win (Kubota) TTh 1:15
123. 2 units, Spr (Kubota) TTh 1:15

GRADUATE
   Number of units to be arranged,
   Aut, Win, Spr (Staff) by arrangement

201,202. Proseminar.
201. 5 units, Aut (Matisoff) W 2:15-4:05
202. 5 units, Win (Hare) W 2:15-4:05

211,212,213. Advanced Modern Japanese.
211. Essays and Scholarly Articles.
    5 units, Aut (Matisoff) MWF 11

212. Newspaper Articles.
    5 units, Win (Matisoff) MWF 11
213. Fiction.
    5 units, Spr (Matisoff) MWF 11

246. 5 units, Aut (Hare) by arrangement
247. 5 units, Win (Hare) by arrangement
248. 5 units, Spr (Hare) by arrangement

250. Introduction to Kambun.
    4 units, Spr (Ueda) MW 2:15-3:30

251. Graduate Seminar: Japanese Historical Texts—(Same as History 498).
    5 units, Win (Mass) given 1984-85

    4 units, Aut (Ueda) given 1984-85

277. Classic Japan—(Same as 177 with additional work requiring knowledge of the language.)
    4 units, Spr (Hare) given 1984-85

278. Japanese Poetry from Manyōshū to Shinkokinshū (759—1201)—(Same as 178 with additional work requiring knowledge of the language.)
    4 units, Spr (Hare) given 1984-85

279. Classical Japanese Drama—(Same as 179 with additional work requiring knowledge of the language.)
    4 units, Spr (Matisoff) given 1984-85

281. Japanese Women Writers—(Same as 181 with additional work requiring knowledge of the language.)
    4 units, Spr (Matisoff) given 1984-85

282. Japanese Popular Religious Literature—(Same as 182 with additional work requiring knowledge of the language.)
    4 units, Aut (Matisoff) given 1984-85

294. Major Haiku Poets.
    4 units, Aut (Ueda) TTh 2:15-3:30

295. Modern Intellectuals in Japanese Literature—(Same as 195 with additional work requiring knowledge of the language.)
    4 units, Aut (Ueda) given 1984-85

296. Readings in Modern Japanese Literature.
    4 units, Win (Ueda) TTh 2:15-3:30

297. Images of Women in Modern Japanese Literature—(Same as 197 with an extra class meeting and additional work requiring knowledge of the language.)
    4 units, Aut (Ueda) M 2:15-4:05 and Th 1:15-2:05
298. Translation Workshop.  
4 units, Spr (Ueda) given 1984-85

299. Translation.  
5 units, (Staff) by arrangement

396. Seminar in Modern Japanese Literature.  
5 units, Win (Ueda) given 1984-85

ECONOMICS
120. The Marxian and Radical Tradition.  
5 units, Spr (Gurley)

121(221). Economic Development in China.  
5 units, Aut (Gurley) MTWThF 11

5 units, Spr (Aoki)

149. The Modern Firm in Theory and Practice.  
5 units, Spr (Aoki)

EDUCATION
306C. Education and Sociocultural Change—(Same as Anthropology 138/238.)  
3-5 units, Spr (Textor) TTh 2:15-4:05

HISTORY
91. Traditional East Asian Civilization.  
5 units, Aut (Van Slyke, Lyell, Staff) MTWThF 10

92. Traditional East Asian Civilization.  
5 units, Win (Duus, Hare, and Staff) MTWThF 10

93. Modern East Asian Civilization.  
5 units, Spr (Duus and Staff) MTWThF 10

192A. China from Earliest Times to the 9th Century.  
5 units, Aut (Dien, Kahn) MTWThF 11

192B. China from the 9th to the 19th Centuries.  
5 units, (Kahn)

PHILOSOPHY
46. Introduction to Chinese Philosophy — (Same as Asian Languages 46.)  
4 units, Win (Nivison) MTWTh 10

122. Chinese Philosophy from Han through Sung.  
4 units, Spr (Nivison) given 1983-84

124. Confucianism Since Wang Yang-ming — (Same as Asian Languages 144 and Religious Studies 154.)  
4-5 units, Spr (Nivison) TTh 2:15-4:05

331. Seminar in Confucian Ethics — (Same as Asian Languages 331.)  
3-5 units, Win (Nivison) T 2:15-4:05
**POLITICAL SCIENCE**

5 units, Spr (Okimoto)

120N. Seminar: Social Change and Politics in Japan.  
5 units, Win (Ike)

137. Seminar: The World of the Superpowers.  
4-5 units, Spr (Ike, North, Triska)

138A. Seminar: Arms Control and Disarmament.  
5 units, Win (Lewis)

138B. Seminar: Arms Control and Disarmament.  
5 units, Spr (Lewis)

139A. Japanese Foreign Policy.  
5 units, Win (Okimoto)

141M. Seminar: U.S.-China Relations.  
5 units, Win (Lewis)

215A. Japan’s Political Economy.  
5 units, Win (Okimoto)

215B. Japan’s Political Economy.  
5 units, Spr (Okimoto)

222. Colloquium in Comparative Politics: Japan.  
5 units, Spr (Ward)

5 units, Spr (Ike)

**RELIGIOUS STUDIES**

1C. Comparative Religious Thought.  
4 units, (Yearley) given 1984-85

1D. Religions of the East.  
3 units, Aut (Bielefeldt) MWF 10

1E. Eastern and Western Conceptions of the Self.  
4 units, Win (Yearley) MWF 10

13(113). Hinduism.  
3-5 units, Spr (Paul) MWF 10

14(114). Buddhism.  
4-5 units, Aut (Paul) MWF 11

3-5 units, (Bielefeldt) given 1984-85

19. Hindu and Buddhist Meditation.  
3 units, Win (Paul) MWF 1:15

35. Buddhist Views of Death and the Afterlife.  
3 units, Win (Paul) MWF 10

5 units, Win (Bielefeldt) TTh 8:30-9:50

18(118). Zen Buddhism.  
5 units, Spr (Bielefeldt) TTh 8:30-9:50

**ECONOMICS**

Emeriti: Moses Abramovitz, Bernard F. Haley, Tibor Scitovsky, Edward S. Shaw (Professors)

Chairman: Nathan Rosenberg

Vice Chairman: John B. Shoven


Associate Professors: Thomas E. MaCurdy, A. Mitchell Polinsky

Assistant Professors: Douglas B. Bernheim, Timothy F. Bresnahan, John T. Cuddington, George Evans, Paul Evans, Stephen R. King, Hajime Miyazaki, William Novshek, Debraj Ray, William P. Rogerson, Jose M. Vinals

Instructors: Robert A. Blecker, Michael L. Boyd, Michelle Matel, Thomas A. Mroz

Visiting Professors: Partha Dasqupta, Paul Stoneman, Yair Tauman

Visiting Associate Professor: Ronald L. Oaxaca

Visiting Assistant Professor: Nai-Pew Ong

Affiliated Professors: Roger W. Gray, Bruce F. Johnston, Timothy E. Josling, (Food Re-
search Institute), Henry Levin (School of Education), Clark W. Reynolds, Scott R. Pearson (Food Research Institute), William F. Sharpe, Robert B. Wilson (Graduate School of Business), Pan A. Yotopoulos (Food Research Institute)

Affiliated Associate Professors: Carl Gotsch, Reynaldo Martorell (Food Research Institute), Anne E. Peck (Food Research Institute), James L. Sweeney (Engineering-Economic Systems)

Affiliated Assistant Professors: James E. Hodder (Industrial Engineering)

OFFERINGS AND FACILITIES

The department’s purposes are to acquaint students with the economic aspects of modern society, to familiarize them with techniques for the analysis of contemporary economic problems, and to develop in them an ability to exercise judgment in evaluating public policy. There is training for the general student as well as for those who plan careers as economists in civil service, private enterprise, teaching, or research. Associated with the department are the Research Center in Economic Growth in Encina Hall, for research and graduate training in problems of economic growth in both industrialized and developing countries, and comparable facilities in Encina Hall for mathematical economics and econometrics.

The University Library is well supplied with literature in all fields of economics. The Hopkins Transportation Library holds invaluable material on transportation problems, and there are special collections on the institutions and commerce of Latin America, the Orient, and Pacific Coast development. Advanced students have access to the Hoover Institution, with its comprehensive collections of original and secondary materials on many foreign nations. The Food Research Library in Encina Hall is particularly valuable for International Trade and Economic Development.

Qualified graduate students in economics are given the opportunity for training and research in the special fields of the Food Research Institute. A few undergraduate courses are also conducted by the Institute.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

To be recommended by the Department of Economics for the degree of Bachelor of Arts in Economics, the student who has declared Economics as a major after July 1, 1983 must (1) have completed the course work requirements listed below and (2) upon declaring an Economics major, have submitted to the Economics Department office a prospective program form signed by the student’s advisor.

Course work requirements for students declaring Economics as a major before July 1, 1983, remain unchanged and are listed on pages 337-338 of Courses and Degrees 1982-83.

COURSE WORK REQUIREMENTS

1. Economics 1, 51, and 52 or their equivalents. Economics 51 and 52 should, wherever possible, be completed by the end of the sophomore year.

2. Thirty (30) units in courses numbered 100 or above, of which 15 units must be taken at Stanford in California.

   a) Two courses must be selected from the following list and taken at Stanford in California: 102, 111, 118, 141, 145, 148, 157, 165.

   b) Any of the following courses may be used as additional Economics courses to meet the thirty unit requirement:

      (1) Any economics course numbered above 99 and below 300 except 151, 152, 190, 191 and 199D. A maximum of 10 units of directed reading (139D and FRI directed reading) may be used.

      (2) Courses 212A, B and 214 in Engineering-Economic Systems and courses numbered 205 and above in the Food Research Institute may be used.

      (3) Each year several overseas courses are approved as economics courses in satisfying these requirements, but not all overseas economics courses count. Check 119 Encina Commons for a list of approved courses.

3. Fifteen (15) units of quantitative coursework. All courses taken to satisfy this requirement must be approved in writing by the student’s Economics Department advisor. Advisors will automatically approve courses from among the following: Economics 90, 91, 102, 170, 171, 180, 181; any Mathematics courses numbered 19 or above; Advanced Placement Mathematics credit (equivalent to Math 41 and 42); any operations research courses; any statistics courses numbered 60 or above; Psychology 60, Computer Science 103, 104, 105, 106. Advisors may approve Industrial Engineering 13 (same as Economics 92 in summer) or computer science courses above 106. No more than 10 units of accounting courses (Econ 90, Econ 91, I.E. 133) may be used towards this requirement.
OTHER REQUIREMENTS:

4. Courses taken at other universities may be given credit for as many as 35 of the required 60 units. At least fifteen (15) units towards requirement (2) must be taken at Stanford in California, including as least two courses from the list in (2a). At least twenty-five (25) units towards requirements (1) and (2) combined must be taken at Stanford in California. To use transfer credit (or any course not expressly listed) to satisfy requirements (1), (2), or (3) the student must obtain written permission from the Director of Undergraduate Studies for the Economics Department who will establish the amount of credit to be granted toward completion of the department requirements. Students who have taken a year’s elementary economics course at another university will normally be required to take Economics 51 and 52.

5. No courses receiving Economics Department credit under headings 1 and 2 above may be taken pass/no credit. No more than 10 units of course work for Economics Department credit under heading 3 above may be taken pass/no credit.

6. An average grade of “C” or better shall have been received for all units completed at Stanford in Economics.

7. No course may be counted more than once in satisfying these requirements.

8. Courses taken by declared majors without the listed prerequisites will not be given credit toward the A.B. in Economics, unless approved in writing by the Director of Undergraduate Studies for the Economics Department.

9. Students are responsible for seeing that all grades of “incomplete” are cleared within one year after the grade was given. If the “incomplete” grade is not cleared within that time, no credit will be given for the course toward the A.B. in Economics.

Students who expect to undertake graduate study in economics, particularly prospective Ph.D. candidates, are strongly advised to take courses in quantitative methods beyond those recommended for other candidates for the Bachelor of Arts in Economics. In particular a year of calculus is strongly recommended.

SPECIAL ANNOUNCEMENT

Beginning in Autumn 1984, students will choose between two programs in the Economics major. One will require higher level of quantitative proficiency than now required and will include courses using quantitative tools to analyze a selected set of applied problems. Students who might be interested in this program should take calculus through 43 (or 23) as soon as possible. They should take Economics 51Q instead of 51V in preparation for new upper division courses which will be available starting in 1984-85.

The other program will retain the quantitative requirement listed in (3) above and will emphasize the use of simple logic and the basic tools of economic analysis in teaching students to think and write about economic problems. A new, upper division course (with small sections) emphasizing writing about economic issues will be available beginning in 1984-85.

The choice of programs will apply to students declaring Economics as a major after July 1, 1984. Students declaring Economics as a major before July 1, 1984, may take part in one of the programs if they desire to do so and have the appropriate preparation. More details about both programs will be available in 119 Encina Commons after May 15, 1983.

HONORS PROGRAMS IN ECONOMICS

Two programs are offered which lead to a Bachelor of Arts with Honors in Economics. Both programs are designed to encourage a more intensive study of economics than is required for the normal major, with course and research work of exceptional distinction.

The Honors Program I entails an in-depth study of an appropriate question and completion of a thesis of very high quality.

The Honors Program II requires especially high grade average sustained through more than the usual number of units of economics, and also calls for the submission of two term papers of very high quality, in economics, written at any point in the student’s course work. A student should always save graded term papers for possible use in the Honors Program II.

Both Programs require completion of all requirements of the Bachelor of Arts in Economics.

Additional requirements of the Honors Program I are:

1. An average grade in economics courses of at least 3.5.

2. Submission of an honors thesis of very high quality. This thesis will normally be written under the direction of a member of the Economics Department (or a member of some closely related department). Honors students may take up to 10 units of Directed Reading (199D) for purposes of
completing their thesis project. Units of 199D do not count towards the 65 units for the basic economics major.

Additional requirements for the Honors Program II are:

1. Completion of 15 units of economics courses numbered 100 or above in addition to the units ordinarily required for the Bachelor of Arts in Economics.
2. Grade average in economics of at least 3.7.
3. Submission of two term papers of very high quality. These will ordinarily have been written in economics courses. They must have been read and graded by a faculty member in economics before being submitted. The original papers must be submitted.

Prospective candidates of Honors Program I should advise the Departmental Director of the Honors Program of their interest and plans at least three quarters before their graduation. At that time, or subsequently, the Director will assist students, if necessary, in finding appropriate thesis advisors. Admission to this program is not automatic and may have to be restricted if there are too many applicants.

Prospective candidates for Honors Program II are also encouraged to inform the Departmental Director of the Honors Program before the end of the junior year. Applications for Honors under this program may be made at any time up to the end of the second full week of the quarter preceding the quarter in which the student will graduate. Potential applicants are responsible for saving copies of high-quality term papers for submission with the applications.

COTERMINAL A.B./A.M. PROGRAM

For admission, a student must have an average grade in economics courses of approximately one “A” grade for every two “B” grades or better. For intelligent program planning, students are strongly urged to seek admission to the program prior to the end of the third quarter of their junior year and must apply prior to the end of the first quarter of their senior year. Application should be made to the Director of Graduate Studies for the Economics Department. In addition to meeting the requirements for the Bachelor of Arts in Economics, students are required to complete the requirements for the Master of Arts as stated below. If the student takes Honors Program I, he or she may submit his or her Honors thesis as one of the alternative two term papers. A student admitted to the coterminal A.M. program is expected to initiate the study plan immediately. A student’s coterminal status will be terminated if the student elects to receive the A.B. degree prior to completion of all requirements for the A.M. degree.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the School of Education section of this bulletin or address inquiry to the Credential Administrator, School of Education.

GRADUATE PROGRAMS

Graduate programs in economics are designed to provide students with a sound basis in modern theory, with a broad background in applied fields as well as specialization within fields of interest, with needed analytic and empirical tools, and with the perspective on the current state and uses of their discipline that is obtained by studying the development of economic thought and the economies of other cultures or other times. The department considers each of these objectives to be essential in the development of qualified researchers, teachers, and practitioners in economics. While departmental requirements for advanced degrees have been structured to secure these objectives, in the final analysis it is the responsibility of students to plan their studies so that these objectives are served.

A student who has been admitted to graduate standing in economics does not automatically become a candidate for a graduate degree. Rather, admission carries with it the expectation that students are preparing themselves for the Doctor of Philosophy degree. Admission to Candidacy and Recommendation for the Degree (and for the Master of Arts degree) occur subsequently, upon satisfaction of departmental requirements outlined below. Recommendation for the Degree and especially, Admission to Candidacy are departmental procedures separate from the formal procedures of the University Committee on Graduate Studies. The University’s basic requirements for advanced degrees (residence, dissertation, etc.) are set forth in the section “Degrees” in this bulletin and must be satisfied along with the departmental requirements listed here.

An undergraduate major in economics or its equivalent is not required for admission to graduate standing, but is desirable and, in any event, some preparation in the social sciences is essential. Students admitted to graduate standing are expected to be prepared in mathematics at least to the level of one year’s intensive study of calculus. Advanced calculus, linear algebra, differential equations, analysis, and math...
Mathematical statistics are useful preparations separately or collectively, and students are encouraged to continue the development of such analytic tools during their graduate study. Narrowly specialized undergraduate programs are not recommended.

Well prepared students proceeding toward the Doctor of Philosophy degree may expect to spend approximately two years in course work and another two years in seminars, independent study, and dissertation research, with some overlap in each direction. Exceptional progress may make a three-year program feasible and, occasionally, ambitious dissertation research cannot be completed within a four-year program.

Questions and petitions concerning admission to the program or the program itself should be addressed to the Director of Graduate Studies, who together with his administrative assistants and the Graduate Studies Committee, of which he is chairman, has departmental responsibility for administering the graduate program. Students approaching their dissertation research are obliged to seek among the regular members of the Economics Department faculty a principal advisor who will supervise that research. Officers and members of the Graduate Economics Society actively participate in advising entering students and, in addition, provide an important channel through which student interests within the department are represented.

MASTER OF ARTS

The Department of Economics does not admit students who plan to terminate their graduate study with a Master of Arts degree. Students may (but need not) elect this degree in preparation for their Doctor of Philosophy degree in economics. Students who have been advanced to Ph.D. candidacy in other departments of the University may, however, be admitted to the A.M. program in economics. Students terminating their graduate study in other departments of the University with an A.M., M.S. or M.B.A. degree are not admitted to the A.M. program in Economics. The following are departmental requirements for the Master of Arts degree:

Admission to Candidacy—Completion of the Stanford requirements for a Bachelor of Arts degree in Economics, or approximately equivalent training, and mathematical competence equivalent to one year of college calculus is required of students who undertake a program of study for the degree of Master of Arts in Economics. Admission to candidacy for the degree will be restricted to students whose record bears promise of successful graduate work. All programs must be approved by the Director of Graduate Studies before filing the Application for Candidacy for the degree of Master of Arts at least four quarters before expected completion of the degree. Programs lacking strength or coherence will not be approved.

Recommendation for the Degree—Students completing programs consistent with the departmental objectives listed in the introductory paragraph above will be recommended to the University Committee on Graduate Studies for the degree of Master of Arts in Economics, provided the following standards are satisfied:

1. Completion of a program of study at Stanford amounting to not less than 45 units of credit. Courses numbered below 100 may not be counted toward the 45 units required. The program must include at least 40 units of economics taken in the Department of Economics, including Economics 202, one course in the series Economics 210, 211, 212, and at least one additional graduate level course. Courses which are listed simultaneously with two numbers (e.g., 51 and 151, 121 and 221) may count towards the 45 units only at the level of the lower number. Courses in subjects closely related to economics may be included with the approval of the Director of Graduate Studies in Economics. Economics 1, 51, and 52, which are required for the A.B. degree in economics, cannot be used to satisfy the basic 45 units. Likewise, no more than three courses from among 102, 111, 118, 141, 145, 148, 157, and 165 can be used to satisfy the basic 45 units. No seminar courses numbered 300 or above can be counted.

2. Training in statistics equivalent to the level of Economics 170 is required.

3. Completion of a thesis acceptable to the department or of two term papers of acceptable quality at least one of which is for a course numbered 200 or over. Credit will be allowed for the thesis to a maximum of 10 units, toward the 45 units required for the degree.

4. An average grade of "B" or better shall have been received for the first 45 units of course work completed and for additional units approved by the department. A grade of "B" or better is required for Economics 202 and for the course selected from Economics 210, 211, 212. All courses must be taken for letter grades.

DOCTOR OF PHILOSOPHY

Programs of study leading to the Doctor of Philosophy degree are designed by the student, in consultation with his or her advisors and the
Director of Graduate Studies, to serve his or her particular interests as well as to achieve the general departmental objectives outlined above. Simple satisfaction of a set of requirements is necessary but not sufficient for Admission to Candidacy or Recommendation for the Degree. Rather, programs of study will be weighed individually according to the following departmental standards or requirements:

**Recommendation for the Degree**—The Departmental Graduate Studies Committee will recommend to the University Committee on Graduate Studies that a student be granted the degree of Doctor of Philosophy in Economics when the student submits, and the Graduate Studies Committee accepts, a completed program of study which will satisfy the following set of standards. This summary list is elaborated upon below.

1. Qualification established by comprehensive examination in five fields of study (if no minor subject is offered) or in four fields and a minor subject.
2. Proficiency in either at least two other areas within economics or the minor subject.
3. Qualification in Mathematics.
4. Qualification in Econometrics.
5. Qualification in Economic History.
6. Distinction requirement.
7. Professional competence in a foreign language or course work developing a needed research skill.
8. Teaching experience.
9. Research training and specialized study in seminars.
10. University oral examination.

It should be noted that the fourth and fifth standards need not involve course work in addition to that offered in satisfying the first and second. More detailed discussion follows:

1. Qualification in five fields of study (if no minor subject is offered) or in four fields and a minor subject. All candidates will be expected to qualify in "Price and Allocation Theory" and "Theory of Income and Economic Fluctuations." Evidence of competence shall be at least equivalent to passing comprehensive examinations in each field.

Comprehensive field examinations will be scheduled annually, usually at the close of the sequence designed to prepare for them. The minimal standard of qualification in each field will be a grade of "B" on the appropriate examination. Successful candidates are expected to show distinction in at least one field of economics. Comprehensive examination papers become a part of each student's permanent file.

In addition to the two theory fields, students may select remaining fields according to the following options:

**a) Option A—Without a Minor Subject**—Consistent with the objectives of their program, students may choose to prepare themselves in three of the following fields of study:
- Alternative Approaches to Economic Analysis
- Econometrics
- Economic Development
- Economic History
- International Economics
- Labor Economics
- Mathematical Economics
- Monetary Theory
- Public Finance
- Structure of Industry
- Theory of Choice

However, students are required to choose at least one field from outside of Econometrics, Mathematical Economics, and Theory of Choice.

Students should complete at least four comprehensives by the end of their second year in residence. Many complete all five. Normally students exercise Option A unless there are strong reasons leading them to take a program with a minor.

**b) Option B—With a Minor Subject**—Consistent with the objectives of their program and advance consent of the Director of Graduate Studies, students may choose to prepare themselves in a minor field. Normally, they would also prepare themselves in two of the fields of study listed under Option A. Additional credit elsewhere in the economics part of the program for the minor may be obtained by consent of the Director of Graduate Studies.

It is also possible to arrange a special minor in fields where no formal minor program is offered by the relevant department.

2. Distribution Requirement. To achieve a balanced program, students without a minor subject are required to show proficiency in at least two fields other than those in which they will take comprehensive exams under option A. Normally, a total of three five-unit graduate lecture courses offered exclusively at the 200 or above level by the Economics Department, approved by the Director of Graduate Studies, passed by grades "B" or better, will be regarded as evidence of such proficiency. Besides selecting from the remaining fields...
listed under option A for this purpose, the student may also elect Economics 200.

3. The student demonstrates competence in mathematics at least to the level of successful completion of Mathematics 7 or 43 with a grade of "C" or better or its equivalent (as judged by an examination administered by the department upon entrance). This standard should be satisfied as soon as possible after first graduate registration and those with little previous mathematical background are advised to register their first Autumn Quarter for Mathematics 5 or 41. Those who have more background but are not quite up to the level of Mathematics 7 or 43 may either complete Mathematics 7 or 43, or complete Economics 180, depending upon their level. Additional preparation in mathematics is strongly suggested, and students should consult with their advisors in choosing courses beyond the level of Mathematics 7 or 43.

4. Students shall submit evidence of competence in econometrics at least by completing Economics 270 and 271 with a grade of "B" or better. Electing econometrics as a comprehensive field automatically satisfies this standard. Students who do take the econometrics comprehensive may still offer Economics 276 as one of their courses satisfying the distribution requirement under 2 above.

5. Students shall submit evidence of competence in economic history either by electing to take the comprehensive exam in the field or by taking a course at the 200 level for five units. Students not offering the comprehensive exam may offer as many as two economic history courses in partial fulfillment of the distribution requirement under 2 above.

In satisfying standards 1 through 4, in unusual circumstances a student may petition the Director of Graduate Studies to substitute economics courses from outside the Economics Department if they demonstrably contribute more to the Ph.D. program.

6. Distinction Requirement. A student is expected to have shown "distinction" in some important aspect of his or her graduate program. The Graduate Studies Committee will determine what constitutes "distinction." In the past a grade of A- or better in one or more of the comprehensive examinations has been accepted as an indicator of "distinction." This does not preclude a student from demonstrating "distinction" in some other way, e.g., writing and publishing an article in a scholarly journal.

7. Consistent with the aims of the program, each student shall demonstrate research capability in a relevant foreign language or mastery of a body of specialized research methods other than econometrics. Research competence in a foreign language will automatically satisfy this standard, but evidence of particular skills in other areas may be accepted as an alternative; e.g., computer science (programming, data analysis), statistics (sample theory), psychology test theory of survey technique), mathematical and quantitative methods of demographic analysis and advanced topics in mathematics may be accepted.

8. Candidates for the Ph.D. in Economics are required to serve as a teaching assistant in the department for at least one quarter. The department considers teaching experience an essential part of the Ph.D. program. It is not recommended that the teaching-assistant requirement be satisfied during the candidate's first year of graduate study, and it will normally be satisfied by the end of the third year of residence.

9. Seminar studies are designed to develop independent research skills, to permit specialized study, and to foster dissertation research. Students are expected to participate in at least two seminars by the end of their third year in residence. Presentation of a well developed proposal for dissertation research should take place in one of these seminars or, alternatively, in a departmental workshop. A dissertation prospectus and two research papers must be submitted as part of each student's permanent file. Students in the process of dissertation research and in residence shall continue to participate in at least one seminar.

10. When these standards have been satisfied and upon a recommendation from the student's dissertation advisor, the Director of Graduate Studies will request that a University oral examination committee and time be set. The examination is based on the dissertation and on the field or fields of economics within which it lies.

11. Completion of a dissertation accepted by a departmental reading committee will be the final standard set in preparation for the Ph.D. degree.

Admission to Candidacy for Ph.D. —Current University regulations require that each department shall establish procedures for qualifying students for the Ph.D. As a result of the qualification procedure, a student shall be either (1)
qualified for admission to candidacy, or (2) explicitly terminated from the Ph.D. program. If adjudged by the department to be qualified he or she will be recommended by his or her department for admission to candidacy for the Ph.D. Thus "Qualification for the Ph.D." should be considered synonymous with "Recommendation for Admission to Candidacy for the Ph.D." The University further requires such qualification procedure for a graduate student to take place no later than at the end of six quarters of graduate work at Stanford (quarters of nine units or more, excluding the summer quarters). There may be occasional exceptions to this rule, e.g., a graduate student who changes department after his or her first year, but all such exceptions must be approved in advance by the Dean of Graduate Studies.

The qualification procedure of the Department of Economics normally takes place at the end of the Spring Quarter of the graduate student's second year. Based on the student's performance in the program up to that time, the Graduate Studies Committee will make a judgment as to his or her qualifications to complete the Ph.D. program successfully. If adjudged to be so qualified, the department will recommend the student for admission to candidacy for the Ph.D. The student should then complete the University form "Application for Candidacy for Degree of Doctor of Philosophy," which has to be signed by him or her, by the Director of Graduate Studies, and by the principal dissertation advisor, if one has been selected by that time. If the Graduate Studies Committee judges the student not qualified to complete the Ph.D. program successfully, the student will normally be terminated from the Ph.D. program, unless extenuating circumstances are shown to exist.

Admission to candidacy for the degree of Doctor of Philosophy is granted by the University Committee on Graduate Studies. Candidacy, once approved by the University Committee on Graduate Studies, remains valid for five years from date of approval (if it has not been terminated earlier by the department because of unsatisfactory progress) and may be renewed by the submission and approval of a new application, or extended upon the recommendation of the department. Admission to candidacy does not imply that the student has completed all requirements for the Ph.D. except the dissertation. Rather, it implies that the department has made a careful review of the progress of the student and has decided that he or she is qualified to complete the Ph.D. program.

The Department of Economics recognizes that there will be differences in academic programs of the students and not all students will have proceeded in the same order or at the same rate. A minimum program on which the Graduate Studies Committee can make a judgment regarding qualification at the end of the Spring Quarter of the student's second year is outlined below. Most students should expect to exceed this standard. A student who cannot meet this standard because of exceptional circumstances should consult the Director of Graduate Studies as early as possible during his second year.

Minimum Program for Qualification:


2. For students without a minor subject, successful completion of comprehensive examinations in at least two other fields of study; for students with a minor subject, successful completion of comprehensive examinations in at least one other field of study and fulfillment of most of the minor requirements.

3. Completion of the econometrics or economic history requirement may be substituted for completion of one field in item 2 above.

4. Qualification in mathematics.

The Dissertation—By the end of the student's third year, normally encompassing the two dissertation seminars and remaining coursework, students will have selected an advisor and a dissertation subject or area. A short dissertation prospectus written by the student and signed by the advisor will be placed on file with the Director of Graduate Studies. The prospectus is not binding on either party, but advisors should be informed of major changes in research directions.

As soon as a firm thesis proposal is agreed on between student and advisor, the second and third members of a reading committee are to be selected with the advisor's approval. The principal advisor and one other member of the reading committee must be from the Department of Economics.

When either a first draft of the dissertation is completed, or core theoretical and/or empirical aspects of the dissertation have been developed, a student may petition for an oral exam with the advisor's approval. The oral committee will normally consist of the three dissertation readers, a chairman drawn from outside the department, and one additional examiner nominated by the department. At least three out of these five examiners must be from the Economics Department.

For the candidate to pass the oral exam, the examining committee must be convinced that (1) the student has mastered the existing literature and professional techniques in the disser-
tation area, and (2) that no major conceptual or empirical problems remain to be overcome in making a significant contribution.

PhD MINOR IN ECONOMICS

To be recommended for the degree of Doctor of Philosophy with Economics as a minor subject, a student will qualify in three fields of economics, one of which must be either "Price and Allocation Theory" or "Theory of Income and Economic Fluctuations. Qualification in these fields is tested in the departmental comprehensive written examinations that are given once annually. The standard of achievement in these examinations is the same for minor as for major candidates.

JOINT DEGREE PROGRAM

Attention is called to a joint program. The Department of Economics and the Stanford Law School offer a joint program leading to the Doctor of Philosophy in Economics and the J.D. degree in Law.

In the above case, the student's program objectives must clearly justify such a joint program; decisions by the Departmental Graduate Studies Committee will govern. In this case, a student's program in economics must satisfy the same standards as a Ph.D. degree in Economics taken with a minor in Law. See the Law School catalogue for descriptions of its participation in the joint program. In this case, it is expected that dissertation research will cross departmental lines and that members of the dissertation committee will be drawn from both faculties.

Students would normally spend their first year full time either in Economics or in Law and their second year full time in the other department. After the second year, courses in Economics and Law could be pursued simultaneously.

Other joint programs may be arranged. For example, the Ph.D. in Economics can be combined with one or two years of study in the Law School, leading either to the non-professional Master of Legal Studies (M.L.S.) degree or the non-professional Master of Jurisprudence (J.M.) See the Law School catalogue for the requirements for these degrees. Conversely, a student taking the J.D. in the Law School may apply for a Master of Arts degree in Economics.

Completed forms for graduate application should be filed before January 15 at the Office of Graduate Admissions.

FELLOWSHIPS AND ASSISTANTSHIPS

The attention of prospective graduate students is directed to the fact that the department awards a number of fellowships for graduate study of economics. Current students under these grants range up to $5000 for an academic year in addition to tuition allowance. Students whose record justifies continuation in the program may be assured of favorable consideration for further support for a period of up to three additional years.

Such support for subsequent years may take the form of employment as research assistants or as teaching assistants. The salary scale in each case depends upon experience and ability. In the case of research assistants, students are currently receiving $5664 plus an allowance for tuition. In the case of teaching assistants, students are currently receiving $5664 per academic year, in addition to a tuition allowance. In each case the appointments are for half-time. Entering students are not normally considered for research or teaching assistantships.

Information for applying for financial aid is included with the admissions packet.

COURSES

Note—consult the Time Schedule for information about the exact times at which courses will be given.

1. Elementary Economics—The functioning of a modern market economy: the determination of national income and its distribution; the composition of output; growth of the economy. (DR:5)
   5 units, Aut, Win, Spr (Gurley, Fuchs, Shoven) MTWThF
   4 units, Sum MTWThF

51Q. Economic Analysis I—The nature of Economic Systems. Methods of allocating economic resources. Theories of production and consumer choice. The role of markets and prices in a decentralized system. Principles of efficient and equitable allocation. Methods of calculus are used to develop theoretical structures most appropriate for doing modern applied economic analysis. Prerequisites: Math 43 or equivalent; Econ 1. (DR:5)
   5 units, Aut (Ray) MTWThF
   Win (Staff)
   Spr (Rogerson)

51V. Same as 51A except that calculus is not used. (DR:5)
   5 units, Aut (Bresnahan) MTWThF
   Win (Dasqupta)
   Spr (Miyazaki)

52. Economic Analysis II—An analysis of equilibrium and instability in the economic system as a whole. National accounts and aggregate relationships among stocks and flows in markets for goods, services, and financial assets. (May
be taken as 152 by graduate students.) Prerequisite: 51. (DR:5)

5 units, MTWThF

Section 1. Aut (Staff)
Win (King)
Spr (King)

Section 2. Aut (Hall, G. Evans)
Win (Hall)
Spr (Matel)

90. Introduction to Accounting—An introduction to the principles and concepts underlying financial reports such as the income statement, statement of financial position, and the “funds” statement, and to the uses of such reports. No prior accounting is assumed. Students who have taken or are now taking a college-level accounting course may not enroll. (May be taken as 190 by graduate students.)

5 units, Aut, Win, Spr (Staff)

91. Introduction to Cost Accounting—The use of internal financial data for managerial decision-making. Students who have had or are now taking a college-level cost accounting course may not enroll. (May be taken as 191 by graduate students.) Prerequisite: 90 or IE 133.

5 units, Spr

100. Economic Theory in Historical Perspective: The Austrian School — This course approaches the historical development of economic theory from several perspectives, focusing on the contributions of the “Austrian School of Economics,” associated with the names of Menyer, Böhm-Bawerk, Wieser, Shumpeter, von Mises, and Hayek, and others, such as J.B. Clark in America and Wicksell in Sweden, who were strongly influenced by the Austrian theory of capital and interest. The emphasis will fall upon the progress of analytical clarification and elaboration, although attention will be given also to the influence of contemporary economic and political categories with which different economists worked, and the relationship of economic writings to concurrent developments in European political and social thought. Prerequisites: 51 and 52. (DR:3)

5 units, Spr (Ong)

102. Introduction to Econometrics—Review of probability, random variables, distribution theory, theory of estimation, and hypothesis testing. Introduction to simple and multiple regression analysis. Applications to economics. Students without computer experience should plan to acquire it early in the quarter. Prerequisites: Statistics 60 or the equivalent.

5 units, Aut (Pencavel) MTWThF

105. Economics of the Worker-Managed Firm—Labor managed firm is of interest to economists because of its democratic organization, its relatively lower capital-labor ratios, and recent evidence of productivity advantages relative to more traditional organization. Purpose is to investigate the theory and practice of the worker-managed or participatory firm in its various forms including producer cooperatives, Co-Determination, the Yugoslav version, and the Swedish experiences under industrial democracy. Emphasis on explaining hiring decisions, internal organization, productivity, factor intensities, finance, and the extensions to worker-managed sectors and economics. Prerequisite: 51.

5 units, given 1984-85

106. The World Food Economy — (Same as Food Research Institute 103.) Examines the interrelationship between food, population, and economic development. Emphasis on the role of agricultural and rural development in achieving economic and social progress in low-income nations. Attention to the economic and nutritional characteristics of the major types of food and to changes in food consumption associated with economic development. Focus on Asia, tropical Africa, and Mexico. The U.S. and Japan receive attention in highlighting structural changes in agriculture and in food consumption. A policy analysis perspective to decision-making related to the design of rural development strategies. Prerequisite: Economics 1 or equivalent understanding of economics; Economics 51 is recommended.

3 units, Aut (Johnston) MWF 10

107A. Commodity Futures Markets and Prices—(Same as Food Research Institute 105.) Description of the uses and functioning of commodity futures markets. Topics include business uses of the markets, the meaning of hedging, the evolution of hedging practice, determinants of the level of market use, and the relationships between level of use and market usefulness, market performance issues and measures, and the importance of speculation. Prerequisite: 1, for economic majors.

4 units, Aut (Gray) TTh 10-11:50

109. Macroeconometric Models—Use of computerized econometric models for analyzing economic fluctuations and trends, preparing and evaluating short- and long-term forecasts, and appraising quantitative policies for stabilization of growth. Students use the LOTS computer facilities and will choose one of their own term projects in addition to participating in common assignments on macroeconomic forecasting and policy. Prerequisite: 52 and 102.

5 units, Win (Hickman) MTWThF
111. Money and Banking—An investigation of financial processes, with an emphasis on the role of the banking sector and monetary policy. Implications for economic growth and stability are developed in the light of modern theory. Prerequisites: 51 and 52.
5 units, Aut, Spr (King, Gurley) MTWThF

112. Introduction to Financial Decisions—(Same as Industrial Engineering 235.) This course focuses on the models and techniques in financial decision-making under uncertainty. Topics covered include risk measurement, expected utility theory, decision trees, portfolio and capital market theories. The effects of taxation and inflation are also discussed. Prerequisites: 51, 181, Statistics 116; Economics 190 recommended, or equivalent.
3 units, Aut (Riggs) MWF 9

113. Technology and Modern Industrial Society—(Same as Values, Technology, Science and Society 107.) The interrelationships between technology and the nature and form of industrial societies over the past 200 years. Technological change as a socio-economic process illuminating the history of industrial societies. Factors in the rate and direction of technological change and diffusion. Implications for economic structure and the growth of large-scale organizations. The impact of these changes on modern industrial man as producer and consumer.
4 units (Staff)

114. British Economic History — Selected problems in the economic history of Great Britain from 1700 to the present day. The agricultural revolution, the standard of living of the workers in the Industrial Revolution, British-American differences in technology, overseas trade, capital exports and migration in the nineteenth century, and the relative decline of Britain in the twentieth century, are among the problems to be treated. Prerequisites: 51 and 52 for economics majors.
5 units, (Staff) MTWThF

115. European Economic History—Survey of growth and development in Western Europe from 1750 to World War II. Comparative approach, with primary but not exclusive emphasis on British, French and German experience. Special reference to general theories of growth, the role of the state in economic development, and the response of labor movements to industrialization. Prerequisites: 51 and 52.
5 units, Spr (Weir) MTWThF

116. American Economic History—Covers the history of American economy from colonial times to present, with greatest emphasis on years between the Revolution and World War II. The application of economic analysis to historical issues is stressed. Topics include: American growth record and its determinants; economics of slavery and the Civil War; industrialization in a land-abundant country; historical causes of the Great Depression; role of the family in American economic history. Term paper required. Prerequisite: 1.
5 units, Win (Wright) MTWThF

117. U.S. Economy in the Twentieth Century—Examines contemporary U.S. economy in historical perspective. Topics include: productivity growth; economic fluctuations since the Great Depression; changes in labor force and labor markets; the rise of the Sunbelt; and the place of the U.S. in world economy. Term paper required. Prerequisites: 51 and 52.
5 units, Spr (Wright) MTWThF

118. The Economics of Development—The state of underdevelopment and the dynamics of development are at the heart of international (and within-country) conflicts between the rich and the poor. Course examines the process of economic development in an international perspective. Focal point is the experience of developing countries since World War II. This experience is discussed with reference to the historical perspective of both developed and less developed countries and evaluated to draw policy conclusions relating to strategies of economic development. The impact of certain aspects of development on societal values and institutions receives special attention. Prerequisites: 51 and 52 for economics majors. Enrollment limited to 60.
5 units, Aut (Ray) MTWThF

119. Development and Population Interactions in the Third World — (Same as Food Research 121.) Historical and contemporary examination of the record of economic development and of population growth suggests a broad diversity of experience. Case studies of specific countries are used as a point of departure to illustrate the systematic components of the experience of economic development and those of population growth. The implications from these studies are drawn in terms of alternative structures of development, the timing of the demographic transition, income distribution, employment and migration. The interactions and possible causal effects between economic development and population growth are discussed.
5 units, Win (Yotopoulos) MW 1:15-3:05

120. The Marxian and Radical Tradition—The economic theories of Marx, Lenin, and Mao, and the application of the theories to current economic problems. Prerequisite: 1. (DR:3)
5 units, Spr (Gurley) MTWThF
121. Economic Development in China—The economic development of China during the 19th and 20th centuries, with emphasis on the Communist period. (Graduate Students enroll in 221.) Prerequisite: 1. (DR:5*)
5 units, given 1984-85

122. The Theory of Capitalist Development—This course is concerned with theoretical and historical analysis of the process of capitalist development: the emergence of the system of capitalist economic relations of exchange and production, the ongoing reproduction and expansion of that system, the determinants and limits of its expansion, and the different stages in the overall process of development. Attention is focussed upon analysis of the mechanisms, determinants, and consequences of capital accumulation and technical change, the formation of a labor supply, the role of international trade and investment, and the uneven character of the development process. Various theoretical approaches to the analysis are examined, with emphasis on the Marxian theory and the recent elaborations and extensions of that theory. Reference is made to relevant historical case studies. Prerequisites: 51 and 52.
5 units, Win (Blecker) MTWThF

123. Economic Development in Latin America— (Same as Food Research Institute 218.) (Open to advanced undergraduate students, with the consent of instructor.) Examination of the historical problems of economic growth and structural change in selected Latin American countries. Emphasis on the application of political economic analysis to problems of accumulation, investment, financial and price behavior, income distribution, innovation, migration and the rural-urban transition. Particular attention to the analysis of interdependence among economies with different economies and social structures as the U.S., Mexico, and Central America. Seminar with research papers. Prerequisites: 51 and 52.
5 units, Spr (Reynolds) Th 1:15-3:05

124. Contemporary Japanese Economic Problems—Describes main features of various Japanese economic institutions, such as household, internal labor organization, corporate structure, industrial organization, financial intermediary, and government. Examines the interactions of their behaviors. Comparison with equivalent American institutions will be emphasized. Discusses the cultural, social, and international context of contemporary economic problems and policy issues.
5 units, Spr (Aoki) MTWThF

128. Marketing, Consumption, and Price Analysis—(Same as Food Research Institute 120.) Survey of approaches used in the analysis of commodity price behavior. Topics include consumer demand analysis, spatial and temporal aspects of prices, market structure considerations, and complete commodity models. Links to microeconomic theory are drawn and emphasis is placed on a policy context. Discussion uses agricultural examples from both developing and developed agriculture. Prerequisite: 51 for economics majors.
3 units, Win (Peck) MW 10-12

129. Analytical Techniques for Development Planning—(Same as Food Research 129/229.) Treats selected analytical techniques of use in development planning, with emphasis on linear programming models and cost-benefit analysis. The lectures will have a strong practical bias and are intended to provide students with basic competence in using the tools and understanding their use by others. Prerequisite: an introductory course in microeconomic theory.
5 units, Aut (Sicular) MW 3:15-5:05

130. Demography and Economic Policy in the U.S.—This course will examine the role of the household in the process of economic development and demographic transition and in modern post-transitional societies. It will build on recent theoretical models of household decision-making concerning marriage and divorce, the sexual division of labor within the household, the life-cycle patterns of fertility, male and female labor supply, human capital and accumulation, consumption and savings. The implications of these models for dynamic aggregate economic behavior within an overlapping generations framework will also be examined. The course begins with a summary of historical and contemporary data on these and other aspects of household behavior and economic models dealing with these matters are discussed and evaluated in terms of their consistency with the data. 102 and 145 suggested as preparation, but not required. Prerequisite: 51.
5 units, Win (Weir) MTWThF

132. Application of Linear Programming to Agricultural Systems—(Same as Food Research Institute 130.) After reviewing programming theory, course concentrates on developing application skills. A basic farming systems model is extended to include exercises in mixed integer and multiperiod programming. Alternative approaches to risk and uncertainty are also incorporated. Final exercises concentrate on the construction of producer-consumer surplus models of sector-level planning. Previously filed data at LOTS and the interactive l.p. system LINDO permits students hands-on experience in using realistic working models. Computer homework exercises analyze such
diverse issues as agrarian reform, water resource development, commodity supply response, technology choice and the allocation of research resources. Model manipulation and data problems are stressed throughout. Prerequisite: 51.

3-5 units, Spr (Gotsch) MW 1:15-3:05


5 units, Spr (Arthur) TTh 3:15-5:05

140. Introduction to Financial Economics—This course will provide an introduction to modern portfolio theory and corporate finance. Topics will include savings and investment, capital formation, consumer behavior towards risk, financial effects of inflation, properties of various financial instruments, and government policy regarding securities markets. Both theoretical and institutional material will be included. Prerequisites: 51 and one course in calculus.

5 units, Win (Cuddington) MTWThF

141. Public Finance and Fiscal Policy—Effects of government expenditure, borrowing and taxation upon resource allocation, national income and employment, prices, and income distribution. Prerequisites: 51 and 52.

5 units, Aut (Bernheim) MTWThF

142. European Agricultural Policy—(Same as Food Research Institute 146.) An analytical approach to the development of agricultural policy in Europe, with particular reference to the Common Agricultural Policy of the European Community, and its relationship to agricultural and food problems of member states. Topics include the agricultural trade relationships between the EC and other advanced countries, trade agreements between EC and developing countries, and the question of enlargement of the community to include Spain and Portugal. Agricultural policies will be discussed in the context of general economic, political, and institutional development. Prerequisite: 51, 52 for economics majors.

3 units, Win (Josling) MW 3:15-5:05

143. Tax Policy Seminar—(Same as Graduate School of Business 306A.) Examines major policy issues at all levels of government, including economic, legal, equity, and administrative and compliance considerations. Topics include economic effects of taxation, tax incidence, comprehensive income taxation, tax expenditures, role of the corporate tax, income vs. expenditure taxation, forms of consumption taxes, indexing, the social security system, intergovernmental fiscal relations, and other issues. Special emphasis will be given to major current issues, such as the flat tax, the consumption expenditure tax, incentive effects of the tax system, and the treatment of income from capital. Students are expected to prepare and deliver a research paper on a major issue. The seminar is open to business students, law students, and advanced students in economics and political science. Limited enrollment. Sign up for class list in Encina Commons 119.

5 units, Aut (Pechman) MW 3-5

144. Economics of American Agriculture: Structure and Policy—(Same as Food Research 144/244.) American agriculture and its historical and contemporary role in the economy. Topics include the structure and characteristics of farming and processing units, the role of agriculture in American economic development, government policy toward commercial agriculture, poverty problems in rural America, and the international dimensions of United States agriculture. Emphasis is on policy alternatives rather than on farm management. Prerequisite: 1, for economics majors.

4 units, Aut (Falcon) MWF 9


5 units, Win (Oaxaco) MTWThF


5 units, Spr (Mroz)

149. The Modern Firm in Theory and Practice—Review and critical re-examination of the orthodox economic theories of the firm; theory of the firm as a co-operative game between shareholders and employees. Examination of efficiency implications of legal models of the American, British, German and Japanese corporation: comparative analysis of corporate behavior in the U.S. and Japan with special reference to financial structures and labor policies. Prerequisite: 51.

5 units, Spr (Aoki) MTWThF
150. Economics and Public Policy—An examination of the reasons for, and the varieties and consequences of government policies in economic affairs. This course will explore the means of policy formation and the means and effects of policies by focussing on specific case materials in three topic areas — market regulation policies (antitrust and commission regulation), tax and income redistribution policies, and macroeconomic stabilization policies. Prerequisites: 51, 52.

5 units, Win (Bresnahan)

151. Economic Analysis I—See 51.

152. Economic Analysis II—See 52.

153. Comparative Economic Systems—The analysis of economic systems: market oriented versus command economies, private property versus socialization of the means of production, labor managed firms, Russia, Hungary and Yugoslavia provide quite different socialist prototypes; whereas Japan and the United States represent dominantly capitalist prototypes, with Western European economies being somewhere in between. How economies function in practice rather than alternative systems of economic thought or doctrine. Term paper required. Prerequisites: 51 and 52. Open to non-majors.

5 units, Spr (Boyd) MTWThF

154. Economics of Legal Rules and Institutions—Analyzes how legal rules (such as property rights) should be designed and enforced in externality situations. The Coase theorem on social costs; private versus public enforcement of law; the tradeoff between the certainty and severity of punishment; and ex ante versus ex post sanctions (when the external harm is statistically uncertain). Applications to pollution control; automobile accidents; the criminal justice system; consumer products liability, land use regulation; and medical malpractice. Prerequisite: 51.

5 units, Aut (Polinsky) MTWThF

155. Economics of Natural Resources—Application of tools of economic analysis to the allocation of natural resources, including environmental resources, depletable mineral resources and renewable resources population. Particular emphasis on analyzing the ability of market mechanism to make socially rational decisions especially in the light of the importance on intertemporal considerations, uncertainty and other market imperfections. Prerequisite: 51 and a first course in differential calculs.

5 units, Spr (Dasgupta)

156. Economics of Health and Medical Care—(Graduate students register for 256.) Description of problems and institutions, review of analytical studies, and discussion of policy issues. Topics covered include mortality and morbidity, physicians and other personnel, hospitals, the drug industry, national health insurance and health maintenance organizations. Open to graduate students, undergraduate economics majors (seniors and juniors), or by permission of instructor. Prerequisite: Preparation in micro theory and some statistics desirable. Prerequisite: 51 plus some background in math or statistics.

5 units, Spr (Fuchs)

157. Theory of Firms and Imperfect Markets—This course is designed to extend and develop the basic tools of price theory in the context of U.S. industrial market structure. Emphasis will be on the application of theoretical models and concepts to the behavior of firms and markets when the conditions of perfect competition are not satisfied. Among the subjects to be covered: monopoly, oligopoly, monopolistic competition, concentration measures, behavioral theories of the firm, advertising, innovation, externalities, economies of scale, and the role of information in markets. Prerequisite: 51.

5 units, Aut (Miyazaki) MTWThF

158. Social Control of Industry—Building on the framework developed in Economics 157, this course considers the history, economics and legal background of those institutions under which U.S. industry is subject to government control. The two principal subjects of the course are antitrust law and economics and the economics and practice of public utility regulation in the communications, transportation, and energy sectors. The effects of licensing are also considered. Emphasis is placed on application of economic concepts in evaluating the performance and policies of government agencies. Prerequisite: 157.

given 1984-85

159. Mass Communication Media—(Same as Communication 266.) Focusing mainly on daily newspapers and TV, this course examines the roles of markets and government regulation in shaping print and electronic communication media. Among topics included are public goods and economics of scale, advertising, product choice and audience determination, inter-and-intramedia monopolistic competition, the FCC, demise of the metropolitan press, cable TV, policy issues and future prospects. Prerequisite: 51.

5 units, Spr (Rosse)

160. Power, Conflict and Cooperation in Economic and Social Systems—A game theoretic perspective on the analysis of conflict resolution
in the economic and political spheres. Review some basic concepts of Game Theory: game description, strategies, the role of information, cooperatives vs. non-cooperative games, extensive and normal forms, and coalitions. Provide an elementary exposition of a sample of solution concepts: Minimax, Equilibrium, Core, Bargaining Theory and Shapley value. Concrete examples will be used in analyzing such diverse problems as oligopoly behavior, the power of the various members of the U.N. Security Council, union-management wage negotiations, disarmament models, taxation and public policy, and the distribution of power among coalitions in governing bodies. Prerequisites: 51 and one course in calculus, or the consent of instructor.

5 units (Staff)

161. Economics of Technological Change—Course aims to cover topics in the area of technological change. The intention is to provide some insight into the process of technological change, to illustrate how economics has approached its analysis and to draw some public policy implications. The topics to be covered include the generation of new technology and the role of the patent system; the diffusion of new technology and the role of public policy in stimulating diffusion; and the impact of new technology with emphasis on employment repercussions. This latter section will focus upon the worldwide debate on the employment and other implications of the introduction of recent advances in microelectronics.

5 units, Win (Stoneman) MTWThF

165. International Economics—Comparative advantages in production and trade among nations; the international monetary mechanism; domestic monetary, fiscal, and exchange rate policies and their relationship to foreign trade. Prerequisites: 1, 51, in addition 52 for economics majors.

5 units, Aut (Cuddington) MTWThF

Spr (Vinals)

166. International Trade Policy — (Same as Food Research Institute 166.) Formulation and effects of selected government policies affecting international trade. Trade policy and economic welfare, government responses to competition from imports, issues underlying international negotiation of reductions of barriers to trade. Multination commodity agreements and cartels, and special trade arrangements for developing countries. Prerequisite: 165 or consent of instructor.

5 units, Spr (Pearson) MW 11-1

170. Intermediate Econometrics I—(Graduate students register for 270.) Review of probability, random variables, distribution theory. Theory of estimation and hypothesis testing.

Introduction to regression analysis. Applications to economics. Prerequisites: 51 and 52; Mathematics 43 or equivalent; Statistics 116 or equivalent.

5 units, Win (Amemiya)

171. Intermediate Econometrics II—(Graduate students register for 271.) Discussion of violations of the classical assumptions of the multiple regression model. Introduction to the estimation of multivariate regression models, simultaneous equation models, and nonlinear models. Applications to economics. Prerequisites: 170, 270.

5 units, Spr (Lau)

176. Applied Econometrics — (Graduate students register for 271.) Critical review of the literature in econometric applications. Discusses the estimation of production functions, demand functions, consumption functions, etc. Prerequisite: 171/271 or equivalent.

5 units, Spr (P. Evans)

180. Mathematics for Economists—Training in areas of mathematics which have frequent applicability to economic problems. Intended for students who have already had some calculus but lack a strong mathematical background. Topics covered include: functions of several variables; partial derivatives and differentials; mean value theorem and Taylor's theorem, integral calculus; elementary matrix algebra, determinants, and characteristic roots; quadratic forms; maximization of a function of several variables subject to equality constraints. Selected applications in economics are discussed. Prerequisites: 51 and Mathematics 41 or the equivalent.

5 units, Aut (Hammond) MTWThF

181. Optimization and Economic Analysis—The development of optimization techniques, including calculus, linear and nonlinear programming, the calculus of variations, and control theory. Emphasis on concepts and results rather than techniques and proofs. Examples will include static and dynamic theories of the household and the firm, and problems in aggregative planning and control. Prerequisites: 51, 180 or Mathematics 43 or equivalent.

5 units, Win (G. Evans) MTWThF

190. Introduction to Accounting—See 90.

191. Introduction to Cost Accounting—See 91.

199D. Directed Reading—Honors. Entails an in-depth study of an appropriate question and completion of a thesis of very high quality. This thesis will normally be written under the direction of a member of the Economics Depart-
ment (or a member of some closely related department). (See description of Honors Program I.)

1-10 units total (P. Evans and Vinals)
(Register for at least
1 unit for at least 1 quarter)

COURSES PRIMARILY FOR GRADUATE STUDENTS


A. CORE THEORY CURRICULUM


5 units, Aut (Lau)

203. Price and Allocation Theory II—Different forms of competitive and monopolistic behavior; their effect on efficiency of economic organization. Prerequisite: 202.

5 units, Win (Rogerson)


5 units, Spr (Kurz)

210, 211, 212. The Theory of Income and Economic Fluctuations—Theory of money, employment, income considered from points of view of comparative statistics, causes of instability and long-term change. 210 is prerequisite for 211; 210 and 211 are prerequisites for 212. Consent of instructor required for 210, 211, and 212.

210. 5 units, Aut (Hall, G. Evans)
211. 5 units, Win (P. Evans)
212. 5 units, Spr (Hickman)

301A,B,C. Seminar in Microeconomics.
10 units (Staff) by arrangement

310A,B,C. Seminar in Macroeconomics.
10 units (Staff) by arrangement

B. ALTERNATIVE APPROACHES TO ECONOMIC ANALYSIS

200. Topics in the History of Economic Thought — Focus on the development of economic thought from the classical school to the first generation of the neoclassical. Survey of the theories of Adam Smith, David Ricardo and some of his contemporaries, John Stuart Mill, Karl Marx, W. Stanley Jevons, Carl Menger, and Leon Walras. The development of thought will be studied both in terms of internal development and changing external economic conditions.

5 units, Aut (Arrow)

219. Value, Distribution, and Growth—A discussion of some conceptual and analytical problems concerning the determination of value, price, distribution, and accumulation in the capitalist economy. Their background in the development of economic thought is considered. This is the starting point for a systematic examination of the meaning, significance, and possible analytic solutions of these problems. Some relevant elements of Marxian economic theory are developed and compared with the approaches of Neo-Keynesian and Neoclassical theories.

5 units, Win (Harris)

220. Marxian Economic Theory—A systematic examination of Marxian economic theory, with regard to the analysis of value and surplus value, prices and profits, the circuits of capital, reproduction, accumulation, technical change, and economic crises. Recent elaborations, extensions, and applications of the theory are presented and discussed.

5 units, Spr (Ong)

395 A,B,C. Seminar in Alternative Approaches to Economic Analysis.
10 units (Staff) by arrangement

C. ECONOMIC DEVELOPMENT

To receive comprehensive credit in the field of Economic Development students must: (1) Complete 215 and 216; (2) and one of the following courses: 223, 230, 266, Food Research Institute 225.


5 units, Aut (Harris)


5 units, Win (Ray)
223. Economic Development in Latin America—See 123.

230. Monetary Theory.

266. International Trade Theory and Economic Development—Students in the Development Field are also directed to Econ 224 and 228, which may be used in fulfilling the Economic History or Distribution requirements.


10 units (Staff) by arrangement

D. ECONOMIC HISTORY

Requirements for the Field of Economic History: Comprehensive exam in Spring based on material from 227, 226 and 224. Students must submit one research paper in addition to taking the written comprehensive exam, on a subject approved by one of the faculty teaching any of the four preceding courses.

224. Science and Technology in Economic Growth — This course will provide an examination of the roles played by the growth of scientific knowledge and technical progress in the development of industrial societies. Particular attention will be paid to understanding the interactions between science and technology as well as to organizational factors which have influenced their effectiveness in contributing to productivity growth. Upper division undergraduates may attend with consent of instructor.

5 units, Spr (Rosenberg)

225. Technology, Economy and Society — Determinants and consequences of the diffusion of technological innovations in the economic history of the West from the ninth to the nineteenth centuries. Selected “clusters” of technical innovations will be examined for the light they throw upon the determinants of the rate and bias of innovative activity, economic and cultural conditions governing diffusion, and the problems of identifying and measuring the primary and second-order economic consequences of new modes of production and warfare. Innovation-clusters considered will include, e.g., the stirrup, horseshoe and horse-collar, the watermill, crank and gearing, the lateen rigged ship and nautical compass, gunpowder and the cannon, convertible husbandry and enclosures, the steam engine, Watt Rotary motion and steam railways.

given 1984-85

226. Problems in American Economic History — This course covers the history of the American economy from colonial times to the present, with focus on the period 1790 to 1940. It stresses the role of economic history as a distinctive intellectual approach to the study of economics. Topics include Slavery and the Southern Economy, Labor Scarcity and Technological Progress, the Emergence of Oligopoly, and the Coming of the Great Depression.

5 units, Aut (Wright)

227. European Economic History — Economic growth and development in Western Europe from the eleventh to the twentieth centuries, with primary emphasis on the period from the Industrial Revolution to the First World War. The course will concentrate on the experiences of Britain, France, Germany, and other continental countries, roughly with that order of emphasis. Special emphasis will be placed on the interrelations between the growth and distribution of output, demographic trends, technological and organizational changes in the agricultural and manufacturing sectors, and the changing formal and informal institutions governing political and economic activity.

5 units, Win (Eichengreen)

228. Institutions in Economic History: Form, Function and Evolution — Institutions as sets of rules, compliance procedures, or moral and ethical norms that affect the behavior of individuals. This course examines the functioning of selected institutional arrangements in the economic life of western societies from Classical Antiquity to the era of industrial capitalism. Concepts from modern economics, political science, and organization theory are brought to bear on the questions of how institutions affect efficiency and distribution, and how they evolve in response to economic forces. The historical experience examined includes: clan institutions and corporate kinship organizations, slavery in Classical Antiquity and in the New World, vassalage and feudal organization, villeinage and manorialism, agrarian village communes, usufruct rights, land tenure, and land ownership, medieval guilds, the modern conjugal family, the nation-state, joint stock companies and corporations, master-servant relationships and wage contracts.

given 1984-85

325A,B,C. Seminar in Economic History.

10 units, (Staff) by arrangement

E. MONETARY THEORY AND INSTITUTIONS


5 units, Win (G. Evans)

230. Monetary Theory—Advanced topics in monetary theory with special reference to policy criteria and control techniques in open economics. Financial intermediation and the banking system in advanced and less developed countries. Prerequisites: 211 and 265.
5 units, Spr (McKinnon)

Students are encouraged to undertake further preparation in the field of finance and the behavior of stock markets—in the Graduate School of Business or within the Economics Department.

10 units, (Staff) by arrangement

F. PUBLIC FINANCE

241, 242. Public Finance and Taxation I and II—Welfare criteria for optimal government expenditure, taxation, and debt; positive analysis of the effects of taxation, expenditure, and debt on resource allocation and income distribution; project evaluation; pricing policies in government enterprise; the local public sector and intergovernmental fiscal relations.

241. 5 units, Win (Shoven)
242. 5 units, Spr (Bernheim)

341A,B,C. Workshop on the Economics of the Public Sector—Issues in measuring and evaluating the economic performance of government tax, expenditure, debt, and other policies; their effects on private economic activity such as saving, investment, labor supply, etc.; alternative policies and methods of evaluation. A workshop format combining student research, faculty presentations, and guest speakers. Prerequisite: 241 or consent of instructor.

10 units (Bernheim, Shoven) by arrangement

354A,B,C. Seminar in Law and Economics.
6 units, Aut, Win, Spr (Polinsky) by arrangement

G. ECONOMICS OF LABOR

3 units, Aut (Pencavel)

5 units, Win (MaCurdy)

249. Economic Demography—(Same as Food Research Institute 287.) The effects of demographic changes on individual and collective economic welfare; and economic theories of demographic decision making. Topics include: overlapping generations models; economic lifecycle analysis; economic implications of changes in fertility and mortality; demography of the labor market; stable population theory; and economic theories of fertility.
5 units, Spr (Arthur) MW 3:15-5:05

345A,B,C. Workshop on Economics of Factor Markets
10 units, (Staff) by arrangement

H. ECONOMICS OF INDUSTRY

256. Economics of Health and Medical Care—See 156.

257. Economics of Industry I—Theories of industrial structure; the role of economies of scale; cost production functions; merger activity; measures of efficiency; investment decisions; inter-industry analysis; emphasis on empirical technique.
5 units, Win (Miyazaki)

258. Economics of Industry II—Models of imperfect competition; behavioral models of the firm; advertising, innovation, and information; measures of concentration; anti-trust economics, law, and cases; regulation of public utilities; public policy problems.
5 units, Spr (Rogerson)

10 units, (Staff) by arrangement

360A,B,C. Energy Modeling Seminar—Seminar topics cover the economics of the supply and demand of energy in the U.S. and in the world, energy-economy interactions, benefit-cost and welfare analysis of economic and energy policies.
10 units (Lau and Sweeney) by arrangement

I. INTERNATIONAL ECONOMICS

265. International Finance—Exchange rates and use of national monies in international
trade. Hedging and speculation. Balance of payments adjustments. Monetary and fiscal policies in open economies. Prerequisites: 204 and 212 or consent of instructor.

5 units, Aut (Vinals)

266. International Trade Theory and Economic Development—Causes of trade and its effects on the allocation of resources, income distribution, growth and development, commercial policies in advanced and poor countries. Prerequisite: 265 for students, or 215 for students in Development.

5 units, Win (Cuddington)


3 units, Spr (McKinnon)

365A,B,C. Seminar in International Economics.

10 units, (Staff) by arrangement

J. ECONOMETRICS

Among the courses listed, an examination in 272, 273, 274 will satisfy the comprehensive requirement.


272. Econometrics I—Includes a review of classical least squares theory, problems pertaining to serial correlation of the residual, autoregressive models, distributed-lag models, and other single-equation methods and problems. Selected applications in economics. Prerequisites: Mathematics 113, Statistics 219 and 220, or the equivalent.

5 units, Aut (Amemiya)


5 units, Win (McCurdy)

274. Econometrics III—Continuation of 273. Discusses nonlinear models; probit, logit, and Tobit models; disequilibrium models; frontiers in econometrics. Prerequisite: 273.

5 units, Spr (Amemiya)

275. Selected Topics in Advanced Econometrics—Covers the current topics not discussed in the sequence 272-273-274. Topics may include spectral analysis, Bayesian analysis, prediction and control, factor analysis, aggregation, etc. Prerequisite: 274.

given 1984-85


5 units

370A,B,C. Seminar in Econometrics.

10 units, (Staff) by arrangement

K. MATHEMATICAL ECONOMICS*

Field I: Theory of Choice

280. Welfare Economics — (Same as Operations Research 367.) The course will cover the normative and descriptive theory of social choice. Alternative axiomatizations of social choice, with special reference to interpersonal comparisons of utility; possibility and impossibility theorems. Measurement of inequality from a social choice viewpoint. Individual rights and social choice. Strategic considerations in social choice procedures; the Gibbard-Satterthwaite theorem on manipulability; demand revelation.

5 units, Aut (Dasgupta)

281. The Economics of Uncertainty—A systematic examination of the implications of uncertainty on microeconomic behavior using axioms of choice under uncertainty and the expected utility theorem. Topics include optimal static and dynamic portfolio choices, insurance, the effect of uncertainty on savings and production decisions, stochastic stability of markets, and general equilibrium and welfare considerations under uncertainty. Prerequisites: 181, Statistics 116, or equivalents.

5 units, Spr (Hammond)

282. Theory of Information and Organization — (Same as Operations Research 363.) Examines the role of information in the design of various economic organizations, including teams and markets, among others; problems of coordination and incentives under incomplete information; search, signaling, and related phenomena.

5 units, Win (Arrow)

283. Game Theory and Economic Application — I. Non-cooperative Game (1) Games in extensive form (with or without perfect information). (2) Games in Normal form. Nash equilibrium and perfect equilibrium. (3) Repeated Games (Falk Theorem). II. Cooperative Games in Coalition Form — (1) Solution concepts: core, Shapley value, Nucleolus and the on Neumann-Morgenstern Solution. (2) Balanced Games (Shapley-Bondereva Theorem). (3) Market Games. (4) The Shapley value core and

*Under Field I and Field II, among the courses listed any two courses plus a term paper satisfy the comprehensive requirement. This does not apply to 289 and 290 which require special approval.
the competitive equilibrium of pure exchange economy with transferable utilities (Asymptotic equivalent results).

5 units, Aut (Tauman)


5 units, Win (Hammond)


5 units, Aut (Tauman)

288. Applied General Equilibrium Analysis—This course develops fundamental theory of general equilibrium including existence proofs and their relationship to computation algorithms. Then will discuss actual application of the algorithms to a range of problems in both developed and developing economies: tariff effects, tax incidence, and natural resource exploitation policies are among the topics to be examined.

given 1984-85


given 1984-85

290. Incentive—(Same as Business 418.) A workshop on the theory of incentives and decentralization. Topics include: implementation of welfare criteria, revelation of preferences and information, decentralization of organizational control. Includes game-theoretic analysis of the effects of differences in information, limitation on observability and contracting, and the particular problems of adverse selection and moral hazard. Prerequisites: Two courses from 280-283, 289, Business 363, or consent of instructor.

5 units, Aut (Tauman)

ENGLISH


Chairman: Robert M. Polhemus
Vice Chairman: George G. Dekker
Director of Creative Writing Program: John L'Heureux


Associate Professors: John B. Bender, George H. Brown, Kenneth W. Fields, Jay Fliegelman, Barbara Charlesworth Gelpi, Arturo Islas, Jr., David R. Riggs
Assistant Professors: Terry Castle, W. S. Di Piero, Sandra E. Drake (English and Comparative Literature), Regenia Gagnier, Mary F. Wack
Professor (Teaching): Larry Friedlander
Lecturers: Katharine Andres, John Daniel, Dennis McFarland, Sheila Schwartz
Visiting Professors: Morton W. Bloomfield, H. Eric Solomon

OFFERINGS
The Department of English offers work in English and American Literature, English Philology, Creative Writing, and Expository Writing. In connection with these programs it maintains the William Dinsmore Briggs Memorial Library for the use of graduate students and the Jones Room as a center for its work in Creative Writing.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS
The English major is designed to provide students with both an understanding of the historical development of English literature and an appreciation of the variety and richness of literary texts.

PREPARATION FOR THE MAJOR
Before declaring an English major, students should have satisfied the University writing requirement. Students should also have begun preparing to fulfill the department’s requirement of proficiency in a foreign language. (Information on how to satisfy this requirement should be obtained from the department office.) The following departmental requirements are in addition to the University’s basic requirement for the bachelor’s degree. Any two of the requisite courses may be taken on a pass/no credit basis at the discretion of the instructor, but students intending to go to graduate school should weigh the fact that a grade of pass will provide little evidence of their abilities.

MAJOR IN ENGLISH
English majors are required to demonstrate proficiency in a foreign language. “Proficiency” means that the student is able to read at least at the level of facility expected in second-year college courses in a foreign language. As a minimum, the requirement may be fulfilled by passing a fourth-quarter foreign language course other than a “conversation” course or by demonstrating equivalent knowledge. English majors are strongly urged to continue with literature courses in whatever language or languages they study.

Because the English Department recognizes that the needs and interests of literature students are extremely various, it has approved several major programs of study in English. Each of these majors has different objectives and requirements; students will wish to consider carefully which major corresponds most closely to their own personal and professional objectives.

Major in English—This program provides for the interests of students who wish to understand the full variety and historical development of English and American literature over the centuries. It is strongly recommended to prospective candidates for admission to graduate schools of English. Of particular value to students selecting this major are courses with broad historical perspectives on literature and language and courses which concentrate on such major writers as Chaucer, Shakespeare, Milton, Pope, Wordsworth, Dickens, Joyce and Melville. Students are required to choose one course from each of the following eight historical areas (a course from Area A will prove more useful if taken sooner rather than later; and insofar as it is possible, students should take courses in chronological sequence):

A) Language: English 102, 205; Linguistics 10, 50.
B) Medieval: English 100B, 171A, 171B, 211, 270A.
C) Renaissance: English 100C, 113, 151, 172.
G) American Literature before 1900: English 120, 121, 122, 234A, 285A.

In addition, students must elect two additional courses in English or American literature from those offered by the English Department (excluding only English 1-2-3 or advanced composition courses). In place of one of these courses, students may choose one course in a foreign literature read in the original language.

Major in English with a Creative Writing Emphasis—This major is designed for students who wish to gain a basic knowledge of the English literary tradition as a whole and at the same time develop skills in the writing of poetry or fiction. Students must choose one course from each of the eight areas A-H listed above. In addition, students with this major are required
to take the following: for fiction writers, “Fiction Writing” (English 90), “Development of the Short Story” (English 137), plus two quarters of “Advanced Fiction Writing” (English 190) or of a more advanced writing course, all with grades of B or better; for poets, “Reading and Writing Poetry” (English 92), one course in poetry (to be approved by the person in charge of the poetry program of creative writing), plus two quarters of “Advanced Poetry Writing” (English 192) or of a more advanced writing course, all with grades of B or better.

Major in English with Interdisciplinary Emphasis—This is a major of broad educational value intended for students who wish to combine the study of the literature of one historical period with an interdisciplinary program of courses relevant to that literature. Students are required to take the following courses:

1. During their freshman or sophomore years, all students planning to major in this program must elect two courses in the history of thought of Europe. One of these should be concerned primarily with the period before the Enlightenment (e.g., Humanities 61, 109A, History 1, History 15, Western Culture 1); the other, primarily with the period since the Enlightenment (e.g., Humanities 63, History 2 or 3, Western Culture 3, Political Science 168A or 168B).

2. Six English Department courses numbered 100 and above in Medieval and Renaissance literature (Areas A, B, C, D); or Renaissance and Enlightenment literature (Areas C, D, E); or English and American literature since the Enlightenment (Areas F, G, H).

3. In addition, students must take the following English courses:
   a) those electing a Medieval/Renaissance emphasis must take English 35; or 115 and 117 and 119.
   b) those electing a Renaissance/Enlightenment emphasis must take English 35; or 117 and 119.
   c) those electing an emphasis in English and American literature since the Enlightenment must take English 25; or English 113 and a course on Chaucer; or a course on Chaucer and a course on Shakespeare and a course on Milton (English 171, 173, 271).

4. Six courses related to the literature of the chosen period from such disciplines as Anthropology, the Arts (including the practice of one of the arts), Classics, Comparative Literature, European or other literature, History, Modern Thought and Literature, and Political Science. These six courses should form a coherent program, approved by the student’s advisor.

EXTENDED MAJORS

English and French Literatures—This major provides a focus in English literature with additional work in French literature, read in the original. Candidates for the A.B. in English and French Literatures complete eight courses in English, one from each of the Areas A-H listed under the major in English and American Literature. In addition they must complete a coherent program of four courses in French literature, read in the original. The program of each student must be approved by the Director of Undergraduate Studies in English and by the Department of French and Italian.

English and Italian Literatures—This is arranged as in the major in English and French Literatures, requiring the completion of eight courses in English, one from each of Areas A-H, and a coherent program of four courses in Italian literature, read in the original. The program of each student must be approved by the Director of Undergraduate Studies in English and by the Department of French and Italian.

English and German Literatures—Candidates for the A.B. in English and German Literatures must complete a program exactly analogous to the two preceding majors, with eight courses in English, one from each of Areas A-H, and a coherent program of four courses in German literature, read in the original, with approval by the departments involved as specified above.

English and Spanish or Spanish-American Literatures—Candidates for the A.B. in this major must complete eight courses in English, including one from each of the eight areas A-H, and a coherent program of four courses in Spanish or Spanish-American literature, totaling at least twenty units and read in the original. The program of each student must be approved by the departments involved as specified above.

HONORS PROGRAM IN ENGLISH

Students who wish to undertake a more intensive and extensive program of study in English literature, including seminars and independent research, are invited to apply for the Honors Program in the winter of their junior year. Application consists of completing a form and submitting a sample of critical writing. Admission will be selective. Provisional admission will be announced in early March. Permission to continue in the program is contingent upon successful completion of the Junior Honors Seminar and submission, by June 1, of a Senior Honors Essay proposal (with bibliography).
In the Autumn and Winter Quarters of their senior year (or their two penultimate quarters), candidates for Honors will write a Senior Honors Essay under the guidance of a faculty advisor. They should register for English 197, for a total of ten units. Honors candidates are urged to take no more than 15 units of work during these two quarters. The deadline for submission of the Honors Essay is the last day of Winter Quarter.

Candidates for Honors will also register in the Autumn Quarter of their senior year for the Senior Honors Seminar, which will focus on a close reading of literary texts. In exceptional cases, English 100A-H may meet one of the Honors Seminar requirements.

Students in the Honors Program will complete the following program:

- Area requirements (A through H)—eight courses
- Junior and Senior Honors Seminars—two courses
- Senior Honors Essay—10 units

The Director of the Honors Program may, in special cases, modify these requirements.

Students electing the major in English with an Interdisciplinary Emphasis will substitute the Junior Honors Seminar for one of the courses in B) and the Senior Honors Seminar for one of the courses in D) and will write the Senior Honors Essay.

On the basis of their performance in the program as a whole, successful candidates for Honors will be awarded either "Highest Honors" or "High Honors" or "Honors."

Note: Exceptional English majors who are not in the Honors Program but who elect Senior Independent Study (199) may apply in their senior year for departmental "Honors," if their program of study has been approximately equivalent to that required of regular honors students.

**HONORS PROGRAMS IN HUMANITIES**

An Honors Program in Humanities is available for majors of this department who wish to supplement their departmental major by a related and carefully guided program of studies. See the section "Humanities Special Programs" for a description of the Honors Program. Students wishing to take the Comparative Literature option within the Honors Program in Humanities should see the section "Comparative Literature."

**VISITING STUDENTS**

Students who do not wish to become candidates for a graduate degree, but who are qualified to meet the standards of admission to a master's or Ph.D. program, may apply to the Graduate Admissions Office, Stanford University for admission as non-matriculated students for a period of not more than three consecutive quarters. Each quarter they may take up to three English courses numbered 101 to 299, or two such courses and (with the permission of the instructor) one English course numbered above 300. Such students are not eligible to apply for admission to the Ph.D. program.

**TEACHING CREDENTIALS**

1. **Single Subject Teaching Credential (Secondary).** For information concerning the requirements for this credential, consult the School of Education. Undergraduates who are interested in preparing to teach English in public secondary schools should give first priority to the departmental requirements for the A.B. with a major in English.

2. **Community College Instructor Credential.** Candidates who successfully complete the requirements for the A.M. degree in English will thereby qualify for the State of California Community College Instructor Credential.

**MASTER OF ARTS IN TEACHING**

The degree of Master of Arts in Teaching is offered jointly by this department and the School of Education. The degree is intended for candidates who have a teaching credential or relevant teaching experience and wish further to strengthen their academic preparation. The program consists of a minimum of 25 units in the teaching field and 12 units in the School of Education. Detailed requirements for the course are outlined in the School of Education section.

Candidates for the Master of Arts in Teaching may also qualify for the State of California Community College Instructor Credential by completing additional units of academic work at the graduate level. For further information consult the Credentials Administrator, Room 110, School of Education, early in the Autumn Quarter.

**GRADUATE PROGRAMS**

For University regulations governing advanced degrees see the section "Degrees" in this bulletin.

**Eligibility**—A student may enter upon graduate work toward an advanced degree in English at Stanford if he or she received a bachelor's degree of acceptable quality. (Formal application for candidacy is a separate step taken somewhat later.) Students whose previous prepara-
tion falls short of the requirements for the degree of Bachelor of Arts in English at Stanford will be expected to make up deficiencies. Credits for previous graduate work at Stanford or elsewhere more than five years old may be reevaluated or rejected.

Graduate students are admitted only as candidates in one of the following programs: the Ph.D., the Master of Arts in English and American Literature, the Master of Arts in Teaching (MAT), or the Master of Arts in Creative Writing. Since master's degree candidates are accepted for a specific terminal program, they will not subsequently be admitted to the Ph.D. program.

MASTER OF ARTS

Candidates may earn the master's degree in English and American literature by satisfying the following requirements:

1. Successful completion (B average) of 9 courses (normally 45 units) 101 and above, including at least two graduate seminars. Ordinarily graduate students enroll in courses numbered 200 and above. They may take no more than three courses numbered 101-199 without the permission of the Director of Graduate Studies. In addition to the two required graduate seminars, the master's student may schedule 5 or 10 units of directed reading and research as English 398, which would result in a substantial piece of scholarly or critical writing of appropriate length.

Candidates for the master's degree in English and American literature should consult the advisor designated by the Director of Graduate Studies during the first two weeks of the first quarter. The student and the advisor will then draw up a three-quarter plan of courses. Normally, the student should take one course each from the following five fields: Medieval; Renaissance; Eighteenth Century and Romantic; Victorian and Modern; American. With the approval of the committee, the student may write off one field on the basis of evidence of substantial work done in that field during the student's senior year. The program should contain a mixture of survey and specialized courses chosen to guarantee familiarity with a reasonable proportion of works on the Reading List for Doctoral Candidates. Normally, no more than two courses taken outside the department may be counted toward the degree, but the Graduate Studies Committee will consider exceptions.

Candidates who can demonstrate unusual-

ly strong preparation in the history of English literature may undertake a master's essay, which will normally be about 40-60 pages in length. Such candidates should register for 15 units of English 398 with the faculty member who will supervise the work on the essay. Candidates who write a masters essay may petition to be excused from up to 15 units of the requirements described above. The additional 30 units will normally consist of the courses chosen by the student and approved by the advisor and the Director of Graduate Studies.

2. Demonstration of a reading knowledge of one foreign language.

Candidates for a coterminal master's degree must fulfill all requirements for the Master of Arts in English, as well as General Requirements and Major Requirements for the A.B. or B.S. See description of programs under the "Degrees" section of this bulletin.

Candidates for the Master of Arts in Teaching must complete a minimum of two-thirds of their specified work in the English Department.

Candidates for the master's degree in Creative Writing must submit a sample of their writing with their application. Should this sample be approved, the candidate will be provisionally admitted to the program, but will not be finally accepted until he or she has demonstrated ability through one quarter's work in an advanced writing course. A candidate may then earn the master's degree by passing satisfactorily nine courses of specified work (including the qualifying advanced writing course) and one foreign language, and by submitting a piece of imaginative writing of substantial length and merit. This must be submitted at least four weeks before the close of the quarter in which the degree is to be granted.

Candidates for the master's degree in Creative Writing who, after a quarter's work, are not accepted as degree candidates in the writing program may earn the master's degree in English by completing satisfactorily nine courses of specified work and by passing one foreign language.

DOCTOR OF PHILOSOPHY

University regulations regarding this degree are discussed in the "Degrees" section in this bulletin. The following departmental requirements, dealing with such matters as residence, dissertation, and examinations, are in addition to the University's basic requirements for the doctorate.

A candidate for the Ph.D. degree must complete three years (nine quarters) of full-time work, or their equivalent, in graduate study beyond the bachelor's degree. He or she will be expected to offer at least 97 units of graduate work in addition to the doctoral dissertation. At
least three consecutive quarters of graduate work, and also the last course work in the doctoral program, must be taken at Stanford.

Towards the 97 course units currently required for the Ph.D., a student may count no more than 20 units of English 398 without the Graduate Director’s written permission. A student must take at least 70 units (normally 14 courses) of the 97 in classroom courses (that is, courses other than 396, 397, 398, and 399), of which no more than 15 units (normally 3 courses) may come from courses numbered 100-199.

Normally, this program should be completed in four years. The first year should be devoted to full-time graduate study; the second and third years to graduate study and teaching; the fourth year to writing the dissertation. Three and one-half quarters of supervised teaching are a required part of the Ph.D. program.

A candidate may take the Ph.D. degree in English literature, in English and American Literature, in English and Comparative Literature, in English and Humanities, in English and Linguistics, in English Philology, or in English Medieval Literature.

Requirements of the Ph.D. program in English literature are as follows:

1. A five-unit course in Old English (usually to be 205) and a five-unit course in Middle English language or literature (read in the original)—or equivalent work elsewhere.

2. A minimum of six courses for a letter grade from the graduate colloquia and graduate seminars, of which at least three must be graduate seminars. These colloquia and seminars should be from different genres and periods as approved by the advisor.

3. A two-unit course introducing the new graduate student to the various opportunities and responsibilities of the department and a five-unit course on teaching composition.

4. Students are encouraged to take an advanced course in literary theory or criticism.

5. A minimum of 60 additional units of graduate courses and seminars (excluding 396, 397A, 398, and 399) distributed according to the advisor’s judgment and the candidate’s needs. A student may receive graduate credit for three courses numbered 101-199 in the offerings of the English Department.

6. A student must have the consent of the advisor to have courses taken outside the English Department count toward the requirement of 97 units.

7. An oral qualifying examination based on a Reading Guide, to be taken at the end of the summer after the first year of graduate work. The final decision as to qualification is made by the Graduate Studies Committee in consideration of the student’s course record in conjunction with his or her performance in the examination.

A student coming to the doctoral program who has done graduate work at another university must petition in the first week of the first quarter at Stanford for transfer credit for course work completed elsewhere and for exemption from the Stanford Qualifying Examination. The petition should list the courses and grades and describe the nature, scope, and result of the qualifying examination taken elsewhere. The Graduate Studies Committee will meet the first week of Winter Quarter to consider these petitions in conjunction with the students’ grades for the first quarter here. If the Committee cannot make a decision at that time, it will meet the first week of Spring Quarter to make a decision after two quarters of Stanford grades. If a student’s petition is not granted, he or she will have the option of taking the Stanford Qualifying Examination either in the Spring Quarter of the first Stanford year or at the regular time at the end of the Summer of the first Stanford year.

A student who has isolated a topic or area which seems promising for a doctoral thesis subject and who wants to explore it right away, and to incur additional specific course requirements insuring coverage and balance in program, may petition upon entrance to qualify upon the recommendation of a committee of advisors who would oversee and evaluate a full year’s course of study, but such petitions will be rigorously scrutinized by the Graduate Studies Committee and granted only in exceptional cases.

8. A University oral examination to be taken no later than the winter quarter of the student’s third year of graduate work. This examination will cover the field of concentration (as defined by the student and the student’s advisor).

Requirements of the Ph.D. program in English and American literature are as follows:

1. A five-unit course in Old English (usually to be 205) and a five-unit course in Middle English language or literature (read in the original)—or equivalent work elsewhere.

2. A minimum of 35 units of graduate courses in American literature and 35 units in English. Among these, a minimum of six courses for a letter grade from the graduate colloquia and graduate seminars, of which three must be in American literature, and of which at least three must be graduate seminars. The colloquia and seminars should be in different genres and periods as approved by the advisor.

3. A two-unit course introducing the new graduate student to the various opportunities and
responsibilities of the department and a five-unit course on teaching composition.
4. Students are encouraged to take an advanced course in literary theory or criticism.
5. A student must have the consent of the advisor to have courses taken outside the English department count toward the requirement of 97 units.
6. Qualification: (See paragraph 7 under requirements of the Ph.D. program in English literature.)
7. A University oral examination to be taken no later than the Winter Quarter of the student’s third year of graduate work. This examination will cover the field of concentration (as defined by the student and the student’s advisor).

The Ph.D. program in English and Comparative Literature is designed for students wishing an extensive knowledge of the literature, thought and history of England and of at least one foreign country, for one period. Approximately half of the student’s course work and reading will be devoted to this period, with the remainder of the time given to other periods of English and American literature since 1350.

This degree, administered by the Department of English, is to be distinguished from the Ph.D. in Comparative Literature. The latter program is intended for students unusually well prepared in foreign languages, and will involve advanced work in three literatures, one of which may be English. Students interested should consult Professor John Freccero, Chairman of the Committee on Comparative Literature.

The requirements for the Ph.D. in English and Comparative Literature are as follows:
1. Qualification: (See paragraph 7 under requirements of the Ph.D. program in English literature.) For qualifications in the doctoral program in English and Comparative Literature candidates are not held responsible for literature before 1350.
2. A knowledge of the basic structure of the English language and of Chaucer. This requirement may be met by examination, or by taking ten units of courses chosen from among those offered in linguistics, English philology, and early and middle English literature including Chaucer. No particular course is required of all students.
3. A two-unit course introducing the new graduate student to the various opportunities and responsibilities of the department and a five-unit course on teaching composition.
4. A knowledge of one foreign language comparable to that demanded under the basic program and an advanced reading knowledge of a second language.
5. A minimum of 45 units in the history, thought, and literature of one period, in two or more languages, one of which must be English and one foreign. Students will normally include at least two courses in a foreign literature read in the original language and two courses listed under Comparative Literature or Modern Thought and Literature. As much as 20 units of this requirement may be satisfied through courses in Reading and Research. A student may receive graduate credit for three courses numbered 101-199 in the offerings of the English department.
6. A minimum of six courses for a letter grade from graduate colloquia and graduate seminars, of which three must be graduate seminars and of which at least four must be in the English Department. Among these courses, students should take one in literary theory or criticism. These colloquia and seminars should be in different genres and periods as approved by the advisor.
7. A University oral examination covering the field of concentration (as defined by the student and the student’s advisor). This examination, based on a reading list established by the candidate in consultation with his or her advisor, would normally be taken no later than the Winter Quarter of the third year of graduate study. However, those who spend the third year studying abroad may take this examination after their return early in the fourth year.

Requirements of the Ph.D. program in English and Linguistics are as follows:
1. A five-unit course in Old English, a five-unit course in Middle English, and English 102 (History of the English Language) for five units.
2. A minimum of three seminars in different genres and periods as approved by the advisor. The student will normally take a total of six courses from the graduate colloquia and graduate seminars.
3. A two-unit course introducing the new graduate student to the various opportunities and responsibilities of the department and a five-unit course on teaching composition.
4. Students are encouraged to take an advanced course in literary theory or criticism.
5. A minimum of 30 additional units of graduate courses and seminars (excluding 396, 397A, B, and C, and 399) in English or American literature. Courses outside the department to be taken only with consent of advisor. The student may not count more than 10 units of English 398 towards the required number for the Ph.D.
6. A minor in Linguistics (30 units, administered by the Department of Linguistics), to be worked out with the graduate advisor in Linguistics in conjunction with the graduate advisor in English. This minor will include English 101 and Linguistics 120, 130 and 140.

7. Qualification: (See paragraph 7 under requirements of the Ph.D. program in English literature.)

8. A University oral examination to be taken no later than the Winter Quarter of the student's third year of graduate work. This examination will cover the field of concentration (as defined by the student and the student's advisor). Topics for the colloquy will include at least one on applications of linguistics to literary studies. Half of the question period will be devoted to literature, and half to linguistics and its application to literature.

Language Requirements—All candidates for the Ph.D. degree (except those in English and Comparative Literature and in English Philology, for whom special language requirements prevail) must demonstrate a reading knowledge of two foreign languages. Candidates in the earlier periods must offer Latin and one of the following languages: Greek, French, German, Italian, or Spanish. In some instances they may be required to offer a third language. Candidates in the later period (i.e., after the Renaissance) must offer either Latin or French or German as one language, and may choose the second language from the following: Greek, Latin, French, German, Italian, Spanish. In all cases the choice of languages offered must have the approval of the candidate's advisor. Any substitution of another language must be approved by the Graduate Studies Committee.

The Graduate Studies Committee will not accept courses taken as an undergraduate in satisfaction of the language requirement for doctoral candidates. For students coming to doctoral work at Stanford from graduate work done elsewhere, satisfaction of a foreign language requirement accepted at the other institution will normally be accepted here.

The candidate must satisfy one language requirement by the end of the first year (that is, before registration in the following year), and the other by the end of the third year.

Foreign language requirements for the Ph.D. may be fulfilled in any of the following ways:

1. Achievement of a sufficiently high score (70th percentile) on the foreign language examination prepared by the Educational Testing Service. Latin and Greek are not tested by ETS.

2. A reading examination given each quarter by the various language departments, except for Latin and Greek.

3. For Latin and Greek, an examination by the English Department. The Latin examination will be given before registration in the Autumn Quarter in order to permit those who need the course to register for Latin 3. It will also be given in the eighth week of the Winter and Spring Quarters, along with other departmental examinations for languages not tested by the Educational Testing Service.

4. Passage with a grade of B or higher of a course in literature numbered 100 or higher in a foreign language department at Stanford. As an alternative for Latin, French, and Spanish, passage of Latin 51 and 52, French 10 and Spanish 10, respectively, with a grade of B or higher.

Dissertation—As early as possible during their graduate study, Ph.D. candidates will be expected to find a topic requiring extensive original research and to seek out a member of the department as his or her advisor. The advisor will request the chairman to appoint a committee to supervise the dissertation. Candidates should take this crucial step as early in their graduate careers as possible. The committee may well advise extra preparation within or outside the department, and time should be allowed for such work.

Immediately after the dissertation topic has been approved by the advisor, the candidate should file a formal application for candidacy as prescribed by the University. Ph.D. dissertations must be completed and approved within five years from the date of that application. Candidates taking more than five years will be required to reinstate their candidacy by application to the graduate director.

The dissertation must be submitted to the advisor in rough draft but in substantially final form at least four weeks before the University deadline in the quarter during which the candidate expects to receive the Ph.D. degree. Dissertations may not be submitted during the Summer Quarter.

JOINT PH.D. IN ENGLISH AND HUMANITIES

The Department of English participates in the Graduate Program in Humanities leading to the joint Ph.D. degree in English and Humanities. For a description of that program, see the section "Humanities Special Programs" in this bulletin.
366 SCHOOL OF HUMANITIES
AND SCIENCES

GRADUATE PROGRAM
IN MODERN
THOUGHT AND LITERATURE

Stanford also offers a Ph.D. degree in Modern Thought and Literature. Under this program students devote approximately half of their time to a modern literature from the Enlightenment to the present, and the other half in interdisciplinary studies. Students interested should see the section "Modern Thought and Literature" and consult Professor David Halliburton in the English Department.

COURSE NUMBERING SYSTEM

Freshman Writing Courses: 1-9
English Language Courses: 101-109, 200-209, 308-309
English Period Courses: 10-19, 110-119, 210-219, 310-319
American Period Courses: 20-29, 120-129, 220-229, 320-329
Drama: 40-49, 140-149, 240-249, 340-349
Poetry: 50-59, 150-159, 250-259, 350-359
Topic Courses: 60-69, 160-169, 186-189, 260-269, 360-369
Author Courses: 70-79, 170-179, 270-289, 370-389
Graduate Colloquia: 300-307
Overseas Campus Courses: 80-89, 180-185
Writing Courses, Workshops, Individual Study, etc.: 90-99, 190-199, 290-299, 300-399

COURSES NUMBERED 1 THROUGH 99 ARE INTRODUCTORY COURSES DESIGNED PRIMARILY FOR STUDENTS WHOSE MAJOR IS UNDECLARED OR IS NOT IN ENGLISH

Drop-In Tutorials—A no-credit service to any student, undergraduate or graduate, who wants help with writing. Available through the Freshman English Office.

0 units, Aut, Win, Spr (Staff)

1, 2. Freshman English—The successful completion in proper sequence of English 1 and 2 satisfies the University Writing Requirement. All courses involve reading texts and reviewing writing techniques. In the first quarter, students will concentrate on finding an appropriate thesis, and developing and organizing ideas. In the second quarter, students will concentrate on style and diction and on preparing and writing a research paper. A variety of workshops are offered.

1A, 2A. Writing Workshops: Thematic—These courses focus on a subject matter that reflects the instructor's special interest or expertise. The writing will be largely based on discussions arising from a body of reading on the subject matter.

3 units, Aut-Win, Win-Spr (Staff)

1B, 2B. Writing Workshops: Prose Writing—These courses focus directly on student writing with special texts used as examples of different kinds of writing.

3 units, Aut-Win, Win-Spr (Staff)

1C, 2C. Writing Workshops: Tutorial—Focus on individual conferences. In addition to one class meeting a week to discuss general writing techniques, all students meet once a week with the instructor to discuss their own writing.

3 units, Aut-Win, Win-Spr (Staff)

1D, 2D. Critical Reading and Writing—(Same as Learning Assistance Center 8, 9.) These courses focus on reading as well as writing and each week students meet four times in class and once in tutorial.

5 units, Aut, Win (Staff)

3. Directed Writing—For students who have been exempted from or have completed the Writing Requirement and wish further work in writing. Taught partly by the tutorial method, tailored to the individual student's needs.

3 units, Aut (Staff)

Freshman Seminars—Freshman Seminars fulfill the University Writing Requirement.

21, 22, 23. Major Texts in Western Culture—Presentation of central issues in Western thinking and culture through the study of closely-related literary and philosophical texts. The course is not structured chronologically; rather each quarter's syllabus is organized around a particular set of problems dominant throughout the history of Western culture. See Comparative Literature 21, 22, and 23 for more information about these courses.

25, 35, 45. Masterpieces of English and American Literature—Courses offering an in-depth study of selected works by major English and American writers from the medieval to modern periods.

25. Masterpieces of English Literature I: Chaucer, Shakespeare, Milton, and their contemporaries—This course is designed as an introduction to the works of three of the greatest English writers: Chaucer, Shakespeare, and Milton. (DR:2)

5 units, Aut (Howard)

35. Masterpieces of English Literature II: From the Enlightenment to the Modern Period—Designed as an introduction to literary masterpieces written in English between
1700 and the present. Divided about equally between poetry and fiction, with some drama. (DR:2)

5 units, Win (Gagnier)

45. Masterpieces of American Literature—This course is designed as an introduction to major literary works by American writers. Works by such authors as Hawthorne, Melville, James, and T.S. Eliot will be read. (DR:2)

5 units, Spr (Islas)

30. The Novel—The objectives of this course are to present the novel as a significant, distinct genre, and by close, sympathetic reading to increase the student's appreciation of individual novels. (DR:2)

5 units, Spr (Packer)

38. Modern Literature and the Irrational—An examination of modern literature's rediscovery and canonization of primal, non-ethical energies. Beginning with Nietzsche's resurrection of Dionysus, the course will include such authors as Conrad, D. H. Lawrence, Forster, Mann, and Camus. (DR:3)

5 units, Aut (Asher)

50. Poetry—An introduction through the careful reading of poems, with emphasis on contemporary American poetry, and through the study of language and technical elements of verse. There will be opportunity for the writing of poetry. (DR:2)

5 units, Aut (Stone)

60. The English Bible as Literature—Selected readings in important versions of the English bible as the source, inspiration, and reference for English and American literary works. (English majors register for 160A.) (DR:2)

5 units, Win (Brown)

68. American Indian Mythology, Legend, and Lore—Introduction to American Indian oral tradition, centering upon an investigation of the nature of native American prose and poetry, and especially the relationship between oral tradition and writing. (English majors register for 168.)

5 units, Win (Fields)

73. Shakespeare—(Same as Drama 59.) An introduction to Shakespeare's dramatic art based on the reading of approximately ten plays. Includes historical background and focus on staging methods and production values. Designed for the general student as well as the prospective English major. (DR:2)

5 units, Spr (Friedlander)

79. Fitzgerald and Hemingway—(English majors register for 179A.) (DR:2)

5 units, Aut (Islas)

90. Fiction Writing—Basic problems of narrative and imaginative writing. Prerequisite: completion of the writing requirement.

5 units, Aut, Win, Spr (Andres, McFarland, Schwartz)

91. Playwriting—An introductory course in problems of scene and dialogue. Prerequisite: completion of the writing requirement.

5 units, Spr (McFarland)

92. Reading and Writing Poetry—An introductory course in the understanding and writing of poetry. Prerequisite: completion of the writing requirement.

5 units, Aut, Win, Spr (Daniel, Di Piero)


COURSES NUMBERED 100 THROUGH 199 ARE MAINLY BASIC UNDERGRADUATE SURVEYS, SEMINARS, AND WORKSHOPS

Note: Graduate students may receive graduate credit for 3 courses numbered 101-199.

100A-J. Basic Seminars—Basic seminars on the scholarly and critical study of literary texts; given each quarter and strongly recommended for beginning English majors. English 100A-H satisfy the appropriate area requirements A-H (see program for major in English, above). The subject matter of English 100A is mainly linguistic studies; of English 100B, medieval literature; of English 100C, Renaissance literature and so on. The subject matter of English 100J, which counts as one of two required electives (see program for major in English above), is mainly the theory of literary genres. Preference given to English majors; seniors given preference in select seminars. Sign up at the English Department. (Instructors: Carnochan, Castle, Evans, Gagnier, Howard, Islas, Ruotolo.) Consult the Time Schedule for specific openings.

5 units, Aut, Win, Spr

102. The History of the English Language—Studies in the evolution of the English language as a medium of literary expression. (DR:4)

5 units, Spr (Brown)

113. The Renaissance. (DR:2)  
 5 units, Spr (Rebholfz)

119. Modern British Literature—Deals  
with whole works touching on the roots and  
currents of modernism. Includes poems,  
short stories, prose, and three novels by  
Arnold, Hopkins, Wilde, James, Conrad,  
Yeats, Joyce, Forster, Woolf, Eliot, Fowles,  
and Beckett. (DR:2)  
 5 units, Spr (Stone)

120. American Historical Novel—Introduc-  
tion to the historical novels of Cooper, Haw-  
thorne, Melville, James, Twain, Wharton,  
Cather, Faulkner, and Janet Lewis. (DR:2)  
 5 units, Win (Dekker)

121. American Literature and Culture to  
1855—(Same as American Studies 50.) (DR:2)  
 5 units, Aut (Fliegelman)

122. American Literature, 1855-1917. (DR:2)  
 5 units, Win (Solomon)

123. American Literature, 1917 to the Pres-  
et.  
 5 units, Spr (Fields)

125. American Fiction, 1917 to the Present.  
(DR:2)  
 5 units, Aut (Drake)

131A. The English Novel through the Eight-  
eenth Century. (DR:2)  
 5 units, Aut (Castle)

 5 units, Spr (Bender)

(DR:2)  
 5 units, Spr (Polhemus)

133. The Twentieth-Century English Novel.  
(DR:2)  
 5 units, Win (Stone)

137. Development of the Short Story—Re-  
quired of creative writing students in fiction.  
Reading and discussion of American, British,  
and Continental short stories, with emphasis on  
changes and developments in the form. (DR:2)  
 5 units, Win (Packer)

151. Renaissance Poetry: Intentions, Struc-  
tures and Styles.  
 5 units, Aut (Trimpi)

154. Major Romantic Poets—Explore some of the  
assumptions of English Romanticism through selected readings from the works of  
Blake, Wordsworth, Coleridge, Byron, Shelley  
and Keats.  
 5 units, Aut (Ruotolo)

160A. The English Bible as Literature—(See  
60.)

161A. The Afro-American Novel—By reading a  
range of Afro-American novels, by both men  
and women, in historical context, examine ways in which Afro-American writers have used and  
adapted the novel genre to interpret various aspects of the Afro-American experience.  
 5 units, Aut (Drake)

162F. Modern Literature of the Caribbean—  
An introduction to modern Caribbean litera-  
ture, in historical context, with particular attention to recurrent themes addressed by Carib-  
bean writers in defining Caribbean-American experience, including colonialism, immigration from Africa and Asia, and the relation between literature and such social and cultural expres-  
sions as Rastafarianism, Reggae and Calypso.  
(DR:2*)  
 5 units, Win (Drake)

163F. Women Writers: The Literary Tradi-  
tion—Women novelists and poets in England and America since the 1790’s. Focus on women’s imaginative portrayal of their situation and on their 200-year-long dialogue with one another about the possibilities for change.  
 5 units, Win (B. Gelpi)

163H. Contemporary Issues in Feminist  
Theory—From medical, legislative, social,  
psychological and literary perspectives, an  
interdisciplinary survey of current feminist theory.  
 5 units, Spr (Gagnier)

164. Early Twentieth-Century British and  
American Fiction: A Feminist Approach—  
Offered in association with the Stanford  
Humanities Center. Using a feminist ap-  
proach to the fiction of Willa Gather, E. M.  
Forster, D. H. Lawrence, Katherine Mans-  
field, and Katherine Anne Porter, the course  
will consider the historical and cultural context  
within which these writers worked and explore  
the possible relationship of gender to their par-  
ticular choices of narrative strategy, theme,  
imagery, and point of view.  
 5 units, Win (Mortimer)

167A. The Literature of Fantasy—Science-  
fiction, the detective and horror story, and  
surreal fiction all began in the nineteenth cen-  
tury. Study seminal works such as Grimms  
Fairy Tales, Frankenstein, Alice in Wonder-  
land, and the stories of Edgar Allan Poe, and  
then read contemporary works which continue  
and extend the tradition of fantasy in literature.  
(DR:2)  
 5 units, Aut (Friedlander)

168. American Indian Mythology, Legend,  
and Lore—(See 68.)
ENGLISH 369

171A. Chaucer's *Canterbury Tales*. (DR:2) 5 units, Aut (Wack)

171B. Chaucer's *Troilus* and the Dream Poems. (DR:2) 5 units, Win (Wack)

172. Milton. 5 units, Spr (Evans)

173A. Shakespeare—Intensive study of the following plays: *Romeo and Juliet, Richard II, Henry IV: Part I, Twelfth Night, Hamlet, King Lear, The Tempest*. (DR:2) 5 units, Aut (Friedlander)

173B. Shakespeare—*The Merchant of Venice, Romeo and Juliet, Henry IV: Parts I and 2, King Lear, Antony and Cleopatra, Twelfth Night*. (DR:2) 5 units, Win (Rebholz)

173C. Shakespeare—*A Midsummer Night's Dream, Henry IV: Part I, As You Like It, Troilus and Cressida, Hamlet, Antony and Cleopatra, The Tempest*. (DR:2) 5 units, Spr (Riggs)

175. Swift and Pope. 5 units, Win (Bender)

177. Virginia Woolf. (DR:2) 5 units, Spr (Ruotolo)

179A. Fitzgerald and Hemingway—(See 79.)

180. Advanced Fiction Writing—Intermediate course. May be taken twice. Prerequisite: 90. 5 units, Aut, Win, Spr (Andres, McFarland, Schwartz, Sorrentino)

191A. Writing About Science. 3 units, Aut (S. Harvey)

191B. Writing About Social Sciences. 3 units, Win (Schacht)

191C. Writing About Business. 3 units, Spr (Ames)

191D. Writing About Law. 3 units, Win (Johnstone)

191E. Advanced General Composition. 3 units, Spr (Schacht)

192. Advanced Poetry Writing—Intermediate course. May be taken twice. Prerequisite: 92. 5 units, Aut, Spr (Daniel)

193A. Advanced Reading and Writing of Poetry—Combines a lecture course, which may be taken for 1 unit of credit by any student, with a poetry workshop which may be taken for an additional 4 units of credit by a small number of undergraduates selected by the instructor. The subject of the lectures is 8-10 poets ranging from "major" (e.g. William Carlos Williams, Wallace Stevens) to some lesser-known writers (e.g. Margaret Avison). In the workshop students work on assignments relating closely to each week's lecture, attempting to explore themes and craft ways found in the work of the poet therein discussed. 1 to 5 units, Win (Levertov)

195. Ad Hoc Undergraduate Seminars—In any quarter a group of undergraduates (at least three but preferably more) who wish in the following quarter to study a subject or an area not covered by regular courses may plan an informal seminar and approach a member of the department to supervise it. A syllabus for the course should be submitted to the director of undergraduate advising at least two weeks before the end of the quarter. No more than five units of credit will be given for English 195 and/or English 196 in one quarter. English 195 may not be used to fulfill departmental area or elective requirements without permission. Any quarter, by arrangement

196A. Junior Honors Seminar—Required of all juniors in the English Honors Program. 5 units, Spr (Wack)

196B. Senior Honors Seminar—Required of all seniors in the English Honors Program. 5 units, Aut (Rebholz)

197. Senior Honors Essay. 10 units (during 2 quarters) Aut, Win (Staff)

198. Individual Work—Undergraduates who wish to study a subject or an area not covered by regular courses may, with permission, enroll for individual work under the supervision of some member of the department. No more than five units of credit will be given for English 198 and/or English 199 in any one quarter. English 198 may not be used to fulfill departmental area or elective requirements without permission. Group seminars are not considered appropriate to English 198. Any quarter, by arrangement

199. Senior Independent Study—Open, on approval by the department, to seniors majoring in English who wish to work throughout the year on a critical or scholarly essay of about 10,000 words (See "Note" under "Honors Program in English"). Applicants should submit (1) a sample of their expository prose and (2) a proposed topic for independent study to the
secretary of the department before preregistration in May of their junior year. Each student who is accepted will be assigned to an instructor, with whom he or she will prepare an appropriate reading list before the end of the Spring Quarter.

10 to 15 units (for the entire year)
Aut, Win, Spr (Staff)

COURSES NUMBERED 200-299 ARE MAINLY COURSES ON SPECIFIC TOPICS AND AUTHORS: FOR UNDERGRADUATE AND GRADUATE STUDENTS

Note—Graduate students in other departments who wish to broaden their programs will find many of these courses useful.

200A. Old Norse—(Same as German 205A/305A.)
5 units, Aut (Andersson)

200B. Advanced Old Norse—(Same as German 205B/305B.)
5 units, Win (Andersson)

201. Old Saxon—(Same as German 207/307.)
5 units, Spr (Robinson)

205. Old English—Elements of Old English grammar; critical reading of short poems and selected prose in Old English.
5 units, Aut (Wack)

208. Post-Classical Latin—(Same as Classics 118.) Careful reading of Latin texts of graded difficulty, beginning with the Vulgate Bible, working through various patristic writings and medieval literature to the Latin of the Renaissance.
4 units, Win (MacCormack)

209. Introduction to Paleography and Codicology—Introduction to the study of late antique and medieval manuscripts in Latin, of medieval Latin and vernacular scripts, and of the materials and composition of the medieval book.
5 units, Aut (Brown)

211. Readings in Middle English.
5 units, Spr (Bloomfield)

5 units, Spr (Carnochan)

5 units, Aut (A. Gelpi)

234A. Colonial American Prose.
5 units, Spr (Fliegelman)

235. Impressionist and Experimental Novel—Critical reading of major impressionist novelists (Conrad, Woolf, Lowry, Faulkner) and innovators (Joyce, Hawkes, García Márquez, Sorrentino).
5 units, Aut (Guerard)

5 units, Aut (Gagnier)

255A. Modern British Poetry—A survey of major British and Irish poets from Thomas Hardy to the present, including Yeats, Edward Thomas, Edwin Muir, Basil Bunting, Ted Hughes, Seamus Heaney, and others.
5 units, Win (Di Piero)

255B. Yeats and His Critics—A reading of the major poems in The Collected Poems of W.B. Yeats, with particular attention given to "The Tower" (1928) and the volumes appearing after it. Also examine the critical perspectives of, among others, Frank Kermode, Richard Ellmann, R.P. Blackmur, F.R. Leavis, Kenneth Burke, T.S. Eliot, and W.H. Auden.
5 units, Aut (Chace)

261. The Liberal Tradition—Concentration on the works of George Eliot, Matthew Arnold, and E.M. Forster as exemplars of humanists striving to find in art a surrogate for a lost religious faith. Four novels of Eliot, three of Forster, and a number of essays and poems.
5 units, Win (Stone)

263G. Feminist Literary Criticism: Theory and Practice—(Same as Feminist Studies 202.) The development of feminist approaches to the study of literature with emphasis on the significance of feminist theory to the practice of criticism.
5 units, Aut (B. Gelpi)

270A. Beowulf—Reading and critical analysis of Beowulf. Prerequisite: 210, or 205 with instructor's permission.
5 units, Win (Brown)

285A. Poe and Hawthorne—An examination of major writings by two of 19th-century America's principal authors. In the case of Poe emphasis falls on the prose, although some attention given to the verse. In the case of Hawthorne, emphasis falls on the tales and two or three romances (including The Scarlet Letter).
5 units, Win (Halliburton)

290A. Reading for Fiction Writers—A practical workshop in the close analysis of fictional
texts in an attempt to define different authors' strategies of style, structure, technique. Not a writing course, but a fiction course for writers. Prerequisite: an advanced course in fiction writing, at Stanford or elsewhere, and submission of a manuscript ten days before registration.

5 units, Win (Sorrentino)

293. Verse Translation Workshop—Members will pursue and present work in progress, discussing practical and theoretical questions. Consult instructor during previous quarter.

5 units, Aut (Di Piero)

COURSES NUMBERED 300 THROUGH 309 ARE GRADUATE COLLOQUIA; COURSES NUMBERED 310 THROUGH 399 ARE GRADUATE SEMINARS AND WORKSHOPS

Note: Some of these courses are relatively broad in scope; some focus on a single theme or genre. Students should consult the instructor before registering for any course in this category.

301A. Colloquium: Studies in the Intellectual History of the Late Middle Ages.

5 units, Aut (Howard)

301B. Colloquium: Allegory and Symbolism—Emphasis on medieval and Renaissance literature, with some discussion of theoretical matters.

5 units, Spr (Bloomfield)


5 units, Spr (Bender)


5 units, Win (Castle)


5 units, Spr (A. Gelpi)

307A. Colloquium: Major Modern Critics—A study of diverse perspectives and systems that have played a seminal role in the development of modern critical theory. Readings include, among others, Frye, Lukács, Benjamin, Auerbach, Barthes, and Derrida.

5 units, Aut (Lindenberger)


5 units, Aut (Fields)

307C. Colloquium: Women's Writing, Women's Estate—Explores, through their writing, women's self-definitions and choices of literary strategy, with special attention to the effect on these definitions and choices of such circumstances as rural or urban life, race and ethnicity, class, and religion.

5 units, Spr (Drake)

307D. Colloquium: Proust and James.

5 units, Win (Islas)

313. Seminar: Methods and Materials for the Study of Renaissance Literature.

5 units, Spr (Evans)

316A. Seminar: Studies in Romanticism—A study of the following major, long poems: The Prelude, Don Juan, Prometheus Unbound, and Hyperion. Stresses the role these poems have played in the development of recent critical theory.

5 units, Win (Lindenberger)

360A. History of Literary Theory (Ancient)—A graduate reading and lecture course.

5 units, Aut (Trimpi)

360B. History of Literary Theory (Medieval/Renaissance)—A graduate reading and lecture course.

5 units, Win (Trimpi)


5 units, Win (Halliburton)

364. Topics in British Literature.

364B. Seminar: The Bloomsbury Group.

5 units, Win (Ruotolo)

365. Topics in American Literature.


5 units, Win (Solomon)


5 units, Spr (Middlebrook)

373. Seminar: Shakespeare and the Tragic Form—(Same as 351A.)

5 units, Aut (Lyons)

388. British Authors of the Nineteenth and Twentieth Centuries.
388G. Seminar: Joyce, O'Brien, Beckett—Writings of the three masters of Anglo-Irish modernism. Readings chosen from James Joyce's *Dubliners*, "Portrait," *Ulysses*, and *Finnegans Wake*; Flann O'Brien's *At Swim-Two-Birds*, *The Third Policeman*, and *The Dalkey Archive*; Samuel Beckett's *Murphy*, *Watt*, and *Molloy*.

5 units, Spr (Sorrentino)

390. Graduate Fiction Writing — A workshop designed primarily for graduate students enrolled in the Writing Program. May be repeated for credit. Prerequisite: consent of instructor.

3-5 units, Aut (L'Heureux)

Win (Sorrentino)

Spr (Packer)

391. Advanced Work in Writing and Criticism.

any quarter, by arrangement

392. Graduate Poetry Writing—A workshop designed primarily for graduate students enrolled in the Writing Program. May be repeated for credit. Prerequisite: consent of instructor.

3-5 units, Aut (Fields)

Win (Levertov)

Spr (Di Piero)

394. Independent Study—Preparation for qualifying examination and for the Ph.D. oral examination. Pass/No Credit only.

by arrangement

395. Ad Hoc Graduate Seminars—In any quarter, a group of graduate students (at least three but preferably more) who wish in the following quarter to study a subject or an area not covered by regular courses and seminars may plan an informal seminar and approach a suitable member of the department to supervise it, either on a graded or Pass/No Credit basis.

396. Introduction to Graduate Study—A two-unit required course for first-year graduate students in English and Modern Thought and Literature and for those students in Comparative Literature who will be teaching in the Freshman English Program. The course provides instruction in teaching—especially leading a section and evaluating essays and examinations—and a broad introduction to the opportunities and responsibilities of graduate study. The class will meet weekly. The instructors will assign brief readings and a short final paper. The course is offered on a Pass/No Credit basis only.

2 units, Aut (Fifer and Fliegelman)

397A. Rhetoric and Teaching Composition—A required course for second-year graduate students in English and Modern Thought and Literature and students in Comparative Literature who will be teaching in the Freshman English Program. The course will be conducted both as a seminar and as an apprenticeship. Each student will be assigned as an apprentice to an experienced teacher. At the beginning of the quarter, the apprentice will sit in on classes, conferences, tutorials; at the end, the apprentice may be given responsibility for conducting a class, grading papers, holding conferences. Class meetings will be devoted to discussing rhetoric, composition, and teaching of writing. Readings will be assigned in both rhetoric and pedagogy. Each student will design a two-quarter syllabus in preparation for teaching English 1 and English 2. The course is offered on a Pass/No Credit basis only.

5 units, Aut (Fifer)

397B. Teachers Workshop I—A seminar for second-year students who will be teaching composition. (Second-year students are advised to enroll in this course and to take during their first quarter of teaching only one literature course.) The course has a strong pragmatic emphasis: discussion of writing assignments, evaluation of essays, coordination of reading and writing, conduct of conferences. Occasionally experienced teachers of composition will be invited to discuss particular problems in teaching. No written work will be required. The class meets one hour a week, at noon.

5 units, Win (Fifer)

397C. Teachers Workshop II—A seminar for second-year students teaching the second quarter of composition. The focus of discussion will be the second-quarter syllabus. Students will share good assignments, problems, solutions they have encountered in their teaching.

5 units, Spr (Fifer)

398. Research Course—Student pursues a special subject of investigation under supervision of some member of the department. Thesis work not to be registered under this course.

any quarter, by arrangement

399. Thesis.

any quarter, by arrangement.

See Overseas Studies section for English courses given at overseas centers.

COURSES REGULARLY OFFERED BUT NOT DURING 1983-84

100A. Undergraduate Seminar: Language.

100D. Undergraduate Seminar: Shakespeare.
100G. Undergraduate Seminar: American Literature before 1900.

100J. Undergraduate Seminar: Literary Genre.

101. Linguistics and Literature.

105. Linguistic Approaches to Point of View in Fiction.

115. Restoration and Eighteenth-Century Literature.

117. Romantic and Victorian.

128. Reflections on the American Condition.

139. Detective Fiction.

142. Medieval and Renaissance Drama—(Same as Drama 152.)

146. Drama Since 1945.

152. Restoration and Early Eighteenth-Century Poetry.

160. The History of Criticism.

161B. Literature of the Holocaust.

161. Afro-American Literature.

161B. Afro-American Poetry.


161F. The Harlem Renaissance.

162A. Contemporary Chicano Literature.

162B. Chicano Literature: Creative Writing for Bilingual Students.

163A. Women’s Writing as Critique and Vision: The Nineteenth Century.

163B. Women’s Writing as Critique and Vision: The Twentieth Century.

163C. English Women Writers.

163D. The Female Experience: Victorian Heritage.

163E. Women’s Situation—(Same as Feminist Studies 101).

165A. Interpretations of the Modern Experience.

166. Modern Literature in English from Africa.

167B. Modern British Comic Fiction.

169A. The Existential Hero in Modern Literature.

169B. Toward an Understanding of Modernism.


174. Swift.


177A. The Brontes and Elizabeth Gaskell.

178. Joyce.

179. Hawthorne and Melville.

179B. Faulkner.

179D. Conrad and Faulkner.

202. Topics in the History of the English Language.

212A. Medieval to Renaissance: The Development of Literary Forms.

212B. Continuation of 212A.

217A. The Bloomsbury Group.


234. American Fiction and Prose.

234B. American Romanticism.

234C. American Fiction: Romance to Realism.

234D. History as Literary Art.

234E. Modern American Literary Critics.

239. American Short Fiction.

242. Elizabethan and Jacobean Drama.

245. Drama of the Restoration and Eighteenth Century.

250. The English Lyric.

251. Versions of Heaven and Hell.


254D. Romantic Poetry as Myth-making.

258. Eliot, Crane, Stevens, Roethke, Merrill, Rich.


259B. Three Visionary Poets: Rilke, Yeats, Eliot.


263B. Gender and Interpretation.

268. Eighteen-Century Narrative and Point of View.

269C. The Poet and the Artist in American Modernism—(Same as Art 130E/230E.)

269D. Poetry and Political Catastrophe—(Graduate students register for 369.)

278. Johnson and his Circle.

281A. Dickens and Trollope.

284B. Whitman and Dickinson.

285B. Twain and James.

288. Authors of the Nineteenth and Twentieth Centuries.
288A. Joyce.
288B. Joyce’s *Ulysses*.
288E. Ezra Pound’s *Cantos*.
288G. Richard Wright and Eudora Welty.
290B. Workshop in Writing and Criticism.
305. Colloquium: Twentieth-Century British Literature.
314. Literary Problems of the Renaissance—Prerequisite: 113 or equivalent.
315. Literary Problems of the Restoration and the Eighteenth Century—Prerequisite: 115 or equivalent.
315A. Seminar: The British Enlightenment.
316. Literary Problems of the Romantic Period—Prerequisite: 117 or equivalent treatment of Romantic period.
316C. Seminar: Romantic Irony.
330. Seminar: Theory of Narrative—(Same as Slavic Languages and Literatures 300.)
340. Seminar: Medieval Drama—(Same as Drama 353.)
355A. Seminar: Byron and the Shelles in Italy.
358A. Seminar: American Poetry since 1940.
365. Topics in American Literature.
365A. Seminar: The American Historical Romance.
365B. Seminar: American Literature and Culture in the 1840s.
369. Seminar: Poetry and Political Catastrophe—(See 269D.)
371. Seminar: Chaucer.
374. Seminar: Ben Jonson.
376. Seminar: Milton.
385. American Authors of the Nineteenth and Twentieth Centuries.
385F. Seminar: Faulkner.
388. British Authors of the Nineteenth and Twentieth Centuries.
388A. Seminar: Virginia Woolf.
388F. Seminar: Joseph Conrad.

**PROGRAM IN FEMINIST STUDIES**

Chairman: Jane Collier

Faculty: Jane Collier, Carolyn Lougee, Diana Paul, Myra Strober, Gaye Tuchman, Sylvia Yanagisako

Staff: Elizabeth Fitting, Alice Supton

Students: Elaine Holliman, Sue Lynn, Lisa Rofel, Kendyll Stansbury

Resource Faculty and Staff: Beverly Allen (French & Italian), Beatrice Arias (Education), Anne Arvin (Medicine), Barbara Babcock (Law), Patricia Barchas (Sociology), Russell Berman (German Studies), Helen Blau (Pharmacology), Judith Brown (History), Albert Camarillo (History), Terry Castle (English), Elizabeth Cohen (Education and Sociology), Jane Collier (Anthropology), Carol Conell (Sociology), Joseph Corn (American Studies and Values, Technology and Society), Wanda Corn (Art), Carl Degler (History), Sandra Drake (English), Diana Dutton (Family, Community and Preventive Medicine), Shirley Feldman (Psychology), John Felstiner (English), Estelle Freedman (History), Diana Freccero (Physical Education), Regina Gagnier (English), Hester Gelber (Religious Studies), Barbar Gelpi (English), Carol Nagy Jacklin (Psychology), Nancy Kollmann (History), Herbert Leiderman (Psychiatry), Suzanne Lewis (Art), Jane Limpert (Physical Education), Iris Litt (Adolescent Medicine), Carolyn Lougee (History), Eleanor Maccoby (Psychology), Joanne Martin (Business), Leona McGann (Family, Community and Preventive Medicine), Ann Mellor (English), Diana Middlebrook (English), Pauline Newman-Gordon (French and Italian), Diana Paul (Religious Studies), Mary Pratt (Spanish and Portuguese), Sandra Richards (Drama), Deborah Rhode (Law), Alberta Siegel (Psychiatry), Marion Smith (Neurology), Susan Stephens (Classics), Kathryn Strachota (German Studies), Myra Strober (Education), Ann Swidler (Sociology), Joan Talbert (Education), Susan Treggiari (Classics), Elizabeth Trangott (English and Linguistics), Gaye Tuchman (Feminist Studies), David Tyack (History and Education), Mary Wack (English), Michael Wall (Law), David Wellbery (German Studies), Jack Winkler (Classics), Sylvia Wynter (Psychology).
ish and Portuguese and Afro-American Studies), Marilyn Yalom (Modern Thought and Literature), Sylvia Yanagisako (Anthropology)

STATEMENT OF PURPOSE

Feminist Studies is an interdisciplinary program that investigates the significance of gender in all areas of human life. Feminist analysis is based on the assumption that gender is problematic, and studies the ways in which gender functions in the dynamics of social life. The courses offered by the program apply feminist analysis to personal lives, cultures, social policy, and all other areas of scholarly inquiry.

The Committee on Feminist Studies coordinates the courses offered on women, gender, and feminism throughout the University and facilitates the Individually Designed major with a concentration in Feminist Studies. In addition, it seeks to encourage feminist analysis and teaching at Stanford, both in courses instituted within the program and those housed within departments. The committee annually compiles a list of courses with feminist emphasis, outlines curriculum for the Individually Designed major, and provides information and advice for graduate work in Feminist Studies.

UNDERGRADUATE PROGRAM

INDIVIDUALLY DESIGNED MAJOR

The major should normally be declared by the beginning of a student's third year. Individually Designed majors must be proposed to, and approved by the Undergraduate Studies Dean's Advisory Committee on Individually Designed Majors (see general guidelines under 'Dean of Undergraduate Studies Special Programs'). Further information on Individually Designed majors is available at the Academic Information Center.

Students interested in an Individually Designed major in Feminist Studies should consult with the chairman of the program several months before submitting a plan of study to the Dean's Advisory Committee. The Feminist Studies Office is at CROW, Serra House, tel. 377-2412. Students may choose faculty advisors from the list of resource faculty (see above) and may consult with peer advisors. Faculty advisors will work closely with the Individually Designed Majors Committee in helping Feminist Studies students to design appropriate plans of study. They will oversee work for the student practicum, and participate collegially with majors in the senior seminar.

CURRICULUM

For an Individually Designed major in Feminist Studies, the following course of study is recommended: each student should take a minimum of twelve courses (a core of three courses plus nine others) for a total of at least 60 units. Of the nine courses not part of the core, at least five should be chosen from the list of approved courses, distributed in the following way: at least two from the humanities, at least two from the social sciences, and at least one should concern Third World cultures. To insure core coverage, and intellectual focus and breadth in the program, the 12 courses required for the major should be distributed as follows.

CORE

The core consists of the three following courses, preferably in sequence:

1. A course on the situation of women in society (could be filled by Feminist Studies 101 or 102).
2. A course in feminist theory (could be filled by Feminist Studies 201, 202 or 203).
3. A seminar in which all senior Individually Designed majors in Feminist Studies participate (Feminist Studies 198).

FOCUS

The thematic focus consists of five courses:

1. At least three courses should be selected from the list of approved courses (see below).
2. At least one complementary course should be offered by a department or interdepartmental program as an initiation into the practice of study in the field: a major survey, methodology, or theory course.

The following thematic clusters illustrate foci that individual students can design, in consultation with the advisor:

Sex and Gender (an exploration of the nature and causes of sex differences): Approved courses — Anthropology 11, 230, 244; Education 170, 171, 231; Human Biology 158; Sociology 104, 112. Complementary courses — Anthropology 12; Human Biology 10, 158, 175, 191, 151; Sociology 5; African and Afro-American Studies 194.

Women in Language and Symbol (images of women in religion, symbolism and the arts): Approved courses — Art 130C; Asian Languages 181, 197; Classics 132; Communication 155; Drama 158; English 163A, B, C, 177, 263A, 288, 100F, 100J, 163G, 177A, 307B, 388A; French 129, 285; German Studies 35, 135; Modern Thought and Literature 207; Religious
Studies 34, 134. Complementary courses — African and Afro-American Studies 101, 165; Art 130A, B, C; English 284B, 290B; Drama 158.

Race, Class and Sex (relations between sexism and other institutionalized forms of social inequality): Approved courses — Anthropology 11, 230; English 288; History 173A, B; Sociology 5, 104. Complementary Courses — African and Afro-American Studies 101, 103; Anthropology 105, 111/English 162G/English 166; History 157; Political Science 25; Psychology 129; Sociology 121, 144, 145; Spanish and Portuguese 294.

Women and Work (historical and economic aspects of women’s labor and the determinants of sex segregation in the labor market): Approved courses — Anthropology 11; Business 333; Communication 155; History 173A, B, 234B, 238; Psychology 154. Complementary courses — Education 172; Economics 100, 129A, B, 131, 145; Sociology 146.

Feminist Perspectives on Science, Health, and the Environment (technological and ecological issues affecting women today): Approved courses — Human Biology 151, 158; Values, Technology, Science and Society 160. Complementary courses — Anthropology 165; Civil Engineering 170; Family, Community and Preventive Medicine 250, 251, 254/Sociology 111, 128, 269/211; History 270; Human Biology 146, 151, 150A, 40; Medicine 224; Religious Studies 174A.


Women and Society: The Twentieth Century (historical and cultural analysis of modern women): Approved courses — English 163B, 177, 388B, 306; French 129; German Studies 35A, 135; History 173B, 238; Modern Thought and Literature 207, Sociology 139. Complementary courses — History 165C, 170; Economics 100; any courses on twentieth century history or literature.

PRACTICUM

The practicum should be taken for two to six units. One course should involve field research, community action, organizing and teaching a course, or other supervised research. This might be fulfilled by enrolling in a SCIRE, SWOPSI, or ARLO course or project, or by undertaking supervised work in a department.

ELECTIVES

The remaining four courses should be selected to complete distribution requirements for the program.

APPROVED COURSES

Following is a partial list of approved courses with feminist emphasis which fulfill requirements as focus courses (see above focus, under head Curriculum), and as electives in the humanities, social sciences, and Third World cultures in the Individually Designed major in Feminist Studies. Consult the departmental listings for course descriptions. For new courses, consult a faculty advisor or the Feminist Studies office each quarter.

GROUP 1: INTERDISCIPLINARY COURSES

FEMINIST STUDIES

101. Women’s Situation — The course draws together materials from history, philosophy, sociology, anthropology and literature as they jointly contribute to the understanding of women’s consciousness. (DR:5)

5 units, Win (Tuchman)

140. Women and the Production of Culture — This course will consider the role of women in cultural processes, paying special attention to women writers and artists, past and present, and to workers in contemporary mass media. It will also examine how the gender of these workers affects the depiction of women.

5 units, Spr (Tuchman)

150. Women In Medicine—An analysis of the development of western technology/health/commercial medicine and its treatment of women, both as physician and as patient, from a feminist perspective.

5 units, Spr (Tuchman)

198. Senior Seminar — A weekly seminar in which Feminist Studies majors design and implement a senior project.

5 units, Win (Staff)

210. Seminar: Introduction to Feminist Theory—(Same as English 100J.) This undergraduate seminar will explore some of the most recent developments of feminist theory, including both political and methodological concerns.

5 units, Spr (Gagnier)

198. Senior Seminar — A weekly seminar in which Feminist Studies majors design and implement a senior project.

5 units, Win (Staff)

210. Seminar: Introduction to Feminist Theory—(Same as English 100J.) This undergraduate seminar will explore some of the most recent developments of feminist theory, including both political and methodological concerns.

5 units, Spr (Gagnier)

201. Feminist Theory—Examination of feminist theory with special attention given to theoretical roots of difference among feminist theorists.

5 units (Tuchman)

202. Feminist Literary Criticism: Theory and Practice — (Same as English 263G.) The devel-
opment of feminist approaches to the study of literature and practice of criticism.

5 units, Aut (B. Gelpi)


5 units, Spr (Middlebrook)

GROUP 2: HUMANITIES

ASIAN LANGUAGES

ART

130D. American Art After World War II.


CLASSICS

132. Women in the Ancient World.

ENGLISH

100E. Representation of Women in 18th c. Literature.

163F. Modern Women Writers: The Literary Tradition.


177. Virginia Woolf.

177A. The Brontes and Elizabeth Gaskell.

263G. Feminist Literary Criticism: Theory and Practice.

307C. Colloquium: Women's Writing, Women's Estate.

FRENCH

185/285. Simone de Beauvoir.

HISTORY

173A. U.S. Women's History to 1870.

173B. U.S. Women's History since 1870.

473. Graduate Seminar: Women's Family and Sexual History.

MODERN THOUGHT AND LITERATURE

207. Sense of Identity in Modern Women Writers.

FEMINIST STUDIES 377

RELGIOUS STUDIES

34 and 134. Women, Religion and Politics.

SPANISH AND PORTUGUESE

265. Contemporary Women Novelists of Chile.

GROUP 3: SOCIAL SCIENCES AND RELATED AREAS

FRESHMAN SEMINAR PROGRAM

022. Freshman Seminar: Women Writers Look at the Nazi Period.

ANTHROPOLOGY

11. Sex Roles and Society.

BUSINESS

333A. Gender Roles and Competence: Responding to Social Change.

COMMUNICATION


EDUCATION

332. Curricular Response to Education Equity.

MEDICINE

224. Cardiovascular Health and Disease in Women—(Open to undergraduates.)

FAMILY, COMMUNITY AND PREVENTIVE MEDICINE


PSYCHOLOGY

194D. Undergraduate Seminar: The Psychology of Sex Differences.

SOCIOLOGY

5. Status, Friendship and Social Pressure.

103. Marriage and Its Alternatives.

104. Sociology of Gender.


142. The Family.

211. Seminar on Social Issues in Health Care: Controversies in Current Medical Practices.

222. Health and Policy.

269. Medical Innovation and Public Policy.

VALUES, TECHNOLOGY AND SOCIETY

160. Women and Technology.
AFRO AND AFRO-AMERICAN STUDIES

130. Coding Difference: Race, Class, Sex, I.Q., and the Gender-Model as Functions of the Contemporary Human System.

ANTHROPOLOGY


COMMUNICATION


DRAMA

158. American Women Playwrights.

EDUCATION

170. Sex and Education.
172. Status Attainment, Education & Work.

ENGLISH

163A. Women’s Writing as Critique and Vision: The Nineteenth Century.
163B. Women’s Writing as Critique and Vision: The Twentieth Century.
263B. Gender and Interpretation.
263C. The Female Experience: Victorian Heritage.
288G. Richard Wright and Eudora Welty.

FRENCH

296. Litterature Feminine en France.

GERMAN STUDIES

35A/135. Images of Women in German Film.

BUSINESS

333. Economic Analysis of Women’s Employment.

PSYCHOLOGY

130. Psychology of Sex Roles.

For additional courses, see also the annual listings of extradepartmental programs, especially Freshman and Sophomore Seminars, Chicano Fellows Program, ARLO, SCIREE, SWOPSI, and Undergraduate Specials.

FOOD RESEARCH INSTITUTE

Emeriti: William O. Jones, Dudley Kirk, S. Daniel Neumark, Holbrook Working (Professors)

Director: Walter P. Falcon

Associate Director: Scott R. Pearson


Associate Professors: Carl H. Gotsch, Reynaldo Martorell, Anne E. Peck

Assistant Professors: Sandra O. Archibald, Terry Sicilar

Librarian: Charles C. Milford

OFFERINGS AND FACILITIES

The Food Research Institute, a research and teaching unit in the School of Humanities and Sciences, was founded in 1921 to study problems of food supply, distribution, and consumption on a world-wide scale. The range of its investigation comprises the world food and agricultural economy, domestic and international trade in primary products, agriculture and economic development, and world population problems.

The Institute’s specialized library contains some 75,000 items, including up-to-date series of periodicals from over 50 countries, and is open for reference to students and others. Food Research Institute Studies, published three times a year, reflects the research interests of the Institute.

THE INSTRUCTIONAL PROGRAM

Graduate teaching leading either to the Master of Arts or Doctor of Philosophy degree has become an integral part of the Institute’s program. The program is designed primarily for graduate students with solid undergraduate training in economics or agricultural economics, who possess a special interest in problems lying within the Institute’s areas of research.

The Institute does not undertake supervision of studies leading to a bachelor’s degree, though certain of its courses may be counted toward a major in economics and other undergraduate programs.

The University requirements for advanced degrees, as set forth under “Degrees” in the bulletin, should be consulted by all prospective students. The following are Institute requirements.
UNDERGRADUATE PROGRAMS

COTERMINAL A.B./A.M. PROGRAM

The Food Research Institute offers a limited number of coterminal degrees for undergraduate students in Economics (and occasionally other departments). For admission a student must have a minimum letter-grade equivalent of 3.2. Prerequisites for admission include Economics 51 and 52 and, typically, one course in quantitative methods. Students are strongly urged to seek admission to the program prior to the end of the third quarter of their junior year. Application should be made to the Chairman of the Institute’s Graduate Instruction Committee. In addition to meeting the requirements for the Bachelor of Arts, students are required to complete the requirements for the Master of Arts as stated below.

GRADUATE PROGRAMS

MASTER OF ARTS

The Master of Arts degree may be awarded to students who complete at least 25 units of work in the Food Research Institute with an average grade of “B” or better and who complete at least 45 units of approved work in courses numbered 100 or above in the first four quarters at Stanford, with an average grade of “B” or better. The master’s program of coursework is designed at the outset of the program to equip students with specific skills and is not encouraged for those desiring a Ph.D. from the Food Research Institute.

Qualified graduate students from other schools and departments may apply for an A.M. degree within the Food Research Institute. For such candidates, the same regulations prevail as for the regular A.M., except that the four-quarter rule may be waived. Applications should be made to the Chairman, Graduate Instruction Committee.

DOCTOR OF PHILOSOPHY

The first two years of the program for doctoral students consist of a series of required and elective courses totaling about 90 units. Economics 202, 203 (Price and Allocation Theory), Economics 210 (Macroeconomic Theory), either Economics 171 or Business 403 (Quantitative Methods) are required. Food Research 201 (Applied Econometrics) is also normally a part of a student’s program. In addition, students prepare through courses, seminars, and directed reading and research three fields for written examinations that are administered by the end of the second year. Normally these are chosen from the following Institute fields: Food Consumption and Nutrition; Economics of Production; Commodity Price Analysis; Agricultural Development and Economic Growth; International Agricultural Policy; and Demography. A student wishing to offer one field outside this list or outside the Institute must secure approval from the Graduate Instruction Committee.

Each student is required to prepare a detailed prospectus of his or her doctoral dissertation, which is subject to committee approval, and to defend this in a University administered oral examination. The completed dissertation is subject to faculty approval, but no further formal defense is required.

To meet the foreign language requirement, a candidate must demonstrate a reading knowledge of one language other than English. The requirement may be satisfied in either of two ways: (a) by completion with passing grade of an approved reading course for the language concerned, or (b) by passing a special reading examination, to be given by a qualified member of the Food Research Institute or of the relevant language department.

At least two years (6 full quarters) of graduate registration in the Institute program is required of each Ph.D. candidate.

Ph.D. MINOR IN FOOD RESEARCH

Qualified doctoral candidates in other schools and departments may apply for a minor in Food Research. Requirements for this option include successful completion of two Institute fields, plus approval by the Chairman of the Graduate Instruction Committee of the overall program of work.

FELLOWSHIPS

The Food Research Institute has available a limited number of University fellowships for qualified students, ranging in amount of support to approximately $5000 a year plus tuition. All students receiving University support are expected to accept a Research Assistantship or Teaching Assistantship during at least one quarter of residence in exchange for fellowship aid. Instructions for applying for financial aid are included in the admissions packet. The financial aid application must be filed by January 15.

COURSES

103. The World Food Economy—(Same as Economics 106.) Examines the interrelationships between food, population, and economic development. Emphasis on the role of agricultural and rural development in achieving eco-
onomic and social progress in low-income nations. Attention to the economic and nutritional characteristics of the major types of food and to changes in food consumption associated with economic development. Focus on Asia, tropical Africa, and Mexico. The U.S. and Japan receive attention in highlighting structural changes in agriculture and in food consumption. A policy analysis perspective to decision-making related to the design of rural development strategies. Prerequisite: Economics 1 or equivalent understanding of economics; Economics 51 recommended.

3 units, Aut (Johnston) MWF 10

105. Commodity Futures Markets and Prices — (Same as Economics 107A.) (Graduate Students register for 205.) Description of the uses and functioning of commodity futures markets. Topics include business uses of the markets, the meaning of hedging, the evolution of hedging practice, determinants of the level of market use, and the relationships between level of use and market usefulness, market performance issues and measures, and the importance of speculation.

4 units, Aut (Gray) TTh 10-11:50

119. Human Nutrition—(Same as Human Biology 120.) An introduction to human nutrition including the function, digestion, absorption and metabolism of nutrients, dietary recommendations and standards, and a general overview of national and international nutrition problems. Prerequisite: Human Biology core or consent of instructor.

4 units, Aut (Taylor, Bray, Arroyave) MWF 8

120. Marketing, Consumption, and Price Analysis—(Same as Economics 128.) (Graduate students register for 220.) Survey of approaches used in the analysis of commodity price behavior. Topics include consumer demand analysis, spatial and temporal aspects of prices, market structure considerations, and complete commodity models. Links to microeconomic theory are drawn and emphasis is placed on a policy context. Discussion uses agricultural examples from both developing and developed agriculture.

5 units, Win (Peck) MW 10-12

121. Development and Population Interactions in the Third World — (Same as Economics 119.) Historical and contemporary examination of the record of economic development and of population growth suggests a broad diversity of experience. Case studies of specific countries are used as a point of departure to illustrate the systematic components of the experience of economic development and those of population growth. The implications from these studies are drawn in terms of alternative structures of development, the timing of the demographic transition, income distribution, employment and migration. The interactions and possible causal effects between economic development and population growth are discussed.

5 units, Win (Yotopoulos) MW 1:15-3:05

129. Analytical Techniques for Development Planning— (Same as Economics 129.) (Graduate students register for 229.) Treats selected analytical techniques of use in development planning, with emphasis on linear programming models and cost-benefit analysis. The lectures will have a strong practical bias and are intended to provide students with basic competence in using the tools and understanding their use by others. Prerequisite: an introductory course in micro-economic theory.

5 units, Aut (Sicular) MW 3:15-5:05

130. Application of Linear Programming to Agricultural Systems—(Same as Economics 132.) (Graduate students register for 230.) After reviewing programming theory, course concentrates on developing application skills. A basic farming systems model is extended to include exercises in mixed integer and multiperiod programming. Alternative approaches to risk and uncertainty are also incorporated. Final exercises concentrate on the construction of producer-consumer surplus models for sector-level planning. Previously filed data at LOTS and the interactive l.p. system LINDO permits students hands-on experience in using realistic working models. Computer homework exercises analyze such diverse issues as agrarian reform, water resource development, commodity supply response, technology choice and the allocation of research resources. Model manipulation and data problems are stressed throughout. Prerequisite: one course in microeconomic theory.

3-5 units, Spr (Gotsch) MW 1:15-3:05


5 units, Spr (Arthur) TTh 3:15-5:05

144. Economics of American Agriculture— (Same as Economics 144.) (Graduate student register for 244.) American agriculture and its historical and contemporary role in the economy. Topics include the structure and cha
4 units, Aut (Falcon) MWF 9

146. European Agricultural Policy—Same as Economics 142. (Graduate students register for 246.) An analytical approach to the development of agricultural policy in Europe, with particular reference to the Common Agricultural Policy of the European Community, and its relationship to agricultural and food problems of member-states. Topics include the agricultural trade relationships between the EC and other advanced countries, trade agreements between EC and developing countries, and the question of enlargement of the community to include Spain and Portugal. Agricultural policies will be discussed in the context of general economic, political, and institutional development.

3 units, Win (Josling) MW 3:15-5:05

166. International Trade Policy—(Same as Economics 166.) (Graduate students register for 266.) Formulation and effects of selected government policies affecting international trade. Trade policy and economic welfare, government responses to competition from imports, issues underlying international negotiation of reductions of barriers to trade, multination commodity agreements and cartels, and special trade arrangements for developing countries.

5 units, Spr (Pearson) MW 11-1

COURSES PRIMARILY FOR GRADUATE STUDENTS

201. Seminar: Applications of Research Methods — Focuses on the uses of economic methods in the analysis of agricultural problems. Lectures and student presentations will be used to develop skills in both model building and estimation. Emphasis is placed on the empirical implications of a model's structure and the choice of estimation technique. Prerequisite: Economics 171 or Business 403 and consent of the instructor.

5 units, Win (Archibald) by arrangement

205. Commodity Futures Markets and Prices — See 105.

218. Economic Development in Latin America—(Same as Economics 123.) (Open to advanced undergraduate students, with the consent of the instructor.) An examination of the historical problems of economic growth and structural change in selected Latin American countries. Emphasis on the application of political economic analysis to problems of accumulation, investment, financial and price behavior, income distribution, innovation, migration and the rural-urban transition. Particular attention to the analysis of interdependence among economies with different economies and social structures such as the U.S., Mexico, and Central America. Seminar with research papers.

5 units, Spr (Yotopoulos) TTh 1:15-3:05

220. Marketing Consumption and Price Analysis—See 120.

221. Economics of Production—An examination of production theory with emphasis on agriculture. Topics include: production, profit, and supply functions; technological change; risk and uncertainty in production decisions. Scholarly research materials will be complemented by a series of case studies prepared by the instructor. These will be assigned regularly and, along with a final exam, will constitute the requirements for the course. Prerequisites: one course in microeconomic theory and one in statistics.

5 units, Win (Archibald) TTh 10-12

224. Economic Development Theory and Policy—Course focuses on identifying major problems in economic development and suggesting operational approaches for their solution. As such it combines the empirical content of underdevelopment with development theory and quantitative techniques for the purpose of shaping development policy. Recent empirical research in development is surveyed to identify the strategic variables and the characteristic features of the process of development.

5 units, Win (Yotopoulos) TTh 1:15-3:05

225. Agricultural Development and Economic Growth—This course will cover selected problems of rural/agricultural development using economic modeling and quantitative techniques to analyze aspects of historical and current experiences of particular countries. Specific topics will include sources of agricultural growth, agricultural price policies, technical change in agriculture, mechanization, and the impact of land tenure and institutional structure on rural development. Both socialist and non-socialist cases will be considered, with most examples drawn from Japan, Taiwan, Mexico, the Soviet Union, and the People's Republic of China.

5 units, Spr (Sicular) MW 9-11

229. Analytical Techniques for Development Planning—See 129.

230. Applications of Linear Programming to Agricultural Systems—See 130.

244. Economics of American Agriculture—See 144.

246. European Agricultural Policy—See 146.

250. Nutritional Problems of Developing Nations—(Same as Anthropology 250.) The various malnutrition syndromes common in developing countries will be described, with emphasis upon protein-calorie malnutrition, nutritional anemias, and vitamin A deficiency. Methods and techniques of nutritional assessment applicable for use in developing nations will be reviewed. Detailed consideration will be given to effects of malnutrition throughout the life cycle, from fetal growth to fertility, with assessment of societal cost of malnutrition and its effects on learning, productivity, and other aspects of national development. Prerequisite: permission of instructor.

5 units, Win (Arroyave) TTh 10-11:30

251. Food and Nutrition Strategies and Development—This course examines major policy issues related to raising food consumption levels and improving nutritional status of populations in developing countries, assessing both production- and consumption-oriented policies and programs, and problems of determining an appropriate balance between income-generating activities and social services. The principal focus will be on the low-income developing countries. Economic, technical, institutional, and political factors that influence design and implementation of food and nutrition strategies will be discussed, including problems of re-constructing growth to achieve broad participation of rural populations in gains in productivity and income. Attention will also be given to the interrelationships between “patterns” of agricultural development and of population growth and to integrated nutrition, health, and family planning programs. (It is recommended, but not required, that this course follow Food Research 250.)

5 units, Spr (Johnston) TTh 10-12

256. International Trade and Investment Policy—See 166.

267. International Agricultural Policy—The major continuing and contemporary problems in world agricultural trade, with emphasis on the economic analysis of such problems and of the variety of proposed and possible solutions. The implications of the domestic policies of the major trading countries on agricultural markets in particular as regards staple food products. Emphasis given to issues of food security, trade liberalization, international market regulation and the role of international institutions. Prerequisite: Economics 151-152 or equivalent.

5 units, Win (Josling) given in 1984-85

287. Economic Demography—(Same as Economics 249.) The effects of demographic changes on individual and collective economic welfare; and economic theories of demographic decision making. Topics include: overlapping-generations models; economic life-cycle analysis; economic implications of changes in fertility and mortality; demography of the labor market; stable population theory; and economic theories of fertility.

5 units, Spr (Arthur) MW 3:15-5:05

305. Seminar: Commodity Price Analysis—Students will prepare a discussion and a paper which analyzes some aspect of a commodity’s market and/or price behavior. Prerequisites: Food Research 105/205 and Food Research 120/220 or their equivalent.

3-5 units, Spr (Gray, Peck) by arrangement

321. Seminar: Applications of the Theory of Production—Prepares students for their dissertation fieldwork in the economics of production.

3 units, Spr (Gotsch, Archibald) by arrangement

324. Seminar: Problems in Economic Development—Prepares students for their dissertations related to economic development.

3 units, Aut (Reynolds, Sicular, Yotopoulos) by arrangement


3 units, Spr (Falcon, Josling, Pearson) by arrangement

386. Seminar: Demography—Prepares students for comprehensive examination and dissertations in the demography field.

3 units, Aut (Arthur) by arrangement

371,372,373,374. Directed Reading and Research.

371. Aut (Staff) by arrangement

372. Win (Staff) by arrangement

373. Spr (Staff) by arrangement

374. Sum (Staff) by arrangement

401,402,403,404. Dissertation Reading and Research.

401. Aut (Staff) by arrangement

402. Win (Staff) by arrangement

403. Spr (Staff) by arrangement

404. Sum (Staff) by arrangement
FRENCH AND ITALIAN

Emeriti: Roberto B. Sangiorgi (Professor); Jessie E. Smith (Assistant Professor)

Chairman: Alphonse Juilland

FRENCH DIVISION


Associate Professor: Marc Bertrand, Brigitte Gazelles

Assistant Professor: Pierre Saint-Amand

Professor (Teaching): John G. Barson

Senior Lecturers: Marguerite Bauer, Clio P. Dorr, Nelee Langmuir, Michelle Moran, Jacqueline Ollivier

Lecturer: Mary Jane Parrine (Curator, Romance Languages and Humanities)

ITALIAN DIVISION

Professor: John Freccero, Vice Chairman

Assistant Professor: Beverly Allen (Florence Program Autumn)

Senior Lecturers: Maria Devine, Leda S. Mussio, Annamaria Napolitano, Emily Olmsted (on leave), Leopoldina Viggiano (Florence Program Spring)

Visiting Professor: Guelfo Frulla (Autumn).

(Others to be announced)

Lecturer: Carla Riga

Visiting Lecturer: Lucia Benini (Spring)

The department accepts candidates for the degrees of Bachelor of Arts and Master of Arts in French and in Italian, and Doctor of Philosophy in French.

FRENCH UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS IN FRENCH

Candidates should normally have completed the series of first- and second-year courses through French 24 or its equivalent. Regular placement tests enable students who have been in their study of French elsewhere to be granted advanced standing.

Candidates specializing in literature or language are expected to take at least three advanced language courses (123, 124, 125), the introductory series to French literature (130, 131, 132) and three advanced courses (numbered above 132) in different periods of literature. Students may then select one of the three following areas of specialization to complete their A.B. in French.

SPECIALIZATION IN LITERATURE

Majors concentrating in literature must take in addition a minimum of six Literature or Civilization electives numbered above 132. Students who intend to pursue graduate studies are urged to take courses in all periods of French literature. They should note that most graduate schools require proficiency in at least one additional modern language.

SPECIALIZATION IN LANGUAGE

Majors primarily interested in language and culture must take in addition six of the following courses:

- Séminaire sur des problèmes contemporains Prononciation et Phonétique
- Civilisation I: 17ème-18ème siècles
- Civilisation II: 19ème-20ème siècles
- French Historical Grammar
- Old French
- Stylitics

Methods of Teaching French

SPECIALIZATION IN FRENCH STUDIES

The aim of this program is to enable students to pursue a broadly based major by combining the study of French language, culture, and literature with such fields as art, communication, drama, economics, history, linguistics, music, philosophy and political science.

Requirements: (a) 32 units of French courses beyond French 120; (b) a coherent program of 28 units of approved courses outside the department which contain a significant component of French material. Study programs are formulated in quarterly consultation with a designated advisor who will help students choose from approved courses in the various fields indicated above. The advisor may also approve courses offered at the Stanford Program in Paris, as well as at Tours. Students are strongly encouraged to participate in at least one Stanford Overseas Program in France.

HONORS PROGRAM IN FRENCH

In addition to the basic undergraduate program, qualified French majors in their junior year may apply for admission to an Honors Program in French. A “B” average in French courses is required: other prerequisites include having completed at least two courses of the language-composition series, French 123, 124, 125, and two of the literature series, French
130, 131, 132. Juniors may apply while still taking the second course of these two series. Ideally, then, the Honors program could be established by Spring Quarter of the junior year. The student’s application must include a proposal and general outline of a senior essay, which will be accredited between 9 and 12 academic units, at the student’s option: it may be either in English or French depending upon the student’s preference and his or her advisor’s recommendation. Honors program students also fulfill all regular requirements for the A.B. in French.

HONORS PROGRAM IN HUMANITIES
For majors who wish to supplement their departmental major by a related program of studies. See the “Humanities Special Programs” section.

EXTENDED MAJORS
French and English Literatures—In addition to the requirements for the A.B. in French Literature, candidates should complete four English literature courses numbered 100 or above, and related to their French courses. However, two English literature courses can count toward the four electives in French.

French and Italian Literatures—In addition to reading proficiency in Italian, candidates should satisfy requirements similar to those stated in the previous paragraph.

English and French, and Italian and French—English majors and Italian majors interested in a combined degree with French literature should refer to “Extended Majors” in the English and Italian sections.

LA MAISON FRANÇAISE
The “Maison Française” located at 610 Mayfield, is an undergraduate residence which offers a wide variety of opportunities for students to expand their knowledge, understanding and appreciation of French language and culture. In-house seminars on French culture, arts and civilization are offered when possible. Assignment is made through the regular undergraduate housing draw.

DEPARTMENTAL PROGRAM AT THE UNIVERSITY OF PARIS
Each year, French majors in their sophomore or junior year, graduate students, as well as other students with an adequate command of the French language, may apply for the departmental program at the University of Paris during the following Autumn and Winter Quarters. If desired, studies may be continued during Spring Quarter. Students live in residence halls or with private families and attend courses at the University of Paris. A faculty supervisor accompanies the group and offers a supplementary program of studies. Applications must be received by March 31. Forms and information may be obtained from the Overseas Studies office.

INTENSIVE LANGUAGE WORK AT STANFORD IN FRANCE
Students attending Stanford in France, in Tours, have the opportunity to take courses in French language, literature, conversation, and civilization. All students will be required to take a language course for the first quarter, and possibly the second quarter of the session overseas. All courses in language bear the designation French 70, 80, or 90. Assignment to a particular level is made by the director and language faculty at the campus.

TEACHING CREDENTIALS
For information concerning the requirements for teaching credentials, consult the “School of Education” section of this bulletin and the Credential Administrator, School of Education.

FRENCH GRADUATE PROGRAMS
Applicants should read carefully the general regulations governing advanced degrees (see the “Degrees” section in this bulletin). They should have preparation equivalent to an undergraduate major in French with a minimum average grade of “B” and should also have reached a high level of speaking proficiency, to be demonstrated either in a personal interview or by a tape recording sent to the department. Previous study of a language other than French is highly desirable.

In addition to the Ph.D., the department offers two different kinds of master’s programs and participates with the School of Education in its Master of Arts in Teaching program.

VISITING STUDENTS
Students who are not candidates for a graduate degree but meet the standards of admission to a master’s or Ph.D. program may apply to the Graduate Admissions Office for admission as non-matriculated students for a period of not more than three consecutive quarters. Each quarter they may take up to three courses numbered 200-299 or two such courses and (with the permission of the instructor) one course numbered 300.
MASTER OF ARTS IN TEACHING

The degree of Master of Arts in Teaching is offered jointly by this department and the School of Education. The degree is intended for candidates who have a teaching credential or relevant teaching experience and wish further to strengthen their academic preparation. The program consists of a minimum of 25 units of French courses selected in consultation with the M.A.T. departmental advisor, and 12 units in the School of Education. Detailed requirements for the course are outlined in the School of Education section.

MASTER OF ARTS IN FRENCH

(The TERMINAL PROGRAM)

The Master of Arts provides a combination of language, literature, civilization, and methodology courses designed to prepare secondary school, junior college, or college teachers. Candidates must complete a minimum of 36 units of graduate work, with a "B" average, and pass a final examination. To fulfill the requirements in one year, they should enroll for an average of 12 units per quarter.

Candidates for this degree are not eligible for financial aid.

The basic course program, intended for those who plan to teach French (modifications are possible for those who do not), is as follows:

<table>
<thead>
<tr>
<th>Units</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>French 200. Stylistique</td>
</tr>
<tr>
<td>4</td>
<td>French 201. Prononciation et Phonétique</td>
</tr>
<tr>
<td>4</td>
<td>French 202. French Historical Phonology</td>
</tr>
<tr>
<td></td>
<td>or French 203. Grammaire historique de la langue française: phonologie</td>
</tr>
<tr>
<td>4</td>
<td>French 210. Old French</td>
</tr>
<tr>
<td>4</td>
<td>French 290. Civilisation I: 17ème-18ème siècles</td>
</tr>
<tr>
<td>4</td>
<td>French 291. Civilisation II: 19ème-20ème siècles</td>
</tr>
<tr>
<td>4</td>
<td>French 293. Methods of Teaching French</td>
</tr>
<tr>
<td>4</td>
<td>Education 383. Recent Developments in Foreign Language Education</td>
</tr>
</tbody>
</table>

Four literature courses numbered 200

Total: 36

Candidates are advised to develop teaching skills by participating in supervised teaching of language courses. Some practice teaching will be conducted in conjunction with the Methodology course. Candidates will, on occasion, assist in the teaching of languages.

MASTER OF ARTS IN FRENCH

(The PH.D. PROGRAM)

The Master of Arts in French is required of all Ph.D. candidates. Doctoral candidates must apply for A.M. candidacy. Upon successful completion of a minimum of 36 graduate units and of the Ph.D. qualifying examination, all candidates will receive an A.M.

DOCTOR OF PHILOSOPHY

IN FRENCH

Normally the Ph.D. program should be completed in four years. The first and second years should be devoted to full-time study; the third and fourth years to study, teaching, and dissertation work.

The Ph.D. graduate in French Literature is expected to have attained a reasonable mastery of the literature and the language. Students will emphasize some areas or centuries rather than others, but knowledge of the whole field should be well advanced at the time of graduation. A primary goal of the program is excellence in the art of writing scholarly articles and books. The Department also emphasizes competence in the teaching of language and literature.

All candidates, regardless of their field of specialization, are expected to fulfill the following general requirements:

1. Course requirements. A total of no fewer than 72 units of graduate work, preferably to be completed by the end of the second year. Additional units of graduate courses, seminars, or individual work in the candidate's major or minor field are strongly recommended and will be determined according to the advisor's (or advisory committee's) judgment and the candidate's needs. French 200, stylistics, and one philology course are to be among the 72 required units.

All candidates, regardless of their area of specialization, must take in the department at least ten literature courses exclusive of directed reading, covering four centuries (For the purpose of this requirement the Middle Ages count as a century).

2. Examinations. The Ph.D. qualifying examination consists of a two-hour oral examination to be held in the Spring Quarter of the second year. The candidate will be asked to give a commentary in French of a text by a previously chosen author. The text will be indicated two days before the examination. A brief question and answer period will follow the commentary.

The second part of the examination will include a discussion in French or English of the period of the work selected, as well as of the periods immediately preceding and following that of the work. The examination is intended to provide an opportunity for the candidate to use his knowledge of the liter-
3. **Dissertation.** The doctoral dissertation should demonstrate ability to carry out research, organize, and present the results in publishable form. The scope of the dissertation should be such that it could be completed in one to one-and-one-half years of full-time work. However, the department will encourage, in appropriate cases, projects requiring more time for completion. Various kinds of dissertations are acceptable to the department; for example, a historical study of a particular phenomenon, the discussion of one or more representative works of a genre, a comparative study, etc.

4. **Teaching experience.** Ph.D. Candidates, whatever their sources of financial support, are expected to demonstrate pedagogical proficiency by teaching under supervision three quarters at one-half time and one quarter at one-quarter time. Students are encouraged to participate in the teaching of literature whenever possible, usually by assisting a professor in conducting an undergraduate literature course.

5. There is no formal language requirement other than French and English. In areas of specialization in which additional languages are essential, students are expected to acquire the necessary knowledge before beginning work on the dissertation.

---

**JOINT DEGREES AND MINORS**

A candidate may also take a joint degree in French and Humanities (for a description of this program, see the section "Humanities Special Programs"). Minors are possible in Medieval Studies, in Linguistics, in Comparative Literature, in Modern Thought, and in departments offering related courses such as history, history of art, music, philosophy, social thought, etc.

Students interested in a joint degree or a minor should plan their course of study with their advisor(s). Joint degrees and minors usually require 24 additional units. By carefully planning their programs, students may complete their course work for the Ph.D. and the minor in a total of nine quarters.

**PH.D. MINOR IN FRENCH LITERATURE**

The department offers a minor in French Literature to students from other departments.

The requirements for a graduate minor in French Literature are:

1. A sound reading knowledge of French.
2. A minimum of 24 units of course work (six courses) covering at least two centuries or two genres (poetry, fiction, theater, or other prose) or a combination of both.

**EXCHANGE WITH THE ECOLE NORMALE SUPERIEURE**

The department has an annual exchange with the Paris Ecoles Normales Supérieures. Every year two of the French doctoral candidates spend the academic year at the Ecoles in Paris.

**ITALIAN UNDERGRADUATE PROGRAMS**

**BACHELOR OF ARTS IN ITALIAN**

This major is oriented toward Italian Studies and offers students an opportunity to bring together in a unifying program a broad cross-section of disciplines other than language and literature having their common denominator in Italian culture and civilization. To allow maximum flexibility, pertinent courses taken in other fields, such as classics, humanities, comparative literature, history, philosophy, architecture, romance literatures, English, German, anthropology, social sciences, political science, drama, art, and music, will count toward satisfying the major requirement.

Upon completion of the first-year language courses, Italian 1, 2, 3, and two second-year language courses, Italian 51, 52, or 53 (or equiv-
ulent courses taken at the Florence center), students wishing to concentrate in Italian Studies may, under the guidance of a departmental advisor, select a course of study best suited to their individual needs and cultural interests.

At least 60 additional units of courses are required, including:

1. 45 units of Italian courses beyond five quarters of Italian language courses. Students are required to take the sequence of Italian 127, 128, and 129 (or in Florence 110A, B, C), one course on Dante, as well as at least one course in each of the following areas: Middle Ages, Renaissance, Eighteenth or Nineteenth Century, and Twentieth Century. A Dante course may fulfill the Middle Ages requirement.

2. Up to 15 units of courses outside the department but in related fields.

In this perspective, the program at the Florence campus will offer students a selection of courses taught in Italian that are acceptable toward the fulfillment of the degree in Italian Studies. Further alternatives may be provided at the Florence center through directed work (in Italian and/or in the above mentioned disciplines) arranged by the students with their advisors. Although attendance at the Florence center is particularly advisable, valid alternative programs will be accepted.

Courses in Italian literature taken at Stanford in Italy may count, with the approval of the Italian Division, toward the fulfillment of the requirements for combined majors.

Students are encouraged to structure their program individually in consultation with a departmental advisor.

EXTENDED MAJORS

Italian and English Literatures—In addition to the 45 units (beyond five quarters of Italian language courses) required for the A.B. in Italian, candidates should complete four English literature courses numbered 100 and above and related to their field of concentration in Italian literature.

Italian and French Literatures—In addition to the 45 units (beyond five quarters of Italian language courses) required for the A.B. in Italian, candidates should complete four courses in French literature related to their field of concentration in Italian literature. Reading proficiency in French is required.

HONORS PROGRAM IN HUMANITIES

This program is offered for majors who wish to supplement their departmental major by a related, carefully guided program of studies. See the “Humanities Special Programs” section.
one Italian language course under departmental supervision in order to gain teaching experience. The program director reserves the right to waive this requirement for those candidates who have prior teaching experience in Italian.

Limited financial aid is available in the form of teaching assistantships.

Applications for admission with financial aid must be received by January 15, without financial aid by May 15.

**FRENCH DIVISION COURSES**

**GENERAL COURSES**

The courses in this section are open to all students and do not require a knowledge of any language other than English.

114A. The 19th Century French Novel—Treatment of the major novelists of the century from Stendahl to Zola. Novels are studied as works of art and for their political and social commentary. Reading and discussion in English. (DR:2)

4 units, Aut (Giraud)


4 units, Win (Cohn)

117. Mythology and Christianity in Wagner and Nietzsche I & II—Attempts to answer such questions as: What does 'mythological' and 'Christian' signify in Wagner's musical dramas from Tannhäuser to Parsifal. Who are Siegfried and Zarathustra? Why did Nietzsche's veneration for Wagner turn into obsessive criticism of Parsifal and everything Wagnerian? Why were Wagner and Nietzsche so highly prized by the Nazis? Judaism and Christianity as "religions of slaves". The significance of Wagner and Nietzsche in contemporary culture.

117A. Mythology and Christianity I: Wagner—(Graduate students register for 297A.)

4 units, Aut (Girard)

117B. Mythology and Christianity II: Nietzsche—(Graduate students register for 297B.)

4 units, Win (Girard)

118A. The Comic Doubles—(Graduate students register for 298A.) Study twins and look-alike characters in Plautus, Shakespeare, Molière and other writers. Read and discuss various theories of laughter, including Bergson's Le Rire (in an English translation).

4 units, Spr (Girard)

Students interested in languages not listed by a specific language department should contact the Special Language Program, Department of Linguistics.

**FIRST- AND SECOND-YEAR LANGUAGE COURSES**

*Note—* Students registering for the first time in a first- or second-year course must take a placement test if they have had any training in French before entering Stanford. The test will be given September 23.

Auditing is not permitted in participation language courses except in special cases.

1. First-Year French (Part 1)—Systematic acquisition of basic French grammar and vocabulary in the immediate reality of the classroom. Only French is used by both the instructor and students. Multiple approach: listening-comprehension, oral expression, original oral and written composition.

5 units, Aut, Win, Spr (Staff) MTWThF

1R. First-Year French (Part 1 accelerated)—A first-quarter French course for students who have some previous knowledge of the language, but who must begin their study of French over again. Equivalent to French 1. Language Laboratory required.

3 units, Aut (Staff)


5 units, Aut, Win, Spr (Staff) MTWThF

2C. First-Year Conversation—Cours de conversation au niveau linguistique du Français 2. Prerequisite: 1 or equivalent. Course offered on a Pass/No Credit basis only.

2 units, Aut, Win, Spr (Staff)


5 units, Aut, Win, Spr (Staff) MTWThF

3C. First-Year Conversation—Cours de conversation. Les étudiants utilisent leurs connaissances en les appliquant à l'étude de la culture et de la vie française: actualités, théâtre, cinéma, voyages, agences, etc. Renseignements utiles pour les étudiants qui partent pour le Campus de Tours ou qui projettent un voyage en France. Prerequisite: 2 or equivalent. Course offered on a Pass/No Credit basis only.

2 units, Aut, Win, Spr (Staff)

5. Intensive French for Beginners—An accelerated first-year French course in which either
or 3 quarters of French may be covered. Course offers preparation in speaking, writing, and reading the language. An all in French method is used; the course is conducted entirely in French with oral presentation immediately reinforced in small group conversation sections. Written exercises, compositions, as well as daily work in the language laboratory are also an integral part of the course. See Summer Session Bulletin for details. (No auditors permitted.)

8-12 units, Sum (Staff)

10. Reading French—An accelerated course designed specifically for the acquisition of reading ability. Primarily intended for graduate students seeking to meet the University reading requirement for advanced degrees. Also open to seniors. No auditors permitted.

4 units, Win (Juilland)

20C. The Art of Conversation—Le français dans les situations de la vie de tous les jours. Prerequisite: French 3 or equivalent. Course offered on a Pass/No Credit basis only.

2 units, Aut, Win, Spr, Sum (Staff)

21R. Grammar Review—Basic French grammar with specific emphasis on written expression with some training in speaking. Offered for students with previous training in French either in high school (3-5 years) or in other universities, whose progress would be best served by a concentrated review of first-year material. Language Laboratory required.

3 units, Aut (Staff) MWF


4 units, Aut, Win, Spr (Staff) MTWTh


4 units, Aut, Win, Spr (Staff) MTWTh


4-5 units, Aut, Win, Spr (Staff) MTWTh

25. Intensive Intermediate French—(Equivalent to both French 22 and 23.) A complete grammar review will be offered in conjunction with reading of selected French texts. Classroom discussions, entirely in French, will focus both on the reading material and on topics of current interest. Written exercises, oral reports, written compositions, and work in the language laboratory are also included. Prerequisite: one year of college French or equivalent preparation. (No auditors permitted.)

6-8 units, Sum (Staff) MTWTh

30C. Conversation and Culture—La France vue par des écrivains français et étrangers. Présentation et discussion des opinions. Prerequisite: French 23 or equivalent. May be repeated once for credit after an interval of two quarters. Course offered on a Pass/No Credit basis only.

2 units, Aut, Win, Spr (Staff)

UNDERGRADUATE SEMINARS

61. French Culture—Grandes tendances de l'histoire sociale et culturelle de la France du Moyen Age à nos jours.

3 units, Aut (Bertrand)

62. French Films—Études et discussions de films en conjonction avec la série de films français.

3 units, Win (Staff)

63. French Theater Workshop—Réalisation d'une pièce; interprétation, techniques, mise-en-scène, décor.

3 units, Spr (Staff)

STANFORD PROGRAM IN TOURS

70-80-90. Intensive and Accelerated French—Given only at Stanford in France.

5 or more units, Aut, Win, Spr (Staff)

THIRD- AND FOURTH-YEAR LANGUAGE COURSES

Auditing is not permitted in participation language courses except in special cases.

120. Séminaire sur des problèmes contemporains—Conversation et discussion sur des problèmes actuels à partir de journaux, revues ou films français. Prerequisite: 24 or 82 through 86 or equivalent. May be repeated once for credit after an interval of two quarters.

3 units, Aut, Win, Spr (Staff)

121. Prononciation et Phonétique—(See 201.)

4 units, Aut (Juilland)

123. Composition, grammaire et étude de textes—Langue orale et écrite, grammaire descriptive, analyse grammaticale, composition, explication de textes. Prerequisite: 24 or equivalent.

4 units, Aut (Weinstein)

124. Langue, style et écriture—Continuation du Français 123. Le commentaire littéraire, les styles de la critique, composition.

4 units, Win (Staff)
125. Cours avancé de français—Exercice de style, traduction et explication de texte: enrichissement du vocabulaire. Prerequisites: 123 and 124 or equivalent.
4 units, Spr (Cazelles)

LITERATURE COURSES

For literature courses in English, see also General Courses section.

130. French Literature I—Middle Ages & Renaissance—Etude générale de la littérature française de l'époque médiévale jusqu'à l'essai philosophique du 16ème siècle (Chanson de Roland, Chrétien de Troyes, poètes du 16ème siècle, Rabelais, Montaigne). Prerequisite: 24 or equivalent. (DR:2)
4 units, Aut (Hester)

131. French Literature II—Seventeenth & Eighteenth Centuries—Etude générale de la littérature française du 17ème et 18ème siècles. Corneille, Molière, Racine, Mme de La Fayette, Voltaire, Marivaux, Prévost, Rousseau. Prerequisite: 24 or equivalent. (DR:2)
4 units, Win (Weinstein)

132. French Literature III—Nineteenth & Twentieth Centuries—Etude de la littérature française du Romantisme à nos jours. Prerequisite: 24 or equivalent. (DR:2)
4 units, Spr (Newman-Gordon)

Note: — prerequisites for the following courses are normally 130, 131, or 132, or 85 and 86, or equivalent.

139. Chrétien de Troyes— Lectures et discussions des cinq œuvres maîtresses de Chrétien de Troyes (XIIe siècle): Erec, Cligès, Lancelot, Yvain et Perceval d'après des adaptations modernes ou dans des éditions bilingues.
4 units, Win (Cazelles)

140. Renaissance I—Poètes et prosateurs de la première moitié du XVIe siècle: Rabelais, Calvin, Scève, Ronsard, du Bellay, etc.
4 units, Spr (Hester)

152. Grands Auteurs du XVIIe siècle—Ce cours se consacrera à l'étude du théâtre classique (Corneille, Racine, Molière). Analyse historique du phénomène théâtral, de la représentation sociale, de la nouvelle psychologie des passions.
4 units, Spr (Saint-Amand)

4 units, Win (Giraud)

198. Language Specials—With special permission of the department only.
1-5 units, (Staff)

199. Individual Work—Open only to majors in French and with special permission of the department. May be repeated for credit. See instructor for section number.
1-3 units (Staff) by arrangement

ADVANCED UNDERGRADUATE AND GRADUATE COURSES

4 units, Aut (Newman-Gordon)

201. Prononciation et Phonétique—(Undergraduates register for French 121.) Etude théorique et travaux correctifs, articulation, rythme, intonation, timbre, quantité, graphie traditionnelle et voyelle instable, liaison et enchaînement, graphie phonétique.
4 units, Aut (Juilland)

210. Old French—Introduction to the grammar and documents of Old French, with particular emphasis on the early period.
4 units, Win (Cazelles)

218. Colloquium on The Romance of the Rose: Text and Image—(Same as Art 206A, Medieval Studies 165.) An interdisciplinary approach to one of the most popular secular works of the High Middle Ages in English Translation. An exploration of how literature and art are uniquely joined together in illuminated manuscripts of the French romance to reveal changing perceptions of meaning by succeeding generations of medieval readers from the late 13th through the 15th century.
5 units, Aut (Cazelles, Lewis)

4 units, Aut (Girard)

237. Les Moralistes français—La Rochefoucauld, Pascal, La Bruyère, etc.
4 units, Win (Girard)

241. Le Roman au XVIIIe siècle: Poétique et critique—Etude des lois de l'économie sociale et analyse des passions dans ce genre fonda-
mentalement nouveau, à partir des œuvres de Marivaux, Prévost, Crébillon, Diderot, Laclos, Rousseau et Sade.
4 units, Win (Saint-Amand)

243. Voltaire — Stress development of Voltaire’s political, social, philosophical and metaphysical thought in the context of contemporary European culture.
4 units, Win (Giraud)

4 units, Spr (Saint-Amand)

275. Le Surréalisme — Une définition du Surréalisme à travers les Manifestes d’André Breton. Etude de poèmes et de romans par A. Breton, Soupault, Eluard, Aragon, J. Gracq.
4 units, Win (Newman-Gordon)

280. Individu et société dans le roman contemporain—Camus, Queneau, Beauvoir, Rochefort, Modiano, etc.
4 units, Win (Bertrand)

285. Simone de Beauvoir — (See 185.)
4 units, Aut (Giraud)

4 units, Aut (Saint-Amand)

290. Civilisation I — XVIIe et XVIIIe siècles. (DR:5)
4 units, Spr (Bertrand)

300. Civilisation II — XVID et XVIIIe siècles.
4 units, Spr (Bertrand)

CIVILISATION FRANÇAISE

Approches: civilisation matérielle et modes de vie; Etat et classes sociales; culture savante et traditions populaires; idéologies et mentalités.

300. Civilisation II — XVIIe et XVIIIe siècles. (DR:5)
4 units, Spr (Bertrand)
FRENCH COURSES REGULARLY OFFERED BUT NOT DURING 1983-84

105. The Writings of Albert Camus.
110. Contemporary French Literature and Thought—(Same as French 281.).
114. The French Novel.
114C. The Contemporary French Novel.
115. Introduction to Existentialism.
135. Le Roman arthurien.
136. Romanciers et Prosateurs du 17ème siècle.
141. Renaissance II.
150. Romanciers et Prosateurs du 17ème siècle.
151. 17th Century Literature.
153. Corneille et Racine: le théâtre tragique.
161. Romans du 18ème siècle.
163. Marivaux et Beaumarchais.
164. Introduction to the Philosophy of the Enlightenment.
173. Symbolism.
180. La Poésie française - 20ème siècle.
182. Le Roman au 20ème siècle.
186. Sartre: Literature & Politics.
191. The Idea of Revolution in Modern French Literature.
192. French Women Poets.
196/296. Littérature féminine en France.
203. Grammaire historique de la langue française: phonologie.
211. Old Provençal.
212. Littérature médiévale I: 11ème—13ème siècles.
214. L’Épopée.
216. Medieval Drama.
219. Special Topics on Medieval Literature.
230. Introduction au 17ème siècle.
244. Rousseau.
262. The Symbolist Poets.
270. Le Roman 1898-1950.
280. Individu et société dans le roman contemporain.
281. Contemporary French Literature and Thought.
282. Structuralism and Post-Structuralism.
283. Le Théâtre contemporain.
286. Sartre: Literature & Politics.
291. Civilisation II: 19ème et 20ème siècles.
292. French Women Poets.
298. Myth and the Bible.
312. Fabliaux.
313. Courtly Love.
314. French Epics.
315. French Medieval Romances.
316. French Lyric Poetry.
318. Chronicles.
319. Special Topics on Medieval Literature.
321. Poésie de la Renaissance II.
323. Montaigne.
324. Renaissance Prose.
330. Le 17ème siècle.
331. Le Théâtre classique.
332. Poésie de Malherbe a la Fontaine.
334. Racine.
335. Molière.
336. Pascal.
346. Diderot.
352. Balzac.
353. Stendhal.
354. Flaubert.
355. Zola.
361. Rimbaud.
362. Ideology of Literature from Romanticism to the Present.
363. Mallarmé.
365. Théories critiques au 19ème siècle.
372. Proust.
373. Apollinaire—Alcools et Calligrammes.
ITALIAN DIVISION COURSES

Department code: 472 (except General Courses: 471).

GENERAL COURSES

The courses in this section are open to all students and have no prerequisites. All readings and discussions are in English.

140. Dante: *Inferno*. (DR:2)
   4 units, Aut (Freccero)
141. Dante: *Purgatorio*. (DR:2)
   4 units, Win (Freccero)
142. Dante: *Paradiso*. (DR:2)
   4 units, Spr (Freccero)
148. Italy as Literary Symbol.
   4 units, Spr (Allen)

FIRST- AND SECOND-YEAR LANGUAGE COURSES

Coordinator: Annamaria Napolitano
Assistant Coordinator: Leopoldina Viggiano

Note—Students registering the first time in a first- or second-year course must see their Italian instructor for proper placement if they have had any training in Italian before entering Stanford.

1. First-Year Italian (First quarter)
   5 units, Aut, Win, Spr (Staff) MTWThF
2. First-Year Italian (Second quarter)—(Continuation of 1.)
   5 units, Aut, Win, Spr (Staff) MTWThF
2A. L'Italia d'Oggi—Introduction to Italian life. Conversation and lectures on various aspects of contemporary Italy (politics, art, cinema, press, customs). Especially designed for students who plan to go to Italy. May be taken concurrently with Italian 2. Prerequisite: Italian 1.
   3 units, Win, Spr (Staff) MWF
3. First-Year Italian (Third quarter)—(Continuation of 2.) A grammatical and lingüistical approach to Italian through contemporary readings (short stories or novels).
   5 units, Aut, Win, Spr (Staff) MTWThF
5. Intensive Italian for Beginners—Equivalent to 1 and 2. Offers preparation in speaking, writing, and reading the language.
   9 units, Sum (Staff) MTWThF 10-12
   plus 2 hours by arrangement

10. Reading Italian—An accelerated course designed specifically for acquisition of reading ability. Primarily intended for graduate students seeking to meet University reading requirement for advanced degrees. Also open to seniors. No auditors.
   4 units, Win (Staff)
30. Italian Conversation—This course is geared to students returning from Florence. For those students who did not go to Florence, minimum prerequisite is Italian 3. May be repeated for credit up to three times.
   2 units, Aut, Win, Spr (Staff)
51. Second-Year Italian—Linguistic and literary introduction to contemporary Italian authors and review of essential linguistic and grammatical points. Prerequisite: 3 or equivalent.
   3 units, Aut (Staff) MWF
52. Second-Year Italian—Logical progression of Italian 51 with more emphasis on written work. Prerequisite: 51 or consent of instructor.
   3 units, Win (Staff) MWF
53. Second-Year Italian—Sequential progression of 51 and 52. Prerequisite: 52 or consent of instructor.
   3 units, Spr (Staff) MWF

Note: Italian 51, 52, 53 are offered for 3 units. May be taken for 4 units by arrangement with instructor.

70-80-90. Intensive and Accelerated Italian—Given only at Stanford in Italy.
   3 units or more, Aut, Win, Spr, Sum (Staff)

Courses taken at the Florence campus will be evaluated according to their relationship with students' specific areas of concentration. Units earned through Italian colloquia (4 units per colloquium) will be evaluated by the departmental Italian advisor.

THIRD- AND FOURTH-YEAR LANGUAGE COURSES

   4 units, Win (Staff) MWF
115. Advanced Grammar and Translation—(Continuation of 114.)
   4 units, Spr (Staff) MWF

CULTURE AND CIVILIZATION

122. Cinema italiano—Aspetti di storia politico-sociale e culturale dell'Italia degli ultimi
LITERATURE COURSES

127. Introduction To Italian History — Historical and cultural background through the study of specific events, movements, figures, and artifacts.
4 units, Spr (Napolitano)

128. Survey of Italian Literature I: 13th to 16th Century — Reading of major works from Dante to Machiavelli, Ariosto, Tasso, and other significant representatives of Italian "Civilta comunale" and Renaissance. (DR:2)
4 units, Aut (Staff)

129. Survey of Italian Literature II: 17th to 19th Century — Close study of selected works by Goldoni, Parini, Alfieri, Foscolo, Leopardi, Manzoni, and Verga against their historical and cultural background. (DR:2)
4 units, Win (Staff)

131. Italian Romanticism — A study of the romantic movement in Italy with emphasis on Foscolo, Leopardi and Manzoni.
4 units, Win (Allen)

135. Introduction to 20th Century Italian Poetry — A survey of Italian poetry from the turn of the century to the present in cultural and critical contexts. Readings include texts of D'Annunzio, Gozzano, Campana, Saba, Ungaretti, Montale, Luzi, Gatto, Zanzotto.
4 units, Win (Allen)

140. Dante: Inferno
4 units, Aut (Freccero)

141. Dante: Purgatorio
4 units, Win (Freccero)

142. Dante: Paradiso
4 units, Spr (Freccero)

148. Italy as Literary Symbol — A study of the symbolic import of Italy in travel accounts and other texts, from the time of Shakespeare to the 20th century. Readings will include Goethe, Stendhal, Byron.
4 units, Spr (Allen)

154. Literature of Unified Italy — A study of poetry, prose and drama from the unification of Italy to the Fascist era.
4 units, Spr (Allen)

161. Machiavelli: The Prince — An introduction to the Renaissance civilization in Italy through the readings of one of its greatest Flor- entine writers.
3 units, Aut (Frulla)

199. Individual Work — Open to all students with special permission of the department. See instructor for section number. May be repeated for credit.
1-3 units, any quarter (Staff) by arrangement

GRADUATE COURSES

231. Italian Romanticism.
4 units, Win (Allen)

235. Introduction to 20th Century Italian Poetry.
4 units, Win (Allen)

240. Dante: Inferno.
4 units, Aut (Freccero)

4 units, Win (Freccero)

4 units, Spr (Freccero)

248. Italy as Literary Symbol.
4 units, Spr (Allen)

254. Literature of Unified Italy.
4 units, Spr (Allen)

290. The Italian Language — Analytical introduction to pronunciation, grammar, and history of Italian. In English.
4 units, Spr (A. Devine)

297. Introduction to Bibliography in French and Italian Studies — Seminar to acquaint graduate students with general and specialized resources for French and Italian studies. While the emphasis is on overall strategy for research, there will be an opportunity to explore bibliographical sources in particular fields of interest to each student. (See full description under "Libraries and Information Services."
2 units, Aut (Parrine)

299. Individual Work — Exclusively for graduate students working on thesis or engaged in special work. See instructor for section number.
1-12 units, any quarter (Staff) by arrangement
OFFERINGS AND FACILITIES

The department offers a variety of programs in German language and linguistics, literature, culture, and thought. Courses are open not only to majors but to all interested students.

The department accepts candidates for the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy.

By carefully planning their programs, students may fulfill the A.B. requirements for a double major in German Studies and another subject. An extended undergraduate major program in English and German literatures is available, as are coterminous programs for the A.B. and A.M. degrees in German Studies, and joint programs for the Ph.D. degree with Graduate Humanities, Comparative Literature, Modern Thought and Literature, and Linguistics.

Special collections and facilities at Stanford offer possibilities for extensive research in German studies and related fields pertaining to Central Europe. Facilities include the undergraduate and graduate libraries and the Hoover Institution on War, Revolution and Peace. Special collections include the Hildebrand Collection (texts and early editions from the 16th to the 19th century), the Austrian Collection (with emphasis on source material of the time of Maria Theresa and Joseph II, the Napoleonic wars, and the Revolution of 1848), and the Stanford Collection of German, Austrian, and Swiss Culture. The Hoover Institution has a unique collection of historical and political documents pertaining to Germany and Central Europe from 1870 to the present. The department also has its own reference library. Extensive use is made of the Language Laboratory in the Undergraduate Library as well as of the department's own audio-visual equipment, films, tapes, slides.

In 1976, on the occasion of the U.S. Bicentennial, the Republic of Austria endowed a Distinguished Visiting Professorship in Austrian Studies. A Distinguished Visiting Professorship in Comparative Western European Studies is funded by the Federal Republic of Germany. Both of these professorships rotate on a yearly basis through several departments.

Haus Mitteleuropa, the German theme house at 620 Mayfield, is an undergraduate residence which is devoted to developing an awareness of the culture of Central Europe. A number of departmental courses are regularly taught at the house, and there are in-house seminars and conversation courses. Assignment is made through the regular undergraduate housing draw.

The department also houses the Institute for Basic German (J. Alan Pfeffer, Founding Director). The Institute holds a unique corpus of data on the contemporary German language, which is available for research to graduate students and faculty. Currently, the Institute is engaged in a major computer-based research project.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Majors in German Studies formulate their plans in quarterly consultation with an undergraduate major advisor. All undergraduate major advising is coordinated by Professor Orrin Robinson.

After completion of the basic courses, majors normally select at least two German courses per quarter. The total requirement for the Bachelor of Arts degree in German is a minimum of 50 units of work beyond the basic courses (1 through 51 or equivalent), except in the area of German Culture Studies, as described below.

Students have the opportunity to select any one of four areas of concentration, without, however, limiting their courses exclusively to that area.

German Language and Linguistics—Students choosing this area of concentration must take 203 (History of the German Language), 211 (Syntax of Modern German), 212 (Linguistics and the Analysis of German) and one linguistics colloquium (usually 118/218 or 119). Further
coursework may fall into any one of the following fields or a combination of them: (a) Contrastive linguistics and language pedagogy (teaching methods, curricular problems, error analysis); (b) Historical German and Germanic linguistics (Old High German, Middle High German, Old Saxon, Old Norse, etc.); or (c) Theoretical linguistics and the analysis of modern German (phonology, syntax, dialectology, etc.). Appropriate courses in the English and Linguistics departments may also be taken. Students interested in languages not listed in this department should contact the Special Language Program, Department of Linguistics.

**German Literature**—Students concentrating in German Literature must take 150 and the complete 160 series, in sequence if possible. Additional courses may be selected from the 150 series, which focuses on various genres, or from the 170 series, which provides possibilities for studying specific developments and topics of German literature and culture in depth. In addition, students are encouraged to take a course or a seminar in literature on the 200 level.

**German Thought**—Students who are concentrating in German Thought should take 150 and must take the Geistesgeschichte series (241-243) and normally one seminar. Students may want to organize their elective courses around certain themes or sets of problems according to their own interests and choose from among the offerings of German, English, French, Philosophy, History, Religious Studies, and other appropriate disciplines.

**German Culture Studies**—The aim of this program, which permits maximum flexibility, is to allow students to plan a more broadly based major than is possible in the other areas of concentration. The student can combine the study of German language and literature with such fields as art history, musicology, political science, history, economics, anthropology, comparative literature, etc. The requirements are: (a) at least 30 units of German courses beyond the 51-level, including at least four courses from the series 161, 162, 163 and 131, 132, 133; and (b) at least 25 units of courses outside the department, but in the Central European field, to be planned and presented to the department by the student. Every student will normally participate in at least one Stanford Overseas Program.

**HONORS IN GERMAN**

Majors with a minimum grade average of "B + " in German courses are eligible for departmental honors. In addition to requirements listed above, each honors candidate will submit an essay representing six to nine units of academic work. This essay will be on a topic chosen in consultation with a faculty member of the department.

**EXTENDED MAJOR IN ENGLISH AND GERMAN LITERATURES**

Students may enter this program with the consent of the chairmen of both departments. See the "English" section of this bulletin.

**DOUBLE MAJORS**

Students can combine a major in German Studies with a major in any other field. By carefully selecting their courses in such disciplines as History or Economics, students can prepare themselves exceptionally well in the area of Central Europe. Double majors are especially recommended for students spending one or more quarters at the Stanford centers in Berlin and/or Vienna.

**COTERMINAL PROGRAMS**

Students may elect to combine programs for the A.B. and A.M. degrees in German Studies. For details, see the "Degrees" section of this bulletin.

**OVERSEAS STUDIES**

Detailed information on the centers in Vienna and Berlin are given in the bulletin Overseas Studies. These programs cover a great variety of courses in language, literature, culture, and other fields of Central European Studies. Most credits earned in Vienna and Berlin can be applied to the undergraduate major in German Studies. For courses offered in Vienna and Berlin see the "Overseas Studies" section of this bulletin.

**STANFORD BONN GRADUATE EXCHANGE**

Annually one or two Stanford graduate students in German Studies are accepted as exchange students by the University of Bonn, and their counterparts from Bonn participate in academic programs at Stanford.

**TEACHING CREDENTIALS**

For information concerning the requirements for teaching credentials, consult the "School of Education" section of this bulletin or inquire at the Degrees Program Office, School of Education.

**GRADUATE PROGRAMS**

**MASTER OF ARTS**

This program is designed for those students who do not intend to continue their studies
through the Ph.D. degree. Students desiring
the A.M. degree must complete a minimum of
36 units of graduate work. If students enroll for
three quarters for a minimum of 12 units per
quarter, they can fulfill the A.M. requirements
in one year. The program normally includes:
201 and 202. Language and Style
302. Methods of Teaching German
A minimum of four courses, with at least one
course in each of the three areas of concentra-
tion: language and linguistics, literature, and
thought.
In addition, students must take graduate
level courses in German and/or approved
courses in related fields such as linguistics,
comparative literature, philosophy, history, or
art history.
Students concentrating in German Culture
Studies should choose these related courses in
the Central European field, in such depart-
ments as Political Science, Economics, An-
thropology, or History.
All A.M. candidates must take an individual
oral examination toward the end of their last
quarter.

MASTER OF ARTS
IN TEACHING
The degree of Master of Arts in the Teaching
of German is offered jointly by the School of
Education and the department. The program
includes 25 units of German in courses selected
in consultation with the departmental advisor.
For a statement of requirements other than
German see the section “School of Education”
in this bulletin.

DOCTOR OF PHILOSOPHY
The requirements for the Ph.D. are: (1) a
minimum of 36 graduate units during the first
year of graduate study and a minimum of 9 units
per quarter during the six quarters following the
first year; (2) a reading knowledge of one lan-
guage other than English and German; and (3)
the writing of a dissertation. Students in
medieval studies must also have a reading
knowledge of Latin.
The first year of graduate work, which leads
to the A.M. degree, is designed to introduce
each student to the three major areas of study. It
accommodates both those students who com-
plete their studies with the A.M. and those who
go on to the Ph.D. An individual oral examina-
tion is taken by both groups at the end of the
Spring Quarter. Those who continue in the
Ph.D. program should devote the summer to
writing a qualifying paper, which will be evalu-
ated by the department in the following Aut-
umn Quarter. When the qualifying paper has
been submitted and approved, the Department
will recommend that the student be admitted to
candidacy for the Ph.D. Students who do not
qualify for the Ph.D. may continue through the
second year.
The qualifying paper, although ordinarily not
meant to represent an original contribution to
scholarship, should demonstrate the candi-
date’s ability to grasp complex subject matter
with sufficient competence, to organize mate-
rials, and to present arguments in a clear and
concise manner commensurate with scholarly
standards. The necessary research and the writ-
ing of the paper must be completed by the
beginning of the Autumn Quarter. Procedural
details are available from the department.
All students, regardless of their future field of
concentration, are expected to acquire near-
native proficiency in German and a thorough
knowledge of the grammatical structure of Ger-
man. The department expects all Ph.D. candi-
dates to demonstrate teaching proficiency in
German; 302 (Methods of Teaching German) is
required. The teaching requirement is six quar-
ters during the second and third years of study.
The department expects all Ph.D. candidates
to demonstrate research skills appropriate to
their special areas of study. The research re-
quirement can be fulfilled in the capacity of
either a University Fellow or a Research Assist-
ant.
All graduate students are also strongly ad-
vised to start developing skill in the teaching of
literature by participating in the teaching of
undergraduate literature courses. Students can
earn up to three units of graduate credit for
practice teaching in literature.
During the first year, all graduate students
planning to continue through the Ph.D. take
especially the same core program, as shown in
the following specific suggestions of appropriate
work in language and linguistics, literature, or
German thought. This flexibility permits
students to change direction at some later stage,
as they develop their intellectual identity on the
basis of actual experience.
Under any concentration, electives chosen
from graduate level courses in German or ap-
proved courses in related fields must be added
to accumulate the 36 units of study required for
the A.M.
For basic University requirements see the
“Degrees” section of this bulletin.

INTERDISCIPLINARY PROGRAMS
The Department participates in the Graduate
Program in Humanities leading to a joint Ph.D.
degree in German Studies and Humanities. For
a description of that program, see the section
“Humanities Special Programs” in this bulletin.
Students may work toward a Ph.D. in German Studies with minors in such areas as Comparative Literature, Modern Thought and Literature, Medieval Studies, or Linguistics. Students who are obtaining a Ph.D. in such combinations may require additional training.

AREAS OF CONCENTRATION FOR THE Ph.D.

Language and Linguistics—Students choosing this concentration should take the general survey courses 203 (History of the Language), 311 (Syntax of Modern German), and 312 (Linguistics and the Analysis of German) or their equivalents. In their further studies, students may choose courses in contrastive English-German linguistics, methods of teaching German, historical Germanic dialects and comparative German linguistics, modern German syntax, phonology and dialectology, theoretical synchronic and diachronic linguistics. Students are also encouraged to take related courses in other departments, especially in English and Linguistics.

During the first year, students normally take the following program:

201 and 202. Language and Style
208A. Introductory Middle High German
311. Syntax of Modern German
203. History of the German Language or
312. Linguistics and the Analysis of German
313. Transformational Grammar of German or
314. Phonology of German
304. Gothic or 305. Old Norse or
306. Old High German or 307. Old Saxon
300. Proseminar

Three courses in German Literature and in German Thought, with at least one course in each.

Literature—Course requirements are a minimum of two courses or seminars per quarter for at least four of the six quarters following the first year. Lecture courses and colloquia will require final examinations but not term papers. Seminars, of which the student is expected to take a minimum of two after the first year, will require research papers.

During the first year, students normally take the following program:

201 and 202. Language and Style
208A. Introductory Middle High German
311. Syntax of Modern German
203. History of the German Language or
312. Linguistics and the Analysis of German
313. Transformational Grammar of German
241. Deutsche Geistesgeschichte I
242. Deutsche Geistesgeschichte II
243. Deutsche Geistesgeschichte III
300. Proseminar

Three courses in German Literature, one of which should be from the 351-359 series, and one from the 360, 370, or 380 series. One seminar in German Thought (349, 449).

COURSES

OVERVIEW OF COURSES

A. General Courses (given in English)
B. Introductory Courses (1-99)
C. Intermediate Courses (100-199)
   Language (100-119)
   Culture (130-139)
   Literature (150-179)
D. Courses for Advanced Undergraduates and Graduates:
   Language: Skills and older dialects (201-210; 302-310). Special topics in linguistics (211-219; 311-319)
   Culture and Civilization (230-239; 330-339)
   Thought and Literary Theory (240-249; 340-349)
   Literature: and Culture I-IX (251-259 or 351-359), Major authors (260 or 360), Genres (270 or 370), Major works (280 or 380), Special topics (290 or 390)
   Proseminar (300)
E. Courses for Advanced Graduate Students (400-499)
   Seminars and colloquia on special topics; interdepartmental courses
GENERAL COURSES
(GIVEN IN ENGLISH)

The courses in this section are given in English and do not require a knowledge of German. They are open to all students. German majors taking these courses as a part of their requirements must do the assigned readings in German.

19A. Introduction to the Germanic Languages—(Same as 119; Linguistics 81.) Survey of the oldest attested stages of the Germanic language family, including Gothic, Old Norse, Old Saxon, Old English, Old High German, Old Dutch, Old Frisian. Presentation both of external history and internal relationships. (DR:4)
3 units, Spr (Robinson)

31A-33A. German Culture and Civilization I-III—(See also 131-133.) These courses provide a survey of different aspects of modern society and culture in the countries of German-speaking Europe: social processes and institutions, modernism in literature and the fine arts, central concerns of philosophical and social thought. There are no prerequisites, and students may elect to enroll in any part of the series without participating in the full series.

31A. Central Europe: Geography, Institutions, and Society —This course surveys geography, people, and institutions of the German-speaking areas of Central Europe focusing on the contemporary situation and historical origins. Topics include governmental structure of the BRD, the DDR, Austria, and Switzerland; population; stability and migration; social structure of East and West Germany; the educational system; communications systems; urbanization and its consequences since World War II. (DR:5)
3 units, Aut (Lohnes)

32A. The Culture of Modernism in Austria and Germany —The birth of modernism in Vienna at the turn of the century and in the Weimar Republic with emphasis on literature, music, painting, and architecture. The connections to broad intellectual and historical developments. Examination of the works of Hofmannsthal, Mahler, Freud, Schönberg, Kandinsky, Gropius, Brecht, and Mann. (DR:2)
3 units, Win (Berman)

33A. Democracy, Protest, and Political Culture in German-Speaking Europe — An introduction to central issues in German thought since 1945 with reference to the political context. “Overcoming the past” and the confrontation with the Holocaust. Democracy as an issue for political philosophy. The Frankfurt School from the critique of enlightenment to the consensus theory of rationality. The New Left, feminism, and ecology. Marxism in the German Democratic Republic and dissident thought. The new sensibility and the new irrationalism. (DR:3)
3 units, Spr (Berman)

35A. Images of Women in German Film —(Same as 135.) Feminist analysis of images of women in selected German films. Lab: Screenings of films discussed in class. Supplementary materials in German for students taking the course for German credit.
3-4 units, (Strachota) given 1985-86

151A. The Heroic Literature of Northern Europe — (Same as 251A.) A survey of the major heroic tales of England, Germany, and Scandinavia in translation; Beowulf; the Old English heroic fragments, the Hamlet legend, the German legends of Hildebrand, Walter, Brynhild, and Dietrich, the heroic poems of the Edda, and the heroic novels of Iceland. Lectures and discussions.
3-5 units, (Andersson) given 1985-86

173A. Contemporary West German Cinema —(Same as 173.) An examination of trends in recent West German films with reference to the aesthetic concerns of the new generation of directors and to the overall political and intellectual environment. Topics include: social criticism, feminism, the notion of “culture industry,” narrative film, and avant-garde. Discussion and critical analysis of works by figures such as Rainer Werner Fassbinder, Werner Herzog, Volker Schlöndorff, Margarethe von Trotta, and others.
4 units, Spr (Berman)

245A. Marxism and Literary Criticism —(Same as 245; 345.) An introduction to important issues and figures in Marxist literary criticism. Themes such as ideology, alienation, and the social function of culture will be discussed with reference to the works of figures including Lukacs, Adorno, Benjamin, and Brecht. The contemporary debate on the institutional character of literature as well as the contributions of critics outside the German tradition (Goldmann, Eagleton) will be treated.
3-5 units, Aut (Berman)

251A. The Heroic Literature of Northern Europe — (Same as 151A.)
3-5 units, (Andersson) given 1985-86
273A. European Novel I: Renaissance Heritage—Theory and practice of prose fiction in Europe from Rabelais and Cervantes to the Enlightenment period, study of the evolution of form, subject matter, and terminology in the romance and novel; special attention to the humoristic, encyclopedic, picaresque, quester, and adventure modes in British, French, German, Spanish, and Italian literature.

3-5 units, (Gillespie) given 1985-86

274A. European Novel II: Sentiment, Education, and the Crisis of Development—The emergence of psychological and confessional models from Mme de La Fayette to Goethe; special attention to the novel as vehicle for the concept of Bildung (formation, education) in such major authors as Fielding, attacks on eighteenth-century norms by radicals such as de Sade, pre-Romantic anxieties as experienced by Rousseau and others, and the revolution of fiction in Sterne.

3-5 units, (Gillespie) given 1985-86

275A. European Novel III: The Romantics—Readings from American, English, French, German, and Italian romantic authors. Romantic theory and practice of the novel, with special emphasis on genres and modes (sentimental, confessional, educational, arabesque, gothic, horrific, etc.) in relation to major concepts (antihero, artist problem, ego, "double," over-soul, romantic irony, etc.)

3-5 units, (Gillespie) given 1985-86

276A. European Novel IV: The Realists—Special attention to the longterm repercussions of Romanticism and the struggle to establish a Realist approach in fiction. Such topics as the transition from Romantic Realism to Positivism and Naturalism, the rise of the historic novel, the inroads of psychological Impressionism, Symbolism, and cultural development. The final list of readings of approximately 6 works will be drawn from such writers as Balzac, Flaubert, Zola, Dostoevski, Gogol, Turgenev, Tolstoy, Meyer, Stifter, Fontane, Schnitzler, Dickens, Eliot, Trollope, Howells, Galdós.

5 units, Win (Gillespie)

294A. Poets of Infinity — (Same as 394A.) Inquiry into the vision of cosmic, evolutionary, historical, and psychological time in selected lyrics by such major romantic poets as Novalis, Hölderlin, Keats, Shelley, Leopardi, Bécquer, and Baudelaire. Readings in the original language and/or bilingual texts.

3-5 units Win (Gillespie)

394A. Poets of Infinity — (Same as 294A.)

3-5 units, Win (Gillespie)

INTRODUCTORY COURSES

First- and second-year language courses are under the direction of Walter F. W. Lohnes. Note—Students registering for the first time in a first- or second-year course must take a placement test if they have studied German before entering Stanford.

FIRST-YEAR COURSES

1,2,3. German Language and Culture—These comprehensive courses provide a balanced introduction to listening and speaking as well as reading and writing.

5 units, Aut, Win, Spr (Staff)

2C. Conversational German—This course aims to enable the student to understand, and to express himself in, simple spoken German. Especially recommended for students going to Vienna or Berlin. Prerequisite: at least one quarter of first-year German.

2-3 units, Aut, Win, Spr (Staff)

1D,2D,3D. Beginning Dutch—Introduction to written and spoken Dutch/Flemish (Algemeen Beschaafd Nederlands).

4 units (Staff) given 1984-85

1P,2P,3P. Individually Programmed Beginning German—These courses are particularly suited to students who wish to complete more or less than five units a quarter, or have a spotty background in German, or have scheduling conflicts, or simply prefer to work independently. Students proceed at their own pace, working on their own with the text and tapes. The instructor is available for consultation on a regular basis. Conversation classes may be attended for listening and speaking practice.

1-15 units, Aut (Chadburn), Win (Strachota), Spr (Chadburn)

1S,2S,3S. An Introduction to the Reading of the Scandinavian Languages — Swedish, Danish, and Norwegian are sufficiently similar in grammar and vocabulary that only minor adjustments are required to move from one to another. This course undertakes to provide a basic reading knowledge of all three, beginning with Danish and progressing to Norwegian and Swedish in the succeeding quarters. A new
The book by Louis Janus and Ian Ritchie, entitled *The Scandinavian Languages: A Grammar and Reader,* will facilitate the three-pronged approach.

2 units (Andersson) given 1985-86

640. Beginning Danish
641. Intermediate Danish
642. Beginning Norwegian
643. Intermediate Norwegian
644. Beginning Swedish
645. Intermediate Swedish

Students should consult with the coordinator of Special Language Programs in Linguistics. 

Aut, Win, Spr

4. Review of First-Year German — For those who need to solidify their basic command of the language and/or have not had contact with the language for a considerable period of time.

3 units, Aut (Staff)

5. Intensive First-Year German — Equivalent of 1, 2, and 3 combined. Enrollment limited. Summer Quarter only.

12 units, Sum (Staff) MTWThF 8-9:30 and 10:30-12

10. Elementary German for Seniors and Graduate Students — This intensive course is designed for students who need to acquire reading ability in German for the Ph.D. and/or for advanced research in their own field. No auditors permitted.

4 units, Win (Staff)

101. Reading and Writing Modern German I — Modern short literary prose works are read and discussed. Students write short essays in German on the works studied. Prerequisite: 51 or consent of instructor.

3 units, Win (Turneaure)

102. Reading and Writing Modern German II — Continuation of 101.

3 units, Spr (Turneaure)

118. Introduction to German Dialects — (Same as 218, Linguistics 182.) Introduction to the major dialects of German-speaking Europe through texts, tapes, lectures, and presentations by native speakers; also a general introduction to the field of dialect geography. (DR:4)

3 units, (Robinson) given 1984-85

131. Central Europe: Geography, Institutions, and Society — Prerequisites: 51 or equivalent.

3 units, Aut (Strachota)

Spr (Strachota)

131-133. German Culture and Civilization I-III — (See also 31A-33A.) In addition to attending the lectures in 31A-33A, students with an adequate knowledge of German may register for German Studies 131, 132, or 133 and participate in a supplementary section in which further material will be read and discussed in German. Students who have received credit for 31A-33A may not repeat courses in this sequence for credit.

131. Central Europe: Geography, Institutions, and Society — Prerequisites: 51 or consent of instructor. (DR:5)

4 units, Aut (Lohnes)
132. The Culture of Modernism in Austria and Germany—Prerequisites: 51 or consent of the instructor. (DR:2)
4 units, Win (Berman)

133. Democracy, Protest, and Political Culture in German-Speaking Europe—Prerequisites: 51 or consent of the instructor. (DR:3)
4 units, Spr (Berman)

134. Readings on Contemporary Germany—Students improve their command of the language while studying contemporary social issues in the interrelated areas of foreigners in Germany, feminism, GDR socialism, squatters movement, and peace movement. Reading of articles supplemented by films, videotapes, and guest speakers. Prerequisite: 51 or equivalent. (DR:5)
3 units, Win (Strachota)

135. Images of Women in German Film— (Same as 35A.)
4 units, (Strachota) given 1985-86

150. Introduction to German Literature—Literary terms and major themes in representative contexts; symbol, metaphor, parody, etc. Discussion of genres; lyric poetry, novel, drama. Introduction to key concepts of major literary periods such as aesthetic man, romantic irony, the absurd. Consideration of various critical approaches to literature. Prerequisite: 51 or equivalent. (DR:2)
4 units, Win (Turneaure)

151-157. Courses in the 150 series introduce the student to German literature in various genres. Prerequisite: 51 or equivalent.

153. Contemporary German Drama—Study of selected plays representative of major authors and trends in German theater since 1945. Readings of works by Brecht, Dürenmatt, Frisch, Weiss, Handke, Sperr, and Plenzdorf. Performances, films, tapes, and videotapes of these and other plays. (DR:2)
4 units, Aut (Strachota)

154. Modern Short Prose—Aphorisms, anecdotes, sketches, fables, parables, short stories, articles, and short novels by contemporary authors writing in German. Practice in reading, talking about, and writing about literature. Discussion in German. (DR:2)
4 units, (Strachota) given 1984-85

155. The Novelle—Interpretations and theory of the Novelle from Goethe to Heyse. Examples of the Novelle of Romanticism and Realism: Tieck, Brentano, Kleist, Grillparzer, Hofmannsthall, Thomas Mann. Discussion of genre: Kafka’s parables: Novelle or short story? (DR:2)
4 units, (Staff) given 1985-86

157. Orpheus in Germany: Lyric Poetry from the Middle Ages to the Present—Poetry provides the reader with the fullest linguistic challenge, incorporating emotional and intellectual apprehensions of the world. German poetry will be analyzed and discussed from its origins in magic to the present. The great poets will be viewed in relation to one another as well as to their cultural contexts. The nature of poetic language, the varieties of poetic forms, the changing function of poetry, techniques of interpretation, and other topics will be discussed. Guest lectures by specialists will be combined with discussion sessions. Exercises in reading poetry aloud, translation, and interpretation will be included. (DR:2)
4 units (Mommsen) given 1984-85

161-163. These courses acquaint the student with the development of German literature from the Enlightenment to the present. Significant works of each period are studied intensively and related to their historical context. Prerequisites: 51 plus 2 additional courses or consent of instructor.

161. The Classical Period—Introduction to major authors, works, and literary movements of the 18th century in historical context. Emphasis on the rise of Weimar classicism against the background of Winckelmann’s aesthetics of Greek art (“noble simplicity and quiet grandeur”), Lessing and the Enlightenment, and Storm and Stress. Examples of drama, narrative, lyric poetry, essays from Goethe, Schiller, Hölderlin, and other authors from the richest period of German literature. (DR:2)
4 units, Aut (Gillespie)

162. Romanticism and Realism—Introduction to the major literary trends of the 19th century in their historical context. Romantic lyric, novella, Kunstmärchen, poetic theory, Junges Deutschland and the critique of romanticism; transition to Realism, Realist theory and prose; cultural pessimism in the later 19th century. Readings from Novalis, Tieck, Hoffmann, Eichendorff, Kleist, Heine, Stifter, Meyer, Fontane. (DR:2)
4 units, Win (Berman)

163. Naturalism to the Present—Introduction to major literary trends since the end of the 19th century with particular emphasis on the changing status of the author. Aestheticism and expressionism; literature in the Weimar Republic; the impact of fascism and exile culture; the writer in East and West
Germany and current developments. Readings by Heinrich and Thomas Mann, Tucholsky, Brecht, Horvath, Böll, Becker and Enzensberger. (DR:2)

4 units, Spr (Staff)

171-178. These courses introduce the student to specific developments and topics of German literature and culture with some emphasis on methods of literary interpretation. Prerequisites: 51 plus 2 additional courses or consent of instructor.

172. Austrian Drama—An examination of the specific Austrian tradition in drama and on stage. While the course will emphasize the works of important authors, reference will be made to social and historical factors, particularly those important for the development of the popular theater. Readings of works by Grillparzer, Raimund, Nestroy, Anzengruber, Schnitzler, Hofmannsthal, Horvath, and Handke.

4 units (Berman) given 1984-85

173. Contemporary West German Cinema—(Same as 173A.) An examination of trends in recent West German films with reference to the aesthetic concerns of the new generation of directors and to the overall political and intellectual environment. Topics include: social criticism, feminism, the notion of “culture industry,” narrative film, and avant-garde. Discussion and critical analysis of works by figures such as Rainer Werner Fassbinder, Werner Herzog, Volker Schlondorff, Margarethe von Trotta, and others.

4 units, Spr (Berman)

174. From Kant to Kierkegaard—(Same as Religious Studies 74/174.) Development of Protestant thought.

3/5 units, Win (Harvey) MWF 9

179. Special Topics—These courses explore the possibility of interdisciplinary studies and research in areas of special interest: e.g., women authors, social satire, political speeches, Freud and literature. Literature in the German Democratic Republic.

179. A Century of Austrian Drama (1883-1983)—(Same as Drama 156A/256A.)

5 units, Win (Stefanek) MWF 1:15

199. Individual Reading—Enrollment only by special permission of the department. Thirty-six hours of reading per unit, weekly conference with instructor. May be repeated for credit. Prerequisite: 51 or consent of instructor.

1-2 units, Aut, Win, Spr (Staff)

by arrangement

COURSES FOR ADVANCED UNDERGRADUATES AND FOR GRADUATE STUDENTS

201. Language and Style I—Writing exercises on different levels of style; discussion of grammatical problems; introduction to literary stylistics. Prerequisite: qualifying examination.

2 units, Aut (Lohnes)

202. Language and Style II—Continuation of 201.

2 units, Win (Lohnes)

203. History of the German Language—Introductory course on the phonological and syntactic development of Modern German from the Germanic parent language. Involves the analysis of selected texts and the consultation of linguistic works on the subject.

3-5 units, (Robinson) 1984-85

204. Gothic—(Same as 304.) Introduction to grammar and texts of the Gothic language. The grammar of Proto-Germanic will also be treated.

3-5 units (Robinson) 1985-86

205A. Old Norse—(Same as 305A; English 200A.) Presentation of Old Norse grammar and selected readings.

5 units, Aut (Andersson)

205B. Advanced Old Norse—(Same as 305B; English 200B.)

5 units, Win (Andersson)

206. Old High German—(Same as 306.) Introduction to the grammar and documents of the earliest attested stage of High German.

3-5 units (Robinson) given 1984-85

207. Old Saxon—(Same as 307; English 201.) Introduction to the grammar and documents of the earliest attested stage of Low German.

3-5 units, Spr (Robinson)

208A. Introductory Middle High German—Presentation of grammar and selected readings from the epic, lyric, and didactic writings of Middle High German.

3-5 units, Win (Robinson)

208B. Advanced Middle High German—A continuation of 208A. Readings in Minnesang.

3-5 units, Spr (Andersson)

211. Syntax of Modern German—Contrastive analysis of English and German syntax.

3-5 units, (Lohnes) given 1984-85

212. Linguistics and the Analysis of German—(Same as 312; Linguistics 181.) An intro-
duction to linguistic theory and analysis with special emphasis on the analysis of modern German.

3-5 units, Win (Robinson)

213. The Transformational Grammar of German—(Same as 313; Linguistics 282.) Study of the syntactic mechanisms of German within the framework of transformational grammar.

3-5 units (Robinson) given 1984-85

214. The Phonology of German—(Same as 314; Linguistics 281.) Systematic treatment of the German sound system, especially within the framework of generative phonology.

3-5 units (Robinson) given 1984-85

218. Introduction to German Dialects—(Same as 118; Linguistics 182.) (DR:4)

3 units, (Robinson) given 1984-85

241-243. The series is designed to acquaint students with the history of German thought from 1750 to the present and its significance for an understanding of modern culture. Authors to be studied include Herder, Hegel, Schiller, Marx, Nietzsche, Freud, Husserl, Wittgenstein, Marcuse, and Adorno. Note: This series will be given in German in alternate years (in English 1983-84).

241. Deutsche Geistesgeschichte I—From Lessing to Romanticism. The course will delineate the conceptual field within which from the middle to the end of the eighteenth century the problems of human knowledge, of history, of the nature of man and of art were revolutionized and given a new basis. In the center of the course are readings and detailed interpretations of selected texts by Lessing, Kant, Herder, Schiller, and Fichte. Given in English.

3-5 units, Aut (Wellbery)

242. Deutsche Geistesgeschichte II — From Hegel to Nietzsche. The outlines of Hegel’s phenomenology and his model of historical development as the becoming-conscious of freedom. The transformations of this model in the cultural criticism of Heine, the anthropology of Feuerbach and the dialectical materialism of Marx and Engels. Nietzsche’s radical critique of the idea of the nature of man and of his historical self-actualization.

3-5 units, Win (Mueller-Vollmer)

243. Deutsche Geistesgeschichte III — From Nietzsche to the present. Texts by Nietzsche, Husserl, Freud, Heidegger, Benjamin, Adorno, and Habermas with special emphasis on aesthetic problems and their relationship to social theory. This introductory course emphasizes the development of the Frankfurt School. Shorter essays on aesthetics will be discussed in order to indicate possible applications to literary theory.

3-5 units, Spr (Wellbery)

245. Marxism and Literary Criticism—(Same as 245A; 345.) An introduction to important issues and figures in Marxist literary criticism. Themes such as ideology, alienation, and the social function of culture will be discussed with reference to the works of figures including Lukacs, Adorno, Benjamin, and Brecht. The contemporary debate on the institutional character of literature as well as the contributions of critics outside the German tradition (Goldmann, Eagleton) will be treated.

3-5 units, Aut (Berman)

246. Poetics I: Narrative Theory and Analysis—(Same as 346.)

3-5 units, (Wellbery) given 1984-85

247. Poetics II: Theory and Analysis of the Lyric—(Same as 347.)

3-5 units, Win (Wellbery)

251-259. German Literature and Culture—(Same as 351-359.) These courses treat the major periods of German literature from the early Middle Ages to the present. See descriptions under 351-359. Open to undergraduates by consent of instructor only.

251A. The Heroic Literature of Northern Europe — (Same as 151A; English 168.)

3-5 units, (Andersson) given 1985-86

251C. Medieval Cyclical Narrative—(Same as 351C.)

3-5 units, (Andersson) given 1985-86

253. German Literature and Culture III—(Same as 353.)

3-5 units, (Gillespie) given 1984-85

254. German Literature and Culture IV—(Same as 354.) From Baroque through Enlightenment (circa 1600-1750).

3-5 units (Gillespie) given 1984-85

255. German Literature and Culture V — Eighteenth Century (1750-1800) — (Same as 355.)

3-5 units, (Mommsen) given 1985-86

257. German Literature and Culture VII—(Same as 357.) Nineteenth Century (1803-1900).

3-5 units (Mommsen) given 1984-85

260-269. Major Authors—In-depth study of a major writer in his literary creativity, relation to his age, or special achievements and significance. Courses will deal with such writers as Walther von der Vogelweide, Grimmshauser, Wieland, Lessing, Goethe, Novalis, Tieck, Kleist, Fontane, Nietzsche, Hofmannsthal, Thomas Mann, Kafka, Brecht, etc.

3-5 units (Staff)
261. Goethes Lyrik — (Same as 361.)
3-5 units, Aut (Keller)

262. Friedrich Hölderlin—(Same as 362.)
A study of some of his major works. The historical and intellectual context (French Revolution, Schelling, Hegel, Schiller). Hyperion and the early hymns; Empedokles and the theoretical writings; the later poetry — in-depth study of several hymns. A critical survey of text editions and of Hölderlin criticism.
3-5 units, Aut (Mueller-Vollmer)

3-5 units (Mueller-Vollmer) given 1985-86

270-279. Genres—These courses treat the development, contents, and formal characteristics of such kinds of writing as lyric poetry, epic, drama, novel, Novelle, tale, short story, essay, etc., in various authors or periods. Focuses on such matters as medieval drama, baroque “metaphysical” poetry, the diary as a literary form, autobiography.

271. Aspects of the Social History of the Austrian Theater from the 17th to the 20th Century—(Same as 371; Drama 263.)
4 units, Spr (Stefanek) MWF 10

272. Deutschsprachige Dramen seit 1945 (Frisch, Handke, Strauss, etc.)—(Same as 372.)
3-5 units, Aut (Keller)

3-5 units (Mommsen) given 1984-85

277. Moderne Lyrik: Expeditionen und Erprobungen—(Same as 377.) Die deutsche Lyrik innerhalb des europäischen Modernismus: Gestaltungsformen, Tendenzen, Aussageweisen, kreative Möglichkeiten. Die Klassiker der Moderne: Hofmannsthal, George, Rilke, Holz; Expressionismus; Dada; Naturgedicht; politisches Gedicht; konkrete Poesie; experimentelle und metaphysische Lyrik.
3-5 units (Mueller-Vollmer) given 1984-85

283. Goethe, Faust. Der Tragödie Zweiter Teil—(Same as 383.)
3-5 units (Mommsen) given 1985-86

284. Goethe’s Novels—(Same as 384.)
3-5 units, Spr (Wellbery)

290-299. Special Subjects and Problems—Variable topics.

292. Heine und das Junge Deutschland — (Same as 392.) An introduction to Heine’s work in its historical and literary context. The man and the writer: his relations to Young Germany and the Young Hegelians. His artistic and political prose. His development as a lyric poet. The nature of Heine’s modernity.
3-5 units (Mueller-Vollmer) given 1984-85

295. Lessing and the Enlightenment— (Same as 395.)
3-5 units (Wellbery) given 1984-85

296. Goethe und die Weltliteratur—(Same as 396.)
3-5 units, Spr (Mommsen)

298. Individual Work—Open only to German majors and to students who are working on special projects. Students taking honors in German will use this number for the honors essay. May be repeated for credit.
1-15 units, each quarter (Staff) by arrangement

GRADUATE COURSES

300. Proseminar: German Studies Today — Differences between the United States and Europe. The history of the discipline sociologically and methodologically considered. Relation to other disciplines (Romance, English, Slavic Studies, Comparative Literature). Definition of terms such as literary history, poetics, philology, literary theory and of the major schools of scholarship and criticism. Problems and areas of scholarship and teaching. For all incoming graduate students.
3-5 units, (Mueller-Vollmer) given 1984-85

300A. Introduction to German Studies—Bibliographical research is a time-consuming task until one acquires the necessary skills to find, to know, and to handle the essential bibliographies, reference works, etc., in the vast field of German Studies—culture, literature, history, political science, and so on. It is the aim of
this course to enable students to find all facts and information needed for study and research by themselves and in the shortest possible time.

2 units, Aut (Frank)

301. Individual Work—Exclusively for work on the A.M.-level qualifying paper.
Units by arrangement (Staff)

302. Methods of Teaching German—(Same as Education 291.)
2 units, Win (Lohnes)

303. Curricular Problems—Given on request only.
3 units, (Lohnes) by arrangement

304. Gothic—(Same as 204.) Introduction to grammar and texts of the Gothic language. The grammar of Proto-Germanic will also be treated.
5 units, (Robinson) given 1985-86

305A. Old Norse—(Same as 205A; English 200A.) Presentation of Old Norse grammar and selected readings. Discussion and reports on the growth of prose literature in Iceland and Norway.
5 units, Aut (Andersson)

305B. Advanced Old Norse—(Same as 205B; English 200B.)
5 units, Win (Andersson)

306. Old High German—(Same as 206.) Introduction to the grammar and documents of the earliest attested stage of High German.
3-5 units, given 1984-85

307. Old Saxon—(Same as 207, English 201.) Introduction to the grammar and documents of the earliest attested stage of Low German.
3-5 units, Spr (Robinson)

311. Syntax of Modern German—(Same as 211.) Contrastive analysis of English and German syntax.
3-5 units, (Lohnes) given 1984-85

312. Linguistics and the Analysis of German—(Same as 212; Linguistics 181.) An introduction to linguistic theory and analysis with special emphasis on the analysis of modern German.
3-5 units, Win (Robinson)

313. The Transformational Grammar of German—(Same as 213; Linguistics 282.) Study of the syntactic mechanisms of German within the framework of transformational grammar.
3-5 units (Robinson) given 1984-85

314. The Phonology of German—(Same as 214; Linguistics 281.) Systematic treatment of the German sound system, especially within the framework of generative phonology.
3-5 units (Robinson) given 1984-85

345. Marxism and Literary Criticism—(Same as 245; 245A.)
3-5 units, Aut (Berman)

346. Poetics I: Narrative Theory and Analysis—(Same as 246.) This course provides a systematic introduction to the theory and analysis of narrative (Narrativik, narratologie). Working from a global model of the narrative text, the course will consider such problems as: the place of narrative among other types of discourse; the logic of action and story construction; the structure of character; problems in the analysis of narrative discourse (e.g., point of view); classification of narrative texts; reading and story comprehension. Also considered are the theoretical contributions of various schools, including such writers as Propp, Lévi-Strauss, Greimas, Barthes, Genette, Kloepfer, Lammet, Eco.
3-5 units, (Wellbery) given 1984-85

347. Poetics II: Theory and Analysis of the Lyric—(Same as 247.) Major questions in the theory and analysis of lyric poetry are studied in terms of works from several periods in German literary history. Issues to be considered: problems in the definition of the lyric; lyrical forms; the levels of the poetic text (sound patterns, rhythm, meter, syntax, strophic forms); trope, figure, symbol; types of affectivity; reader response. Major poems from the German tradition will be examined together with a wide spectrum of theoretical positions (from Jakobson to Adorno).
3-5 units, Win (Wellbery)

349. Seminars

349A. Humboldt and Structuralism—(Same as 449A.)
3-5 units (Mueller-Vollmer) given 1984-85

349L. Goethes West-ostlicher Dīvan
3-5 units (Mommsen) given 1985-86

349M. Theories of the Humanities — (Same as 449M.) A critical investigation of major attempts to define the nature and function of the humanities and human sciences. Authors and movements to be examined: Vico, Herder and the Enlightenment; positivism and historicism; Dilthey, Weber, Cassirer; phenomenology and philosophical hermeneutics; structuralism and the Frankfurt School.
3-5 units, Win (Mueller-Vollmer)

3-5 units, Aut (Gillespie)

349S. The Dream-Play in Austrian Theater from Grillparzer to Horvath—(Same as Drama 355A.)
5 units, Spr (Stefanek)
350. Methods of Teaching Literature—Students may enroll for practice in literature teaching on a voluntary basis.

1 to 3 units, Aut, Win, Spr (Staff) by arrangement

351-359. German Literature and Culture I-IX—These courses treat the major periods of German literature from the early Middle Ages to the present. They are intended to convey to the student a sense of the developing traditions that have shaped German literature. By focusing on a specific period, the literary and non-literary (cultural, social, political, philosophical) contexts can be established within which individual authors, works, and movements are situated.

351C. Medieval Cyclical Narrative—(Same as 251C.) Reading and discussion of the chief medieval cycles of England, France, and Germany centering on such figures as Alexander, Arthur, Charlemagne, and Dietrich von Bern.

3-5 units (Andersson) given 1985-86

353. German Literature and Culture III—(Same as 253.) Introduction to New High German literature from the waning of the Middle Ages through the Renaissance and Reformation period (circa 1350-1600). Readings in the 15th- and 16th-century poetry, drama, fiction, and polemics; special attention to such topics as magic, humanism, Protestantism, the development of genres out of national and international heritages, and Renaissance mysticism, syncretism, and nature philosophy.

3-5 units (Gillespie) given 1984-85

354. German Literature and Culture IV—(Same as 254.) From Baroque through Enlightenment (circa 1600-1750). Readings in literary renewal, experimentation, and theorizing of the 17th century; analysis of masterworks of the lyric from Opitz to Günther, and of baroque world theater, romance, and novel; study of themes (e.g., theodicy, reason, sentiment) and modes (e.g., metaphysical, mannerist, baroque, neoclassical, rococo) on the threshold of the Enlightenment, the establishment of Enlightenment tastes, generic expectations, and language.

3-5 units (Gillespie) given 1984-85


3-5 units (Mommsen) given 1985-86

356. German Literature and Culture VI—(Same as 456.) German and European Romanticism. Origins and formation. The principal theoretical statements of early German romanticism in their historical and ideological setting (Fichte, A. W. and F. Schlegel, Schelling, and Novalis). Types of romantic literature by Tieck, Wackenroder, Bonaventura, Arnim, and E. T. A. Hoffmann. Salient features of the European movement: Wordsworth, Blake, Coleridge, and Carlyle in England; Mme. de Staël and her group, Hugo, Nerval, and Baudelaire in France. Close attention paid to the problem of periodization and the establishing of valid criteria for the study of cross-cultural and cross-national phenomena.

3-5 units (Mueller-Vollmer) given 1984-85

357. German Literature and Culture VII—(Same as 257.) Nineteenth Century (1803-1900).

3-5 units (Mommsen) given 1984-85

360-369. Major Authors—In-depth study of a major writer in his literary creativity, relation to his age, or special achievements and significance. Courses will deal with such writers as Walther von der Vogelweide. Grimmelshausen, Wieland, Lessing, Goethe, Novalis, Tieck, Kleist, Fontane, Nietzsche, Hofmannsthal, Thomas Mann, Kafka, Brecht.

361. Goethes Lyrik—(Same as 261.)

3-5 units, Aut (Keller)

362. Friedrich Hölderlin—(Same as 262.) A study of some of his major works. The historical and intellectual context (French Revolution, Schelling, Hegel, Schiller). Hyperion and the early hymns; Empedokles and the theoretical writings; the later poetry— in-depth study of several hymns. A critical survey of text editions and of Hölderlin criticism.

3-5 units, Aut (Mueller-Vollmer)


3-5 units (Mueller-Vollmer) given 1985-86

370-379. Genres—These courses treat the development, contents, and formal characteristics of such kinds of writing as lyric poetry,
epic, drama, novel, Novelle, tale, short story, essay, etc., in various authors or periods. Focuses on such matters as the following: medieval drama, baroque “metaphysical” poetry, the diary as a literary form, autobiography.

371. Aspects of the Social History of the Austrian Theater from the 17th to the 20th Century—(Same as 271; Drama 263.)
4 units, Spr (Stefanek)

372. Deutschsprachige Dramen seit 1945 (Frisch, Handke, Strauss, etc.)—(Same as 272.)
3-5 units, Aut (Keller)

375. Formen der Lyrik vom 17. bis 20. Jahrhundert — (Same as 275.)
3-5 units (Mommsen) given 1984-85

377. Moderne Lyrik—(Same as 277.)
3-5 units (Mueller-Vollmer) given 1984-85

383. Goethe, Faust. Der Tragödie Zweiter Teil—(Same as 283.)
3-5 units (Mommsen) given 1985-86

384. Goethe’s Novels—(Same as 284.) Intensive study of Werther, Wilhelm Meister, and Wahlverwandtschaften from various critical perspectives: formalist, generic, socio-historical, psychoanalytical. Problems in the theory of the novel will be considered as well as the place of the novel in Goethe’s oeuvre.
3-5 units, Spr (Wellbery)

385. Lessing and the Enlightenment—(Same as 295.)
3-5 units (Wellbery) given 1984-85

3-5 units (Mueller-Vollmer) given 1985-86

392. Heine und das Junge Deutschland—(Same as 292.)
3-5 units (Mueller-Vollmer) given 1984-85

395. Goethe und die Weltliteratur—(Same as 296.) Goethe als Übersetzer aus 17 Sprachen und seine Konzeption von Weltliteratur.
3-5 units, Spr (Mommsen)


**HISTORY**

**Emeriti:** Thomas A. Bailey, William C. Bark, Claude A. Buss, Gordon A. Craig, John J. Johnson, George H. Knolles, John C. Miller, Wayne S. Vucinich, Gordon Wright (Professors), Rixford K. Snyder (Associate Professor)

**Chairman:** James J. Sheehan


**Associate Professors:** Albert M. Camarillo, Clayborne Carson (on leave Autumn), Frederick P. Bowser, Kennell A. Jackson, Harold L. Kahn (on leave Winter and Spring), Carolyn C. Lougee, Jack N. Rakove

**Assistant Professors:** Joel Beinin, Judith C. Brown (on leave Spring), Herrick Chapman, Stephen C. Ferruolo, Estelle B. Freedman (on leave Autumn), Nancy S. Kollman, Sabine MacCormack, Richard Roberts (on leave 1983-84)

**Courtesy Professors:** Paul David, Michael Jameson, Susan M. Treggiari

**Affiliated Professor:** Albert E. Dien

**Modern Europe Lecturers:** Donald English, Ruth Gladden, Dena Goodman, Lloyd Kramer, James Murray, David Peterson, Lindsay Wilson

**Visiting Professors:** Felix Gilbert (Winter); Hans-Ulrich Wehler (Autumn and Winter); Kratter Professor; Keith Middlemas (Winter); Jose Carlos Sebe bom Meihy (Winter and Spring); Edward LaRoque Tinker Professor

**Visiting Assistant Professors:** Michael Kazin, William M. Reddy, Humanities Fellow (Autumn)

**Mellon Fellow:** Adrian Shubert

The Department of History offers to all students of the University courses of general cultural and educational value. It seeks not only to provide knowledge in special historical fields but also to equip the student for duties as a citizen and to give instruction which will aid in law, in journalism, in library work, in local, state, and national public service, and for business.

**UNDERGRADUATE PROGRAMS**

**BACHELOR OF ARTS**

The department's program for the undergraduate major in history emphasizes breadth of training yet allows students to concentrate their studies in a selected field of history.

As a foundation requirement, each candidate for the A.B. in History: (1) should be enrolled, if possible, in the department for six quarters (counting the quarter in which the registration takes place); (2) must complete at least two small-group courses—undergraduate colloquium (reading and discussion involving an explicit historical research) or undergraduate seminar (research and writing on an explicit historical topic); and (3) must complete at least ten courses in history with a minimum of three units each, and passed with a letter grade of “C” or higher. A minimum of five courses must be taken from members of the Stanford History faculty. Directed reading and undergraduate research may not count toward the ten required courses in history and are given only for Pass/no Credit, unless such courses are part of the Honors project.

To emphasize broad coverage in space and time, it is required that at least two courses must be completed in each of the following three fields: (a) Western Europe (including Britain), and North America (especially the colonial and national history of the present United States), all since 1700; (b) Africa and the Middle East, Asia, Latin America, Russia, and Eastern Europe; and (c) the period before 1700, with at least one course in the field of Western Europe before 1700. No single course may be counted to fulfill more than one of these three fields. Colloquia and seminars meet the field requirement.

History majors are required to demonstrate proficiency in a foreign language (or take specified courses in Computer Science and Statistics in lieu of it). "Proficiency" means that the student is able to read at least at the level of facility expected in second year college level courses in a foreign language. The requirement may be fulfilled by passing a fourth-quarter foreign language course or by demonstrating equivalent knowledge.

All students planning to major in History must enroll at the History Department Office, where detailed information on requirements is available.
HONORS PROGRAM IN HISTORY

For a limited number of undergraduate majors, the department offers a special program leading to Honors in History. Students accepted for this program, in addition to fulfilling the general requirements stated above, will complete an honors essay, the work for which will normally begin in Spring Quarter of the junior year and be completed by the end of Winter Quarter of the senior year. To enter this program the student must be accepted by a member of the department who will agree to advise him or her on the essay. In considering an applicant for such a project, the advisor and the Director of the Honors Program will take into account the student's general preparation in the field of the project, and will expect at least a "B" average in the student's previous work, both in history and in the University. Prospective Honors students are urged to take an undergraduate seminar sometime in the junior year. Students satisfactorily completing the program will be eligible for Honors in History, depending upon the quality of their work. To enter the Honors program, apply at the History Department Office.

James Birdsell Weter prizes are awarded each year for the outstanding Honors essay.

HISTORY IN THE SECONDARY TEACHER'S CREDENTIAL

Applicants for the Single Subject Teaching Credential (Secondary) in the social studies may get details of the requirements by applying to the Credential Administrator, School of Education.

COTERMINAL A.B. AND A.M. PROGRAM IN HISTORY

The department admits each year a limited number of undergraduate History majors to work for a coterminal A.B. and A.M. degree in History. Applications for admission to this program should be submitted during the Spring Quarter of the student's junior year and must be submitted no later than November 1 of his or her senior year. Applicants are expected to meet the same general standards as those seeking admission to the A.M. program; they must submit a written statement of purpose, a transcript, and three letters of recommendation, at least two of which should be from members of the History Department faculty. The decision on admission rests with the Graduate Admissions Committee. Students must meet all requirements for both degrees. They must complete 15 full-time quarters (or the equivalent) or 3 full-time quarters after completing 180 units for a total of 216 units. During their senior year they may, with the consent of the instructors, register for as many as two graduate courses. In the final year of study they must complete at least three courses that fall within a single Ph.D. field.

GRADUATE PROGRAMS

ADMISSION TO GRADUATE STANDING

All applicants for admission to graduate work are required to take the Aptitude Test of the Graduate Record Examination. This examination may be taken at most American colleges and by arrangement may be taken in nearly all foreign countries. For details concerning this test see the Information Bulletin. Overseas applicants, who may not receive the Information Bulletin promptly, should write directly to the Educational Testing Service, Box 955, Princeton, New Jersey 08540.

Students who have been admitted to graduate standing do not automatically become candidates for a graduate degree. With the exception of students in the Terminal A.M. program, they are admitted with the expectation that they will be working toward the Doctor of Philosophy degree, and may become candidates to receive the Master of Arts degree after completing three quarters of work.

MASTER OF ARTS

The department requires the completion of nine courses (totalling not less than 36 units) of graduate work; seven courses of this work must be History Department courses. Of these seven, one must be a graduate seminar, and three must be either graduate colloquia or graduate seminars. Directed reading may be counted for a maximum of 10 units. A candidate whose undergraduate training in history is deemed inadequate, must complete nine courses of graduate work in the History Department. The department does not recognize for credit toward the A.M. degree any work that has not received the grade of A, B, P, or +.

TERMINAL A.M. PROGRAM

The department admits applicants who do not wish to continue beyond the A.M. degree at the discretion of the individual fields (U.S., modern Europe, etc.). Students admitted to this program may not apply to enter the Ph.D. program in History during the course of their work for the A.M. degree.

MASTER OF ARTS IN TEACHING (HISTORY)

The department cooperates with the School of Education in offering the Master of Arts in
Teaching degree. For the general requirements, see description under section “School of Education” in this bulletin. For certain additional requirements made by the Department of History, contact the Department Office. Candidates must possess a teaching credential, or relevant teaching experience.

DOCTOR OF PHILOSOPHY

Students planning to work for the doctorate in history should be familiar with the general degree requirements of the University outlined in the “Degrees” section in this bulletin. Upon enrollment in the graduate program in History, the students will have a member of the department designated as an advisor and should plan the Ph.D. program in consultation with this advisor. During the first two years of graduate study, the students will spend much of the time taking courses, but should be aware from the outset that the ultimate objective is not merely the completion of courses, but the preparation for general examinations and for writing a dissertation.

Admission to the History Department in the Graduate Division does not establish any rights respecting candidacy for an advanced degree, and application must be made separately for admission to candidacy for the A.M. (not later than the end of the first four weeks of the quarter preceding the one at the end of which the degree is to be awarded) and also for the Ph.D. Applicants for the doctoral program must proceed by two steps: First, students must apply for admission to (not candidacy in) the Ph.D. program. Those seeking admission to the program should file application during their second quarter of enrollment in graduate work at Stanford. Early in the third quarter, a committee of the department will determine either that the applicant shall be admitted to the Ph.D. program or that he or she terminate his or her work in History at Stanford.

Second, after admission to the program and after the completion of certain further requirements, students must apply for acceptance for candidacy for the doctorate in the Graduate Division of the University.

The following requirements must be met:

1. In consultation with the advisor, students will select a major field of study from the list below in which to concentrate their study and later take the University oral examination. The major fields are:
   - Europe, 300-1400
   - Europe, 1400-1789
   - Europe since 1700
   - Russia
   - Eastern Europe
   - Middle East
   - East Asia before 1600
   - Africa
   - Britain and the British Empire since 1460
   - Latin America
   - The United States (including Colonial America)

2. The department seeks to provide a core colloquium in every major field, in which the students will normally enroll in the first year of graduate study.

3. Students are required to take two research seminars, at least one in the major field. Normally, research seminars should be taken in the second year.

4. Each student, in consultation with his or her advisor, defines a secondary field. This requirement may be met in one of three ways: (a) a field selected from the list below; (b) a European national history of sufficiently long time to span chronologically two or more major fields—for example, students may elect to offer the history of France from about 1000 to the present; (c) a comparative study of a subject across countries or periods.

The secondary fields are as follows:
   - The Ancient Greek World
   - The Roman World
   - Europe, 300-1000
   - Europe, 1000-1400
   - Europe, 1400-1600
   - Europe, 1600-1789
   - Europe, 1700-1871
   - Europe since 1848
   - Russia to 1800
   - Eastern Europe to 1800
   - Russia since 1800
   - Eastern Europe since 1800
   - Middle East to 1800
   - Middle East since 1800
   - Africa
   - China before 1600
   - China since 1600
   - Japan before 1600
   - Japan since 1600
   - England, 450-1460
   - Britain and the British Empire, 1460-1714
   - Britain and the British Empire since 1714
   - Latin America to 1825
   - Latin America since 1810
   - The United States (including Colonial America) to 1865
   - The United States since 1850

   The secondary field may be satisfied (a) by completing three graduate courses relevant to the field, or (b) by completing two graduate courses relevant to the field and by
being examined on the secondary field in the University oral examination by a faculty member specializing in the secondary field. Each student should consult with his or her advisor to determine which of the above options may be pursued. Whichever option is chosen, the student must complete the required course work in the secondary field before taking the University oral examination.

5. Each student, in consultation with his or her advisor, defines a tertiary field. This requirement may be satisfied by taking two courses outside the Department of History related to the student’s training as a professional historian.

6. Each student, before the Ph.D. is conferred, is required to satisfy the department’s teaching requirement.

7. There is no university or departmental foreign language requirement for the Ph.D. degree. A reading knowledge of one or more foreign languages is required in fields where appropriate. The faculty in the major field prescribes the necessary languages. In no field will a student be required to take examinations in more than two foreign languages. Certification of competence in commonly taught languages (i.e. German, French, Spanish, Portuguese, Russian and Latin) for candidates seeking to fulfill the language requirement in this fashion, will be done by the appropriate language department of the University. Certification of competence in other languages will be determined in a manner decided upon by faculty in the major field. In either case, certification of language competence must be accomplished before a student takes the University oral examination.

8. The student is expected to take the University oral examination in the major field early in the third graduate year.

9. The student must complete and submit a dissertation which is the result of independent work and is a contribution to knowledge. It should evidence the command of approved techniques of research, ability to organize findings, and competence in expression. For details and procedural information, please apply to the department.

JOINT PH.D. IN HISTORY AND HUMANITIES

The Department of History participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in History and Humanities. For description of that program see the section “Humanities Special Programs” in this bulletin.

RESOURCES FOR GRADUATE STUDY

The above section relates to formal requirements, but the success of a student’s graduate program depends in large part upon the quality of the guidance which he receives from the faculty and upon the library resources available. Prospective graduate applicants are advised to study closely the list of History faculty and the course work which this faculty offers. As to library resources, no detailed statement is possible in this bulletin, but areas in which library resources are unusually strong include the following:

The rich, and in some respects unique, collections of the Hoover Institution on the causes, conduct, and results of World War I and World War II are being augmented for the post-1945 period. The materials include government documents, newspaper and serial files, and organization and party publications (especially British and German labor movements and the German Socialist parties). There are also important manuscript collections, including unpublished records of the Paris Peace Conference of 1919 and the Herbert Hoover archives, which contain the records of the Commission for Relief in Belgium; the American Relief Administration; the various technical commissions established at the close of World War I for reconstruction in Central and Eastern Europe; the personal papers of Herbert Hoover as United States Food Administrator; and the personal papers of other important individuals. Other important materials for the period since 1914 relate to revolutions and political ideologies of international importance; colonial and minority problems; propaganda and public opinion; military occupation; peace plans and movements; international relations; international organization and administration including the publications of the United Nations, as well as the principal international conferences.

The Hoover Institution also possesses some of the richest collections available anywhere on the British labor movement, on Eastern Europe, including the Soviet Union, on East Asia (runs of important newspapers and serials and extensive documentary collections, especially for the period of World War II) and on Africa since 1860, including especially French-speaking Africa, the former British colonies, and South Africa.

The University Library maintains strong general collections in almost all fields of history. It has a very large microtext collection, including, for instance, all items listed in Charles
Evans' American Bibliography, and in the Short-Title Catalogues of English publications, 1474-1700, and virtually complete microfilmed documents of the Department of State to 1906. It also has a number of valuable special collections in the Bender Room, including the Borel Collection on the History of California, many rare items on early American and early modern European history, the Brasch Collection on Sir Isaac Newton and scientific thought during his time, and other such materials.

See the Time Schedule for changes in course offerings each quarter. For updated information, the History Department has a board listing all courses with the appropriate meeting days and times.

INTRODUCTORY COURSES

1,2,3. Europe: From the Middle Ages to the Present — This sequence, which fulfills the Western Culture Requirement, explores the inter-relationships between the literary and philosophical masterpieces of Western culture on the one hand and political, social, and economic developments in Europe since the Middle Ages on the other. Special attention is focused on the rediscovery of classical learning in the age of the Renaissance and Reformation, the consolidation of the European state system, intellectual innovations emerging with modern industrial society, and the global consequences of the breakdown of traditional Europe. Students meet three hours a week with lecturers from the regular history faculty and two hours a week for colloquia in small groups led by post-doctoral fellows. Enrollment is limited; students intending to apply the sequence toward their Requirement are given priority.

1. Europe from the Middle Ages to the Reformation — A survey of the eclipse of classical culture, the ordering of Christendom in the Middle Ages, humanism and classical revival in the Renaissance, and theological controversies in the Reformation. Assigned texts include works of Plato, Aristotle, Cicero, Augustine, Aquinas, Dante, Machiavelli, More and Luther. (DR:1; three-quarter sequence)

5 units, Aut (Lougee, Ferruolo, Staff)

2. Europe from the Wars of Religion to the Nation State — A survey of the evolution of the European state system after the Thirty Years War, political, social, and intellectual currents of the 17th and 18th centuries, the French Revolution and the Napoleonic empire and their impact on European politics, society, and culture. Three lectures and one two-hour colloquium per week. (DR:1; three-quarter sequence)

5 units, Win (Paret, Staff)

3. Europe: 1815 to the Present — In 1815, some Europeans hoped to restore the pre-revolutionary world; they failed. European history since Waterloo has been a persistent attempt to come to terms with the promise and perils of the great revolutions of the 18th century. This course will emphasize the impact of industrialization and democracy on Europe's politics, society, and culture, from the fall of Napoleon to the present. Three lectures and one two-hour colloquium per week. (DR:1; three-quarter sequence)

5 units, Spr (Sheehan, Staff)

65. Introduction to Medieval Society and culture—The development of medieval culture through study of some salient religious, philosophical, literary, artistic, social and political sources with emphasis on their interrelationships.

5 units, Win (Ferruolo, Lewis, and Staff)

80. Culture, Politics and Society in Latin America—(Same as Latin American Studies 80 and Political Science 123D.) An interdisciplinary course which surveys the interaction of Amerindian, African, and European cultures in the creation of the New World societies from 1500 to the present. The course is organized into four major topic areas: migration and culture contact; the city and the countryside; relations between state and society; and perceptions and foreign policy. This is a basic introduction to the Latin American courses within several departments. (DR:5*)

5 units, Spr (Durham, Wirth)

91. Traditional East Asian Civilization—(Same as Asian Languages 91 and Humanities 91.) An introduction to the development of civilization in China and Japan from earliest times to the spread of Buddhism. Lectures and discussions will cover political institutions, social and political ideas, religious currents, and artistic and literary trends. Intended for the non-specialist. (DR:3*)

5 units, Aut (Van Slyke, Staff)

92. Traditional East Asian Civilization—(Same as Asian Languages 92 and Humanities 92.) A sequel to History 91. An in-depth introduction to six major epochs of traditional Chinese and Japanese civilization: the aristocratic cultures of Tang China and Heian Japan;
the warrior cultures of Yuan China and Edo Japan. Reading will include key works of literature. Intended for the non-specialist. (DR:2*)

5 units, Win (Duus, Hare and Staff)

93. Modern East Asian Civilization—(Same as Asian Languages 93, and Humanities 93.) An overview of the history of China, Japan and Korea since 1800. The focus will be on the impact of Western imperialism and its aftermath; the collapse of traditional social and political institutions; the emergence of revolutionary or modernizing regimes; the outbreak of colonial wars and anti-colonialist movements; the creation of a new regional balance of power. Intended for the non-specialist. (DR:5*)

5 units, Spr (Duus and Staff)

ADVANCED COURSES

Courses numbered 100 through 199 are primarily lecture courses designed for advanced undergraduates.

THE ANCIENT WORLD

See Classics, Ancient History section, for description of the following courses, all of which are accepted for credit toward a major in History.

101H. History of Greece—(Same as Classics 101.)

5 units, Aut (Jameson)

102H. Greek and Roman History from Alexander to Caesar—(Same as Classics 102.)

5 units, Win (Treggiari)

103H. History of the Roman Empire—(Same as Classics 103.)

5 units, Spr (Treggiari)

206B. Undergraduate Colloquium: Roman Society in the Age of Cicero and Augustus—(Same as Classics 181.)

5 units, Win (Treggiari)

244. Graduate Seminar: Cicero’s Letters and Contemporary Society.

5 units, Win (Treggiari)

MEDIEVAL AND RENAISSANCE EUROPE

107. The 12th Century Renaissance: European Society and Culture, 1050-1220. (DR:5)

5 units, Ferruolo given 1984-85

108. The Christianization of Western Europe, 500-1350—How the Europeans came to believe in a god named Christ; why the thought and conduct associated with that belief changed so radically; why different forms of religiosity and dramatic conflicts developed; how religious beliefs affected social organization; and how social changes modified religiosity.

5 units, Spr (Langmuir)

109. The Age of the Renaissance—Examines the artistic and intellectual breakthroughs of the age in relation to the economic, social, and political institutions of Renaissance Italy.

5 units, Aut (Brown)

110. The Age of the Reformation—(Same as Religious Studies 126.) The religious phenomenon in the general setting of European developments during the 16th century, relating the reformation to the urban setting and the economic and social forces of the rising national states. (DR:3)

5 units, Win (Spitz)

112A. Sailing to Byzantium: The Mediterranean World from Constantine to Leo III (312-717 AD)—(Same as Classics 107.) The period marks a turning point in world history. The statecraft, religion and philosophy of imperial Rome were transformed by Christianity. In 330, Constantine founded Constantinople which for centuries was to be the capital of a Christian Roman empire. Meanwhile, Germanic invaders settled in Western Europe and later the Arabs and Islam came to dominate the Middle East. Reading will focus on original sources. (DR:5)

5 units, Win (MacCormack)

EASTERN EUROPE AND RUSSIA

119. Aristocracy and Absolutisms: Eastern Europe, 1300-1800—Examines the diverse societies and cultures of East European lands (Poland, Ukraine, Belorussia, Bohemia, Hungary) in the medieval and early modern periods. Explores the clash of their aristocratic parliamentary governments with absolutist states (Russia, Prussia, Austria-Hungary). Shows Eastern Europe’s close relationship with West European social and economic development; contrasts it to the Russian historical experience.

5 units, Spr (Kollmann)

120C. Russia in Revolution, 1861-1930—A survey of Russia from an agrarian-rural to an industrial-urban society (from the abolition of serfdom to the Soviet Five-Year Plans), and the Russian Revolution of 1917 considered in this broader context. (DR:5*)

5 units, Spr (Emmons)

122B. Soviet Foreign Policy—Foreign and domestic determinants of policy, intentions and capabilities, continuity and change since 1917, institutions and personnel, war and peace, perceptions, priorities, and attitudes, and alternative futures.

5 units, (Dallin) given 1984-85
123A. The Soviet Union: Politics and Society
Since 1917—Major trends and events: political leadership, political process, social change and stratification, legitimacy and dissent, major conceptual frameworks used to explain the Soviet experience; alternative approaches and conflicting points of view.

5 units, (Dallin) given 1984-85

124A. Russian Civilization: The Shaping of Culture and Society from the Ninth to Seventeenth Century—An integrated approach to Russian history and culture; examines literature, society, institutions.

5 units, Aut (Kollmann)

124B. Russian Civilization II: Society, Culture, and Politics in Imperial Russia.

5 units, Win (Emmons)

WESTERN EUROPE

129A. 19th-Century Germany from 1789 to 1914—The emphasis is on the political and cultural developments which attended Germany's emergence as a modern state and society. (DR:5)

5 units, Aut (Wehler)

129B. 20th-Century Germany—From 1914 to 1945, with particular emphasis on the problems of German democracy, the origins and nature of National Socialism, and the historical roots of the post-1945 era. (DR:5)

4 to 5 units, Aut (Seaver)

132A. Modern France, 1815-1914 — Transformation of France into a leading industrial power, with an emphasis on revolutionary conflicts, social movements, economic developments, and major cultural and political trends. (DR:5)

5 units, Win (Weber)

132B. Modern France, 1914-Present — Impact of the two world wars, decolonization and postwar social and political conflict on the evolution of modern France. (DR:5)

5 units, Spr (Chapman)

136B. European thought in the 20th Century—Course treats the important European thinkers and intellectual movements of the 20th century. Among the figures treated are Freud, Weber, Lenin, Mann, Orwell, Sartre, and Marcuse. (DR:3)

5 units, Win (Robinson)

137. Spain from Restoration to Civil War—Covers period 1874-1939 emphasizing the social conditions which led to the breakdown of constitutional government and to civil conflict.

5 units, Spr (Shubert)

140. England to 1400—The integration of English society with emphasis on the relation between social and political structure and the limitation of monarchy by law and Parliament.

5 units, Aut (Langmuir)

141. Yorkist and Tudor England—The transition from the late medieval realm to the Renaissance monarchy of Henry VIII, to the English Reformation, and to the new conservatism of the Elizabethan regime. (DR:5)

4 to 5 units, Aut (Seaver)

142. Stuart England, 1603-1688—An analysis of the conditions that led to the first of the modern revolutions, the collapse of the Stuart regime, the mid-century republican experiments, and the attempted return to royal absolutism in the Restoration era. (DR:5)

4 to 5 units, (Seaver) given 1984-85

145B. Modern Britain 1918-1984—Course will consider modern Britain, in its political, literary, and social aspects. Primary focus will be on England, with some attention to Ireland, Scotland and Wales.

5 units, Spr (Stansky)

AFRICA

148. Introduction to African History—Survey of African cultures, societies, economies and politics from earliest times to the present; state building, the slave trade, colonialism, nationalism and independence. (DR:5*)

4 to 5 units, Aut (Jackson)

149B. Imperialism, Colonialism and Neo-Colonialism — This course covers the phenomenon of imperialism on the world historical stage. A variety of topics and issues are discussed in the class — the ethos that generated imperialism, the persons who forged its foundations, the institutions that made imperialism work, and the theories of imperialism. Also discussed are the consequences of the imperialist age.

5 units, Win (Jackson)

THE UNITED STATES

150. Emergence of American Society, 1607-1760 — The development of the markedly different colonies of British America, emphasizing major themes of social history: migration, demography, religion, slavery, family, community, and the contact of peoples.

5 units, Spr (Rakove)

152A. The Making of Urban America.

5 units, Spr (Carson)

152B. U.S. Urban Life and Culture—A survey of the process of American urbanization and its effects on phenomena such as immigration/
migration, the development of an urban culture, ethnicity and race, machine politics, education, poverty and welfare, and the family.

5 units, Win (Camarillo)

156. History of American Workers 1877-Present—Examines the history of American labor in the modern era, including transformation of the work process, interaction of ethnic groups and women with the corporate economy; the evolution of the labor movement; working-class politics.

5 units, Aut (Kazin)

158. History of Education in the United States—(Same as Education 201.) Analysis of selected turning points in education in relation to such topics as religion, political socialization, race relations, immigration and urbanization.

3 units (Tyack) given 1984-85

158B. American Education and Public Policy—(Same as Education 105).

3 units, (Kirst and Tyack) given 1984-85

165A,B,C. United States History From the Revolution to the Present—An articulated sequence, general in focus, but with special attention given to political and institutional history. The series as a whole is designed to give students a broad foundation in United States history on which to base further work in history, literature, economics, political science, religious studies, art history, etc. Though the three parts of the series are intended to form an integrated whole, any portion may be taken independently of the others.

165A. 18th Century America. (DR:5)

5 units, Aut (Rakove)

165B. 19th Century America. (DR:5)

5 units, Win (Fehrenbacher)

165C. The United States in the 20th Century—1896-Present. (DR:5)

5 units, Spr (Kazin)

170. America in the 1960's: The Tumultous Decade—An analysis emphasizing the cultural, intellectual, and social history, foreign policy, and the politics: civil rights and black power, the antiwar movement, the countercultures, the women's movement, the New Left, the arms race, Vietnam, the missile crisis, the Great Society, and the crises of liberalism.

4-5 units, Spr (Bernstein, Carson)

172A. America Since 1945—An analysis of America that emphasizes foreign policy and politics, social themes, and intellectual history.

4-5 units, Win (Bernstein)

173A. History of Women in America to 1870. (DR:5)

5 units, Win (Freedman)

173B. History of Women in America Since 1870. (DR:5)

5 units, Spr (Freedman)

LATIN AMERICA

176. Spanish America to World War I—From the Spanish conquest to the apogee of economic and cultural dependency; the relationships between colonial developments, political independence, and modern conditions and problems.

5 units, Aut (Bowser)

179. The Historical Evolution of Mexico—From the conquest of the 1520's to the oil crisis of the 1980's.

4 to 5 units, Spr (Bowser)

180. History of Brazil.

5 units, Win (Sebe bom Meihy)

182. History of the Church in Latin America.

5 units, Spr (Sebe bom Meihy)

MIDDLE EAST

187A. The Middle East, 570-1718—From the rise of Islam until the decline of Ottoman absolutism. Emphasis is on the organic relationship between the Middle East and Europe throughout this period.

5 units, Aut (Beinin)

187B. The Modern Middle East, 1718-Present—From the emergence of regional Arab entities and the commercial penetration of Europe to the present.

5 units, Win (Beinin)

EAST ASIA

192A. China from Earliest Times to the 9th Century — (Same as Asian Languages 156.) Geo-historical origins to the Tang period: the first 4,000 years of social formations and historical transformations of ancient and early medieval China. (DR:5*).

5 units, Aut (Dien and Kahn)

192C. Modern China: 19th and 20th Centuries—(192A recommended as prerequisite.) The social and political setting from about 1800 to 1911 and the overthrow of the last imperial dynasty, the Republican period to 1949, and the Peoples Republic of China to the present. Although the narrative line is structured around political history, much attention is paid to social, economic, and cultural currents. (DR:5*)

4-5 units, Spr (Van Slyke)

194A. Medieval and Early Modern Japan, 1336-1800—From the end of the Kamakura era through mid-Tokugawa: descent into localism
and feudalism; cultural flowering of the Muromachi era, re-welding of the country in the 16th century; the Tokugawa peace of early modern times; moves away from "medievalism." (DR:5*)

5 units, Aut (Mass)

194B. The Rise of Modern Japan—A survey of Japanese history from 1840 to the present. The Meiji Restoration and its background; building modern state; industrialization of the economy; emergence as an imperialist power; the reorientation of postwar Japan; the creation of "Japan, Inc." Economic and social changes will be covered along with political history. (DR:5*)

5 units, Win (Duus)

195. Nomad Empires of Inner Asia—(Same as Asian Languages 152.)

4-5 units, Spr (Dien)

UNDERGRADUATE SEMINARS AND COLLOQUIA

During 1983-84, a number of colloquia will be offered for undergraduate History majors. Each will ordinarily consist of reading and discussion involving an explicit historical theme. Short papers, reports, and a final examination may be required. A number of undergraduate seminars will also be offered during 1983-84. A seminar differs from a colloquium principally by its concentration on materials and methods of historical research rather than on reading and discussion of a given body of historical literature. The student, in writing a research paper based on a substantial degree upon original sources, will have the opportunity to learn how historians arrive at their conclusions, as well as what the results of their work are. In this sense, the subject matter handled in any given seminar is less important than the process of investigation, analysis, and writing. "How do you know?" becomes more important than "What do you know?"

Courses numbered 200 through 299 (undergraduate seminars and colloquia) are designed primarily for juniors and seniors majoring in history. Admission to seminars and colloquia involve permission of the instructor.

200A, B, C. Senior Honors.

units by arrangement (Staff)

200W. Undergraduate Directed Reading.

units by arrangement (Staff)

200X. Undergraduate Directed Research.

units by arrangement (Staff)

202. Undergraduate Colloquium: Introduction to Basic Problems of Historical Conceptualization and Understanding.

5 units, Spr (Emmons)

206B. Undergraduate Colloquium: Roman Society in the Age of Cicero and Augustus.

5 units, Win (Treggiari)


5 units, Win (Langmuir)

212A. Undergraduate Colloquium: History and Historiography—Ancient and Modern.

5 units, Aut (MacCormack)

213A. Undergraduate Colloquium: Luther and the Radicals—(Same as Religious Studies 141A.)

5 units, Win (Spitz)

214A. Undergraduate Colloquium: The Crusades.

5 units, Aut (Ferruolo)

216A. Undergraduate Colloquium: Political Ideals and Social Realities in the Renaissance: Italy from City Republics to Territorial States.

5 units, Win (Brown and Gilbert)


5 units, (Dallin) given 1984-85


5 units (Dallin) given 1984-85

221. Undergraduate Colloquium: Lords, Peasants and Historical Change in 16th-Century Eastern Europe.

5 units, Win (Kollmann)

222. Undergraduate Colloquium: Inter-War Eastern Europe.

5 units, Win (Vucinich)

224. Undergraduate Colloquium: Nationalism and Communism in Eastern Europe.

5 units, Win (Vucinich)

225. Undergraduate Colloquium: Community and Society in Muscovite Russia.

5 units (Kollman) given 1984-85


5 units, Aut (Chapman)


5 units, Aut (Paret)


5 units, Spr (Wright)
233A. Undergraduate Colloquium: European Labor and Working Class History: A Comparative Perspective.
5 units, Win (Chapman)

234. Undergraduate Colloquium: The Industrial Revolution as Cultural Change—(Same as Anthropology 258.)
5 units, Aut (Reddy)

235A. Undergraduate Colloquium: European Socialism in the 19th and 20th Century.
5 units, Spr (Wright)

237A. Undergraduate Colloquium: Opera and History.
5 units, Aut (Robinson)

237B. Undergraduate Colloquium: The Novel and Society in Modern Europe.
5 units, Spr (Robinson)

238A. Undergraduate Colloquium: Spanish Anarchism.
5 units, Win (Shubert)

239. Undergraduate Colloquium: Austria to 1914.
5 units, Win (Craig)

239A. Undergraduate Colloquium: World War II.
5 units, Spr (Craig)

5 units, Win (Seleski)

241A. Undergraduate Colloquium: Crime and The Law in Pre-Industrial England.
5 units, Aut (Shoemaker)

245. Undergraduate Colloquium: Government and Industrial Politics in Britain Since 1850.
5 units, Win (Middlemas)

5 units, Spr (Jackson)

5 units, Spr (Jackson)

252S. Undergraduate Seminar: Politics and Political Thought in Revolutionary America.
5 units, Win (Rakove)

253. Undergraduate Colloquium: Major Interpretations of American History—(Same as American Studies 219.)
5 units, Spr (Rakove)

255. Undergraduate Colloquium: American Urban History—(Same as Urban Studies 188).
5 units, Win (Carson)

256A. Undergraduate Colloquium: San Francisco and Los Angeles—(Same as Urban Studies 154.) A Comparative History.
5 units, Win (Kazin)

258S. Undergraduate Seminar: Race and Slavery in the American Constitutional System.
5 units, Win (Fehrenbacher)

259. Undergraduate Colloquium: The Presidency from Washington to Lincoln.
5 units, Aut (Fehrenbacher)

260. Undergraduate Colloquium: Reform and Radicalism in Post-War America.
5 units, Spr (Kazin)

261A. Undergraduate Colloquium: Ethnicity in American Cities: Past and Present—(Same as Urban Studies 153.)
5 units, Spr (Camarillo)

266S. Undergraduate Seminar: Research Seminar in U.S. Foreign Policy.
5 units, Aut (Kennedy)

268. Undergraduate Colloquium: The Shaping of 20th-Century America—(Same as American Studies 202.)
5 units, Aut (Bernstein)

269. Undergraduate Colloquium: Crises in Modern American Foreign Policy.
5 units, Spr (Bernstein)

276A. Undergraduate Colloquium: Mexican Revolution.
5 units, Aut (Chowning)

277A. Undergraduate Colloquium: The Quest for National Identity: Latin America, Russia, Japan (1850-1930).
5 units, Spr (Morse)

5 units, Spr (Beinin)

288. Undergraduate Colloquium: Palestine and the Arab-Israeli Conflict.
5 units, Aut (Beinin)

293A. Undergraduate Colloquium: Power and Authority in 20th Century Japan.
5 units, Aut (Duus)

294. Undergraduate Colloquium: The Middle Period in Chinese History, A.D. 607-907—(Same as Asian Languages 154.)
5 units, Win (Dien)

5 units, Aut (Van Slyke)

299. Undergraduate Colloquium: The Institutions of Medieval Japan.
5 units, Win (Mass)
GRADUATE COURSES

300W. Graduate Directed Reading.
   units by arrangement (Staff)

301. Graduate Colloquium: Historiography of American Education—(Same as Education 301.)
   4-5 units, Spr (Tyack) given 1984-85
   and by arrangement

301C. Graduate Colloquium: Administration and Organization of Educational Institutions in Context—(Same as Education 221C.)
   4 units, Spr (Bridges and Cuban)

302A. Graduate Colloquium: Introduction to Problems of Historical Conceptualizations and Understanding.
   5 units, Spr (Emmons)

304A,B. Graduate Colloquium: Historiography of Colonial Latin America.
   10 units, Aut, Win (Bouwer)

307A. Graduate Core Colloquium in Medieval History.
   5 units, Aut (Langumir)

312A. Graduate Colloquium: The Crusades.
   5 units, Aut (Ferruolo)

312B. Graduate Colloquium: Topics in Russian History.
   5 units, Aut (Emmons)

313. Graduate Colloquium: Approaches to the German Question.
   5 units, Aut (Wehler)

330. Graduate Colloquium: Problems in French History.
   5 units, Win (Chapman)

331A,B,C. Graduate Core Colloquium on Modern Europe.
   15 units, Aut, Win, Spr (Spitz, Brown, Lougee, Paret)

333. Graduate Colloquium: The Industrial Revolution as Cultural Change.
   5 units, Aut (Reddy)

334. Graduate Colloquium: The Development of Cultural History in the 19th Century.
   5 units, Win (Gilbert)

337. Graduate Colloquium: European Socialism in the 19th and 20th Century.
   5 units, Spr (Wright)

341A. Graduate Colloquium: Topics in English Society and Culture, 1500-1700.
   5 units, Aut (Seaver)

346. Graduate Colloquium: The New History of Africa—(Same as Anthropology 246.)
   5 units, Spr (Jackson)

349. Graduate Colloquium: History and Anthropology.
   5 units, Win (Jackson)

351A,B,C,D,E,F. Graduate Core Colloquium in American History.
   30 units, Aut, Win, Spr (Rakove, Fehrenbacher, Carson, Kazin, Kennedy, Bernstein)

   5 units, Spr (Kazin)

377A. Graduate Colloquium: The Quest for National Identity: Latin America, Russia, Japan (1850-1930).
   5 units, Spr (Morse)

386A. Graduate Colloquium: Origins of the Iranian Revolution.
   5 units, Spr (Beinin)

390A,B. Graduate Colloquium: Topics in Late Traditional and Modern Chinese History.
   10 units, Aut, Win (Kahn, Van Slyke)

393A. Graduate Colloquium: Power and Authority in 20th Century Japan.
   5 units, Aut (Duus)

   5 units, Win (Dien)

395A. Graduate Colloquium: Early and Medieval Japan.
   5 units, Aut (Mass)

395B. Graduate Colloquium: Medieval and Early Modern Japan—1600-1800.
   5 units, Win (Mass)

395C. Graduate Colloquium: Modern Japan.
   5 units, Spr (Duus)

ADVANCED GRADUATE COURSES

Courses numbered 400-499 are intended primarily for second and third year graduate students, but other qualified students may be admitted by consent of instructor.

400X. Graduate Research.
   units by arrangement (Staff)

408. Graduate Seminar: Medieval History.
   5 units, Spr (Langmuir)

410A,B. Graduate Seminar: Early Modern Europe.
   10 units, Win, Spr (Spitz)
420A. Graduate Seminar: Russian History.  
5 units, Win (Emmons)

420B. Graduate Seminar: Russian History.  
5 units, Spr (Kollman)

425. Graduate Seminar: Imperial Russia and the Slavs in Austria-Hungary and the Ottoman Empire.  
5 units, Aut (Vucinich)

432. Graduate Seminar: Modern France.  
5 units, Spr (Chapman)

5 units, Aut (Sheehan)

10 units, Win, Spr (Seaver)

445. Graduate Seminar: Research in Modern Britain.  
5 units, Win (Stansky)

5 units, Spr (Jackson)

451. Graduate Seminar: Twentieth Century U.S.  
Win (Bernstein)

5 units, Spr (Ferenbacher)

473. Graduate Seminar: Women’s Social History.  
5 units Spr (Freedman)

483. Graduate Seminar: The Brazilian 20th Century Essay as a Literary Form.  
5 units, Spr (Sebe bom Meihy)

490A. Graduate Seminar: Modern China.  
5 units, Win (Van Slyke)

490B. Graduate Seminar: Modern China.  
5 units, Spr (Van Slyke)

490A. Graduate Seminar: Modern China.  
5 units, Aut (Van Slyke)

490B. Graduate Seminar: Modern China.  
5 units, Win (Van Slyke)

493A,B. Graduate Seminar: Late Traditional China.  
10 units, Win, Spr (Kahn)

498. Graduate Seminar: Japanese Historical Texts—(Same as Asian Languages 251.)  
5 units, Win (Mass) given 1984-85

PROGRAM IN THE HISTORY OF SCIENCE

Faculty: Peter Galison and Wilbur Knorr, Assistant Professors

Committee in Charge: Eric Hutchinson, Chairman (Chemistry); Wilbur Knorr, Vice-Chairman (Classics and Philosophy); Francis Everitt (Hansen Labs); Alexander Fetter (Physics); Peter Stansky (History); Patrick Suppes (Philosophy); Walter Vincenti (Aeronautics and Astronautics)

The Program in the History of Science is in part a consolidation of activities already in progress at Stanford and in part a new venture of considerable breadth. The object of the program is to provide a variety of courses suitable to both undergraduate and graduate instruction, to the more general historical studies within the humanities and social sciences and to the more technical demands of the sciences, engineering, and specialization in the history of science. Fields represented in the program reflect the interests of the participating faculty, and at present include the physical sciences, the exact sciences, engineering and technology, and more philosophical subjects insofar as they can be examined through the history of science. The chronological period is extensive, reaching from antiquity through the twentieth century.

The structure of the program will require students to define and pursue their own areas of investigation according to the rubrics of an individually designed major under the administration of the Dean of Undergraduate Studies’ Advisory Committee on Individually Designed Majors.

Members of the History of Science Committee are available to serve as a faculty advisory group for any student wishing to design a History of Science major. A list of appropriate courses is available from the History of Science office, Room 200-27.

COURSES

138A. Ancient Period.
4 units, Aut (Knorr) MWF 1:15

138B. Middle Ages to Newton.
4 units, Win (Knorr) MWF 1:15

138C. Newton to Einstein.
4 units, Spr (Knorr) TTh 1-2:10

140. Topics in the History of Mathematics: From Antiquity to the 17th Century—(Same as Philosophy 140.) Origins and development of concepts and techniques in their social and philosophical context. Special emphasis on ancient Greek geometry, its adoption of the idea of proof and interaction with early philosophy, its application in optics and mechanics, its significance and limitations.
3 units, Spr (Knorr) MWF 2:15

145. Scientific Revolution—(Same as Philosophy 145.) Social, intellectual and institutional background of the period that established modern science, the 17th century. Stress on theories of matter and motion, especially Descartes, Galileo and Newton. Historical controversies: Yates’ thesis on hermeticism and magic; Merton on Protestantism and science; Hessen on the economic basis of scientific change. Readings from 17th century texts and modern historical studies.
4 units, Win (Galison) MWF 11

148. History of Modern Physics—(Same as Philosophy 148.) History of the physics view of the fundamental nature of matter from Maxwell’s time to the present. Will discuss the mechanical and electromagnetic world views, special relativity, quantum mechanics and the standard model of elementary particle physics. Will focus on several case studies to illustrate the historical problem orientation of each period, as well as the connection between theory and experiment. Readings: original scientific texts, archival material and secondary sources.
4 units, Aut (Galison) TTh 9:45-11

149. Experimentation in Twentieth-century Physics—(Same as Philosophy 149.) Explore several of the formative physics experiments of the 20th century. Will examine changes in the standards of demonstrations over the last 100 years, as well as changes in the type of instrumentation, from torsion balances to drift and bubble chambers. Case studies will include experiments in electromagnetism, quantum theory and particle physics. The fundamental questions of the course: how have experimentalists convinced themselves that they have demonstrated something; have these criteria changed?
4 units, Win (Galison) MW 3:15-4:30

237A,B,C. Colloquium in History of Science—(Same as Philosophy 237A,B,C.) Contemporar-
STATEMENT OF PURPOSE

This program is an undergraduate major designed to encourage the convergence of natural and social science in the study of humankind. The program is an interschool, interdepartmental major, utilizing not only those faculty and courses particularly created for the major, but also pertinent areas of instruction available throughout the University. It also is concerned with man and woman as an organism, his or her adaptation to other men and women and to nature, his or her ability to control and to live with the environment, the mechanism by which these factors relate to his or her biological and behavioral evolution, and the ways in which such knowledge can be brought to bear on the design of public policy.

This program examines the complex relationship of humankind with nature, exemplified by the dilemmas of social policy in health and education, population problems, pollution of the environment, and conservation and development of resources. The program is designed for the general education of policy makers and citizens. It is also a route to advanced study in the established natural and social sciences and related professions.

OFFERINGS AND FACILITIES

The program leads to an A.B. in Human Biology. The curriculum is designed for those students who desire a knowledge of biology, particularly of humankind, linked with knowledge of the behavioral and policy sciences. The program involves faculty predominantly from the School of Humanities and Sciences and the Medical School, with representatives from other schools as well.

There is no graduate program in Human Biology, but students will be prepared for advanced training and coterminal programs in either biology, the behavioral and social sciences, medicine, law, education, or economics-engineering systems, depending on their choice of advanced courses following the fundamental program.

The office of the Program in Human Biology is located in building 80 of the Inner Quad.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The degree of Bachelor of Arts in Human Biology requires approximately 64 units or more in the major. The major consists of three parts.

1. Introductory Level. At least 35 units at the introductory level, to be taken as follows:
   - Human Biology Core .......................... 24
   - Statistics ........................................ 3-5
   - Policy Course .................................. 3-5
   - Human Biology 6 ............................... 4

   In addition, familiarity with computer science principles is required. This may be obtained via formal coursework, workshops, research, or in some other fashion.

2. Foundation Level. Students must take significant foundation coursework designed to prepare them for their areas of specialization. These courses will vary depending on the exact program designed by the student.

3. Specialization Level. At least 20 units in the student's chosen area of specialization. These may be drawn from courses throughout the University; final approval of any selection rests with the student's advisor.

   Within these guidelines, students are required to elect three Human Biology upper division courses, some of which may be included in the area of specialization.

   As part of designing their curriculum, students should plan to submit a brief one-page proposal of study to their student advisor. This should be prepared beforehand, and be ready for review at the time the major is declared. It will then be reviewed by the faculty advisor. The proposal should contain a statement of the student's goals within the Program and how the course of study fits his/her longer-term goals.

   In addition, as noted above all majors must select and successfully complete an approved policy course (3-5 units); the Workshop in Human Biology HB 06, an independent field experience project (4 units); and an approved course in statistics (3-5 units).

   Detailed guidance should be sought at the program office so that the individual student's course of study can be developed to fit her/his particular needs and career goals. Faculty advisor approval is required at least once each year to ensure that a coherent program of study is developed and followed.

   The Honors Program provides qualified majors with an opportunity to do research and write a thesis on a subject of individual interest, for which up to 15 units of credit can be earned in the honors candidate's senior year. These units (see Human Biology 198 under "Courses")
will be in addition to the approximately 30 upper division units ordinarily required for an A.B. in Human Biology.

Application for admission to the Honors Program should be made by the third quarter of the junior year. Applicants must have completed the Human Biology core requirements including the workshop. The submission of the honors thesis is expected by the beginning of the Spring Quarter of the year of graduation.

THE FUNDAMENTAL PROGRAM

The Human Biology core Courses (2A and 2B, 3A and 3B, and 4A and 4B) are a sequence of courses which introduce the biological sciences, the social sciences, and most importantly, the relationships between the two. The courses meet MWF from 9-10:50 throughout the academic year. Students must register concurrently for the A and B series and take the core courses in sequence. Students are advised to initiate the core in the Autumn Quarter of their sophomore year. Any deviation from the core sequence must have the consent of the Program Chairman. Freshmen are not permitted to enroll in the core.

All of the fundamental program courses, the core, a public policy course, and a statistics course, are to be taken for a grade by majors with the exception of the workshop (HB 06) which is taken pass/no credit exclusively.

2A,B. Human Evolution: Genetics and Culture—2A is devoted to the basic principles of Mendelian and population genetics, and population biology. 2B studies human evolution, the acquisition of language, and the rise of culture. The theme of the courses is the evolution of human populations, with discussion of biological and cultural aspects of such topics as sociobiology, racial differences, and the incest taboo.

4 units, Aut (Durham, Staff) MWF 9

2B. Human Evolution: Genetics and Culture. Entire sequence, 2B, 3B, and 4B fulfills (DR:4) and (DR:5).
4 units, Aut (Staff) MWF 10

3A,B. Properties of the Individual and the Social Process — 3A concentrates on the basic principles of biochemistry, cell biology and developmental biology. 3B stresses the development of social bonds and social influences on the individual's perception of the world. The relation between 3A and 3B will be explored in a series of special topics, such as perception, puberty and abnormal behavior. Prerequisite: 2A,B.

4 units, Win (Bernfield, Staff) MWF 9

3B. Properties of Society. Entire sequence, 2B, 3B, and 4B fulfills (DR:4) and (DR:5).
4 units, Win (Feldman, Staff) MWF 10

4A,B. The Human Organism and Society — 4A concentrates on integrative system physiology, neurophysiology, and the biological basis of behavior. 4B studies the interaction of human populations and their environments. Demographic and economic processes are related to the development of social order. The interaction between 4A and 4B is illustrated by exploring such topics as fertility control and agriculture.

4 units, Spr (Thompson, Staff) MWF 9

4B. Social Process of Decisionmaking. Entire sequence 2B, 3B, and 4B, fulfills (DR:4) and (DR:5).
4 units, Spr (Dornbusch, Staff) MWF 10

6. Workshop in Human Biology—Required of all program majors. Offers the student the opportunity to augment the formal course work with a supervised field, community, or laboratory project of his or her own choosing. To be arranged in advance and to be initiated at least three quarters prior to graduation. Limited to majors in Human Biology. Course graded pass/no credit exclusively.

4 units (Morgan) by arrangement

40. Public Decisionmaking Regarding Human Health—(Same as Health Services Research 222.) This course sets four goals for students in the study of health policy: to understand the role of health care and disease prevention in maintaining health; to develop a working knowledge of the organization, financing, and regulation of health care in the United States; to learn to carry out analyses of health policies and to be able to assess the validity of analyses carried out by others; and to understand the logical basis for decision making in health policy. This course will provide an overview of health policy formulation from several perspectives. Consideration will be given to social, ethical, political, legal and economic implications. A group research project will be a major part of the course. Small sections will meet weekly. Prerequisite: Human Biology Core or equivalent.

4 units, Spr (Bunker, Staff) MWF 11

41. Public Decisionmaking Regarding the Human Environment—This course has the
purpose of introducing and sensitizing the class to the overall complexion of American public decision making in the "environmental" arena, to demonstrate how scientific and technical factors are accommodated in policy-making and how technically-trained people contribute to the policy process, and to introduce systematic decision making skills. Throughout the course, section exercises and policy research projects will be required. Prerequisite: Human Biology Core.

4 units, Win (Race) MWF 11

ADDITIONAL COURSES

10. Human Sexuality—This course is intended to provide a broad perspective in human sexuality. The first part deals with the biological aspects of sex: anatomy, physiology, endocrinology, pregnancy, contraception, and diseases of the sexual organs. The second part focuses on sexual behavior: its development, patterns, variations and malfunction. In the final portion, the relationship of sex and society is examined in evolutionary western, and cross-cultural contexts.

This is a lecture course without discussion sections. The emphasis is on information not advice. Preregistration is required.
3 units, Win (Katchadourian) MWF 1:15

50. Human Biology Colloquium.—Weekly seminar designed for present and potential Human Biology majors. The course will feature various Human Biology associated faculty presenting seminars and leading discussions on their areas of interest.

1 unit, Spr (Staff) Th 4-5

90. Human Nature: The Human Animal—This course will investigate several topics concerning what makes up human science; how does evolution operate, are there basic emotions; what is basic to human brain that is different to other brains; what specifically makes us human; how does the brain grow and change with experience. The course will have guest speakers, the authorities in this area and will include student participation.

4 units, Win (Ornstein) T 3-5, plus mandatory W section

91. Human Nature: The Social Animal—This course will investigate some of the mental and social factors which determine humanities' characteristics: how the mind works; why the same mistakes are made twice; why people forget. Topics to be covered include: how biology and culture coevolve, how society affects people; how health is dependent on many psychosocial factors, and a consideration of the affects of social pathology. The course will have guest speakers who are experts in their field and will include student interaction.

4 units, Spr (Ornstein) T 3-5, plus mandatory W section

ADVANCED COURSES

Of the minimum 20 units of upper division credit each Human Biology student is expected to earn, 20 units must be selected from course offerings within departments other than Human Biology. This 20 unit concentration of credit should be designed to enable the student to focus on his/her post-baccalaureate goal. The student's individual design of this advanced program must have approval from a program faculty advisor. At the student's discretion one upper division course in the area of concentration and one upper division Human Biology course may be taken for Pass/No Credit.

Students who plan to pursue graduate work should be aware of admission requirements for graduate programs and the necessity for early planning of their programs, in order to satisfy the requirements of both the program and graduate schools.

Advanced courses presented by the program in Human Biology are open to non-majors with the proper prerequisites. Human Biology majors will have preference when the number of students must be restricted.

103. The Natural History of the San Francisco Bay Area—The course will consider the influence of physical factors on the development of the major plant associations characteristic of the region and the faunas associated with them; the impact of human activity on these natural communities will also be discussed. A one-hour lecture plus one field trip per week to be arranged. Limited to 12 seniors. For acceptance, application form is available in the Human Biology Office. Prerequisite: Human Biology Core.

3 units, Aut, Win (Dengler) T 9, Th 8-12 plus hours to be arranged

106. Principles of Ecology —A basic course in ecology focusing on contemporary issues in ecological research. Topics include the structure and function of ecosystems; distribution patterns of organisms in response to limiting factors and physical environment; interactions at population and community levels; short-term vs. evolutionary responses of communities and organisms to disturbances and selective pressures. Lectures and one discussion/lab each week. Prerequisites: Human Biology Core or Biology Core, or consent of the instructor.

3 units, Aut (Race) TTh

111. Human Physiology—Purpose is to present information on the functioning of organ
systems with emphasis on mechanisms of control and regulation. Topics will include structure and function of the endocrine and central nervous systems, cardiovascular physiology, respiration, salt and water balance, immunology, exercise and gastrointestinal physiology. Lectures and discussion/laboratory. Prerequisite: Human Biology or Biology core. Limited to 120. Registration required.
4 units, Win (C. Heller and Staff)

112. Educational Policy — Objective is to provide Human Biology students with an opportunity for close faculty/student interaction through an examination of selected contemporary issues in Educational Policy. Guidance provided in the development of strategies for the development of a research project which will include the formulation of a statement of the problem, the design of a research study, collection and analysis of data and presentation of findings in both written and oral modes. Systematic evaluation of each student’s progress through individual faculty conferences as well as opportunities for peer review. Resources include the utilization of computer literature searches, video taped oral presentations and the use of text editing in the production of a printed document.
3 units, Win (Morgan)

113. Biology and Evolution of Language—(Same as Anthropology 005.) Lecture course on the biology, function, and evolution of the organs of speech and the brain, with emphasis on the relationship between Biology and the structure and function of language. Topics include: non-human primate and other animal communication, human non-verbal communication, the structure of language, biology and physics of speech, speech disorders, cognitive and biological inferences from language universals and language acquisition, the interaction of linguistic and biological evolution. (DR:4)
4 or 5 units, Spr (Fox)

114. Research Seminar in Coevolution—(Same as Anthropology 181.) Seminar of the interactions of genes and culture in the evolution of human diversity. Reviews major new works relating biology and culture (e.g. sociobiology, dual inheritance theory, cultural transmission, etc.) with special emphasis on theory and supporting examples. Teams of students conduct original research projects and report to the class. Prerequisites: Anthropology 2 or the Human Biology Core, and a course in statistics.
4 units (Durham)
alternate years, given 1984-85

116. The Eye and Eyeing — This course will explain the workings of the eye, and apply this knowledge to the larger problems of how humans perceive the world and how that perception influences endeavors. Compares the human eye to the specialized eyes of animals. Explores less-defined areas such as illusions, the optics, and visual physiology of art, and the eye in history. Prerequisites: Human Biology Core, Biology Core, or consent of the instructor.
3 units, Win (Marmor) TTh 1:30-3

120. Human Nutrition—(Same as Food Research 119.) An introduction to human nutrition including the function, digestion, absorption and metabolism of nutrients, dietary recommendations and standards, and a general overview of national and international nutrition problems. Prerequisite: Human Biology core or consent of instructor.
4 units, Aut (Taylor, Bray, Arroyave)
MWF 8

134. Ecological Anthropology—(Same as Anthropology 164.) Seminar on the cultural adaptations of human populations to their environments. Evaluates major theories relating cultures and ecosystems in light of examples from diverse habitats (arctic, desert, tropical rainforest, ocean islands, mountain tops, etc.). Topics include adaptation and cultural change, optimal foraging theory, resource management, social demography and population dynamics, resource competition, warfare, social stratification. Prerequisites: Anthropology 1, the Human Biology Core, or consent of instructor.
5 units (Durham)

135. Seminar in Cancer Research — This course will focus on selected topics in cancer biology, particularly on newer ways of using radiation, chemotherapy, and immunotherapy to treat malignancies. Each student will be required to research his/her own topic under the general guidance of the faculty and to present a seminar on the subject at the conclusion of the course. Limited to 10 students. Prerequisite: Human Biology Core.
3 units, Win (Brown, Sikic)
by arrangement

139. Seminar on Climate Change and Human Affairs—Seminar deals with the impact of changing drastically varying climate on economics, geopolitics, agriculture, in brief, the ability to live within the climatic limits set by the environment. Observational material ranges from the historical ("little ice age") to the current. An introduction into the processes of climate and their impact on human affairs preceded research by individual students or small groups on topics ranging from water resources to miracle crops to the politics of hunger. The research is designed to introduce the student to the art and skill of finding data, oral or written,
on an environmental or public issue, to the technique of preparing a report and advocating in writing recommendations on such an issue, and to the best methods of oral presentation in front of audiences able, but not necessarily willing to consider the issue and the recommendations. Report writing and oral presentation skills are key components of the seminar. Limited to 24 students.

3 units, Win (van Andel)

143. Early Experience—(Same as Psychology 190A.) Focus on experimental literature related to the effects of pre- and postnatal environmental factors on development and adult function. Material covers both animal and human research and deals with behavioral and physiological function. Prerequisite: Human Biology Core or consent of instructor.
3-5 units, Win (Levine) Th 4:15-6 alternate years, given 1984-85

147. Law in Radically Different Cultures—(Same as Anthropology 157 and Law 157.) Uses American law as a benchmark, to examine comparable issues in the law of the Peoples Republic of China (Eastern law), Republic of Egypt (religious law), and the Republic of Botswana (traditional law) in order to identify the historical, philosophical, social, and cultural factors which contributed to the development of different attitudes and practices regarding law. Prerequisite: Junior or senior standing.
5 units, Win, Spr (Barton, Gibbs, Merryman) MWTTh 2:15

148. Environmental Policy — Discussion of important environmental issues of today and the future, how to deal with them technically and politically, and how to resolve conflicts between environmental concerns and other social needs. Focus will be on the U.S. but an international perspective will be used when appropriate. Main points include definition and description of environment and environmental impact, history of human impact on environment, causes of increased human impact, history of environmental protection, decision-making and resolution of issues, future environmental issues. Two discussion hours per week. Enrollment limited to 15 Human Biology Seniors. Prerequisites: Human Biology Core and 40 or 41 or with permission of the instructor.
3 units, Spr (Ehrlich, Anne) TTh 2:15

150A. Biosocial Aspects of Birth Control—(Same as Chemistry 137A.) The problems of introducing a new, practical birth control agent or procedure involve legal, political, cultural and economic factors in addition to purely biological ones. The subject matter therefore represents a perfect case of illustrating how many components ought to enter into major policy decisions. The course will deal with a critical evaluation of the logistic aspects of human fertility control and will include lectures on "hardware" as well as "software" aspects of birth control. Groups of five to eight students of diverse backgrounds will develop a series of position papers dealing with new birth control procedures suitable for populations of different cultural and socioeconomic backgrounds. The first portion of the quarter will consist predominantly of lectures, of selecting the population groups and task forces and of individual discussions with each task force. The remainder of the quarter will be dedicated to library and field work, the completion of written task force reports and oral presentations to the class. The selection of students admitted to this class will be based on the desire to create a multidisciplinary student group (approximately equally divided between males and females) so that each position paper will be prepared by task forces consisting of participants with different undergraduate backgrounds (e.g., Pre-Medicine, Pre-Law, Biological Sciences, Anthropology, Chemistry, Economics, Political Science, Psychology, etc.) who will focus on specific logistic aspects of a common topic in the birth control field. Limited to 35 students. For acceptance, application prior to Nov. 6, 1983, is essential, using special questionnaires available from the Human Biology office. Prerequisite: At least junior standing.
5 units, Win (Djerassi) TTh 1:15-4:05 alternate years, given 1984-85

150C. Seminar: Feminist Perspectives of Birth Control — In most societies where human fertility control is practiced the responsibility rests predominantly with women. Is this desirable and realistic, or should changes be instituted? Participants in the seminar will be free to choose specific aspects of this problem and to address themselves in the form of research papers to possible answers. Admission limited to 15 seniors after completing special questionnaires available from the Human Biology office. Under exceptional circumstances junior standing may also be considered.
5 units, Aut (Djerassi) Th 1:15-4:05

152. Pest Control—Technical and Policy Aspects—(Same as Chemistry 139.) Course focuses on technical, operational and especially policy issues in the field of pest control in agriculture and public health. Among topics to be considered will be the following: history of chemical pest control including chemical and biological rationales for these developments; present research on biorational alternatives.
with special emphasis on recent insect development endocrinology and pheromones; economic and political factors that affect pest control practices; measuring the costs and benefits of chemical controls; impact of regulation on the development of new technology in private and public sectors. The first part of the course will consist of lectures on these and related problems and will be given in part with the aid of outside specialists. In the second part of the course task forces consisting of four to six students will investigate a particular pesticide problem using the type of multidisciplinary approach that is being employed in Human Biology 150 (see corresponding course description). Limited to 25 students with at least junior standing. Prerequisite: Chemistry 33 and/or 35 consent of instructor. Pre-registration prior to the Winter Quarter is essential, using special preregistration forms available from the Human Biology or Chemistry Department offices.

5 units, Win (Djerassi) TTh 1:15-4:05

154. The Biosocial Aspects of Cancer—(Same as Radiology 154.) This course is concerned with various aspects of cancer as a biological phenomenon and as a clinical, emotional and societal problem. The diagnosis and treatment of human neoplasms, their psychosocial and economic impact, and the organization of cancer care and research will be discussed. There will be detailed consideration of the specific control mechanisms operative in vitro and/or in vivo and delineation of their influence in an attempt to characterize the differences between normal and malignant growth. Prerequisite: Human Biology Core or equivalent.

3 units, Spr (Kaplan, Brown, Hahn, Weissman)

159. The Social Impact of the New Biology—Focus will be on the biological principles underlying genetic engineering (recombinant DNA, monoclonal antibodies, etc.) and exploration of social issues raised by this new technology. Recent discoveries about gene organization, revealed by recombinant DNA analysis; potential applications and biohazards associated with the expression of cloned foreign DNA in bacterial and mammalian cells; social role of the scientific community and the relationship between industry, academia, and public regulatory agencies; relationship between science and morality, with particular emphasis on genetic engineering. Enrollment limited to 20. Prerequisite: Human Biology Core or consent of instructor.

3 units, Aut (Erlich, Henry) M 7:30-9:30 p.m.

160. Primate Biology — This course will focus on the factors that shaped the evolution and behavior of non-human primates. Particular attention will be given to the diverse ecological niches, social adaptations, and reproductive strategies of living primates. In addition, the unique features of the primate brain and endocrine system will be discussed with respect to the physiological basis of behavior. Approaches to conserving and breeding primates for the future will also be covered. Prerequisite: Human Biology Core and consent of the instructor.

3 units, Spr (Coe)

162. The Ecology of Mental Health Care—The course will examine environmental influences on the process of diagnosing and treating mental illness. Psychological, political, philosophical, and legal dimensions of problems will be considered. A variety of techniques will be used to examine the complex relationship between clinical experience and broader social and community mental health interventions. Prerequisite: Human Biology Core or consent of instructor. (Limited to 30 students.)

3 units, Win (Spiegel)

163. Psychobiology: Biological Basis of Psychiatric Disorders—Course focuses on recent developments in psychopharmacology, as they relate to the study of human mood disorders and schizophrenia. Current theories regarding the etiology of mental illness will be discussed. Relationship between hormones and human behavior will be examined. Emphasis in the course will be on student participation, using a seminar format. Limited to 24 senior students. Prerequisite: Human Biology core.

3 units, Aut (Berger) T 3:15-5:05 given 1984-85

165. Aspects of Recreational Drug Use—Examines the pharmacological and social consequences of licit and illicit drug use in a series of lectures and discussion sessions. Topics to be covered will include caffeine, tobacco, alcoholic beverages; and cannabis, sedatives, stimulants, opiates, and hallucinogens. Prerequisite: Human Biology Core or consent of instructor.

3 units, Win (Hollister, Staff) TF 2:15

166. Biosocial Aspects of Cardiovascular Disease—Examines epidemiological, biological and behavioral perspectives of cardiovascular disease. The assessment and modification of risk factors relating to cardiovascular disease will be reviewed. Detailed consideration of the potential for disease prevention, and an examination of the major preventive trials. Public policy ramifications will be discussed. Although the course will be primarily didactic in nature, students will be asked to monitor one of their own health risk behaviors and prepare reports of their experiences. Enrollment limited to 35.
167. Neurochemical Aspects of Behavioral Disorders in Children—Course consists of a series of lectures which cover principles of neurotransmitter dynamics as they relate to our understanding of behavioral disorders in children. Current hypotheses concerning the neurochemical and neurobiologic basis of behavior disorders in children will be discussed. Clinical syndromes including infantile autism, childhood schizophrenia, hyperkinetic syndrome and childhood depression will be discussed in terms of disturbed neurochemical or neurophysiologic functioning. Limited to junior and/or senior students. Prerequisites: Human Biology or Biology Core or permission of the instructor. In addition, Human Biology 111, 163 and organic chemistry are strongly recommended.

4 units, Win (Ciaramello) TTh 9-10:30 alternate years, given 1984-85

170. Laboratory in Behavioral Neurophysiology — (Same as Psychology 149.) Selected aspects of behavioral neurophysiology will be covered in group lectures, with a focus on the recording of single neuron activity from the mammalian brain in the context of behavioral learning. Students will then be trained as a group in standard laboratory technique—manufacture of microelectrodes, surgical implantation, recording, behavioral training and histological reconstructions. They will then be divided into smaller groups to conduct a mini experiment. Prerequisites: Human Biology Core or Psychology 107. Class limited to 12.

4 units, Win (Thompson and Staff) TTh 3-5 and by arrangement

171. Adolescence—The changes that occur during adolescence will be viewed from a variety of perspectives including anthropological, sociological, psychological and psychiatric. Topics include physical and physiological development, cognitive growth, identity, peer group, generation gap, impact of the school, vocational development, among others. Prerequisite: Human Biology Core or Psychology 111, a basic statistics course.

4 units, Aut (Feldman) TTh 1:15-2:45

173. Medical Ethics — (Same as Philosophy 78.) The application of systematic ethical theory to problems in medicine and biobehavioral research. Abortion, euthanasia, justice in the allocation of scarce medical resources. Justifications for experimentation on human subjects. Definitions of death, health, and disease.

4 units, Aut (Davidson) MWF 9

176. Child, Family, and State—This course will serve as an introduction to a variety of family law issues examining how law distributes power and responsibility among the child, family, and the state. Explores in some detail the moral, philosophical and legal issues relating to newborns, child abuse and neglect; and problems relating to divorce, child custody, and child support; adolescent's rights with emphasis on policy issues relating to teenage pregnancy, contraception, and abortion. Prerequisites: Human Biology Core or consent of the instructor.

3 units, Aut (Mnookin) MTTh 10

177. Social Psychology of Physical Deviance and Disability—This course will consider the issues and problems faced by the handicapped with a three-pronged approach. Study of the biological basis of various handicaps together with the psychosocial problems and stigmas associated with them. In addition, discussion of the legal and political issues concerning the handicapped.

4 units, Spr (Staff) TTh 11-12:15 (plus 1 mandatory section to be arranged)

178. Problems of Aging—Aging will be discussed from the following points of view: (a) the prevention of premature aging of the respiratory and cardiovascular systems; (b) the cellular and immunological aspects of aging; (c) problems in mentation, psychosocial behavior and sexuality; (d) aging of various additional organ systems; (e) discussion of some of the current theories for the fundamental cause of aging of organisms; (f) discussion of comparative aspects of aging in various societies; (g) economics and public policy. This course will primarily emphasize the biological and medical aspects of aging.

There will be field trips to representative health care systems for the elderly and a discussion of drug use by the elderly. Prerequisite: Human Biology Core or consent of instructor.

4 units, Aut (Ebaugh, Staff) TTh 1-3 alternate years, given 1984-85

183. Hunter-Gatherers in Archeological Perspective—(Same as Anthropology 187.) Encompasses problems of the organization and subsistence of band-level hunter-gatherers, especially as approached through archeological investigations. Survey of modern hunter-gatherers, providing background for prehistoric groups. The archeological record of Africa, Europe and the New World will provide examples of how archeological data is used to reconstruct the cultural systems of extinct hunter-gatherers. Artifact typology, settlement
pattern analysis, modeling approaches, ethnoarchaeological methods, and other techniques will be used to determine the similarity of early groups to their modern counterparts. Prerequisite: Human Biology Core or consent of instructor.

5 units, Spr (Rick) MW 1:15-3:05

184. Intensive Life Support Systems: Present Practice and Moral Issues—This course will investigate the intensive life support systems used in intensive care units. First, the class will study the current state of the art of critical care medicine focusing on the function, need, productivity and national costs of intensive care units. Second, selected examples will be given of how our basic understanding of physiology can be translated through bioengineering into life support systems. Third, the moral issues surrounding which patients should be admitted to intensive care units and how to “help the dying and their families have a good death” will be discussed. Students will have the opportunity to spend time in intensive care units. Limited to 30 students. Prerequisite: Human Biology Core.

3 units, Win (Raffin) Th 3:15-5:05

185. History of Culture of Biological Correlates—Seminar will consider some major cultural advances and changes, like the spread of agriculture, urbanization, the control of disease, that of births, and the structure of the family; all of which have important interrelations and strong biological causes and effects of multiple nature. These complex problems will be analyzed, and the need for a widely based interdisciplinary approach will be stressed. The course will start with lectures on these topics and how to “help the dying and their families have a good death” will be discussed. Students will have the opportunity to spend time in intensive care units. Limited to 30 students. Prerequisite: Human Biology Core.

3 units, Win (Cavalli-Sforza)

186. The Evolution of Prehistoric Civilizations—(Same as Anthropology 188.) Study of the radical transitions involved in the evolution from original non-complex societies to complex state organizations. Basic problems considered include the change from food collecting to food-producing societies, the evolution of rank and stratification in society, as well as the role of trade, interaction, mobility, population growth, and ideology in the development of civilizations. Various theories of state evolution will be examined in the light of prehistoric Mesamerican and South American complex societies. Prerequisite: Human Biology Core or consent of instructor. (DR:5)

3-5 units, Win (Rick) alternate years, given 1983-84

189. Endocrines and Behavior—(Same as Psychology 189.) This course focuses on the influences of hormones on behavior. In particular, reproduction and reproductive behavior, maternal behavior, courtship and aggression will be discussed in terms of gonadal hormonal influences. Further, the influences of the pituitary-adrenal system on sensory processes, learning and memory will also be discussed. The neuroendocrine control of hormonal systems will be covered. Limited to 35. Prerequisite: Human Biology Core or consent of instructor.

3 units, Spr (Levine) TTh 4:15-6:05

196. Advanced Neurochemistry Seminar — This seminar is intended for students with a prior background in neurochemistry. Topics decided by the students and the instructor, and taken from areas of current importance and activity in neurochemistry. Through judicious selection of topics and articles it is hoped that the course will be at the cutting edge of neuroscience and offer students a unique opportunity to watch the progress of a rapidly moving field. Emphasis of the course will be on critical reading and evaluation of current literature, and coherent presentation of topic material. Course enrollment limited to eight Human Biology Seniors. Prerequisites: Permission of the instructor plus either 167 or Biochemistry 200 and Neurobiology 200.

3 units, Spr (Ciarnello)

198. Honors Program — This establishes an opportunity for in-depth research on an appropriate issue or problem by the student. It is necessary to choose a faculty sponsor who will be the advisor to the project and a faculty consultant who will act as second reader of the thesis; at least one of these two must be a member of the Human Biology faculty. Minimum requirement for the Honors program work and the resultant thesis is the equivalent of 10 units of work; a maximum of 15 units may be awarded. Limited to majors in the Program in Human Biology who have completed the core courses, including the workshop. Interested candidates should consult with advisors in the Program in Human Biology and Lorraine Morgan for explicit requirements for the Honors Program.

(Staff) by arrangement

199. Directed Reading/Special Projects — Independent study undertaken with faculty in the Program in Human Biology.

(Staff) by arrangement

SENIOR SEMINARS

These in-depth courses are intended to provide appropriately prepared students with the
opportunity to work closely with a faculty member on advanced aspects of a specific field of study. They are designed to enable students to exercise and strengthen research and analytical skills as well as abilities to communicate orally and in writing. These seminars are normally limited to Human Biology seniors who satisfy the prerequisites set by the instructor. Enrollments will be limited. Senior Seminars satisfy the program's requirement regarding an upper division course. Full description of the courses listed below may be found in the preceding numerical listing of courses.

112. Educational Policy
114. Research Seminar in Co-Evolution
135. Cancer Therapy
139. Seminar in Climatic Change and Human Affairs
148. Environmental Policy
150C. Feminist Perspectives of Birth Control
185. History of Culture of Biological Correlates.
196. Advanced Neurochemistry Seminar

HUMANITIES SPECIAL PROGRAMS

Emeriti: John W. Dodds, Paul H. Kocher,
Philip H. Rhinelander (Professors)
Chairman: Paul Robinson
Director, Graduate Program: Kurt Mueller-Vollmer
Professors: William A. Clebsch (Religious Studies and Humanities) (on leave 1983-84),
Kurt Mueller-Vollmer (German Studies and Humanities), Lawrence V. Ryan (English and Humanities) (on leave 1983-84)
Lecturer: Helen Brooks

Humanities Special Programs include:
1. Associated Courses
2. Honors Program in Humanities
3. Master of Arts Program in Humanities
4. Graduate Program in Humanities
5. American Studies (see information under American Studies)
6. Medieval Studies

ASSOCIATED COURSES

91. Traditional East Asian Civilization—
(Same as Asian Languages 91 and History 91.) An introduction to the development of civilization in China and Japan from earliest times to the spread of Buddhism. Lectures and discussions will cover political institutions, social and political ideas, religious currents, and artistic and literary trends. Intended for the non-specialist.

5 units, Aut (Lyell, Van Slyke, Staff)
MTWTh 10

92. Traditional East Asian Civilization—
(Same as Asian Languages 92 and History 92.) A continuation of Asian Languages/History/ Humanities 91 covering the period down to 1700. (DR:2*)

5 units, Win (Duus, Hare, Staff)
MTWTh 10

93. Modern East Asian Civilization—
(Same as Asian Languages 93 and History 93.) A continuation of 92 covering the period from initial Western contacts down to the present. (DR:5*)

5 units, Spr (Duus, Staff)
MTWTh 10

HONORS PROGRAM IN HUMANITIES

Committee in Charge: Beverly Allen, Helen Brooks, Kurt Mueller-Vollmer, Richard Pruitt, Paul A. Robinson

PURPOSE OF THE PROGRAM

The Humanities Honors Program aims to heighten the student's sense of the relations among various humanistic disciplines, and to increase awareness of the basic humanistic values—intellectual, aesthetic, literary, historical, social, and ethical.

ADMISSION

Freshmen and sophomores interested in the Program should consult with the Director. The consultation should take place at the earliest opportunity, preferably during freshman year, and in every case before beginning the junior year.

The Program is open to majors in every field, and may be taken in addition to a departmental major.

Students who are admitted to the Program may enroll as Humanities majors:

1. If they choose a major in Humanities concentrating in Comparative Literature (consult information under Comparative Literature).
2. If they are permitted, upon petition granted by the Honors Committee, to plan a 40-unit concentration of interdepartmental course work constituting a unified program of study.
Students who wish to major in Humanities must enter the Program and plan the concentration before registering for the first quarter of the junior year. Competence in reading a foreign language is required of Humanities majors.

**REQUIREMENTS**

1. Completion of the Western Culture Requirement — 15 units, freshman year, with an average of at least B and an A— or better in at least one quarter of the sequence. Students who think that they may wish to enroll in the Program are urged to select Humanities 61, 62, 63 to fulfill the Western Culture Requirement. (A student who has not completed Humanities 61, 62, 63 may be required to take one or more additional courses as specified by the Committee in Charge of the Program)

2. Humanities 90 — 5 units, sophomore year

3. A course in a non-Western culture approved by the Committee in Charge of the Program. (This course will fulfill one of the general distribution requirements for graduation)

4. Two different Humanities Seminars in the series 190-199 — 10 units, junior year

5. Honors Essay — A critical essay on a topic of general importance and approved by the Committee (2 units spring, junior year; 5 units autumn and 5 units winter, senior year). A grade of at least B is required on the essay for graduation with Honors in Humanities.

See the Time Schedule each quarter for changes in listings.

**COURSES**

61,62,63. Western Thought and Literature—An introduction to fundamental ideas of the past; lectures, discussions, reading of selected masterpieces.

61. The World of Classical Antiquity—Homer, Bible, Aeschylus, Sophocles, Euripides, Plato, Aristotle, Cicero, Virgil, Seneca, Ovid. (DR:1; three-quarter sequence)

- 5 units, Aut (Edwards, Staff) WThF 11; two hours by arrangement

62. Christian and Secular Europe: Medieval and Renaissance St. Augustine, Boethius, Medieval Romance, Aquinas, Dante, More, Machiavelli, Luther, Montaigne, Cervantes, Galileo, Shakespeare, Milton. (DR:1; three-quarter sequence)

- 5 units, Win (M. Evans, Staff) WThF 11; two hours by arrangement

63. From the Enlightenment to the Present—Voltaire, Rousseau, Darwin, Dostoevsky, Marx, Freud, Conrad, Lawrence, Kafka. (DR:1; three-quarter sequence)

- 5 units, Spr (Chace, Staff) WThF 11; two hours by arrangement

90. Introduction to the Humanities—Basic themes and issues of the humanities as treated in important works from various humanistic disciplines, including texts from the Western Culture courses that will be re-examined in greater depth. Prerequisite: Completion of the Western Culture requirement. Honors majors will be given preference in enrollment. (DR:3)

- 5 units, Aut (Lindenberger) MW 1:15-3:05 Spr (Mueller-Vollmer)

175. Individual Work—For students in the Humanities Honors Program with definite objectives not met by current course offerings.

- 2 to 5 units, any quarter (Staff) by arrangement

190-196. Interdepartmental Seminars on the Nature of the Humanities—Students in the Humanities Honors Program are required to complete two of these seminars; other students may enroll in them only by consent of the Director. Prerequisite: 90.


- 5 units, Win (Stansky) MW 1:15-3:05

192. The Arts and the Humanities.

- 5 units, Aut (Bender) MW 3:15-5:05

193. Philosophy and the Humanities.

- 5 units, Aut (Bratman) TTh 1:15-3:05 Spr (Pruitt) MW 3:15-5:05

194. Literature and the Humanities—The critical study of major texts; theory and practice of criticism.

- 5 units, Win (Wellbery) TTh 1:15-3:05 Spr (Pratt) TTh 1:15-3:05


- 5 units, Spr (Yearley) MW 1:15-3:05

200A,B,C. Honors Essay—A critical essay of about 15,000 words. Limited to Humanities Honors students.

200A. Submission of Essay Proposal—Preliminary planning and study. Approval of proposal by Committee in Charge required for credit and for continuation in the Program.

- 2 units, (Staff) by arrangement

200B. Continued Study and Writing—Regular meetings with tutor. Prerequisite: 200A.

- 5 units, (Staff) by arrangement
200C. Further Work on Essay—Regular meetings with tutor; submission of complete first draft to tutor by end of quarter. Prerequisite: 200B.

5 units, (Staff) by arrangement

MASTER OF ARTS
PROGRAM IN
HUMANITIES

(The Master of Arts Program is administered by the Committee in Charge of the Graduate Program in Humanities.)

The Master of Arts Program in Humanities will normally require a two-year residency at Stanford, beginning with the Autumn Quarter the first year and coming to completion at the end of the Spring Quarter of the second year. Students, however, may apply for admission to the A.M. Program beginning in either Winter or Spring Quarters, in which case the sequence of study will differ.

During the first year the typical candidate for the A.M. degree will take Humanities 301-303 (the first three courses in the series “The Western Traditions”), plus at least one of three required seminars or proseminars in an established discipline (for example, Art History, Classics, Philosophy, etc.). During the second year the student will take Humanities 304-306 (the remaining three courses in “The Western Traditions”), Humanities 353 (the two-quarter, bi-weekly colloquium), and at least one of the three required seminars or proseminars in the chosen established discipline. The third seminar or proseminar may be taken in either the first or second year. At the end of the second year a written comprehensive examination will be required.

A student will usually complete either 16 or 20 units during the first year, and 20 or 24 units during the second year, for a total of 40 units. Additional elective units may be taken at the option of the student.

When applying for the A.M. Program in Humanities through Graduate Admissions, the candidate should indicate from which established discipline he or she will be choosing the three required seminars or proseminars. This choice should be indicated under the section “Area of Specialization” on the application form for Graduate Admissions. Once a student has been admitted to the A.M. program he or she must submit a proposed plan of study to the Committee in Charge, specifying the courses that will be used to fulfill the requirement of three seminars or proseminars in an established field.

The Committee in Charge of the Graduate Program in Humanities will approve each A.M. program on its own merits, to ensure that the proposed three seminars and proseminars in an established discipline are suited to the A.M. in Humanities. Since reading knowledge of a foreign language appropriate to the department in which specialized work will be pursued is required, language proficiency should be noted on the application form submitted to Graduate Admissions.

GRADUATE PROGRAM IN HUMANITIES

Committee in Charge: Constantin Behler, John Freccero, Julius Moravcsik, Kurt Mueller-Vollmer (Director), James Sheehan, Lewis W. Spitz, Robert Tilton, William M. Todd, III

The Graduate Program in Humanities supplements the Ph.D. programs of certain Stanford students, especially in Classics, Drama, Education, English, French and Italian, German Studies, History, Modern Thought and Literature, Philosophy, Religious Studies, Slavic Languages and Literatures, Spanish and Portuguese, with an interdepartmental program devoted to the study of the Western tradition as a whole. The degree offered is a joint Ph.D. in “Classics and Humanities,” “English and Humanities,” “German Studies and Humanities,” etc.

Because the Graduate Program in Humanities supplements, and does not substitute for, departmental specialties, its members must be students earning the Ph.D. in an academic department at Stanford.

Application for entrance into the Program should be made to the Director; selections are made to give broad representation to the participating departments. Members of the Program are given first preference in registration for all of its offerings. The normal pattern of the Program involves one Humanities seminar in each of six successive quarters, but no particular pattern is enforced.

Graduate students who are not members of the Program may enroll, by consent of the Director, in offerings whose enrollments are not filled by members of the Program. Limits: 25 in Humanities 301-305; 18 in Humanities 306.

REQUIREMENTS

1. Continued satisfactory work in the student's major field, in accordance with departmental requirements.

2. Completion of the six historical seminars (Humanities 301-306) in the Western Traditions series. To qualify for candidacy, stu
students should complete at least three of these seminars in the first two years of graduate residence. Special exemption from or permission to audit one or two of the seminars may occasionally be secured by petition to the Committee in Charge.

3. Regular attendance and active participation throughout two consecutive quarters in the bi-weekly Humanities Colloquium (Humanities 353), for which two units of credit are required and four units may be earned.

4. At least one quarter of teaching for the Humanities Department, though other interdisciplinary teaching may be substituted for this requirement by petition to the Committee in Charge.

5. Reading knowledge of at least one foreign language, ancient or modern, to be certified in the first two years of graduate work.

6. Passing the University Oral Examination according to the schedule prescribed by the major department, with one representative of the Graduate Program in Humanities, designated by the Director, as a member of the examining committee.

7. Submission of a Ph.D. dissertation that is acceptable to a committee which includes one representative of the Graduate Program in Humanities, designated by the Director.

COURSES

275. Directed Reading.
2-5 units (Staff) by arrangement

301-306. The Western Traditions—Required of students in the Graduate Program in Humanities. Open to other graduate students only by consent of the Director.

301. The Classical Period.
4 units, Aut (MacCormack) TTh 4:15-6:05

302. The Roman and Early Christian Periods.
4 units, Win (Spofford) TTh 4:15-6:05

303. The Middle Ages.
4 units, Spr (Freccero) TTh 4:15-6:05

304. The Renaissance.
4 units, Aut (Forcione) MW 4:15-6:05

305. The Early Modern Period.
4 units, Win (Harvey) MW 4:15-6:05

306. Modernism and the Consciousness of the Humanities—Normally taken after completion of 301-305.
4 units, Spr (Halliburton) MW 4:15-6:05

353. The Humanities in the University—How the humanistic disciplines bear upon one another and upon other aspects of research and higher education. A three-quarter colloquium of limited enrollment, required of students in the Graduate Program in Humanities. Prerequisite: Enrollment in or completion of one or more seminars of the series Humanities 301-306 or permission of the instructor.
1 or 2 units, Aut, Win (Clebsch) given 1984-85

MEDIEVAL STUDIES

Committee in Charge: George Brown, Hester Gelber, Gavin Langmuir (Chairman), Suzanne Lewis, William P. Mahrt

Affiliated Faculty: Theodore M. Andersson (German Studies), Lawrence V. Berman (Religious Studies), George H. Brown (English), John Freccero (French and Italian), Hester Gelber (Religious Studies), Joseph C. Harris (English), Donald R. Howard (English), Nancy S. Kollmann (History), Gavin I. Langmuir (History), Suzanne Lewis (Art), Sabine G. MacCormack (Classics and History), William Mahrt (Music), Eleanor Prosser (Drama), William M. Todd III (Slavic Languages and Literatures), W. Wesley Trimpi (English)

There is no formal undergraduate degree program in Medieval Studies, rather the option exists for interested students to propose individually designed majors in “Medieval Studies.” Individually designed majors must be proposed to and approved by the Dean of Undergraduate Studies’ Advisory Committee on Individually Designed Majors. Guidelines may be found under the section “Program for Individually Designed Majors.” Students interested in planning a course of studies should consult the Chairman of Medieval Studies. Additional information about this option, as well as referral to faculty advisors, is available through the Humanities Special Programs office. For information about proposing individually designed majors, students should go to the Academic Information Center. The major would normally be declared by the beginning of the student’s third year. To help students develop their own syntheses and methods, the faculty will undertake to provide two types of interdisciplinary courses in Medieval Studies: first, “Medieval Culture: An Interdisciplinary Introduction,” and second, a number of upper level courses conducted by two or more professors from different disciplines. In addition, a faculty advisor will help each student choose courses that complement the interdisciplinary core of the program, while still providing depth in one area. To
that end the following guidelines are provided.

Each student should take a minimum of ten courses dealing directly with the Middle Ages and distributed as follows:

The introductory course, Medieval Studies 65, “Medieval Culture”

Two upper level interdisciplinary courses in Medieval Studies

Four courses in one of the following categories:

1. Literature
   A. English
   B. German and Scandinavian
   C. French
   D. Spanish
   E. Italian
   F. Slavic
   G. Latin
2. History
3. Art History, Drama, Music
4. Philosophy, Religious Studies, Humanities (Certain Humanities courses may fulfill requirements within other categories.)

Two courses in a second category chosen from the above list.

One course in a third category chosen from the above list.

In addition to these ten courses, a language proficiency equal to two years of college-level study is suggested in Latin or one of the following: French, German, Spanish, or Italian.

COURSES

65. Medieval Culture and Society: An Interdisciplinary Introduction—(Same as Art 65.)
   This course will offer an introduction to the culture and society of the Middle Ages in Western Europe from 1100 to 1500. Major events, works of art and literature will be explored within the broad context of medieval life. The approach to medieval history, literature and art will be interdisciplinary and integrated throughout the course, with a consistent structured emphasis on the mutual interdependence of all aspects of culture and society from the 12th through the 14th century. The course will thus explore such questions as how medieval people defined themselves and their world, their conceptions of reality, their relationships to God and nature, and the individual's role in society.
   (DR:2)
   5 units, Win (Lewis, Ferruolo, Staff)

165. Colloquium on the Romance of the Rose: Text and Image—(Same as French 218 and Art 206A.) An interdisciplinary approach to one of the most popular works of the High Middle Ages in English Translation. An exploration of how literature and art are uniquely joined together in illuminated manuscripts of the French romance to reveal changing perceptions of meaning by succeeding generations of medieval readers from the late 13th through the 15th century.
   5 units, Aut (Lewis, Cazelles)

RELATED COURSES

Courses which are suitable for self-designed majors in Medieval Studies are listed below.

More detailed descriptions of the courses are to be found under the various departmental headings with (DR) notations. See the Time Schedule each quarter for changes in listings.

ART

105A. Medieval Britain.
108. 15th Century Netherlandish Painting.
206A. Colloquium on Chartres Cathedral.

CLASSICS

103. History of the Roman Empire.
107. Sailing to Byzantium — The Mediterranean World from Constantine to Leo III.
118. Post-Classical Latin.
174. The Classical Tradition in European Literature.
280. History of Rhetoric and Writing in the Middle Ages and Renaissance.

ENGLISH

100B. Courtly Literature.
102. The History of the English Language.
171A. Chaucer's Canterbury Tales.
171B. Chaucer: Troilus and the Minor Poems.
200A,B. Old Norse.
201. Old Saxon.
205. Old English.
208. Post-Classical Latin.
209. Introduction to Paleography and Codicology.
211. Readings in Middle English.
270A. Beowulf.
301A. Colloquium: Studies in the Intellectual History of the Late Middle Ages.
301B. Allegory and Symbolism.
360A,B. History of Literary Theory: Ancient; Medieval/Renaissance.
FRENCH AND ITALIAN

FRENCH

139. Chrétien de Troyes.
210. Old French.
317. French Medieval Drama.

ITALIAN

128. Survey of Italian Literature I: 13th to 16th Century.
140. Dante: Inferno.
141. Dante: Purgatorio.
142. Dante: Paradiso.

GERMAN STUDIES

205A. Old Norse.
205B. Advanced Old Norse.
208A. Introductory Middle High German.
208B. Advanced Middle High German.

HISTORY

108. The Christianization of Western Europe 500-1350.
112A. Sailing to Byzantium—The Mediterranean World from Constantine to Leo III.
120A. Russia from its Origins to Autocracy. given 1984-85
124A. Russian Civilization—The shaping of Culture and Society from the 9th to the 19th Century.
140. England to 1460.
225. Community and Society in Early Russia. given 1984-85

MUSIC

100. Music History: Medieval and Renaissance.

PHILOSOPHY

138B. Introduction to Cosmology: Middle Ages to Newton.

RELIGIOUS STUDIES

23. Introduction to Judaism.
24A/124A. Christianity.
24B/124B. Christianity to the Year 1000.
27. Islam.
149A. Comparative Mysticism.
168. Francis of Assisi.
170. Neoplatonism and Christianity.
171. Augustine.
172. Maimonides.

SLAVIC LANGUAGES AND LITERATURES

211. Introduction to Old Church Slavic.
212. Reading of Old Church Slavic and Old Russian Texts.

INTERNATIONAL POLICY STUDIES

Committee in Charge: Elie Abel (Communication), Walter P. Falcon (Food Research), Stephen D. Krasner (Political Science), Robert E. Ward, Chairman (Center for Research in International Studies), John D. Wirth (History)

The Master of Arts Program in International Policy Studies is administered by the Center for Research in International Studies, 207 Lou Henry Hoover Building, Tel: (415) 497-3347.

GRADUATE PROGRAM

MASTER OF ARTS

The master of Arts Program in International Policy Studies in an interdisciplinary curriculum intended to provide both a liberal education and practical preparation for an internationally oriented career in either the private sector or in government. Although conceived as a one-year postgraduate program, it presupposes the completion during the student's undergraduate career of an unusual number of specifically prescribed courses preparatory to and essential for that year of graduate work. Students seeking admission to the program from university backgrounds other than Stanford must, therefore, supply a description of coursework that they would like to have considered in connection with their application for admission to this Program.

The total program emphasizes understanding of the historical processes that gave rise to the contemporary world scene; sufficient training in economics and political science to provide a basis for understanding and analyzing the inter-
national activities and policies of governments and important private interests; work in greater depth on the culture of one major world area such as East Asia or Latin America or, alternatively, on a major topic or world problem such as economic development, international trade, or international finance; training in accounting and computer science; proficiency in one modern foreign language; and the completion of 45 units of approved courses, at least 25 units of which must be at the graduate level, i.e., courses numbered 200 or above. An effort will also be made to incorporate in the Program an internship with an international firm, research project, or governmental agency whenever possible.

ADMISSION TO THE PROGRAM

Students may enter the program in three different ways:

Early Admission for Stanford Undergraduates—Because the Program requires such extensive and specific undergraduate preparation, it is possible for students already enrolled as undergraduates at Stanford to apply for admission as early as their eighth quarter (or upon completion of 105 units) and no later than their eleventh quarter. They are strongly advised to make such application prior to the end of their ninth quarter. Such applicants are in effect regarded as participants in a coterminal degree program involving their undergraduate major department and this Program. For these students, admission to the Program requires a letter grade average of 3.4 or better, an up-to-date transcript, two letters of recommendation from university-level instructors familiar with the student and his or her academic work, and a statement setting forth any personal background information the student would like to have considered, describing the reasons for which the student wishes to enroll in the Program, and the way in which the student’s contemplated schedule of studies will make a coherent and practical contribution to his or her career goals. Application is made through the Center for Research in International Studies, and file the completed Petition with the Graduate Program Office, Building 590, Room 104 and the Program Sheet with the Center for Research in International Studies.

Early Admission for Transfer Students—Transfers from other colleges or universities with a view toward early admission to the Program in undergraduate status are subject to Stanford’s normal policies for transfer students. Transfer admissions are limited to a relatively small number of students who are admitted only to the sophomore and junior classes. Application for admission to Stanford as a transfer student is a separate process and should be made directly to the Office of Admissions, Stanford University, Stanford, CA 94305. Admission to the Program is possible only after acceptance as a transfer student by the Office of Admissions. The procedures involved are identical with those described above.

Admission at the Graduate Level—Applicants for admission to the program at the graduate level from universities other than Stanford or applicants from Stanford who did not apply by their eleventh quarter should submit the form entitled “Application for Admission to the Graduate Division” to the Office of Graduate Admissions and provide the credentials and information required by that office plus a statement setting forth any personal background information the student would like to have considered, describing the reasons for which the student wishes to enroll in the Program, and the way in which the student’s contemplated schedule of studies will make a coherent and practical contribution to his or her career goals. Applicants will be expected to have a A.B. or B.S. degree from an accredited college or university and a 3.4 undergraduate grade point average.

DEGREE REQUIREMENTS

The Degree of Master of Arts in International Policy Studies will be awarded to students in the Program who have fulfilled the following requirements:

1. Met satisfactorily all departmental, university and program requirements for their A.B. degree. Where departmental requirements at the A.B. level are concerned, it is expected that most participants in the Program will be undergraduate majors in international relations, political science, or economics. While other backgrounds are possible and acceptable, it seems improbable...
that they would supply any very substantial amount of the prescribed undergraduate preparation. In such cases, it would be necessary for the student to make up the missing undergraduate work, and the time required to qualify for the A.M. degree would increase correspondingly.

2. Completed satisfactorily all requirements for the A.M. degree in International Policy Studies. These are described in detail in the abovenoted "Information for Students..." and set forth in tabular form in Appendix I of that document. They involve a total of 98-120 quarter units of specified courses and seminars normally to be completed in the space of five years (four undergraduate and one graduate). 45 of these units must be completed while enrolled with graduate standing at Stanford. 25 of the total 98-120 units must be in graduate level courses or seminars (those bearing course numbers of 200 or higher). These are normally taken during a student's fourth or fifth years. Students entering the Program at the graduate level, however, can receive degree credit for these 25 units only if the work has been done during their graduate enrollment at Stanford.

3. Completed and filed their "Application for Candidacy for the Degree of Master of Arts" before the last day of January for a degree to be received in June or by the last day of class of the quarter before the quarter in which the degree is to be conferred should this occur in the Summer, Autumn, or Winter quarters. When completing this form a student should list no more than 45 of his or her most appropriate course units. Adding units for other courses completed is not to the student's advantage.

Students should be aware that no financial aid from the University will be available to students in this Program during their period of graduate level registration. Such support is limited to the first four years of undergraduate work at Stanford or to work for the doctoral degree.

Committee in Charge: David Abernethy, (Political Science) (Chairman), Jan Triska (Political Science) (Acting Chairman Autumn Quarter), John Cuddington (Economics), J. Martin Evans (English), Alexander L. George (Political Science), Stephen Krasner (Political Science), Mark Mancall (History), Scott Pearson (Food Research Institute), Robert Ward (Political Science), John Wirth (History)

Affiliated Faculty: Elie Abel (Communication), David Abernethy (Political Science), Joel Beinin (History), Barton J. Bernstein (History), Coit Blacker (Political Science), Carl Bielefeldt (Religious Studies), Fred Bowser (History), Herrick Chapman (History), William Clebsch (Religious Studies), Wanda Corn (Art), Gordon A. Craig (History), John T. Cuddington (Economics), Alexander Dallin (History and Political Science), Sandra Drake (English), Donald Donham (Anthropology), Peter Duus (History), J. Martin Evans (English), Richard Fagen (Political Science), Alexander George (Political Science), James L. Gibbs (Anthropology), Judith L. Goldstein (Political Science), John Gurley (Economics), Nobutaka Ike (Political Science), Alex Inkeles (Sociology), Kennell Jackson, Jr. (History), Timothy Josling (Food Research Institute), Bruce F. Johnston (Food Research Institute), David M. Kennedy (History), Stephen D. Krasner (Political Science), John W. Lewis (Political Science), Mark Mancall (History), Gerald Meier (Graduate School of Business), Bella Mody (Communication), Richard M. Morse (History), Robert North (Political Science), Daniel Okimoto (Political Science), Robert Packenham (Political Science), Peter Paret (History), Scott Pearson (Food Research Institute), Mary Pratt (Spanish and Portuguese), Debraj Ray (Economics), Condoleezza Rice (Political Science), Philip Rhinelanders (Philosophy), Richard Roberts (History), Renato Rosaldo (Anthropology), Peter Stansky (History), Michael Sullivan (Art), Jan F. Triska (Political Science), Makoto Ueda (Asian Languages), Lyman Van Slyke (History), Jose Viñals (Economics), Wayne S. Vucinich (History), Robert E. Ward (Political Science), Hans N. Weiler (Political Science and Education), John D. Wirth (History), Gordon Wright (History), Sylvia Wynter (African and Afro-American Studies)
This program is an undergraduate major designed to enable students to study international relations in a variety of dimensions and from a variety of disciplinary perspectives. The program aims to educate broad-gauged citizens who will be sensitive to the complexities of relations among different cultures, sophisticated in their ability to think about world affairs, and capable of creative work in the international field.

The program seeks to enrich undergraduate course offerings in international relations for non-majors as well as for majors. All students considering either a major or extensive work in international relations are strongly encouraged first to take Political Science 35, "How Nations Deal with Each Other." After that, prospective majors will develop their own programs, in conjunction with advisors, as outlined below.

**UNDERGRADUATE PROGRAMS**

**BACHELOR OF ARTS**

The degree of Bachelor of Arts in International Relations requires the completion of at least fifty units in the major, including both Political Science 35 ("How Nations Deal with Each Other") and one course in American foreign policy. In addition, each student is required to demonstrate proficiency in a language other than English, equivalent to at least two years of university-level instruction. All majors in International Relations are expected to spend some time overseas, for instance, in the Stanford Overseas Studies Program or its equivalent. Finally, International Relations majors are required to complete a minimum of ten units either in social science or history courses dealing with the student's geographical or topical area of concentration, or in economic analysis (Economics 51 and 52).

Other course requirements will depend on the cluster which the student chooses as the focus for his or her program. Cluster A encompasses courses that emphasize political and historical aspects of international relations. Cluster B focuses on humanistic aspects of relations among national cultures, and Cluster C constitutes a set of policy-oriented courses, largely on political-economic issues. All students must take at least two courses in the humanities-cultural area (Cluster B), at least five courses in one of the two remaining areas, and three courses in the other.

In each individual case, the student will develop his or her program in conjunction with an advisor, who will be a member of the Committee on International Relations or a faculty member approved by it. Students must declare the International Relations Major before the senior year by submitting an acceptable proposal to the chairman of the program. Double majors or students fulfilling International Relations as a secondary major also are required to file a proposal before the senior year.

Students who have already been accepted as majors in the program may petition for credit towards the International Relations major for courses not listed in this section of the bulletin or in the updated course lists in the International Relations office. It is important to note that petitions from non-majors or prospective majors will not be reviewed by the committee. Petitions should contain as much information as possible about the course in question: syllabi, reading lists, examinations, papers, etc. No course should be proposed for inclusion in the major unless it meets two conditions:

1. More than half the course work must deal with international materials.
2. "International" here means "transnational," that is, dealing with real-life relationships among national or cultural units, as distinguished from relationships that exist only in the mind of the observer, such as comparisons.

Extrabudgetal courses (undergraduate specials, SWOPSI, SCIRE, and others) will not be counted towards the major.

Students are encouraged to shape their own programs so that coherent central themes will emerge around which they can organize their reading and thinking about international relations.

**HONORS PROGRAM**

The International Relations Honors Program offers qualified students the opportunity to conduct a major independent research project under faculty guidance. Such a project requires a high degree of initiative and dedication, significant amounts of time and energy, and skill in research and writing.

The honors program is designed as a two-year undertaking. In their junior year, students consult with prospective honors advisors, choose the courses that will provide academic background in their area of inquiry, demonstrate an ability to conduct independent research, and write a formal thesis proposal. In their senior year, students are also expected to participate in a special honors colloquium, in which they can discuss the results of their research with other students in the program.

Prerequisites for participation in the honors
program include: a 3.5 letter grade average in humanities and social science courses; successful experience in writing a 20-30 page research paper based on primary sources; and submission of an acceptable thesis proposal. Normally, students receive fifteen units of credit for their honors project, spread out over three quarters. These units may not count toward the required fifty units in the major, but ten of them may be used to fulfill the requirement of ten units of related coursework.

Further details of the International Relations honors program are available from the program office.

AWARDS

The International Relations Committee invites undergraduate Stanford students, particularly juniors, to apply for funds to finance research or intensive study on forces that transcend national borders. These grants, provided by The Maribel Ricker Rogers Fund, the First Interstate Bank, and the Committee on International Relations, are intended primarily for use during the summer by students writing honors theses in international relations. Application forms are available in the Winter Quarter in the International Relations office. Preference is given to students whose research proposals are thoughtful and thorough and show promise of leading to truly distinguished honors theses. Funds may be used to finance travel to places where field work or library research is to be conducted, or may be used to support intensive work during the summer at Stanford. The imaginativeness and intellectual promise of the project and the preparation of the student are major considerations in awarding these funds.

GRADUATE PROGRAMS

MASTER OF ARTS

It is possible for students majoring in International Relations to work simultaneously for a coterminal master's degree in a number of related fields. Coterminal students should consult advisors in both departments or programs to make sure they will fulfill the degree requirements in both fields. For information on the A.M. program in International Policy Studies, see the section on International Policy Studies in this bulletin.

COURSES

It should be noted that course offerings at Stanford often change after catalog copy is sent to the printer. Students are advised to check each quarter's Time Schedule carefully. See departmental listings for (DR) notations.
School of Humanities and Sciences

Abilities; continuity and change since 1717; institutions and personnel; war and peace; perceptions, priorities and attitudes; alternative futures.

5 units (Dallin) given 1984-85

Seminar: Latin American Dependency—(Enroll in Political Science 124.) (See description under Cluster C. This course will count for either Cluster A or C.)

5 units, Spr (Packenham)

Seminar: Politics in Eastern Europe—(Enroll in Political Science 126.) Examination of the eight East European political systems in terms of their historical development, their policymaking processes, their system maintenance and adaptation. Attention will also be paid to Eastern Europe as a region in world politics.

5 units, Aut (Triska)

Introduction to International Law—(Enroll in Political Science 130.) A broad overview of theories, development, present state and propensities of international law as a policy process in various critical arenas of international interaction.

5 units (Triska) given 1984-85

U.S. and Soviet National Security Policies: The Responsibilities of Empire in the Nuclear Age—(Enroll in Political Science 133R.) Examines the formulation and execution of national security policy in the United States and the U.S.S.R. Special attention is devoted to the creation and rapid growth of the national security apparatus after 1945 and the attempt by both countries to balance domestic concerns with expanding international responsibilities. Four cases of security policy formation and conduct are used to provide an analytical basis for comparison: weapons procurement, alliance maintenance, the politics of military intervention and crisis management. Prerequisite: Political Science 138A, 117R or 136C are recommended.

5 units, Aut (Rice and Blacker)

The World of Superpowers—(Enroll in Political Science 137.) A comparative and international study of the superpowers—U.S., China, USSR, Western Europe, and Japan—in terms of recent major events and developments. Emphasis is on political change and formulation of theory of political dynamics.

5 units, Spr (Ike, North, Triska)

Arms Control and Disarmament—(Enroll in Political Science 138A.) The introductory course, 138A, is a general survey of international security relations, the revolutionary development of modern weapons, the arms competition and efforts at arms control and disarmament in the post World War II period. Political, conceptual and technological problems of national security policies and arms controls are stressed. Time is devoted to the evolution of strategic doctrines and negotiations on strategic arms control in SALT I and SALT II. The course is taught by an interdisciplinary faculty.

5 units, Win (Lewis and Blacker)

Seminar: Arms Control—(Enroll in Political Science 138B.) Tutorial and research problems of arms control, disarmament, and international security. 138A is a prerequisite.

5 units, Spr (Lewis and Blacker)

Japanese Foreign Policy—(Enroll in Political Science 139A.) Analysis of the postwar evolution of Japan’s foreign policy historical background, external environment, and domestic institutions.

5 units, Win (Okimoto)

Seminar: Public Policy and International Law—(Enroll in Political Science 141.) Analysis of the nature, determinants, and consequences of public policy decisions which impinge upon orderly, sequential development of world community. How states and courts attempt to reconcile rights of particular contestants with general interests of others in the international system. Emphasis on topics such as: the Law of the Sea Treaty and exploitation of the oceans; pollution; terrorism; weather control; arms control of weapons which aggravate suffering; nuclear proliferation, and human rights. Desirable prerequisite: Political Science 130 or equivalent.

5 units, Aut (Triska)

Seminar: U.S.-China Relations—(Enroll in Political Science 141M.) Provides an analysis of major issues in U.S.-China relations in the 1980’s, and offers opportunities for individual student research. Prerequisite: Political Science 115 or 139.

5 units, Win (Lewis)

Seminar: Force and Diplomacy—(Enroll in Political Science 144) Seminar will focus on problems of crisis management and crisis avoidance in U.S.-Soviet relations since the beginning of the cold war. Prerequisite: Political Science 35 or a course in American Foreign Policy.

5 units, Aut (George)

American Foreign Policy—(Enroll in Political Science 145J.) Introduction to American foreign policy, its formulation and implementation and specific problems which have been influential in its development in the post-World War II era. Begins with the examination of modes of foreign policy analysis and the particular internal and external constraints facing American
central decision-makers. Topics covered include the development and evolution of American containment policy, American foreign-economic policy, U.S. national security policy, and important contemporary issues of American foreign policy. Prerequisite: Political Science 35 or equivalent.

5 units, Win (Goldstein)

The Soviet Union and the United States: The 20th Century—(Enroll in History 220 or Political Science 148.) Soviet-American Relations, focusing on both continuities and changes over time, historical roots, alliance systems, the role of ideology, and the "national interest." Assignments will include different interpretations of the relationship, with attention to the strategic balance, mutual perceptions, conflicts over third areas, the role of domestic factors in shaping foreign policy, and conflict management.

5 units (Dallin) given 1984-85

Introduction to African History—(Enroll in History 148.) Survey of African cultures, societies, economies and politics from earliest times to the present; state building, the slave trade, colonialism, nationalism and independence.

5 units, Aut (Jackson)

Africa in the 20th Century—(Enroll in History 148C.) Transformation of African societies during Colonial rule. Resistance to colonial conquest; decline of the old elite and rise of the new one; peasants and labor; nationalism; decolonization.

4 to 5 units (R. Roberts) given 1984-85

Imperialism, Colonialism and Neo-Colonialism—(Enroll in History 149B.) The phenomenon of imperialism on the world historical stage. Topics include: the ethos that generated imperialism, the persons who forged its foundations, the institutions that made imperialism work, and the theories of imperialism. Also the consequences of the imperialist age.

5 units, Win (Jackson)

Social Structure of World Society—(Enroll in Sociology 152 or Education 231.) This course pursues a sociological analysis of human society on a world-wide basis, that is, all the people inhabiting the earth and the institutions through which their lives are organized are treated as participants in one global social system. Competing models of the emerging world order and its dynamics will be viewed and compared. Special attention will be given to the question of whether once distinctive societies and cultures are converging on a common standard. Among the topics to be covered will be worldwide population dynamics, the nature of the world economy, communication and exchange of persons on a global scale, socio-economic stratification of the world population, and education, science and technology as global systems. The course will utilize a mixed lecture-discussion format, with Thursdays from 10-11 set aside for discussion only.

5 units, Aut (Inkeles)

America Since 1945—(Enroll in History 172A.) An analysis of America that emphasizes foreign policy and politics, intellectual history, social themes, and the political economy. (This course fulfills the American Foreign Policy requirement.)

5 units, Win (Bernstein)

International Communication: Structures and Issues—(Enroll in Communication 176.) Survey of different national media systems and the policy issues arising from the existing imbalances between developed and developing countries. This seminar examines the new technologies that have transformed the global flows of news, economic data, cultural, and technical information. Prerequisite: Communication 1. Seniors and graduate students in communication and international relations have first priority with permission of instructor.

4 units, Aut (Abel)

Spanish America to World War I—(Enroll in History 176.) From the Spanish conquest to the apogee of economic and cultural dependency, the relationship between colonial developments, political independence, and modern conditions and problems.

5 units, Aut (Bowser)

Modern Latin America—(Enroll in History 177.) From the Latin American wars of independence to the present: the breakup of empire (1830-70); "development from without" (1870-1910); discovery of nationhood (1910-1950), and claims of tradition in arenas of change since 1950.

4-5 units, Win (Morse)

Modern Brazil—(Enroll in History 180.) With its huge size, multi-racial society, mixed economy and pragmatic foreign policy, Brazil's drive for great-power status and its neocapitalist model of development distinguish it from its Spanish-speaking neighbors in both Latin America and world contexts.

5 units, Win (Sebe)

The Middle East, 570-1718—(Enroll in History 187A.) The Middle East from the rise of Islam until the decline of Ottoman absolutism.

5 units, Aut (Beinin)

The Modern Middle East, 1718 to the Present—(Enroll in History 187B.) The Middle East from the emergence of regional Arab entities and the commercial penetration of Europe to the present.

5 units, Win (Beinin)
Theories of State-Society Relations in Latin America — (Enroll in Political Science 213P.)
Works of Cardoso, O'Donnell, Stepan, Paz, Veliz, and others are considered.
5 units, (Packenham) given 1984-85

Inter-War Eastern Europe—(Enroll in History 222.)
5 units, Win (Vucinich)

Nationalism and Communism in Eastern Europe—(Enroll in History 224.)
5 units, Win (Vucinich)

Seminar: The U.S. and the U.S.S.R. as Regional Powers—(Enroll in Political Science 228.) A research seminar on the progressive alienation between restive, frustrated social forces and obsolete political structures in Eastern Europe and in Central America and the Caribbean. Focus will be on the dilemma of the two regional powers of how to deal with social change without harming their regional interests.
5 units, Win (Triska)

European Socialism in the 19th and 20th Centuries—(Enroll in History 235A.)
5 units, Spr (Wright)

World War II—(Enroll in History 239A.)
5 units, Spr (Craig)

Seminar: International Relations Theory—(Enroll in Political Science 243.) Examines and compares both traditional and some of the more contemporary approaches to international relations theory from an interdisciplinary viewpoint. Realists, idealists, behaviorists, environmentalists, socio-cultural evolutionists, futurists, and others.
5 units, Aut (North and Goldstein)

Colloquium: Global Politics and the Future—(Enroll in Political Science 244.) Course identifies major trends in the North-South and East-West conflicts since World War II and examines data and current literature pertaining to projections and possible alternatives between now and the year 2000.
5 units, Win (North and Goldstein)

The Politics of Alliances—(Enroll in Political Science 244R.) Seminar will focus on the role of political-military alliances in the international system. Major theories of alliance formation and behavior and issues of alliance utility, the role of alliances in the propagation of conflict are explored. The course draws upon cases from both the 19th and 20th centuries, including the two major modern cases, NATO and the Warsaw Pact. Prerequisite: Political Science 35 or permission of the instructor.
5 units, Win (Rice)

Seminar: American Foreign Policy—(Enroll in Political Science 245J.) This is a graduate research seminar in American foreign policy. Emphasis will be on alternative explanations for major tenets of American policy which explain in particular the origins of the cold war, the Vietnam war and post-war foreign economic policy. Undergraduates who have taken P.S. 145J will be admitted with the consent of the instructor.
5 units, Spr (Goldstein)

Mau-Mau—The 1950's Anti-Colonial Rebellion in Kenya—(Enroll in History 247S.)
5 units, Spr (Jackson)

Undergraduate Colloquium: Slavery in Africa and the Americas—(Enroll in History 248B.)
5 units, (R. Roberts) given 1984-85

Research Seminar in U.S. Foreign Policy—(Enroll in History 266S.) In-depth reading, research and reports on World War I, World War II, the Cold War and Vietnam, and the post-World War II role of America in the world economy.
5 units, Aut (Kennedy)

The Shaping of Twentieth-Century America—(Enroll in History 268.) American foreign relations, the political economy, the nature of American liberalism, and the structure of politics and society.
5 units, Aut (Bernstein)

Palestine and the Arab-Israeli Conflict—(Enroll in History 288.) Discussion of the issues involved in the conflict from its origins in the late nineteenth century to the present will be rooted in an effort to understand the modes of argumentation of the various participants.
5 units, Aut (Beinin)


CLUSTR B: HUMANITIES EMPHATIHS

Christianity—(Enroll in Religious Studies 24A.) Ten historic types of Christian religions: martyr and monk, philosopher and prelate, mystic and theologian, pietist and moralist, apologist and activist. The main cultural crises and intercultural transactions in Europe that elicited these life-styles. Christianity as transmitter and transformer of Palestinian, Hellenistic, Germanic, Holy Roman, territorial, and modern national culture.
3 units, Aut (Bowden)
Moral Dilemmas of War and Peace—(Enroll in Philosophy 76.) The tragic ambivalence of war as a human phenomenon. Topics will include: possible justifications for war; standards for the conduct of war; obligations and responsibilities of leaders, participants and civilians; the status of non-combatants and prisoners; pacifism and the ideal of non-violence; prospects for eliminating war in the nuclear age.

4 units, Win (Rhinelander and Stockdale)

Ethics, Justice and the International System—(Enroll in Philosophy 77.) Problems of human rights will be the basis for discussing (a) cross-cultural views of norms and values (b) dominant Western conceptions (c) similarities and differences between problems of domestic and international morality (d) divergent types of obligations and rights and (e) implementation of models in the international community.

4 units, Spr (Rhinelander)

Culture, Politics, and Society in Latin America—(Enroll in History or Latin American Studies 80 or Political Science 123D.) An interdisciplinary course which surveys the interaction of Amerindian, African, and European cultures in the creation of the New World societies from 1500 to the present. The course is organized into four major topic areas: migration and culture contact, agrarian systems and agrarian changes, urban dominance and innovation, and the relations between states and societies. This is a basic introduction to Latin American courses within several departments.

5 units, Spr (Durham and Borges)

Traditional East Asian Civilization—(Enroll in History 92 or Asian Languages 92 or Humanities 92.) Traces the maturation of Chinese civilization and its spread to neighboring areas, especially Japan from the 8th to 18th century. The course will emphasize cultural and literary history.

5 units, Win (Duus and Hare)

Impact of the West on East Asia—(Enroll in History 93, Asian Languages 93, or Humanities 93.) Describes the impact of Western power and Western culture on China and Japan during the 19th and 20th centuries. The course will focus on the themes of imperialism, revolution and nationalism in both countries.

5 units, Spr (Duus and Staff)

The Reciprocal Vision—(Enroll in English 100J.) A study of how Americans and Europeans have perceived and portrayed each other in fiction works from the end of the eighteenth century to the middle of the twentieth. By juxtaposing American and European visions in chronological order, their reciprocity and historical evolution will be illuminated.

5 units, (Evans) given 1984-85

Japanese-Western Literary and Cultural Interactions—(Enroll in Asian Languages 110.) Discussion of cross-literary and cross-cultural topics, such as haiku in English, Marxism in Japanese prose fiction, and Zen in American literature.

3 units, Win (Ueda)

Africa and the Black Diaspora: An Introduction to its Literature, Thought, and Cultural Worlds—(Enroll in African and Afro-American Studies 114.) This course sets out to provide a general introduction to parallelisms and differences in the literature, thought, and cultural worlds, both of contemporary Africa and of the African-descended communities in the New World i.e.: The U.S.A., Brazil, Spanish-speaking Latin America and the Caribbean.

5 units, (Wynter) given 1984-85

Peoples of Island Southeast Asia—(Enroll in Anthropology 115.) The contemporary cultural unity and diversity within the Southeast Asian region may be accounted for in terms of the interaction between indigenous societies and a succession of outside colonizing influences. Among topics discussed are: prehistory, the process and impact of colonization, the contrast between hill and valley peoples, subsistence modes, social organization, religion, and aesthetics.

5 units, Aut (Franke and Rosaldo)

Japanese Buddhism—(Enroll in Religious Studies 116.)

3-5 units, Win (Bielefeldt)

Zen Buddhism—(Enroll in Religious Studies 118.) A survey course of the history and development of ideas represented in these two forms of Buddhism in China and Japan respectively. In studying and comparing Ch'an with Zen, emphasis will be given to the cultural transmission of Buddhism from India to China and then from China to Japan. The class will attempt to understand the various methods Buddhists used to "market" their religion and define the "consumer's" needs in both China and Japan. The role of religion as an agent for change will be explored. The last week of class will be devoted to exploring methods used to transmit Zen Buddhism to the United States by Zen centers in California.

5 units, Spr (Bielefeldt)

Walter Arensberg will be discussed, as well as movements such as Cubism, Expressionism and Dadaism.

4 units, Win (W. Corn)

Modern Literature of the Caribbean—(Enroll in English 162F.) An introduction to modern Caribbean literature, in historical context, with particular attention to recurrent themes addressed by Caribbean writers in defining the Caribbean-American experience, including colonialism, immigration from Africa and Asia, and relation between literature and such social and cultural expressions as Rastafarianism, Reggae and Calypso.

5 units, Win (Drake)

An Introduction to Africa Through Film: Tarzan, Terrs, and Liberation—(Enroll in Education 195.) The contemporary African situation with the use of film as an instructional medium. No prerequisites.

4 units, (Samoff) given 1984-85

War, Revolution and the Aftermath: European Society, Culture and Politics, 1900-1925—(Enroll in History 230.) The First World War and the political revolutions which followed it traditionally mark the divide between 19th and 20th century Europe. This course will explore how war and revolution transformed European society and how contemporaries made sense of the upheavals they experienced. The course stresses less the military and diplomatic history of the period and more the social, political and cultural impact of the war.

5 units, Aut (Chapman)

The Caribbean Americas: An Introduction to Their Literature, Thought and Cultural Worlds—(Enroll in African and Afro-American Studies 248.) This course is based on the hypothesis that Caribbean-America exists in its own right as a culture sphere, partly eccentric both to the “Latin” and the “Anglo” culture sphere, and constituted by an Euro-African Christian-Animist syncretic mix; that it thereby constitutes, as Fernandez Moreno argues, a “bridge which tends to unify culturally the three geographic Americas”; this gives a definite and specific identity to the thought, literature and popular arts emerging from its multiple cultural worlds.

5 units, (Wynter) given 1984-85

Undergraduate Colloquium: Cultural and Intellectual History of Latin America—(Enroll in History 278.)

5 units, (Morse) given 1984-85

Western Views of the Non-West Through the Literature of Travel—(Enroll in Spanish and Portuguese or Comparative Literature 296.) The Western traveler in the Third World as cross-cultural mediator and interpreter, and the ideological appropriation of foreign contexts as related to developments in world history and economy. Course materials include travelogues, journals, letters, essays, works of fiction, documentary and ethnographic writings, and film. Open to all students; no prerequisites. Readings will be in English.

3-5 units, Win (Pratt)

CLUSTER C: POLITICAL-ECONOMIC ISSUES AND POLICY ANALYSIS

The World Food Economy—(Enroll in Food Research 103 or Economics 106.) This course will examine the individual components essential to a macro-perspective of the world food economy. The biological and economic principles of food production will be used to explain the potential for food supplies. Next attention will be devoted to nutritional, social and economic factors that influence the consumption of major food groups. Techniques for measuring and evaluating nutritional well-being will be discussed briefly. The last part of the course will examine the world food economy in global perspective.

3 units, Aut (Johnston)

The Economics of Development—(Enroll in Economics 118.) The state of underdevelopment and the dynamics of development are at the heart of international (and within-country) conflicts between the rich and the poor. This course examines the process of economic development in an international perspective. The focal point is the experience of developing countries since World War II. This experience is discussed with reference to the historical perspective of both developed and less developed countries and it is evaluated to draw policy conclusions relating to strategies of economic development. The impact of certain aspects of development on societal values and institutions receives special attention. Prerequisite: Economics 51 and 52.

5 units, Aut (Ray)

Socialism in Latin America—(Enroll in Political Science 119.) (See description under Cluster A. This course will count for either Cluster A or C.)

5 units, Win (Fagen)

The Marxian and Radical Tradition—(Enroll in Economics 120.) The economic theories of Marx, Lenin, Stalin, and Mao, and the application of the theories to current economic problems. Prerequisite: Economics 1.

5 units, Spr (Gurley)

Seminar: Latin American Dependency—(Enroll in Political Science 124.) Assessment of
fundamental concepts and theoretical frameworks, single country case studies, and research and political strategies regarding dependency in Latin America. (This course will count for either Cluster A or C.)

5 units, Spr (Packenham)

Development and the International System—(Enroll in Political Science 125F.) Participants will address a number of key issues raised by external constraints and influences on development in the Third World. Emphasis is on the interaction between national and international factors.

5 units, Win (Fagen)

International Dependence—(Enroll in Political Science 131.) What is meant when it is said that one state is dependent upon another, more powerful state? What are the implications of a dependent relationship for the domestic political economy of both parties? What occurs when a weak state tries to reduce its dependence on a strong state? These questions will be examined through an historical analysis of European colonialism and through contemporary case studies, examining U.S. relations with a Latin American country, France with an African country, and the USSR with an Eastern European country. Desirable prerequisite: Political Science 35.

5 units, Spr (Abernethy)

American Foreign Economic Policy—(Enroll in Political Science 131J.) Course uses a developmental approach to analyze aspects of American foreign economic policy. Centers on an historical analysis of the basic issues involved in the formation of American foreign policy over the last 200 years. Issues covered include the evolution of American tariff and trade policy, the development of mechanisms for international monetary management, and American foreign investment policy, all in light of changing political goals pursued by American central decision-makers. Prerequisite: Political Science 35 or equivalent.

5 units, Win (Fagen)

European Agricultural Policy—(Enroll in Food Research 146 or Economics 142.) An analytical approach to the development of agricultural policy in Europe, with particular reference to the Common Agricultural Policy of the European Community, and its relationship to agricultural and food problems of member states. Topics include the agricultural trade relationships between the EC and other advanced countries, trade agreements between EC and developing countries, and the question of enlargement of the community to include Spain and Portugal. Agricultural policies will be discussed in the context of general economic, political and institutional development.

3 units, Win (Josling)
variety of proposed and possible solutions. The implications of the domestic policies of the major trading countries on agricultural markets in particular as regards staple food products. Emphasis given to issues of food security, trade liberalization, and international market regulation and to the role of international institutions. Prerequisite: Economics 51, 52 or equivalent.

5 units, (Josling) given 1984-85

INDEPENDENT STUDY IN INTERNATIONAL RELATIONS

197. Directed Study in International Relations.

2-5 units, any quarter (Staff)

198A,B,C. Honors Thesis—Open only to declared I.R. majors with approved honors thesis proposals.

2-10 units, any quarter (Staff)

LANGUAGE LABORATORY

Committee in charge: Walter Lohnes (German Studies), (Chairman); John Barson (French and Italian), Albert Dien (Asian Languages), Kathryn Strachota (German Studies), Richard Schupbach (Slavic Languages and Literature), Maria-Paz Hora (Spanish and Portuguese)

Director: John Metcalfe

The Language Laboratory with one hundred and fourteen Level III (listen-respond-record) student positions offers varied programs in Afrikaans, Amharic, Bambara, Bengali, Bulgarian, Cambodian, Cantonese, Catalan, Cebuano, Cree, Czech, Danish, Dutch, Egyptian, English, Estonian, Farsi, French, Fula, Gaelic, German, Creek, Hakka, Hausa, Hebrew, Hindi, Hokkien, Hungarian, Icelandic, Indonesian, International Morse, Irish, Italian, Japanese, Korean, Kurdish, Lakota, Latvian, Lao, Lithuanian, Mandarin, Mam, Navajo, New Guinea Pidgin, Norwegian, Oluluyia, Polish, Portuguese, Quechua, Quiche, Rumanian, Russian, Sanskrit, Serbo-Croat, Shona, Spanish, Swahili, Swedish, Tagalog, Tamil, Telugu, Thai, Tiawanese, Turkish, Twi, Ukrainian, Urdu, Vietnamese, Welsh, West African Pidgin, Yiddish, Yoruba, and Yucatec. Additional language materials for Amslan, Chad, Cherokee, Efic, Esperanto, Ewe, Finnish, Hawaiian, Ixcateco, Kpelle, Latin, Malay, Mongolian, Samoan, Tibetan, and Tongan.

Whether engaged in formal language studies or not, students are invited to use the Language Laboratory for listening, repetition, recording and self-evaluation. The Language Laboratory is open daily.

CENTER FOR LATIN AMERICAN STUDIES

Chairman of the Committee and Director of the Center: George A. Collier

Affiliated Faculty:

Anthropology: Clifford Barnett, George Collier, Jane Collier, William Durham, James Fox, John W. Rick, Renato Rosaldo, Bernard Siegel

Classics: Gregson Davis

Communication: Steven Chaffee, Dennis Foote, Bella Mody, Everett Rogers

Economics: Donald Harris, Ronald McKinnon

Education: Martin Carnoy, Edmundo Fuenzalida, Shirley Heath, Arturo Pacheco

English: Sandra Drake, John Felstiner

Food Research Institute: Bruce Johnston, Reynaldo Martorell, Clark Reynolds

History: Frederick Bowser, Albert Camarillo, Sabine MacCormack, Richard Morse, John D. Wirth

School of Law: John Merryman, Thomas Heller

School of Medicine: Paul Basch

Political Science: Richard Fagen, Stephen Krasner, Robert Packenham

Sociology: William Goode, Alex Inkeles

Spanish and Portuguese: Fernando Alegría, Hector Mario Cavallari, Mary Pratt, Sylvia Wynter, Tomás Ybarra-Frausto

The Center for Latin American Studies coordinates the University's teaching, research and extracurricular activities related to Latin America. Field research, language training and interdisciplinary approaches are stressed in the Latin American Studies program at Stanford, which draws on the strength and diversity of its nationally recognized faculty affiliates and substantial library holdings on Latin America. These resources are enhanced by the Tinker Visiting Professorship in Latin American Studies, which brings one or more distinguished Latin American academics to teach at Stanford each year. Since 1981-82, the Stanford Berkeley Joint Center for Latin American Studies has also provided opportunities for Latin Americanist faculty and students on the two campuses to meet and work with each other.

The principal academic programs administer-
ed by the Center for Latin American Studies (the bachelor's degree, summer field research programs, the master's degree and joint degree programs with Law, Medicine and Education) are described below. For further information please contact the Center for Latin American Studies, Bolivar House, 582 Alvarado Row, Stanford University, Stanford California 94305, or call (415) 497-4444.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The purpose of the A.B. degree is to allow a small number of undergraduates to design individualized, interdisciplinary programs emphasizing independent study. Students must apply for admission to the major not later than the beginning of the second quarter of their junior year; exceptions will be made only in unusual circumstances.

The student must fulfill the following requirements for the major:

1. Completion of a coherent interdisciplinary program of at least 55 units, based on an individualized plan of study achieved in consultation with, and approved by, a faculty advisory committee. This program will ordinarily include:
   a) At least 25 units in a single base discipline.
   b) At least 40 units in 100-level courses or higher, focused directly on Latin America or closely related topics. (Relevant courses may be found in the listings for the participating departments.)

First- or second-year language courses do not count toward the 55 units.

2. Demonstration of language competency in either Spanish or Portuguese at least equivalent to three years of university training. Portuguese 109, "Portuguese for Students of Spanish" is strongly recommended for those students demonstrating competency in Spanish.

3. Submission in the senior year of a substantial research paper of acceptable quality relating to Latin America on a topic approved by the student's faculty committee. Up to ten units may be given for preparation of the senior paper.

4. Only 10 units of pass/no-credit work may be counted toward LAS degree requirements.

Honors in Latin American Studies will be recommended for students who have completed a strong and well-designed program and submitted a senior research paper judged to be outstanding by the Subcommittee on the Undergraduate Major.

LATIN AMERICAN STUDIES 447

SUMMER FIELD RESEARCH

Each summer the Center sponsors a small number of juniors who conduct individual research projects in Latin America. Students must have demonstrated the ability to work independently and must possess the necessary language competence. A course in research design, LAS 152, is required the Spring Quarter before departure and an extensive written report is submitted the following Autumn Quarter for the independent research seminar LAS 153. Students from all departments are eligible to apply.

GRADUATE PROGRAMS

MASTER OF ARTS

The Latin American A.M. program is designed for: (1) students who wish to pursue an interdisciplinary approach to the study of Latin America before continuing on to a relevant doctoral program in one of the social sciences or humanities; and (2) individuals who desire to add graduate-level expertise in Latin American Studies to other training necessary for careers in business, journalism, government, or one of the professions. The Departments of Anthropology, Communication, Economics, History, Political Science, Sociology, Spanish and Portuguese, the School of Education, and the Food Research Institute participate in the A.M. program.

To qualify for admission to the program, applicants must have the equivalent of an A.B. or a B.S. degree, training in at least one of the social sciences, and a working knowledge of Spanish or Portuguese. Applicants must also take the Aptitude Test of the Graduate Record Examination and have the results sent to the Office of Graduate Admissions. Deadline for submission of applications for admission and financial aid is January 15, 1984. Admission is normally granted beginning in the Autumn Quarter only.

The student's program is worked out in consultation with the Director of the Center and with the faculty of the participating departments, within the framework of the following academic requirements:

1. Ten courses with a minimum of 38 units. At least eight of the ten courses must be basically Latin American in content. Courses are distributed as follows:
   a) Core Seminar (LAS 250, 251, 252)—an interdisciplinary course required of all A.M. candidates in Latin American Studies. Fifteen units; 5 units per quarter.
2. Demonstration of language competency in either Spanish or Portuguese at least equivalent to three years of university training. Students with advanced competency in Spanish, but with no knowledge of Portuguese, must take Portuguese 109 “Portuguese for Students of Spanish” during the Autumn Quarter; otherwise, first- and second-year language courses may not be counted toward the degree. If Spanish or Portuguese is the student’s base discipline, he or she must show ability in both languages. Courses in linguistics may be counted toward this concentration.

There is no thesis requirement for the A.M. degree in Latin American Studies. Instead, a paper that gives satisfactory evidence of methodological, analytical, research and writing skills is required from each member of the Core Seminar.

All requirements for the A.M. degree are normally completed in three academic quarters as a full-time student.

JOINT-DUAL DEGREE PROGRAMS

LAS/Law—The Center for Latin American Studies and the Stanford Law School offer a joint program leading to the J. D. degree in Law and the A.M. degree in Latin American Studies. Students must apply to and be independently accepted by both Law and Latin American Studies.

LAS/Education—The degree of Master of Arts in Teaching with an interdisciplinary concentration in Latin American Studies is offered jointly by the Center and the School of Education. For the general requirements, see the section “School of Education” in this bulletin. Candidates must have a teaching credential.

LAS/Medicine—An A.M. degree in Latin American Studies is also offered in conjunction with the M.D. degree program at Stanford. Students accepted by the School of Medicine can then apply to the Center for Latin American Studies for admission into the special joint-degree program.

For additional information regarding Latin American Studies joint degree requirements, inquiry should be made to the Center.

Since the University does not offer a Ph.D. in Latin American Studies, students who wish to remain in an academic program at Stanford after completing their A.M. must be accepted by one of the regular departments.

SUMMER FIELD RESEARCH

Advanced Stanford graduate students having a Latin American area of concentration may apply to the Committee on Latin American Studies for summer grants for pre-dissertation research.

COURSES

In addition to the courses listed here, the faculty affiliated with the Center regularly offer over sixty courses related to Latin America in their base departments. Please consult the Time Schedule for course offerings each quarter, or contact the Center for Latin American Studies.

80. Culture, Politics and Society in Latin America—(Same as History 80 and Political Science 123D.) An interdisciplinary course which surveys the interaction of Amerindian, African, and European cultures in the creation of New World societies from 1500 to the present. The course is organized into four major areas: migration and culture contact; the city and the countryside; relations between state and society; and contemporary policy issues. This is a basic introduction to the Latin American courses within several departments. (DR:5)

5 units, Spr (Wirth, K. Durham) MTWTh 9

152. Undergraduate Seminar in Research—Restricted to students accepted for the Latin American Studies Summer Research Program.

5 units, Spr (Staff) by arrangement

153. Undergraduate Independent Research—Restricted to students in Latin American Studies Summer Research Program.

5 units, Aut (Staff) by arrangement

169. Directed Individual Study—For students engaged in special interdisciplinary work that cannot be arranged by department. (Graduate students enroll in 269.)

1-5 units, Aut, Win, Spr, (Staff) by arrangement

177. Urban Planning in Latin America—(Same as Urban Science 157.)

4 units, Spr (Campbell) TTh 4:15-5:30

198. Senior Thesis—Restricted to undergraduate majors.

1-10 units, Aut, Win, Spr (Staff) by arrangement
LINGUISTICS

Acting Chairman: Thomas Wasow

Professors: Joan Bresnan, Clara N. Bush, Charles A. Ferguson, Joseph H. Greenberg, P. Stanley Peters, Elizabeth C. Traugott (on leave 1983-84)

Associate Professors: Eve V. Clark (on leave 1983-84), Dorothy A. Huntington (by courtesy), William R. Leben, Thomas Wasow, Terry Winograd

Assistant Professors: William J. Poser, John Rickford, Ivan Sag

Affiliated Faculty: Herbert H. Clark, Andrew M. Devine, James A. Fox, Shirley Brice Heath, Robert L. Politzer, Mary L. Pratt, Orrin W. Robinson, III

Senior Lecturers: Beverley McChesney, Frieda N. Politzer

Lecturer: Mina Ben-Meir

Research Associate: Geoffrey Nunberg

Visiting Emeritus Professor: Dwight Bolinger

Visiting Professor: Steven R. Anderson

Visiting Associate Professor: Elissa Newport

Visiting Lecturer: Ted Supalla

Special Language Program Coordinator: (Staff)

ENGLISH FOR FOREIGN STUDENTS:

Director: Beverley McChesney

Associate Director: Frieda N. Politzer

Senior Lecturers: Beverley McChesney, Frieda N. Politzer

Lecturer: Michele Fisher

OFFERINGS AND FACILITIES

Linguistics concerns itself with the fundamental questions: What is language, and how is it related to the other human faculties? In answering these questions, linguists consider language as a cultural and social phenomenon, and seek to determine what is unique in languages, what universal; how people learn language; how they use it; and how it changes.

Linguistics is therefore one of the cognitive sciences; it provides a link between the humanities and social sciences, and also with education and hearing and speech sciences.

The department offers courses at the undergraduate and graduate levels in the areas central to linguistic theory and analysis: phonetics, phonology, morphology, syntax, semantics, pragmatics, and language change. It also offers particularly strong areas of specialization in child language, formal (including computational) linguistics, sociolinguistics, and philosophy of language.

A variety of open forums are provided for the discussion of linguistic issues, including the weekly linguistics seminar and monthly child language lunches. A number of postdoctoral fellows in the Cognitive Science Group, which consists of linguists, philosophers, psychologists, and computer scientists, participate extensively in the activities of the department.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The undergraduate program in Linguistics stresses the study of language, both as a fundamental human faculty, and as a changing social institution. At the core of the program is a set of Linguistics Department courses on the nature of human language; in addition, the program draws on courses offered in other areas of the university.

This major cuts across the humanities, social sciences, and physical sciences, and provides a solid general education as a background for advanced studies in such fields as Anthropology, Communications, Computer Science, Education (Language Arts and Language Teaching), Hearing and Speech Sciences, Languages, Law, Linguistics, Philosophy, and Psychology.

Requirements for the A.B. include at least 45 units of coursework in Linguistics and related fields, and study of a foreign language.

1. Courses—A total of 45 units is required, including LL10. These 45 units must form a coherent program within one of the following areas of specialization, and must be approved by the undergraduate studies advisor. Specific requirements vary with each area. Detailed information is available from the Department of Linguistics (Bldg. 100).

a) Formal Linguistics—Formal Linguistics concerns the development of mathematical models of linguistic structure. Subspecializations are possible in syntax, semantics, phonology, or computational
linguistics. Designated courses may be selected in Philosophy, Computer Science, and Mathematics.

b) **Linguistics and Cognitive Science**—Cognitive Science seeks to understand the mind, specifically the nature of cognitive systems like language, the way language is represented in the mind, and the procedures by which language is learned and utilized. Designated courses in Psychology, Computer Science, Anthropology, and Philosophy may be selected.

c) **Linguistics In Education**—This area of study prepares a student for the application of linguistic tools to vital problems both in the learning process and in educational policy. Specific foci include language attitudes and bilingual education. Designated courses may be selected in Education, Anthropology and Communication.

d) **Linguistics and Literature**—This area of study focuses on analysis of discourse, literary vs. non-literary language, oral vs. written literature, and literacy. It provides suitable preparation for advanced study in literary theory, law, and other fields where textual analysis is important. L11 is required. Other requirements are determined by the undergraduate advisor in consultation with the appropriate language and literature department.

e) **The Linguistics of a Particular Language or Language Family**—This specialization, which provides a suitable preparation for foreign language teaching, translating or graduate study, may be arranged in any language or language family offered at Stanford (e.g., French, Spanish, Germanic, Chinese, Indo-European or African Linguistics). Specific requirements are determined by the undergraduate advisor in consultation with the appropriate language department.

f) **Sociolinguistics**—Sociolinguistics is the study of language as a social and cultural phenomenon. It includes such topics as the language of social class, ethnicity, nation, sex, religion; languages in contact, bilingualism, language and the law; nonverbal communication and conversational analysis; social factors in linguistic variation and change. Designated courses in Anthropology, Sociology, Education, and Communication may be selected.

g) **Speech Production and Perception**—This specialization focuses on behavioral and physiological aspects of normal and defective processes of human communication. It is an appropriate preparation for graduate work in speech, language, and hearing sciences, speech and hearing disorders, or neurolinguistics. Specific requirements include L120, L121 and L122. Designated courses in Psychology and Hearing and Speech Sciences may be selected.

h) **General Linguistics**—This area is intended for students wishing to specialize in more than one of the above-mentioned areas. Requirements include at least one course in each of the following subjects: phonetics, phonology, syntax, and semantics.

i) **Individually Designed Area**—An individually designed area of specialization different from any of the areas above can be arranged in consultation with the undergraduate studies advisor.

2. **Language**—Majors must have competence in a modern foreign language. This is usually demonstrated by completing a course on the second-year level, but the requirement may be met by special examination, presentation of superior foreign language placement scores, or certification in writing from an appropriate department. The requirement may be modified in the case of certain areas of specialization, in consultation with the undergraduate studies committee.

3. **Honors Program**—Students majoring in Linguistics who plan to apply for graduate studies in Linguistics or fields related to Linguistics should seek departmental honors. An application to pursue honors work should be presented well before the end of the junior year; approval will be given only to students who have maintained an average of B+ or better in the courses required for the major.

Honors students will take a total of 55 units. These will include L110, an area of specialization as above, plus Linguistics 97, Research in Linguistics (4 units) in the Autumn Quarter of the Senior Year, and Linguistics 98, the Honors Seminar (6 units) in the Winter Quarter. An honors project will be prepared on a topic approved by the faculty member in charge of the Honors Seminar. This project must be submitted in final, acceptable form no later than six weeks before the date of intended graduation.

**GRADUATE PROGRAMS**

The following requirements are in addition to the basic University requirement for the degree sought (refer to the "Degrees" section of this bulletin). Candidates should review depart-
mental Guidelines for A.M. and Ph.D. Degrees
for further particulars concerning these require-
ments.

MASTER OF ARTS
1. Candidates must demonstrate their pro-
ficiency in reading linguistic literature in one
foreign language, preferably French, Ger-
man or Russian. If the candidate's area of
specialization or professional goals make a
different kind of proficiency more appro-
priate or favor a language other than these
three, this requirement may be satisfied
otherwise through the mechanism of a peti-
tion subject to approval by the departmental
Graduate Studies Committee.
2. Courses—Candidates must complete a mini-
um of 36 units of graduate work in linguis-
tics and allied fields, including the seven
core graduate courses (Linguistics 200, 201,
220, 221, 230, 240 and 245), which total 30
units, and the option of up to 6 units for a
research project or A.M. thesis; see 4 below.
A grade point average of at least "B" must be
maintained for all degree program course
work.
3. Examination—Candidates must successfully
complete a qualifying examination on the
principles of general linguistics and the
theory, methods, and techniques of the main
linguistic disciplines. The examination is
based on the kinds of materials covered in
Linguistics 200, 201, 220, 221, 230, 240 and
245. It will normally be taken at the end of
the Spring Quarter of the first year.
4. Thesis—Terminal A.M. candidates are ex-
pected to present either a formal A.M.
thesis, fulfilling the University require-
ments specified in the "Degrees" section of
this bulletin, or a research paper of A.M.
scope.

PhD MINOR IN LINGUISTICS
1. Courses—Candidates must complete 30
units of course work in Linguistics at the 100
level or above, including L120, L130 and
L140 (or equivalent courses at a more ad-
vanced level.) The student's program should
be worked out in advance with the student's
advisor and approved by the Ph.D. minor
advisor.
2. Research project (optional) — Candidates
may elect to present a paper which inte-
grates the subject matter of linguistics into
the field of specialization of the candidate.
3. The linguistics advisor will serve on the
candidate's University Oral Examination
committee and may request that up to one-
third of the examination be devoted to the
minor subject.

DOCTOR OF PHILOSOPHY
1. Language—Candidates must demonstrate
their ability to read at least one foreign lan-
guage with sufficient facility to understand
and to interpret linguistic research publish-
ed in that language. (Particular areas of
specialization may require additional re-
search languages.)
In addition, each candidate must demon-
strate an explicit in-depth knowledge of the
structure of at least one language (normally
neither the candidate's native language nor
the language used for the reading exam).
2. Courses—A minimum of 80 units of grad-
uate work beyond the A.B. or B.S. exclusive
of dissertation units or, beyond the A.M., 40
units exclusive of dissertation units. This
includes the seven core courses in linguis-
tics, Linguistics 200, 201, 220, 221, 230, 240,
245 (30 units normally to be taken in the first
year), and also Linguistics 257, 265 (normal-
ly to be taken in the second year). Candid-
ates must achieve a grade of B or better in
each of these courses.
3. Examinations—Successful completion of a
qualifying examination on the principles of
general linguistics and the theory, methods,
and techniques of the main linguistic disci-
plines. The examination is based on the
kinds of materials covered in Linguistics
200, 201, 220, 221, 230, 240 and 245. It will
normally be taken at the end of the Spring
Quarter of the first year.
4. Teaching—A minimum equivalent to one-
half of one quarter during the second or third
year in residence. May be fulfilled by Lin-
guistics 396.
5. Research—A research paper, normally to be
completed by the end of the Autumn quarter
of the second year. May be fulfilled by Lin-
guistics 398.
6. Colloquia—Two oral presentations exclu-
sive of the oral presentation of thesis pro-
duction (see 7a below). This requirement is
satisfied by class presentations, conference
papers, or talks in the Linguistics Seminar.
Both should be given during the first three
years of study.
7. Dissertation—
a) Oral presentation of thesis proposal in the
Linguistics Seminar.
b) Approval of dissertation topic and ap-
pointment of a dissertation committee by
the Chairman.
c) Successful passing of a University Oral
Examination on the dissertation project
and related areas.
d) Dissertation (up to 15 units).
FOREIGN LANGUAGES

The Department of Linguistics administers a number of different foreign language programs, including African Languages, Mideastern Languages, the Special Language Program and the Program in English as a Foreign Language. Course offerings for each of these language programs are presented immediately following the linguistics courses in this section of the bulletin.

LINGUISTICS COURSES

Courses with two-digit numbers are primarily designed for undergraduates. Courses with 100-level numbers are designed for advanced undergraduates, those with numbers 200 and above are designed primarily for graduate students. With consent of instructor, certain of these 200-level courses may be taken for credit by qualified undergraduates.

At all levels, the course numbering indicates a special area, as follows:

- 00-19 General
- 20-29 Phonetics, Phonology & Morphology
- 30-44 Syntax, Semantics & Pragmatics
- 45-54 Language Change, Language & Culture
- 55-64 Sociolinguistics
- 65-74 Psycholinguistics
- 75-79 Computational Linguistics
- 80-89 Linguistic Analysis of a Language
- 90-94 Methods and Applied Linguistics
- 95-99 UG Honors; Graduate Directed Work, Theses, Dissertations

10. Introduction to Linguistics—A general introduction to the nature of human language and the methods of modern linguistics. Topics include: comparisons between human language and animal communication, how children acquire language, non-verbal communication, language change, universals, the relationship between language and society, and the application of linguistic science to social, educational, and political problems. (DR:4)

4 units, Aut (Poser, Sag)
Spr (Ferguson, Rickford)

11. Linguistics and Literature—(Same as English 101.) An introduction to English linguistics and applications of linguistic concepts to literary analysis. Emphasis on the phonological, syntactic, semantic and pragmatic structure of English, with some attention to regional and social dialects. (DR:4)
given 1984-85

15. Language and Speech Disorders—Introductory survey of disorders of human communication. The course focuses on the major congenital and acquired pathologies (e.g. deafness, aphasia, articulatory deficits, vocal malfunctions), their physiological bases and remediation.

3 units, Aut (Huntington)

45. Language and Culture—(Same as Anthropology 4.) Lecture course on the ethnography of communication and theories of language and culture. Intensive analysis of linguistic repertoire, rules of use, ethnosemantics, and linguistic history of a single speech community. Comparison with other speech communities throughout the world. (DR:4)

alternate years, given 1984-85

50. The Structure of English Words—This course is devoted to analyzing English vocabulary words in order to determine their meanings. There are two goals. The first is to increase the student's vocabulary. The second is, by enumerating the principles behind changes in pronunciation and meaning, to take some of the mystery out of the processes that have made English vocabulary what it is today.

4 units, Win (Leben)


alternate years, given 1984-85

57. Language Minorities in Modern Nations — Social, historical, and linguistic aspects of language minorities in a number of nations, comparing patterns of language use and national language policies. Deals with the rise of language nationalism in Europe, the spread of English and other languages of wider communication, and the world-wide resurgence of ethnicity and language loyalty.

4 units, Win (Ferguson)

75. Computers and Language—(Same as Computer Science 75.) A basis for understanding computer uses dealing with language and implications of computer systems in everyday life situations. Introduces basic principles of computing and linguistics through lectures, films, discussions and demonstrations of existing systems. Term paper required. No prerequisites. Computer background not required. Enrollment limited. (DR:4) or (DR:8)

4 units, Spr (Winograd)

81. Introduction to the Germanic Languages —(Same as German Studies 19A/119) Survey of
the oldest attested stages of the Germanic language family, including Gothic, Old Norse, Old Saxon, Old English, Old High German, Old Dutch, Old Frisian. Presentation both of external history and internal relationships. (DR:4)

3 units, Spr (Robinson)

85. Black English—Survey of the features of the English vernacular spoken by Black Americans, especially in big city settings, and its relation to the creole English dialects spoken on the south Carolina Sea Islands ("Gullah"), in the Caribbean, and West Africa. The expressive uses of Black English (e.g., in soundin', and rappin') will also be considered, and its educational implications will be explored. (DR:4)

4 units, Aut (Rickford)

90. Critical Thinking—(Same as Philosophy 56.) An introductory course on reasoning, combining a survey of some relevant philosophical issues with extensive practice in interpreting, analyzing, and criticizing arguments. Special attention will be paid to legal reasoning, examining relevant court opinions.

4 units, Spr (Wasow)

92A. Introduction to Methods of Teaching English as a Foreign Language—A practical approach to problems of teaching English to speakers of other languages, including a survey of those features of English phonology, morphology, and syntax which present particular difficulties, presentation of problems, construction of exercises and lesson planning. For the duration of the course, each student is required to serve as a tutor to an individual who is learning to speak English.

3 units, Win (McChesney)

92B. Practicum in TEFL—Workshop for volunteer teachers currently active in area TEFL programs or planning to teach English abroad. Course includes demonstration teaching, discussion of teaching problems, and evaluation of classes observed. Prerequisite: 92A or equivalent.

1-2 units, Spr (McChesney)

97. Research in Linguistics—Introduction to research goals and methods in linguistics and related disciplines. Assigned readings and presentations by different faculty members. Open to undergraduate honors majors, others with consent of instructor.

4 units, Staff

98. Honors Seminar—Largely individual work on honors projects. Each student will have a faculty member as project supervisor (usually the student's advisor). Class meetings chiefly devoted to progress reports and discussion of topics related to the projects. Work on the honors project may continue into the Spring Quarter, but the project must be completed no later than six weeks before the date of intended graduation. Prerequisite: 97 or consent of instructor.

6 units, Win (Staff)

99. Independent Study.

1 or more units, any quarter (Staff) by arrangement

101. Mathematics for the Study of Language—Introduction to mathematical methods and results relevant to the analysis of natural language syntax and semantics. Topics will include elementary logic, model theory, automata theory, and the Chomsky hierarchy of grammars. No prerequisite, (DR:4) or (DR:6).

4 units, Aut (Wasow)

110. Linguistic Theory and Analysis—(Same as Anthropology 70.) An introduction to the theoretical concepts and analytic techniques of modern linguistics. Emphasis on the solution of problems in phonology, morphology, syntax, semantics and historical reconstruction, drawn from a variety of languages. Prerequisite: 10 or consent of instructor.

4 units, Win (Nunberg)

120. Foundations of Phonetic Analysis—Fundamentals of phonetic analysis (physiological, acoustic, perceptual); survey of human articulatory capabilities.

4 units, Aut (Leben, Poser)

121. Physiology of Speech Production—(Same as Hearing and Speech Sciences 230.) Study of the structure of the speech mechanism and its function. Includes laryngeal control in the production of segmented and prosodic features of speech as well as articulatory coordinations and control. Prerequisite: course in phonetics or consent of instructor.

4 units, Win (Huntington)

122. Speech Perception—(Same as Hearing and Speech Sciences 231.) Perceptual and physiological correlates of the acoustic constituents of speech. Prerequisite: course in phonetics, Linguistics 121 or consent of instructor.

3 units, Spr (Huntington)

130. Introduction to Syntax—Introduction to the theory of syntax. The course deals with analyses of various grammatical constructions, primarily in English, and their consequences for a general theory of language. Practical experience in forming and testing linguistic hypotheses, reading and constructing rules.

4 units, Win (Bresnan, Sag)

140. Semantics and Pragmatics—A survey of fundamental issues in the analysis of meaning in natural language. Includes an introduction to model-theoretic semantics, and selected read-
155. Introduction to Sociolinguistics—The study of language in society. Social dialects, awareness of social and ethnic differences in speech. Prestige and stigma associated with different ways of speaking. The aim of this course is to train students in the systematic observation of speech; there will be some practice in participant-observation, interviewing and recording of conversations. Prerequisite: 10 or its equivalent.

alternate years, given 1984-85

160. Languages in Contact—Study of the different kinds of situations in which two or more languages remain in or come into contact, and the sociolinguistic effects of such contact. Topics include borrowing and linguistic interference, language convergence and divergence, multilingualism, pidginization, decreolization, interlanguage and other continua, social and psychological dimensions of language contact.

4 units, Win (Rickford)

161. Introduction to Multilingualism — Surveys key issues in the study of individual and societal multilingualism (including bilingualism). Topics include: types of multilingualism, multilingualism and intelligence, code-switching, language acquisition and language change, language attitude and function in multilingual settings, linguistic interference. Students are expected to do research on the characteristics of multilingualism in a country of their choice.

alternate years, given 1984-85

162. Pidgins and Creoles—(Same as Anthropology 177.) Lecture on the formation of simplified contact languages (pidgins) and their subsequent elaboration. Emphasis on the relationship between language structure and function, language universals, and the relevance of political power, ethnic identity, and social structure in the contact speech community. Attention given to other simplified languages and registers. Prerequisite: an introductory course in linguistics or anthropology or consent of instructor.

alternate years, given 1984-85

165. Child Language Acquisition I—(Same as Psychology 240.) Review of present knowledge of processes of language acquisition from a linguistic point of view. Survey of recent and past literature. Prerequisite: 10 or consent of instructor.

4 units Aut (Ferguson)

170. Language and Thought—(Same as Psychology 146.) Survey of psycholinguistics, including speech perception, sentence structure and sentence processing, language acquisition by children, and the biological bases of language. Consideration of the relationship between constraints on the structure of natural languages and the processes by which they are produced, comprehended, and acquired.

4 units Win (Newport)

181. Linguistics and the Analysis of German — (Same as German Studies 212/312.) An introduction to linguistic theory and analysis with special emphasis on the analysis of modern German.

3-5 units, Win (Robinson)

182. Introduction to German Dialects—(Same as German Studies 118/218) Introduction to the major dialects of German-speaking Europe through texts, tapes, lectures and presentations by native speakers; also a general introduction to the field of dialect geography.

alternate years, given 1984-85

185. The Structure of American Sign I—Overview of the phonology, morphology, and syntax of American Sign Language, with emphasis on comparisons between signed language and spoken language.

4 units, Win (Supalla)

186. The Structure of American Sign II—In-depth study of current issues in the linguistics of American Sign Language, with special attention to morphology and syntax. Prerequisite: 185 or consent of instructor.

4 units, Spr (Supalla)

200A,B,C. Proseminar—The diversity of linguistic theories, types of language, types of structure, types of social settings. Designed for graduate students taking degrees in Linguistics.

2 units, Aut (Nunberg)
Win (Wasow)
Spr (Rickford)

201. Mathematical Models of Natural Language — (Same as Linguistics 101, with additional requirements.) Introduction to mathematical methods and results relevant to the analysis of natural language syntax and semantics. Topics will include elementary logic, model theory, automata theory, and the Chomsky hierarchy of grammars. No prerequisite: (DR:4) or (DR:6)

4 units, Aut (Peters)

202. Mathematical Linguistics—(Same as Philosophy 292.) Investigation of mathematical results relevant to empirical issues of linguistics. Prerequisite: 201 or consent of instructor.

4 units, Spr (Peters)
207. Discourse and Ideology—(Same as Spanish and Portuguese 310.) Creation of meaning as a social process, ways in which ideology is produced, reproduced, and transformed in linguistic interaction, whether and how American competence models can interlock with theories that see language as constituting social reality and self. Readings on the concept of socially determined meaning, discursive practices in the French tradition, British empirical analysis, American sociolinguistics.

3-5 units, Spr (Pratt)

208. Typology and Universals of Language—(Same as Anthropology 174.) The relation between typology and universals; universals in phonology, grammar and semantics; universals and linguistic change; the role of universals in overall explanatory theory in linguistics; universals research in contemporary linguistic theory.

alternate years, given 1984-85

214. History of Linguistics—The historical development of linguistic theory and method with major emphasis on the Western tradition up to the present.

alternate years, given 1984-85

215. Language and Speech Disorders—Directed reading on selected congenital and acquired pathologies (e.g. deafness, aphasia) which underlie language deficits. Given any quarter. May be repeated for credit. Prerequisite: Linguistics 15 or consent of instructor.

1-3 units (Huntington) by arrangement

220. Foundations of Phonetic Analysis—(Same as Linguistics 120, with additional requirements.) Fundamentals of phonetic analysis (physiological, acoustic, perceptual); survey of human articulatory capabilities.

4 units, Aut (Leben, Poser)

221. Phonology—Basic issues in contemporary phonology, including developments in generative phonology. Description of representative sound systems, sound processes, and sound changes found among the languages of the world. Practice in problem solving. Prerequisite: 220 or consent of instructor.

4 units, Win (Leben)

222. Phonological Theory—Survey of contemporary theoretical issues in phonology, with detailed treatment of topics that have recently led to significant results. Prerequisite: 221.

4 units, Spr (Poser)

223. Practicum in Phonology and Morphology—Practice in problem solving, using data from a lesser known language. The course is designed to increase proficiency in dealing with linguistic evidence and to contribute to scholarship in lesser known languages.

alternate years, given 1984-85

224. Topics in Phonetics and Phonology—May be repeated for credit.

History of Twentieth Century Phonology.
4 units, Aut (Anderson)

Tone and Intonation.
4 units, Win (Poser)

225. Morphology—Survey of types of word formation processes found in the world's languages. Morphology in relation to phonology, syntax, and semantics. Prerequisite: consent of instructor.

alternate years, given 1984-85

227. Instrumental Phonetics—Techniques of instrumental research in speech perception and production. Theory and instrumentation for analysis and manipulation of speech signals. Laboratory course. Given any quarter. Prerequisite: consent of instructor.

2-4 units, (Huntington) by arrangement

230. Introduction to Syntactic Theory—(Same as Philosophy 284 and Linguistics 130, with additional requirements.) Introduction to the theory of syntax. The course deals with analyses of various grammatical constructions, primarily in English, and their consequences for a general theory of language. Practical experience in forming and testing linguistic hypotheses, reading and constructing rules.

4 units, Win (Bresnan, Sag)

231. Intermediate Syntax—Constraints on the form and functioning of generative grammars. Topics include anaphora, island constraints and the roles of transformations, lexicon, and grammatical relations in syntactic theory. Prerequisite: 230 or consent of instructor.

4 units, Spr (Bresnan)

233. Topics in Syntactic Theory—In-depth study of particular topics in natural language syntax which are of particular theoretical interest. May be repeated for credit.

Theories of Anaphora.
4 units, Aut (Bresnan)

Generalized Phrase Structure Grammar.
4 units, Win (Sag)

240. Semantics and Pragmatics—(Same as Linguistics 140, with additional requirements.) A survey of fundamental issues in the analysis of meaning in natural language. Includes an introduction to model-theoretic semantics, and selected readings in the philosophy of language. Other topics addressed include the role of semantics in generative grammar, conversational implicature, and speech acts. Prerequi-
sites: either 201 or Philosophy 56, or consent of instructor.
4 units, Spr (Peters)

243. Topics in Semantics/Pragmatics—Detailed study of selected topics in natural language semantics or pragmatics. May be repeated for credit.
alternate years, given 1984-85

244. Philosophy of Language—(Same as Philosophy 181.) Issues in the philosophy of language, with special reference to the views of Frege, Russell, and Wittgenstein. Prerequisite: Philosophy 80 or consent of instructor.
4 units, Spr (Almog) MWF 9

245. Language Change—(Same as Anthropology 245). The nature of linguistic change in phonology, grammar and semantics, problems of internal and comparative reconstruction, and basic issues in the explanation of diachronic processes in language. Prerequisite: 120 and 221 or consent of instructor.
4 units, Aut (Anderson)

246. Topics in Language Change—Topic for 1983-84: Morphological change. May be repeated for credit.
4 units, Aut (Anderson)

249. Introduction to Indo-European Linguistics—(Same as Classics 153, 253.)

256. Topics in Sociolinguistics—May be repeated for credit.
alternate years, given 1984-85

257. Sociolinguistic Theory and Analysis — Graduate-level introduction to the kinds of problems with which sociolinguists deal, and the theories and methods of analysis which they have developed. Special attention to the question of what general linguistics might gain from the sociolinguistic approach to problems of linguistic theory and description, and linguistic change. Prerequisite: Graduate standing in Linguistics or consent of instructor.
4 units, Spr (Ferguson)

259. Literacy: Social and Historical Perspectives—(Same as Education 366.) Historical examination of writing systems, the impact of print, and links between social mobility and literacy will be used to identify norms and practices which affect the teaching and learning of reading and writing today. Emphasis will be on the social functions of literacy in work, home, and school settings. Myths regarding literacy’s consequences for cognition, socioeconomic mobility, and the predictability of citizen behaviors will be examined with respect to recent social historical and other social science research.
4-5 units, Aut (Heath)

260. Topics in Multilingualism.
alternate years, given 1984-85

262. Language Planning and Public Policy—(Same as Education 248.) Overview of language planning theories and implementation strategies and impacts on public policies. Among topics to be covered are: sociolinguistic surveys; information resources in language planning; approaches of the social sciences to language planning; and language law and its relation to constitutional law and state systems. Cross-national and historical dimensions of issues in language policy-making provide comparative perspective for in-depth examination of language situations within the United States.
5 units, Spr (Heath) MW 1:15-3:05 and by arrangement

265. Child Language Acquisition I — (Same as Linguistics 165 and Psychology 240.) Review of present knowledge of processes of language acquisition from a linguistic point of view. Survey of recent and past literature.
4 units, Aut (Ferguson) MW 3:15-5:05

266. Child Language Acquisition II—(Same as Psychology 241.) Theoretical issues in first language acquisition, with detailed examination of the evidence available. Interaction of linguistic and psychological factors.
alternate years, given 1984-85

267. Topics in Language Acquisition—(Same as Psychology 251.) Variable topics selected from semantics, syntax, morphology, discourse structure or phonology. 1983-84: Acquisition of morphology and syntax.
4 units, Spr (Netoport)

268. Acquisition of Phonology—Current state of knowledge on children’s phonological development. Relation of perception to production, babbling to early speech, child phonology to adult phonology. Relevance of phonological theory to child development and vice versa. Prerequisite: 221 or equivalent.
4 units, Win (Ferguson)

271. Induction—(Same as Psychology 277.) Consideration of the problem of inductive learning in language acquisition and concept formation; discussion of issues and possible solutions to the induction problem, e.g. through domain-specific constraints on inductive outcomes vs. domain-general constraints on inductive procedures.
4 units, Win (Newport) by arrangement

275. Computational Models for Syntax of Natural Language—(Same as Computer Science 275.) Introduction to formal systems and computer implementations for syntax. Survey
of relevant material from linguistics and formal language theory. Review and discussion of past and current parsing systems. Overview of relevant aspects of the syntax of English.

3-4 units, Win (Winograd)

276. Computational Models for Semantics of Natural Language—(Same as Computer Science 276.) Conceptual overview of problems of meaning. Formalisms from logic, computation theory, psychology and linguistics, relevant to computer systems for natural language. Survey and critical discussion of current research on computational approaches to natural language.

3-4 units, Win (Brachman)

277. Topics in Computational Linguistics—(Same as Computer Science 277.) Computational models of discourse. May be repeated for credit.

3 units, Aut (Winograd)

281. The Phonology of German—(Same as German Studies 214/314.) Systematic treatment of the German sound system, especially within the framework of generative phonology.

alt years, given 1984-85

282. The Transformational Grammar of German—(Same as German Studies 213/313.) Study of the syntactic mechanisms of German within the framework of transformational grammar.

(Robinson) alt years, given 1984-85

285. The Structure of Hausa—A sketch of Hausa syntax, morphology, and phonology, with emphasis on points of current theoretical interest. Prerequisite: 220 and 230 or consent of instructor.

4 units, Spr (Leben)

288. The Structure of Modern Chinese—(Same as Asian Languages 291.) Prerequisite: 23 or equivalent. Recommended: a general introductory course in linguistics.

4 units, Spr (Kao) by arrangement

290. Research Methodology:—Introduces the student to social science research methods within the context of a given area of linguistic research.

alt years, given 1984-85

291. Linguistic Field Methods—Provides an overview of the principal methods of data collection in linguistics, including an assessment of their complementary strengths and weaknesses. Reading, discussion, and practice revolve around the following methods: oral elicitation, survey questionnaires, the Matched Guise Technique, tape recorded sociolinguistic interviews, and other methods of extending the stylistic continuum and tapping linguistic intuitions.

4 units, Win (Rickford)

292. Linguistics and the Teaching of English as a Foreign/Second Language—(Same as Education 282.) Linguistic aspects of the problems of teaching English to speakers of other languages and standard English to speakers of other dialects. For the duration of the course, each student is required to serve as a tutor to an individual who is learning to speak English. Prerequisite: introductory course in linguistics or consent of instructor.

4-5 units, Aut (Politzer)

395. Thesis Project (A.M.)

1-5 units, any quarter (Staff) by arrangement

396. Directed Teaching.

1-5 units, any quarter (Staff) by arrangement

397. Directed Reading.

1-5 units, any quarter (Staff) by arrangement

398. Directed Research—Research at predissertation level.

1-6 units, any quarter (Staff) by arrangement

399. Dissertation Research.

1-15 units, any quarter (Staff) by arrangement

FOREIGN LANGUAGES

AFRICAN LANGUAGES

(600-619)

602A,B,C. Beginning Hausa—Successful completion of 602C may fulfill the foreign language requirement.

5 units, Aut, Win, Spr (Leben)

603A,B,C Intermediate Hausa.

5 units, Aut, Win, Spr (Staff)

606A,B,C Beginning Swahili—Successful completion of 606C may fulfill the foreign language requirement.

5 units, Aut, Win, Spr (Staff)

607A,B,C Intermediate Swahili.

5 units, Aut, Win, Spr (Staff)

610A,B,C. Beginning Yoruba.

3 units, Aut, Win, Spr (Staff)

611A,B,C. Intermediate Yoruba.

3 units, Aut, Win, Spr (Staff)
Other African languages may be offered on request. In the past several years, these courses have included:

- 608A,B,C. Amharic.
- 612A,B,C. Lingala.
- 616A,B,C. Setswana.

### SPECIAL LANGUAGE PROGRAM (620-679)

The Special Language Program offers a number of foreign languages not otherwise taught at Stanford. Courses planned for 1983-84, given sufficient enrollment, are:

- **620A,B,C. Beginning Arabic**—Successful completion of 620C may fulfill the foreign language requirement.
  - 4 units, Aut, Win, Spr (Staff)
- **621A,B,C. Intermediate Arabic.**
  - 4 units, Aut, Win, Spr (Staff)
- **628A,B,C. Beginning Accelerated Hebrew**—Successful completion of 628C may fulfill the foreign language requirement.
  - 5 units, Aut, Win, Spr (Ben-Meir)
- **629A,B,C. Intermediate Accelerated Hebrew.**
  - 5 units, Aut, Win, Spr (Ben-Meir)
- **630A,B,C. Advanced Accelerated Hebrew.**
  - 5 units, Aut, Win, Spr (Ben-Meir)
- **640A,B,C. Beginning Danish.**
  - 3 units, Aut, Win, Spr (Staff)
- **642A,B,C. Norwegian.**
  - 3 units, Aut, Win, Spr (Staff)
- **644A,B,C. Beginning Swedish.**
  - 3 units, Aut, Win, Spr (Staff)
- **648A,B,C. Beginning Cantonese.**
  - 3 units, Aut, Win, Spr (Staff)
- **650A,B,C. Beginning Navajo.**
- **652A,B,C. Beginning Hindi.**
- **654A,B,C. Beginning Tagalog.**
- **658A,B,C. Beginning Korean.**
- **660A,B,C. Beginning Taiwanese.**
- **666A,B,C. Beginning Thai.**
- **672A,B,C. Beginning Hungarian.**

All beginning level 3 unit courses are offered on a Pass/No credit basis only.

Other languages will be offered only on request. Requests must be made by the end of Autumn registration period at the Special Language Program desk in the registration arena. The course offerings for the entire year are decided immediately following Autumn registration, and additional new courses cannot usually be given. If a sufficient number of requests are received and suitable arrangements for instruction can be made, a 3 units per quarter course will be set up; grading is on a Pass/No Credit basis. For further information, consult Coordinator, Special Language Program, Linguistics, Building 100.

Languages offered on the basis of student requests during the last few years have included:

- **632A,B,C. Beginning Armenian (Computer-Assisted).**
- **636A,B,C. Beginning Icelandic.**
- **638A,B,C. Beginning Finnish.**
- **646A,B,C. Beginning Quechua.**
- **650A,B,C. Beginning Navajo.**
- **652A,B,C. Beginning Hindi.**
- **654A,B,C. Beginning Tagalog.**
- **658A,B,C. Beginning Korean.**
- **660A,B,C. Beginning Taiwanese.**
- **666A,B,C. Beginning Thai.**
- **672A,B,C. Beginning Hungarian.**
ENGLISH AS A FOREIGN LANGUAGE (685-699)

The courses below represent the basic offerings in English as a Foreign Language. Each quarter, additional sections of these courses are scheduled as needed. Those students who are required to take 697 should normally expect to take the subsequent course in the sequence during a succeeding quarter.

During the regular 8-week summer session, courses in spoken and written English up to a maximum of 8 units will be offered.

A 9-week program in Intensive English and Academic Orientation for Foreign Graduate Students is also offered in the summer. This program is open to qualified graduate students who have been admitted to degree programs at other United States institutions as well as those who have been admitted to Stanford for the following Autumn Quarter.

In addition, a late-summer 5-week intensive program is offered.

690. Spoken Usage—Structured practice in spoken English with emphasis on current usage in a variety of natural situations. Review and practice of grammatical patterns as needed.
3 units, Aut, Win, Spr (Staff) by arrangement

691 A. Discussion and Speech—Opportunity to participate in and lead seminar discussions on academic and general topics. Emphasis on fluency and intelligibility; feedback from instructor on language and effectiveness.
3 units, Aut, Win, Spr (Staff) by arrangement

691B. Making Oral Presentations in English—Opportunity to make biweekly oral presentations to a small group, followed by short discussions. Emphasis on appropriate language and style in academic or non-academic settings. Feedback from instructor and other students.
3 units, Aut, Win, Spr (Staff) by arrangement

692. Speaking and Teaching in English—For non-native speakers who must teach, present papers or take orals in English. Focus on developing clarity, intelligibility, and effectiveness in oral presentations. With collaboration of Center for Teaching and Learning, various methods of feedback will be utilized (e.g., audio, video, peer and staff evaluations). Techniques of self-criticism encouraged. May be taken without credit by those on Teaching Assistantships.
3 units, Aut, Win (McChesney and Fisher) by arrangement

693. Aural Comprehension—Graded exercises in listening to lectures, dialogs, and discussions with evaluation of comprehension. Prerequisite: consent of instructor.
3 units, Aut, Win, Spr (Staff) by arrangement

695. Special Topics in English—Topics such as academic orientation, general vocabulary, reading comprehension, or pronunciation, to be determined each quarter according to enrollment.
3 units, Aut, Win, Spr (Staff) by arrangement

697. Written English I—Intermediate work in expository writing with special attention to correct grammatical usage. Prerequisite: consent of instructor.
4 units, Aut, Win (Staff) by arrangement

698A. Written English II—For students with some facility in written English. Emphasis on fluency, idiomatic usage, and style. Special attention given to mechanics and form appropriate to academic papers. May be repeated for credit. Prerequisite: consent of instructor.
3 units Aut, Win, Spr (Staff) by arrangement

698B. Written English II—Weekly class meetings grouped by academic interests, plus one individual conference per week. Consent of instructor.
3 units, Aut, Win, Spr (Staff) by arrangement

699. Tutorial in Academic Writing—For students with heavy writing loads, primarily dissertation and research writing, whose problems with English are clearly the result of non-native use of the language and who demonstrate potential for rapid improvement with individualized instruction. Focus on student's work in progress. Emphasis on self-correction and achievement of independent control. Recommendation of major adviser and consent of instructor required.
2 units, Aut, Win, Spr (Staff) by arrangement
At Stanford courses in literature are taught in a number of departments and programs, and the courses work with texts in many languages. However, departments and programs do offer specific courses which use texts translated into English in order to make these works available to students who do not read the original language. The Advisory Committee on Literature (Humanities and Sciences) has prepared the following list of courses to assist students in selecting courses which feature foreign works in English translation. Please consult departmental listings for further information.

**ASIAN LANGUAGES**

110 (257). Japanese-Western Literary and Cultural Interaction.

114. Haiku.

125. Japanese Culture Through Novels and Films.

131. Chinese Poetry and Drama in Translation.


133. Modern Chinese Literature in Translation.


177 (277). Classic Japan.


197 (297). Images of Women in Modern Japanese Literature.

255A. The Nature of Literature: Japanese and Western Views.

255B. Chinese and Western Theories of Literature.

**CLASSICS**

11. Age of Heroes.


135. Classical Conventions in European Lyric.

172. Classical Influences in Modern Literature

**DRAMA**

155. Modern Drama (1870-1918).

352. Seminar: Theatre of the Absurd.

355. Seminar: German Drama from Frisch to Kroetz.

**FRENCH AND ITALIAN**

115. Existentialism (Julliard).

119. Literature and Marxism (Apostolides).

185. Simone de Beauvoir (Giraud).

**GERMAN STUDIES**

19A. Introduction to the Germanic Languages.

31A, 32A, 33A. German Culture and Civilization.

35A. Images of Women in German Film.

141A. Friedrich Nietzsche.

151A/251A. The Heroic Literature of Northern France.

179A. European Feminist Theory.

284A. Joyce, Proust, Mann.

291A. Literature of Decadence.

372A. Seminar in Romantic Drama.

**HUMANITIES SPECIAL PROGRAMS**

61. The World of Classical Antiquity.


63. From the Enlightenment to the Present.

301. The Classical Period.

302. The Roman and Early Christian Periods.

303. The Middle Ages.

304. The Renaissance.

305. The Early Modern Period.

306. Modernism and the Consciousness of the Humanities.
MATHEMATICAL SCIENCES

Committee in Charge: Bradley Efron (Statistics), Chairman; Paul W. Berg (Mathematics), Richard W. Cottle (Operations Research), John G. Herriot (Computer Science), Joseph B. Keller (Mathematics), John McCarthy (Computer Science), Ernst W. Mayr (Computer Science)

Ex-officio members: Thomas M. Cover (Electrical Engineering and Statistics), John T. Gill III (Electrical Engineering), and David R. Rogosa (Education)

STATEMENT OF PURPOSE

This interdepartmental, interschool undergraduate program is designed as a major for students interested in the mathematical sciences or in the use of mathematical ideas and analysis in problems in the social or management sciences. It provides a core of mathematics basic to all of the mathematical sciences, and an introduction to the concepts and techniques of automatic computation, optimal decision making, probabilistic modeling, and statistical inference; it also provides an opportunity to undertake elective work in any of the mathematical science disciplines at Stanford.

The program utilizes the faculty and courses of the Departments of Computer Science, Mathematics, Operations Research, and Statistics. It is intended to prepare students for graduate study or employment in the mathematical sciences or in those areas of applied mathematics which center around the use of high-speed computers and are concerned with the problems of the social and management sciences.

The requirement for the bachelor's degree, beyond the University's basic requirement, is an approved course program of 74 to 79 units, distributed as follows:

1. Mathematics (33 units): Calculus and Analytic Geometry through Mathematics 44, or equivalent; Linear Algebra and Matrix theory (113) or Linear Algebra and its Applications (113S); Linear Algebra and Matrix Theory (114) or Linear Algebra and its Applications (114S); Fundamental Concepts of Analysis (115); Modern Algebra (120) or Modern Algebra and its Applications (120S); Differential Equations (130).

2. Computer Science (9 units): Introduction to Structured Programming (106); and Fundamentals of Computer Science (108A,B); or Numerical Analysis (137A and either 137B or 137C); or Mathematical Theory of Computation (156) and Recursive Programming and Proving (206); or Concrete Mathematics (155) and Introduction to Algorithms and Data Structures (161).

3. Operations Research (7-9 units): Introduction to Operations Research (151,153); or Linear Programming (240) and Models in Operations Research (250,251).

4. Statistics (12 units): Theory of Probability (116); and Statistical Inference (119, 120); or Data Analysis (217).

5. Electives (12 units): Four 100-level courses in the Mathematical Sciences of which two must be chosen from the following: Mathematics 101; Mathematics 116; Computer Science 111; Computer Science 137A; Computer Science 155 (or Computer Science 150 or Operations Research 245); Statistics 217.

The choice of electives will be determined by the student's interest. In particular, students planning doctoral study in Operations Research or in Numerical Analysis (Computer Science) are advised to take Mathematics 116.

All courses used to fulfill the major requirement must be taken for a letter grade, with the exception of courses offered Pass/No Credit only. The student must have an average grade of "C" or better in all course work used to fulfill the major requirement. Majors must file a plan with their advisors for completing their degree requirements at least three quarters before their graduation.
HONORS PROGRAM IN MATHEMATICAL SCIENCES

The Honors Program in Mathematical Sciences is designed to encourage a more intensive study of mathematical sciences than the program provided by the Bachelor of Science. In addition to meeting all requirements for the Bachelor of Science in Mathematical Sciences, the student must meet the following:

1. An average letter grade equivalent in Mathematical Sciences courses of at least 3.4.
2. Completion of at least 15 units in Mathematical Sciences in addition to the requirements for the Mathematical Sciences major listed above. These courses should form a sustained effort in one area and constitute a program which is approved by the committee in charge of the Mathematical Sciences Program.
3. Included in the above 15 units must be at least one of the following: (a) an approved higher level graduate course, (b) participation in a small group seminar, or (c) at least three units of directed reading.

MATHEMATICS

Emeriti: Harold M. Bacon, Ralph Phillips, George Polya, Menahem Schiffer, Gabor Szegö (Professors)
Chairman: Gregory Brumfiel
Vice Chairman: Paul W. Berg
Associate Professors: Ralph Cohen (on leave 1983-84), Peter Sarnak (on leave Autumn)
Assistant Professors: Steven Kerckhoff (on leave 1983-84), Dennis Stowe (on leave Spring), Lou van den Dries, Stephanos Venakides, Brian White
Acting Assistant Instructors: Robert Bartnik (on leave 1983-84), Doris Fischer-Colbrie, Ilan Vardi, Norman Wildberger
Visiting Professors: Richard Schoen, Benjamin Weiss

OFFERINGS AND FACILITIES

The Department of Mathematics offers programs leading to the degrees Bachelor of Science, Master of Science, and Doctor of Philosophy in Mathematics, and participates in the program leading to the degree B.S. in Mathematical Sciences.

INTRODUCTORY COURSES

The Department of Mathematics offers two sequences of courses in the calculus.
1. Calculus and Analytic Geometry (41, 42, 43) presents one-variable calculus and plane analytic geometry in the first two quarters (41, 42), and multi-variable differential calculus and space geometry in the third quarter (43).
2. Calculus and Analytic Geometry (19, 20, 21, 22, 23) covers the material of (41, 42, 43) in five quarters instead of three.
Pre calculus Mathematics (3) is offered for those who need or desire a better preparation in these subjects before entering one of the calculus sequences.
The introductory course in modern algebra is Linear Algebra (113 or 113S). There are no formal prerequisites for this course, but appropriate mathematical maturity is expected.

ADVANCED PLACEMENT FOR FRESHMEN

Secondary school students of unusual ability in mathematics often pursue one or more semesters of college-equivalent courses in mathematics while they are still in high school. Under certain circumstances it is possible for such students to secure both advanced placement and credit toward the bachelor's degree on the basis of these courses. A decision as to placement and credit will be made by the department after consideration of the student's performance on the Advanced Placement Examination in Mathematics (either forms AB or BC) of the College Entrance Examination Board. This examination is the only one used for this purpose. The department does not give its own Advanced Placement examination. For referral to an advisor on advanced placement, communicate with the Academic Secretary of the department.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The following departmental requirements are in addition to the University's basic requirements for the bachelor's degree:
1. Calculus and Analytic Geometry (courses 19, 20, 21, 22, 23, 44 or 41, 42, 43, 44). These courses should be started during the first year.

Students intending to go on to graduate work in mathematics are strongly urged to study at least one foreign language chosen from French, German, and Russian.

2. Nine courses each carrying at least three units credit, numbered 100 or above or 44H, 45H, distributed as follows: three courses in algebra or number theory, four courses in analysis, and two courses in geometry or topology. These will typically be chosen among the following: algebra—113 (or 113S), 114 (or 114S), 120 (or 120S), 121, 152; analysis—44H, 45H, 101, 106, 115, 116, 130, 131, 132; geometry—142, 143, 159. Graduate courses in the same subject may be substituted for the preceding courses—for example, 206A for 106.

3. Five additional courses, each carrying at least three credits, chosen from courses numbered 100 or above.

Mathematics majors must have at least a C average in all courses used to fulfill the major requirement. Letter grades are required in all courses used to fulfill the major requirement, except for those offered Pass/No Credit only and for cognate courses (see 4, below).

Students planning graduate study in mathematics are advised to include one or more 200 level courses in their programs and, to facilitate this, to complete 113 (or 113S), 114 (or 114S), 115 and 116 as early as possible.

4. One of the following options. The choice of (a) or (b) is recommended.

a) Physics 51, 53, 55, 57 (total, 15 units).

b) Any four quarters of physics lecture courses, chosen from those numbered 51 or above.

c) A series of courses, within which mathematics is applied in a significant manner. Students choosing this option must have their plans approved by the Undergraduate Affairs Committee of the Department of Mathematics.

Variations in the basic program described above are possible. In particular, students interested in applied mathematics may obtain the B.S. in Mathematics by taking a suitable program of courses in a field of application of mathematics in place of some of the courses prescribed above. Individual programs in such cases must be approved by the departmental Committee on Undergraduate Affairs.

To receive the departmental recommendation for graduation a student must have been enrolled as a major in the department for at least two full quarters, including the last full quarter before graduation, and must complete at least 15 units of 100 (or higher) level courses in the department.

More detailed information about the preceding and other aspects of the B.S. program is contained in the publication *Handbook for Mathematics Majors*, available on request from the Academic Secretary of the department.

HONORS PROGRAM IN MATHEMATICS

The Department of Mathematics offers a program leading to the degree of Bachelor of Science in Mathematics with Honors. Programs leading to this degree are formulated by individual students in consultation with a department representative. Typically such a program includes, beyond the courses required for the B.S. degree, electives including graduate courses and courses in Independent Work, with one of the latter culminating in a scholarly paper. Further details concerning admission to the program and a statement of the requirements of the program can be obtained from the Academic Secretary of the department.

BACHELOR OF SCIENCE IN MATHEMATICAL SCIENCES

The Mathematics Department participates with the Departments of Computer Science, Operations Research, and Statistics in a program leading to the degree of Bachelor of Science in Mathematical Sciences. See the Mathematical Sciences section of this bulletin.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The University's basic requirements for the master's degree (residence, etc.) are discussed in the section "Degrees" in this bulletin. The following are additional departmental requirements:

Candidates must complete an approved course program of 36 units beyond the departmental requirement for the B.S. degree. The candidate's program must include 18 units of courses numbered 200 or above. The candidate must have a B average over all course work taken in Mathematics, and a B average in the 200 level courses considered separately.

For the degree of Master of Science in Computer Science, see Computer Science Department material in this bulletin.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the doctorate (residence, dissertation, examination, etc.) are discussed in the section "Degrees" in this bulletin. The following are additional departmental requirements:

Candidates must complete an approved course program of 72 units beyond the departmental requirement for the B.S. degree. The candidate's program must include 36 units of courses numbered 200 or above. The candidate must have a B average over all course work taken in Mathematics, and a B average in the 200 level courses considered separately.
tion, etc.) are discussed in the “Degrees” section in this bulletin. The following are additional departmental requirements:

To be admitted to candidacy for the Ph.D. degree, a student must have successfully completed 27 units of graduate courses (i.e., courses numbered 200 and above). In addition the student must pass qualifying examinations given by the department.

Beyond the requirements for candidacy, the student must complete a course of study of at least 48 units approved by the Graduate Affairs Committee of the Department of Mathematics and submit an acceptable dissertation. The course program should display sufficient breadth in mathematics outside the student’s field of application of mathematics. In addition, the student must pass the University oral examination and pass a reading examination in two foreign languages, chosen from French, German, and Russian. A student must receive a grade B or better in a course to satisfy the Ph.D. requirement.

Training and experience in teaching is part of the Ph.D. program. Each student is required to teach or assist in teaching one course per quarter for three quarters. The quarters and nature of the teaching assignment will be determined by the department in consultation with the student.

For the degree of Doctor of Philosophy in Computer Science, see the Computer Science Department material in this bulletin.

For further information concerning degree programs, requirements for a Ph.D. minor in Mathematics, fellowships, and assistantships, inquire of the Academic Secretary of the department.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the School of Education section of this bulletin or address inquiry to the Credential Secretary, School of Education.

MASTER OF ARTS IN TEACHING (MATHEMATICS)

In cooperation with the School of Education, the department offers a program leading to a degree, Master of Arts in Teaching (Mathematics). This degree is intended for candidates who have a teaching credential or relevant teaching experience and wish further to strengthen their academic preparation. Detailed requirements are outlined in this bulletin under “School of Education, Master of Arts in Teaching.”

COURSES

INTRODUCTORY AND UNDERGRADUATE COURSES

Introductory courses will be offered only if twenty or more students enroll.

3. Precalculus Mathematics—Establishes the background needed to begin calculus: Functions and graphs; linear and quadratic equations; inequalities; logarithms; binomial theorem; trigonometric functions, identities, and equations; solutions to triangles.

4 units, Aut (Staff) MTWThF 8
Spr (Staff) MTWThF 8

15. Introduction to Mathematics—For students who are curious about what mathematics is and what mathematicians do, but who do not plan to use mathematics as a tool in their careers and do not have much background. Discussion of some phases of mathematics through study of problems of “applied” and of “pure” type, taken from number theory, geometry, topology, probability, analysis, etc. Also some discussion of the historical development. Prerequisites: high school algebra and geometry and the willingness to follow arguments that can be intricate and fairly long. (DR:6)

3 units, Win, (Samelson) MWF 11

19. Calculus and Analytic Geometry — Presents a rather complete introduction to the concept, techniques and applications of differentiation and a brief introduction to the concept, techniques and applications of integration. The sequence (19, 20, 21, 22, 23) covers the same subjects as the sequence (41, 42, 43) described below. Prerequisites are the same as for 41. (DR:6)

3 units, Aut (Staff) MW 8, 9, and 1:15
Win (Staff) MW 8, 9, 10, and 11


3 units, Win (Staff) MW 8, 9, and 1:15
Spr (Staff) MW 8, 9, and 10


3 units, Aut (Staff) MW 8 and 11
Spr (Staff) MW 8 and 1:15


3 units, Aut (Staff) MW 8 and 11
Win (Staff) MW 8

23. Calculus and Analytic Geometry—Continuation of 22. Prerequisite: 22. (DR:6)

3 units, Win (Staff) MW 8
Spr (Staff) MW 8

41. Calculus and Analytic Geometry — Note: Mathematics 41-42-43 (Autumn, Winter, Spring respectively) will consist of three large
lecture classes per week together with two classes in small sections. The sections will allow options for emphasis in particular directions, including physics/engineering and economics. Mathematics 41 presents an introduction to differential and integral calculus. Principal topics are limits, derivatives of polynomials, algebraic functions, and trigonometric functions, curve sketching, mean value theorem, maxima and minima, indefinite and definite integrals, geometric and physical interpretations and applications. Prerequisite: algebra and trigonometry. (DR:6)

5 units, Aut (Staff) MTWThF 11, 1:15, and 2:15

42. Calculus and Analytic Geometry—Continuation of 41. Logarithms, exponential functions, hyperbolic functions, techniques of integration, analytic geometry: conic sections, polar coordinates, introduction to vectors. Prerequisite: 41 or equivalent. (DR:6)

5 units, Aut (Fischer-Colbrie) MTWThF 1:15
Win (Staff) MTWThF 11 and 1:15

43. Calculus and Analytic Geometry — Continuation of 42. Vector functions, functions of several variables, partial derivatives, gradient, Lagrange multipliers, multiple integrals. Prerequisite: 42 or consent of department. (DR:6)

5 units, Aut (Staff) MTWThF 11 and 1:15
Win (Staff) MTWThF 1:15
Spr (Staff) MTWThF 11 and 1:15

44. Calculus—Continuation of 43. Principal topics included are: double and triple integrals, iterated integrals, applications, surface area; infinite series, convergence tests, power series, Taylor’s theorem; complex numbers and functions. Prerequisite: 43 or equivalent.

3 units, Aut (Staff) MWF 10, 11, and 1:15
TTh 11-12:15 and 1:15-2:30
Win (Staff) MWF 9, 10, 11, and 1:15
Spr (Staff) MWF 1:15
TTh 11-12:15

43H. Honors Calculus and Analytic Geometry—The sequence 43H, 44H, 45H covers essentially all the topics of 43, 44, 101, and 130, as well as possible additional topics from advanced calculus and ordinary or partial differential equations. Mathematics 43H, 44H, and 45H are designed for students contemplating majors in Physics, Chemistry, Engineering, Mathematical Sciences, or Mathematics who have a firm grasp of the methods and ideas of differentiation and integration. The pace of 43H is faster than that of 43 and, in addition, somewhat greater attention will be paid to justification and more thorough understanding of the techniques learned. Topics covered in 43H include those listed under 43 above, as well as selected topics from power series and Taylor’s theorem, infinite series, complex numbers and functions, and ordinary differential equations. Prerequisite: a score of 5 on the BC form of the CEEB Advanced Placement calculus test or consent of instructor.

5 units, Aut (Brumfiel) MTWThF 2:15-3:15

44H. Honors Calculus—Continuation of 43H. Topics from multiple integrals, applications, line and surface integrals, first order differential equations, higher order linear differential equations, Laplace Transform, numerical methods. Prerequisite: 43H or consent of instructor.

5 units, Win (P. Cohen) MTWThF 2:15-3:15

45H. Honors Advanced Calculus—Continuation of 44H. Topics from differentiation and integration of integrals depending on a parameter, change of coordinates in multiple integrals and the implicit function theorem, vector analysis and the theorems of Gauss, Green, and Stokes, stability of solutions of differential equations and phase plane analysis, introduction to partial differential equations.

5 units, Win (P. Cohen) MTWThF 2:15-3:15

92. Topics in the History of Mathematics from Antiquity to the 17th Century — (Enroll in Philosophy 140.)

3 units, Spr (Knorr)

COURSES FOR UNDERGRADUATES AND GRADUATE STUDENTS

Unless explicitly stated there are no prerequisites for the courses listed below. Where a prerequisite is stated it may be waived with the consent of the instructor.

101. Advanced Calculus—Topics include: differentiation and integration of integrals depending on a parameter; transformations and the implicit function theorem; change of variables in multiple integrals; vector analysis and the theorems of Gauss, Green and Stokes. Prerequisite: 44 or equivalent. 113 (or 113S) or equivalent recommended.

3 units, Win (Levine) MWF 10
Spr (Staff) MWF 10

106. Introduction to Theory of Functions of a Complex Variable—Complex numbers, analytic functions, Cauchy-Riemann equations, complex integration, Cauchy formula; elementary conformal mappings. Prerequisite: 44.

3 units, Aut (Levine) MWF 10
Spr (Chung) MWF 9

113. Linear Algebra and Matrix Theory—The study of the algebraic properties of matrices and their interpretation in geometric terms. The
relationship between the algebraic and geometric points of view and matters that are fundamental to the study and solution of linear equations are dealt with. Topics include: linear equations, vector spaces, linear dependence, bases and coordinate systems; linear transformations and matrices; similarity and eigenvalues; reduction of quadratic forms. (DR:6)

3 units, Aut (Royden) MWF 9
Spr (Staff) MWF 11

113S. Linear Algebra and Its Applications—A treatment of linear algebra and matrices with an emphasis on computational and algorithmic aspects together with a consideration of scientific problems in which linear algebra is applied. Solution of linear equations. Linear spaces and matrices. Orthogonal projection and least squares. Eigenvalues and eigenvectors. (DR:6)

3 units, Aut (Royden) MWF 10, 11, and 1:15
TTh 11-12:15
Win (Staff) MWF 10 and 1:15
Spr (White) MWF 11
Sum (Staff)

114. Linear Algebra and Matrix Theory—Continuation of 113. A deeper study of certain of the topics indicated as well as additional topics chosen among the following: invariant subspaces, canonical forms of matrices; minimal polynomials and elementary divisors; vector spaces over arbitrary fields; inner products; Hermitian and unitary matrices; multilinear algebra.

3 units, Win (Royden) MWF 9

114S. Linear Algebra and Its Applications—Continuation of 113S. Determinants, eigenvalues and eigenvectors. Positive definite matrices, extremum problems, computations with matrices, elements of linear programming and game theory.

3 units, Win (Staff) MWF 11
Spr (Berg) MWF 1:15

115. Fundamental Concepts of Analysis—A rigorous development of real analysis in Euclidean space: sequences and series, limits, continuous functions, derivatives. Basic point set topology. Especially recommended for students who intend to take graduate work in mathematics. Prerequisite: 44.

3 units, Aut (Staff) MWF 11 and 1:15
Win (Staff) MWF 11 and 1:15
Spr (White) MWF 2:15

116. Fundamental Concepts of Analysis—Lebesgue theory of measure and integration in Euclidean space; completeness of L$^1$. Elements of Hilbert space theory; orthogonal expansions. Prerequisite: 115 or equivalent.

3 units, Win (Chung) MWF 11
Spr (Gilbarg) MWF 1:15

120. Modern Algebra—Group theory: normal subgroups, permutation groups, Sylow's theorems, finite abelian groups. Introduction to rings. Prerequisite: 113 or 113S.

3 units, Win (Vardi) MWF 11

120S. Modern Algebra and Its Applications—A course with the same principal content as Mathematics 120, but with emphasis on applications of modern algebra. Applications will include symmetry groups—in particular, crystallographic groups—and error-correcting codes. Prerequisite: 113 or 113S.

3 units, Win (Diaconis) TTh 1:15-2:30

121. Modern Algebra—Continuation of 120. Rings, ideals, polynomials, fields, Galois theory.

3 units, Spr (Vardi) MWF 11

123. Theory of Probability—Introductory course to the theory of probability and some of its applications. Basic concepts of probability, random variables and their distribution functions are treated in the modern manner. Classical limit theorems for sequences of independent random variables are discussed in some detail. Prerequisite: 44.

3 units, Spr (Chung) MWF 11

126. Mathematical Models in Population Biology—(Same as Mathematics 226.) A course for advanced undergraduates and beginning graduate students in biology and mathematics. Topics will include the elements of population genetics and ecology, and theory of enzyme kinetics.

3 units, Spr (Karlín) TTh 1:15-2:30

130. Ordinary Differential Equations—Special equations, exact equations, linear equations; series solutions, numerical solution; Laplace transform; systems of equations. Prerequisite: 44, concurrent registration in 44, or consent of instructor.

3 units, Aut (Staff) MWF 10 and 1:15
Win (Staff) MWF 11 and 1:15
TTh 11-12:15
Spr (Staff) MWF 9, 11, and 1:15
Sum (Staff)

131. Partial Differential Equations I—First order equations, classification of second order equations. Initial-boundary value problems for heat equation, wave equation, and related equations. Separation of variables, eigenvalue problems, Fourier series, existence and uniqueness questions. Prerequisite: 130 or equivalent.

3 units, Win (McGregor) MWF 1:15
(Gilbarg) TTh 11-12:15
Spr (Staff) MWF 11


3 units, Spr (Levine) MWF 10
134A,B. Honors Analysis—A course designed to give a coherent, mathematically sophisticated presentation of some of the basic areas in classical real analysis. Directed chiefly toward mathematics majors who would normally enroll in an honors sequence—but of use and interest to other majors who are at ease with rigorous proofs and qualitative discussion. A major portion of the course will be devoted to ordinary and partial differential equations. Prerequisite: 116, or consent of instructor. Corequisites: 113-114, or 113S-114S.

alternate years, given 1984-85

135. Perturbation Methods in Mathematics and Physics—An introductory account of the analysis intent on securing quantitative results for problems which, though lacking exact solutions, are correlated with others that admit complete resolution. Applications to eigen-function/eigenvalue problems in irregularly shaped domains, diffusion/wave problems in nonhomogeneous settings and non-linear differential equations. Prerequisite: 131 or equivalent.

alternate years, given 1984-85

136. Introduction to Computing—(Enroll in Computer Science 106.)

137A,B,C. Numerical Analysis—(Enroll in Computer Science 137A,B,C.)

142. Higher Geometry—A study of various geometries, including projective, affine and non-euclidean geometry. Prerequisite: 113.

alternate years, given 1984-85

143. Topics in Differential Geometry—Geometry of curves in the plane and in the space. Surfaces in \( \mathbb{R}^3 \). Definition of Gaussian curvature. Lines of curvature and geodesics on the surface. Parallel transportation. Surfaces with constant curvature. Minimal surfaces. 3 units, Win (Stowe) MWF 10

150. Introduction to Combinatorial Theory — (Enroll in Computer Science 150.)

152. Elementary Theory of Numbers—Euclid’s algorithm, fundamental theorems on divisibility; prime numbers; congruence of numbers; theorems of Fermat, Euler, Wilson; congruence of first and higher degrees; Lagrange’s theorem, its applications; residues of power; quadratic residues; introduction to theory of binary quadratic forms.

3 units, Aut (McGregor) MWF 11

159. Introduction to Topology—This course will cover some of the basic properties of metric and topological spaces; compactness, connectedness, and continuity. Special attention will be paid to the Euclidean spaces; and the fixed-point and degree of mapping theorems will be developed.

3 units, Spr (Staff) MWF 1:15

160A. First-order Logic—(Enroll in Philosophy 160A.) The syntax and semantics of first-order logic. Gödel’s Completeness Theorem which relates formal rules of proof to Leibniz’ notion of truth in all logically possible worlds. Consequences like the Löwenheim-Skolem Theorem and the Compactness Theorem will be discussed and applied. Prerequisite: Philosophy 57 recommended for students with no mathematics or computer science background.

4 units, Win (Etchemendy)

160B. Computability and Logic—(Enroll in Philosophy 160B.) A precise definition of “effective procedure” is given through Turing machines, register machines and recursive functions. Church’s Thesis is explained. These are used to develop Gödel’s work on the undecidability of arithmetic, culminating in his famous Incompleteness Theorem. Other undecidable problems are also discussed. Prerequisite: 160A.

4 units, Spr (Etchemendy)

161. Axiomatic Theory—(Enroll in Philosophy 161.) Zermelo-Fraenkel axioms are the basis of the course. Operations on sets, relations and functions. Equivalence and ordering relations. Equipollence of sets and cardinal arithmetic. Topics on ordinal numbers and axiom of choice as time permits. This is a computer-based course; there are no lectures. Each student progresses through the course at his or her own pace. The first meeting is organizational only, held at 2:15 on the first class day of the quarter.

4 units, Aut, Win, Spr (Suppes)

192A,B. Topics in the History of Mathematics.

192A. Topics from the 17th to the 19th century. Principally the rapid development of the powerful new concepts and methods in analysis and their direct connection with the physical sciences, in particular mechanics. Illustrations from the work of famous mathematicians from Descartes to Abel.

192B. Topics from the 19th to the early 20th century. The further extension and expansion of analysis and its applications. Rigorization and generality; the rise of algebra and abstract mathematics. Illustrations from the work of famous mathematicians from Fourier to Lebesgue.

alternate years, given 1984-85

196. Undergraduate Colloquium—Based on reading and discussion of topics in history and philosophy of mathematics. Prerequisite: consent of instructor.

3 units, Win (Hawley) T 2-4
199. Independent Work—This course provides an opportunity for any undergraduate to pursue a reading program on a topic of the student's choice under the direction of a faculty member of the Department of Mathematics. The choice of topics is limited to those which are not the content of regular course offerings of the department. Credit for the course may be used toward the fulfillment of the elective requirement for the degree in mathematics. Students wishing to use credit for the course toward the fulfillment of the department's area requirements must receive the approval of the Undergraduate Affairs Committee of the department.

Students having a topic they wish to investigate but who need help in finding a faculty member to direct their reading should consult the Academic Secretary of the department.

(Staff) by arrangement

COURSES INTENDED PRIMARILY FOR GRADUATE STUDENTS


205A. 3 units, Aut (Weiss) MWF 10
205B. 3 units, Win (Weiss) MWF 10
205C. 3 units, Spr (Weiss) MWF 10

206A,B,C. Theory of Functions of Complex Variable—Complex integration. Cauchy's theorem, calculus of residues; power series, infinite products, entire functions, Picard's theorem; Riemann mapping theorem. Prerequisite: 116 or equivalent.

206A. 3 units, Aut (Schoen) MWF 11
206B. 3 units, Win (Hawley) MWF 11
206C. 3 units, Spr (Hawley) MWF 11

210A,B,C. Modern Algebra—Groups, rings and fields; Galois theory, ideal theory, introduction to algebraic geometry; representations of groups and algebras; multilinear algebra. Prerequisite: 120 or equivalent.

210A. 3 units, Aut (Brumfiel) MWF 1:15
210B. 3 units, Win (Brumfiel) MWF 1:15
210C. 3 units, Spr (Milgram) MWF 1:15


217A. 3 units, Win (Royden) MWF 11
217B. 3 units, Spr (Royden) MWF 11

220A,B,C. Methods of Mathematical Physics—An exposition of characteristic and Green's function, integral transform, variational, perturbation and distribution theoretic methods for the analysis of differential, difference and integral equations, together with numerous specific illustrative examples. Prerequisite: some familiarity with differential equations and functions of a complex variable.

220A. 3 units, Aut (Venakides) MWF 2:15
220B. 3 units, Win (Venakides) MWF 2:15
220C. 3 units, Spr (Venakides) MWF 2:15

221. Calculus of Variations—Euler-Lagrange equations, sufficient conditions; applications to eigenvalue and scattering problems; direct methods, Dirichlet's principle. alternate years, given 1984-85

224. Integral Equations—Singular types and methods for their solution; alternative integral equation reformulation of boundary value problems, dual equations and affiliated variational principles. alternate years, given 1984-85

226. Mathematical Models in Population Biology—(Same as Mathematics 126.)

3 units, Spr (Karlin) TTh 1:15-2:30


230A. 3 units, Aut (Staff)
230B. 3 units, Win (Staff)

232. Topics in Stochastic Processes—Ito and Stratonovich stochastic integrals and their properties will be developed. Methods for solving stochastic differential equations will be discussed. Applications to electrical system driven by white noise, biological growth processes involving random birth and death rates, and stochastic economic models will be highlighted. Prerequisite: 230A (or equivalent).

3 units, Win (Karlin) TTh 9:15-10:30

233. Stochastic Equations and Waves in Random Media—Differential equations with random coefficients arise in wave propagation in random media vibrations of systems with random imperfections, the theory of amorphous solids, etc. Such equations will be developed for various cases, and methods of solving them will be presented. Prerequisites: some knowledge
of differential equations and the elements of probability theory.

3 units, Spr (Keller) TTh 9:35-10:50

235A,B,C. Selected Topics in Ergodic Theory
- Topics from: The Kolmogorow-Sinai theory of entropy; the isomorphism theorem for Bernoulli shifts and Bernoulli flow; K-automorphisms applications to mechanical systems, and automorphisms of compact groups. 

alternate years, given 1984-85


238A,B,C. Advanced Topics in Numerical Analysis—(Enroll in Computer Science 238A,B,C.)

alternate years, given 1984-85

244A,B. Riemann Surfaces—Primarily treats compact Riemann surfaces: topological classification, Hurwitz' formula, Riemann-Roch formula, uniformization theorem, Abel's theorem, Jacobian varieties. Also, some elements of harmonic analysis will be developed with applications. Methods generally applicable to algebraic curves will be highlighted.

alternate years, given 1984-85


alternate years, given 1984-85

252A,B. Advanced Matrix Theory and Inequalities — Perron Frobenius Theorem for positive matrices, eigenstructure of totally positive matrices. Variational formulas in matrix analysis, ordering and monotone preserving properties, a hierarchy of determinantal inequalities, applications to stability analysis of certain nonlinear transformations. Applications in statistics, probability and in the natural, biological and managerial sciences.

alternate years, given 1984-85

254. Ordinary Differential Equations—Fundamental existence theorems, stability and asymptotic behavior of nonlinear systems, Poincaré-Bendixson theorem, linear systems and Sturm-Liouville eigenvalue problems; selected topics from equations in the complex domain; Fuchsian theory, Hamiltonian systems, existence of periodic solutions and orbital stability.

3 units, Spr (Gilbarg) MWF 10


alternate years, given 1984-85


alternate years, given 1984-85


261A. 3 units, Aut (Royden) MWF 10
261B. 3 units, Win (McGregor) MWF 10
261C. 3 units, Spr (Klainerman) MWF 10


263A. 3 units, Win (Samelson) MWF 9
263B. 3 units, Spr (Samelson) MWF 11

270. Perturbation and Asymptotic Methods with Applications—An exposition of perturbation and asymptotic methods. Topics include regular perturbation theory, singular perturbation theory, initial and boundary layers, the method of multiple scales, ray theory, two-time methods, etc. Applications will include problems from fluid and solid mechanics, wave propagation, etc. Prerequisites: Some familiarity with ordinary and partial differential equations.

3 units, Aut (Keller) TTh 9:35-10:50

272A,B. Equilibrium Free Surface Interfaces—Free surfaces associated with capillarity and surface tension phenomena are characterized as surfaces of prescribed mean curvature with a geometrical transversality condition at
the boundary. The formal mathematical study of such surfaces has led to the discovery of striking and unexpected physical behavior. The course will be at a level of current research; however, the first quarter will not require extensive mathematical background and should be accessible to physics and engineering students.

272A. 3 units, Aut (Finn) MWF 1:15
272B. 3 units, Win (Finn) MWF 1:15

274. Wave Propagation — (Same as Mechanical Engineering 236B.) The following concepts will be presented: waves, wavefronts, rays, phase functions, amplitude functions, ray equations, eikonal equations, transport equations, reflection coefficients, transmission coefficients, edge diffraction coefficients, surface diffraction coefficients, asymptotic expansions, etc. Applications will be made to electromagnetic, acoustic, elastic, and other types of waves. (M.E. 236A is not a prerequisite for this self-contained course.)

3 units, Win (Keller) TTh 9:35-10:50


alternate years, given 1984-85

277A,B. Mathematical Theory of Relativity — Ricci calculus; variational principles and covariation properties; differential geometry of space-time; Cauchy's problem for the differential equations of gravitation and electromagnetism; relativistic hydrodynamics; unified field theories.

alternate years, given 1984-85


alternate years, given 1984-85


3 units, Aut (Milgram) MWF 1:15

284A,B. Differentiable Manifolds—Embeddings of manifolds in Euclidean space, tubular neighborhood theorem, Morse theory, transversality, differential forms, integration on manifolds, deRham cohomology.

alternate years, given 1984-85

286. Topics in Differential Geometry—The purpose of this course is to present some parts of differential geometry which will lead students to do research in the field. Possible topics include: the relation between the curvature of a manifold and its topology; the use of the methods of partial differential equations in the construction of metrics, and the isometric embedding problem; the problem of isometric deformation of submanifold; the application of geometry to general relativity. The choice of the topics will depend to some extent on the interest of the students. Prerequisite: 217B.

3 units, Spr (Schoen) TTh 11-12:15

287A,B. Topics in Algebra and Number Theory—The classical theory of algebraic numbers including local p-adic theory, class numbers, Dirichlet unit theorem and decomposition of prime ideals. If time permits, an introduction to class field theory and a discussion of quadratic forms, especially the Minkowski-Siegel theorem.

287A. 3 units, Win (P. Cohen) MWF 11
287B. 3 units, Spr (P. Cohen) MWF 11


290A. 3 units, Win (van den Dries) MW 12:50-2:05
290B. 3 units, Spr (van den Dries) MW 12:50-2:05


alternate years, given 1984-85

292A,B. Set Theory—The cumulative hierarchy. Axiomatic theories of sets (and classes). Inner models, particularly the constructible sets. Models obtained by forcing and generic sets; Boolean valued models. Consistency and independence results for mathematical statements. Prerequisites: 160A, B and 161 or equivalent.

alternate years, given 1984-85

293A,B. Proof Theory—Gentzen's natural deduction and/or sequential calculi for first order predicate logic. Normalization, respectively cut-elimination procedures. Extensions to infinitary calculi; ordinal complexity of proof.
trees. Subsystems of analysis and their reduction to constructive theories. Prerequisites: 160A,B or equivalent.

293A. 3 units, Aut (Feferman) TTh 1:15-2:30
293B. 3 units, Win (Feferman) TTh 1:15-2:30

294. Topics in Logic —These will vary from year to year. Examples: complexity of decision procedures, abstract model theory and generalized quantifiers; recursion in higher types, generalized recursion theory; large cardinals, infinite games; constructive functional interpretations, foundations of constructive and semi-constructive mathematics. Prerequisites: appropriate background from one of 290A,B, through 293A,B or equivalent.

3 units, (Staff) by arrangement

350. Directed Reading.
   any quarter (Staff) by arrangement

351. Seminar Participation—Participation in a student-organized graduate seminar under the general supervision of a faculty member.
   any quarter (Staff) by arrangement

360. Advanced Reading and Research.
   any quarter (Staff) by arrangement

361. Seminar Participation—Participation in faculty-led seminar which has no specific course number.
   any quarter (Staff) by arrangement

   by arrangement

381. Seminar in Analysis.
   by arrangement

383. Seminar in Function Theory.
   by arrangement

385. Seminar in Abstract Analysis.
   by arrangement

386. Seminar in Geometry and Topology.
   by arrangement

387. Seminar in Algebra and Number Theory.
   by arrangement

   3 units, Aut (Chung) by arrangement

389. Seminar in Mathematical Biology.
   by arrangement

391. Seminar in Foundations of Mathematics.
   by arrangement

MODERN THOUGHT AND LITERATURE

Committee in Charge: René Girard (French); Albert Guerard (English); Van Harvey (Religious Studies); Renato Rosaldo (Anthropology); Peter Stansky (History); Ann Swidler (Sociology)

Chairman: David Halliburton (English)

Faculty: Sandra Drake (English); Charles Drekmeier (Political Science); Jay Fliegelman (English); Estelle Freedman (History); Tom Grey (Law; Stanford Humanities Center Fellow); Albert Guerard (English); David Halliburton (English, Comparative Literature, and Modern Thought and Literature); Van Harvey (Religious Studies); John McNees (Stanford Humanities Center Fellow); Diane Middlebrook (English); Thomas C. Moser (English); Kurt Mueller-Vollmer (German Studies); Mary Pratt (Spanish & Portuguese); Arnold Rampersad (English); Paul A. Robinson (History); Renato Rosaldo (Anthropology); Lucio Ruotolo (English); Ann Swidler (Sociology); Ian Watt (English); Marilyn Yalom (Center for Research on Women)

OFFERINGS

The Committee sponsors a program leading to the Ph.D. in Modern Thought and Literature. This degree is designed for students intending to teach modern literature in English departments or in interdisciplinary programs. It assumes serious interest in one or more areas of modern thought: history, psychology, philosophy, anthropology, linguistics, political and social thought, religious studies, the several arts, contemporary culture generally. The term modern is construed to mean, roughly, from the Enlightenment to the present. Students are expected to acquire an extensive knowledge of English and American literature (normally with more emphasis on one of the two) from 1750 to the present, but no attempt need be made to cover aspects of nonliterary thought or of other arts and literatures for the full modern period. "Extensive knowledge" is understood to mean a knowledge of major authors and movements as full and as balanced, historically, as that expected of Ph.D. candidates in English.

Two advisory reading lists will help students in planning their academic year's work and their summer reading. One will emphasize English literature, but include American writers; the
second will emphasize American literature, but include English writers.

GRADUATE PROGRAMS
MASTER OF ARTS

Only candidates for the Ph.D. will be admitted. But students in the Ph.D. program who satisfy the committee of their progress, and who complete satisfactorily 45 units of work, may apply for an A.M. in Modern Thought and Literature.

DOCTOR OF PHILOSOPHY

A candidate for the Ph.D. degree in Modern Thought and Literature must complete three years (nine quarters) of full-time work, or their equivalent, in graduate study beyond the A.B. He or she will be expected to offer at least 90 units of graduate work in addition to the dissertation. At least three consecutive quarters of graduate work must be taken at Stanford. Students may spend one year of graduate study abroad.

Each student will plan his or her program with specific advisors. The exact distribution of time, between the literature of specialization and the interdisciplinary work in modern thought and literature, will depend on the nature of the undergraduate preparation. Candidates with an inadequate preparation in earlier literature may be asked to take appropriate additional courses.

The Committee believes that creative writing or other artistic activity contributes to the development of the teacher of modern literature. A reasonable amount of creative work (the amount to be approved by each student's advisor) may be counted among the 40 units of interdisciplinary work required.

The requirements for the Ph.D. in Modern Thought and Literature are as follows:

1. An introductory seminar, Modern Thought and Literature 361 (5 units).

2. 45 units of advanced work in modern literature of one language, normally English. Of the 45 units, at least 30 must be regularly scheduled, substantive courses in post-1750 English and American literature. Courses in the teaching of composition (English 396, 397), ad hoc graduate seminars (395), research courses (398), and thesis registration (399) may not be counted among these 30 units. 396, 397, and 399 may not be counted among the 90 units of graduate work required for the degree.

3. Approximately 40 units of advanced work in a coherent and individually arranged interdisciplinary program, including at least one further seminar. The program may include courses and readings in various areas of modern thought and culture, and individual creative work.

4. Qualifying Procedures:

a) Colloquium or Essay

By the end of the Spring Quarter of the first year each student will either organize a colloquium developed from work done in the Winter Quarter Modern Tradition seminar, or submit a 25-30 page essay based on the student's term paper for that seminar. The colloquium must be scheduled, or the seminar paper completed and given to the secretary, at least three weeks before the end of the Spring Quarter.

b) Knowledge of Literature Since 1750

Students may choose between two ways of demonstrating their knowledge of literature since 1750: a special one hour examination at the beginning of the second year, or a collection of brief critical commentaries on authors not covered in courses, to be submitted not later than the eighth week of the sixth quarter in residence. These tests or commentaries will be based on reading lists drawn up by the student in consultation with her or his advisor and approved by the committee in charge. The list should be based primarily on one of the advisory reading lists in literature, but may include additional works in modern thought or drawn from the student's special field of interest.

5. Teaching is an essential part of the program. All candidates are required to do four quarters of supervised teaching at half-time. During the first year a candidate is expected to act as a reader for two courses or a section leader for one course, in the second year to teach two quarters of Freshman English, and in the third or fourth years to assist a faculty member as a section leader in a larger course.

As preparation for teaching, students are required to take English 396, a two-unit course introducing students to the obligations and opportunities of graduate study, and 397A, a five-unit course on teaching composition.

6. Students must demonstrate by the end of the third quarter of the first year a reading knowledge of one foreign language comparable to that required by the Department of English; and by the beginning of the first quarter of the third year, an advanced reading knowledge of one other foreign language. An "advanced" reading knowledge means the ability to make a genuine scho-
larly use of the language: that is, to read prose of ordinary difficulty.

Students may not take the University oral examination until they have completed the foreign language requirement.

7. Annual review. The program of each student must be approved by the Committee in Charge at the end of each academic year.

8. Summary Requirement. At the termination of his or her course work, and prior to the University oral examination, each student will prepare a detailed statement of the advanced work he or she has done outside the area of his or her specialization. This will normally include a summary of reading in literature as well as in interdisciplinary fields. This statement must be approved by the student's advisor, by the Chairperson, and by the Committee in Charge.

9. University Oral Examination. This examination, covering the student's areas of concentration, will normally be taken in the third year of graduate study.

10. Dissertation. The fourth year will be devoted to the dissertation, which shall be a substantial and original contribution acceptable to the Committee on Modern Thought and Literature. The subject may be drawn from the literature of specialization, from the area of non-literary studies, or from a combination of the two.

GRADUATE PROGRAM IN HUMANITIES

The Committee participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in Modern Thought and Literature and Humanities. For a description of the Humanities program, see the "Humanities Special Programs" section.

UNDERGRADUATE PROGRAM

The Committee sponsors several courses open to qualified undergraduates, but does not at present offer a major in Modern Thought and Literature. Undergraduates who wish to develop their own majors in Modern Thought and Literature should consult with the Chairperson and may be given permission to undertake an interdisciplinary plan of study under the Humanities Honors Program.

In special cases involving a few very qualified honors undergraduates, the Committee offers a coterminous A.M. Interested students should petition the chairperson not earlier than their ninth quarter (or upon completion of 105 units) and not later than the eleventh quarter.

COURSES

See departmental listings for course descriptions and for (DR) notations.

Courses are open to qualified students from any department.

4 units, Win (Katz)

137. Jewish Responses to Catastrophe—(Enroll in Religious Studies 137/237.)
5 units, Aut (Cohn)

139. Italy's Women Poets Thirteenth Century to Present—(Enroll in Italian 139/239.)
4 units, Spr (B. Allen)

147. The Nineteenth-Century Novel in Italy and France—(Enroll in Italian 147/257.)
4 units, Spr (B. Allen)

5 units, Spr (Bowden)

149. Seminar: Cultural Approaches to Alternate Futures—(Enroll in Anthropology 148 or Education 287.)
3-5 units, Win (Textor)

150. Manzoni: The Fiction of History (taught in English) — (Enroll in Italian 150/250.)
4 units, Spr (B. Allen)

166. Twentieth-Century Italian Drama — (Enroll in Italian 166/266.)
4 units, Win (B. Allen)

173A. Contemporary West German Cinema—(Enroll in German Studies 173A.)
4 units, Spr (Berman)

207. Sense of Identity in Modern Women Writers—(Same as Comparative Literature 207.) An examination of female writers whose sense of identity is related to their creativity, sexuality, maternity, and social class. Will include works by Simone de Beauvoir, Violette Le duc, Marguerite Duras, Sylvia Plath, Tillie Olsen, Maxine Hong Kingston, Paule Marshall, and Margaret Atwood.
5 units, Spr (M. Yalom)

212. Linguistics and the Analysis of German—(Enroll in German 212/312; Linguistics 181.)
3-5 units, Win (Robinson)

215. Prose and Poetry, 1740-1800—(Enroll in English 215.)
5 units, Spr (Carnochan)

218. Zen Buddhism—(Enroll in Religious Studies 118/218.) History, teachings, and prac-
PREREQUISITES: The prerequisite for many of the courses listed below is consent of the instructor. Please see the course description for specific prerequisites where applicable.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>Film Aesthetics</td>
<td>4 units</td>
<td>Spr (Breitrose)</td>
</tr>
<tr>
<td>221</td>
<td>History of Film</td>
<td>4 units</td>
<td>Win (Staff)</td>
</tr>
<tr>
<td>227</td>
<td>Modern Southern Writers</td>
<td>5 units</td>
<td>Aut (A. Gelpi)</td>
</tr>
<tr>
<td>228</td>
<td>Nietzsche</td>
<td>3 units</td>
<td>Aut (McNees)</td>
</tr>
<tr>
<td>231</td>
<td>Italian Romanticism</td>
<td>4 units</td>
<td>Win (Freccero)</td>
</tr>
<tr>
<td>234A</td>
<td>Colonial American Prose</td>
<td>5 units</td>
<td>Spr (Fliegelman)</td>
</tr>
<tr>
<td>235</td>
<td>Impressionist and Experimental Novel</td>
<td>5 units</td>
<td>Aut (Guerard)</td>
</tr>
<tr>
<td>236</td>
<td>Introduction to Twentieth-Century Italian Poetry</td>
<td>4 units</td>
<td>Win (Allen)</td>
</tr>
<tr>
<td>237</td>
<td>Seminar on Legal and General Interpretation</td>
<td>3 units</td>
<td>Spr (Grey)</td>
</tr>
<tr>
<td>237B</td>
<td>The Novel and Society in Modern Europe</td>
<td>5 units</td>
<td>Spr (Robinson)</td>
</tr>
<tr>
<td>240</td>
<td>Dante: Inferno</td>
<td>4 units</td>
<td>Aut (Freccero)</td>
</tr>
<tr>
<td>241</td>
<td>Dante: Purgatorio</td>
<td>4 units</td>
<td>Win (Freccero)</td>
</tr>
<tr>
<td>241A</td>
<td>Dante: Paradiso</td>
<td>4 units</td>
<td>Spr (Freccero)</td>
</tr>
</tbody>
</table>
57B. American Drama 1950-Present—(Enroll in Drama 257B.)
5 units, Aut (Dickey)

58. Theory of the State—(Enroll in Political Science 255.)
5 units, Spr (Drekmeier)

59. Contemporary Drama from 1918 to Present—(Enroll in Drama 259.)
5 units, Spr (Esslin)

5 units, Win (Stone)

63G. Feminist Literary Criticism: Theory and Practice—(Enroll in English 263G or Feminist Studies 202.)
5 units, Aut (B. Gelpi)

66. Cultural Transmission — (Enroll in Anthropology 266.)
3-5 units, Win (G. and L. Spindler)

68. Family Ecology — (Enroll in Anthropology 268.)
5 units, Spr (Barnett and Grobstein)

274A. Sigmund Freud — (Enroll in Religious Studies 174/274.)
3-5 units, Win (Yearley)

274D. Friedrich Nietzsche — (Enroll in Religious Studies 174D/274D.)
4-5 units, Spr (Harvey)

275. Aesthetics of Modernism—(Enroll in Philosophy 175/275.)
3 units, Win (A. Davidson)

282. Seminar: Topics in Comparative and Historical Sociology — (Enroll in Sociology 282.)
5 units, Spr (Conell)

4 units, Aut (Giraud)

285A. Poe and Hawthorne—(Enroll in English 285A.)
5 units, Win (Halliburton)

286. Roland Barthes—(Enroll in French 287.)
4 units, Aut (Saint-Amand)

287. Seminar: Convergence and Divergence in Industrial Societies — (Enroll in Sociology 287.)
5 units, Spr (Inkeles)

290. History of Anthropological Theory — (Enroll in Anthropology 290.)
5 units, Aut (Greenberg)

290A. Reading for Fiction Writers — (Enroll in English 290A.)
5 units, Win (Sorrentino)

300A. Graduate Seminar: Russian Literature as an Institution—(Enroll in Slavic 300A.)
4 units, Spr (Todd)

302. Problems in the Interpretation of Religion—(Enroll in Religious Studies 302.) Prerequisite: Consent of the instructor.
4 units, (Staff)

304. The Historical Tradition in the Academic Study of Religion—(Enroll in Religious Studies 304.) Prerequisite: Consent of instructor.
4 units, Aut (Harvey)

306. Colloquium: American Romanticism—(Enroll in English 306.)
5 units, Spr (A. Gelpi)

307A. Colloquium: Major Modern Critics — (Enroll in English 307A.)
5 units, Aut (Lindenberger)

307B. Colloquium: Symbolist Poetry, French and American — (Enroll in English 307B.)
5 units, Aut (Fields)

307C. Colloquium: Women’s Writing, Women’s Estate — (Enroll in English 307C.)
5 units, Spr (Drake)

307D. Colloquium: Proust and James—(Enroll in English 307D.)
5 units, Win (Ilsas)

316A. Seminar: Studies in Romanticism—(Enroll in English 316A.) A study of the following major long poems: The Prelude, Don Juan, Prometheus Unbound, and Hyperion.
(Same as Win (Lindenberger)

319. East Asian Religions—(Enroll in Religious Studies 319.)
(Bielefeldt, Nivison, Paul, Yearley) by arrangement

320A. Graduate Seminar: Modern Russian History—(Enroll in History 420A.)
5 units, Win (Emmons)

320B. Graduate Seminar: Russian History — (Enroll in History 420B.)
5 units, Spr (Kollman)

329. Near Eastern Religions—(Enroll in Religious Studies 329.)
(Berman, Cohn, Hamerton-Kelly, Sells) by arrangement

349. Modern European Religions—(Enroll in Religious Studies 349.)
(Harvey, Yearley) by arrangement

351B. Contemporary British Playwrights (Pinter, Stoppard, Bond)—(Enroll in Drama 351B.)
5 units, Win (Esslin)

352A. Seminar: Drama on Stage and Screen — (Enroll in Drama 352A.)
5 units, Spr (Esslin)
359. American Religions—(Enroll in Religious Studies 359.)
(Bowden, Harvey) by arrangement

5 units, Win (Halliburton)

364. Topics in British Literature.

364B. Seminar: The Bloomsbury Group—(Enroll in English 364B.)
5 units, Win (Ruotolo)

365. Topics in American Literature.

5 units, Win (Solomon)

368. Seminar: Psychoanalysis and Feminism—(Enroll in English 368 or Feminist Studies 302.)
5 units, Spr (Middlebrook)

369. Social and Psychological Aspects of Religion—(Enroll in Religious Studies 369.) Prerequisite: consent of the instructor and of the department.
(Staff) by arrangement

377. Literature and Society in the 1960's—(Enroll in Spanish 377.)
3-5 units, Win (Alegria)

379. Religious Thought—(Enroll in Religious Studies 379.) Prerequisite: consent of instructor and of the department.
(Staff) by arrangement

388G. Seminar: Joyce, O'Brien, Beckett—(Enroll in English 388G.) masters of Anglo-Irish modernism
5 units, Spr (Sorrentino)

389. Theory of Religion—(Enroll in Religious Studies 389.) Prerequisite: consent of the instructor and of the department.
(Staff) by arrangement

390. Graduate Fiction Writing—(Enroll in English 390.)
3-5 units, Aut (L'Heureux)
Win (Sorrentino)
Spr (Packer)

391. Advanced Work in Writing and Criticism—(Enroll in English 391.)
any quarter, by arrangement

392. Graduate poetry Writing—(Enroll in English 392.)
3-5 units, Aut (Fields)
Win (Levertov)
Spr (Di Piero)

395. Ad Hoc Graduate Seminars—In a given quarter, a group of graduate students (at least three but preferably more) who wish the following quarter to study a subject or an area not covered by regular courses and seminars may plan an informal seminar and approach a suitable member of the faculty to supervise it, either on a letter grade or Pass/No Credit basis.
any quarter, by arrangement

397A. Rhetoric and Teaching Composition—(Enroll in English 397A.)
5 units, Aut (Fifer)

397B. Teachers Workshop I—(Enroll in English 397B.)
5 units, Win (Fifer)

397C. Teachers Workshop II—(Enroll in English 397C.)
5 units, Spr (Fifer)

398. Research Courses—The student pursues a special subject of investigation under supervision of some member of the Committee or another faculty member. Thesis work not to be registered under this course.
any quarter, by arrangement

RELATED COURSES
Students of Modern Thought and Literature are referred to the offerings of the following departments: Anthropology, Art, Asian Languages, Communication, Comparative Literature, Drama, English, French and Italian, German Studies, History, Humanities Special Programs, Linguistics, Philosophy, Political Science, Psychology, Religious Studies, Sociology, Slavic Languages and Literatures, and Spanish and Portuguese. Consent of the instructor is required for most courses offered in this department.
Emeritus: William L. Crosten, Wolfgang E. Kuhn, Sandor Salgo, Harold C. Schmidt (Professors); Marie Gibson (Adjunct Professor); Adolph Baller*, Earle Blew, Edward C. Colby (Lecturers)

Chairman: Albert Cohen


Associate Professors: Karol Berger, William P. Mahrt

Professors (Performance): Arthur P. Barnes (Director of Bands), Lila Stuart (Voice), Andor Toth* (Director of Orchestras and Opera)

Senior Lecturers: Margaret Fabrizio, Naomi Sparrow

Lecturers: Jonathan Berger (Theory), Gregory A. Wait (Voice), Josephine A. Gandolfi (Piano), Gennady Kleyman (Violin, Viola), Stephen Harrison, Margaret Rowell, (Viocello), Larry Epstein (Contrabass), Frances Blaisdell, Alexandra W. Hawley (Flute), James Matheson (Oboe), Rufus Olivier (Bassoon), William Klingelhofer (French Horn), David Burkhart (Trumpet), J. Elwood Williams (Trombone), Floyd O. Cooley (Tuba), Anthony J. Cirone (Percussion), Marjorie Chauvel (Harp), Charles A. Ferguson (Guitar), Herbert Myers (Early Winds), Harlan Hokin (Early Voice)

Director of Glee Club: David Babbs

Gabor Rejto (Violoncello), Member, Alma Trio

*Members of Alma Trio, Visiting Ensemble in Residence

OFFERINGS AND FACILITIES

The department's aims are to promote understanding and enjoyment of music in the University at large and to provide specialized training for those who plan careers in music as composers, performers, teachers, or research scholars.

Practice facilities are available in the Knoll, the Music Annex, and the Dinkelspiel Auditorium Building, which also includes a theater for concert and operatic productions. In addition to pianos, organs, harpsichords, and a variety of early stringed and wind instruments, students may use rare instruments from the Harry R. Lange Historical Collection.

The departmental library contains a comprehensive collection of complete editions, scores, books, and records. Supplementing this is the Stanford Memorial Library of Music, which is an invaluable collection of musical manuscripts and first editions.

The Music Department has access to large digital computers on which work is being done in sound synthesis, acoustical analysis, and composition. Advanced composition students interested in electronic music and use of the computer in composition, and students with a particular interest in acoustics are encouraged to make use of this facility.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Undergraduate Major—May be planned in one of three ways depending on whether the student wishes:

1) A concentration in composition, performance, or music history.
2) Preparation for secondary school teaching.
3) A general program of studies without special emphasis on any particular branch of music.

The plan in each case will be drafted by the student and his or her advisor to include certain required work as outlined below plus electives which take into account the individual's particular talent and interest.

To ensure a strong foundation for the individual concentrations, all students are required:

A. To include the following courses in their programs:
   1. Music 21-22 (Elements of Music)
   2. Music 23 (Functional Harmony)
   3. Music 24 (Elementary Tonal Counterpoint)
   4. Music 100, 101, 102, 103, 104, 121 and 122 (Music History and Theory)
   5. One elective from among the following topics: theory and composition, history and literature, conducting, or performance practices. Music 199 and honors projects will not satisfy this requirement.

B. To demonstrate a minimum proficiency in piano, which will include sight-reading of works at the level of Clementi sonatinas as well as playing two prepared pieces comparable in difficulty to Bartok's Mikrokos-
mos, Book 4. This requirement should be fulfilled as early as possible and not later than the beginning of the junior year.

C. To demonstrate ability to hear music accurately and to perform it at sight. These skills will be checked by two examinations, the first to be taken upon completing Music 22, the second to be taken in the first quarter of the senior year.

Independent work by advanced students is encouraged as indicated under Music 199.

Prospective music majors should consult one of the advisors in the Music Department as early as possible in order to plan a program that allows sufficient time for practice as well as for other study. This applies especially to freshmen and to those who wish to concentrate in performance.

The sample schedule given below shows how the University Distribution Requirements may be fulfilled so as to permit substantial work in music during the freshman and sophomore years. Note the inclusion of foreign language study, which is strongly recommended for all music majors and especially for those expecting to continue into graduate work.

### RECOMMENDED SCHEDULE FOR COMPLETING THE MUSIC MAJOR PROGRAM

#### FIRST YEAR

<table>
<thead>
<tr>
<th>Courses</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>English* (2 quarters writing)</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Music 21, *22,23</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Individual Instruction and/or Ensemble</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
</tr>
<tr>
<td>Choice of Foreign Language,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman Seminar, Western</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture or University</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution requirement</td>
<td>3-5</td>
<td>3-5</td>
<td>3-5</td>
</tr>
</tbody>
</table>

#### SECOND YEAR

<table>
<thead>
<tr>
<th>Courses</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music 24</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music 100, 101, 102, 121</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Individual Instruction and/or Ensemble</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
</tr>
<tr>
<td>University Distribution Requirement in Science or Social Science</td>
<td>3-5</td>
<td>3-5</td>
<td>3-5</td>
</tr>
<tr>
<td>Elective (or Music 23 in autumn if not taken previously)</td>
<td>3-5</td>
<td>(3)†</td>
<td>(3)†</td>
</tr>
</tbody>
</table>

#### THIRD YEAR

<table>
<thead>
<tr>
<th>Courses</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music 103, 104, 122, Music Elective</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

* (English or Music 21 may begin Winter Quarter. If Music 21 and 22 are taken in Winter and Spring Quarters of first year, Music 23 must be taken in Autumn Quarter of second year).

† Optional

---

### HONORS PROGRAM IN MUSIC

The department offers a special program for undergraduate majors leading to honors in music. Eligibility for this program consists of a marked ability in composition, performance, or music history, as indicated by grade average and recommendations from members of the faculty. The program, in addition to the regular requirements for the major, consists of a special honors project undertaken for the duration of one or two quarters of the senior year. Application for the program must be made well before the end of the Spring of the junior year.

### GRADUATE PROGRAMS

The following statements apply to all the graduate degrees described below, unless otherwise indicated.

Applicants for admission to graduate study should arrange to take the Graduate Record Examination, including the Advanced Music sections, and a department entrance test in theory. Prior to initial registration, the student should be prepared: (a) to demonstrate proficiency in piano equal to that specified in the A.B. program; (b) to demonstrate a reading knowledge of one foreign language chosen from French, German, or Italian; (c) to take placement tests in theory and music history.

Students whose previous preparation proves insufficient must expect to spend more than the minimum time in residence.

None of Stanford's required undergraduate courses in music may be credited toward an advanced degree.

Only work that receives a grade of A, B, or plus will be recognized as fulfilling the advanced degree requirements in music.

Doctoral candidates working in absentia on Ph.D. dissertations or D.M.A. final projects which require consultation with faculty members must continue enrollment in the University under the heading of Terminal Graduate Registration.

#### Teaching

All fellows, whatever their sources of financial support, are required to do three quarters of supervised teaching at half-time and one quarter at quarter-time.

### MASTER OF ARTS

#### Residence

A minimum of three quarters of full-time study in residence is required.

#### Study Program

Students may concentrate in composition, or performance (including conducting). To be recommended for the A.M. degree, a candidate must complete a program of 36 units of graduate course work, including Music 200, 240 and 299 plus three quarters of ensemble performance. Depending on the concentration, the Master of Arts Project will be an investigative essay, a composition, or a demon-
 ration of performance supported by a written commentary on the performance practices that are involved.

DOCTOR OF MUSICAL ARTS

The purpose of the Doctor of Musical Arts program is to offer advanced training in the practice and pedagogy of music. Students may concentrate in composition, or performance (including conducting)—the latter concentration to be centered on the investigation of performance practices from medieval to modern times. Each concentration will be given breadth through collateral studies in other branches of music and in relevant fields outside music as seems desirable.

Admission—In addition to completing entrance tests, an applicant will be asked to submit evidence of accomplishment in the purposed field of concentration.

Residence—If there are no deficiencies to be made up, this program may be completed in a minimum of two years of full-time study following the master's degree. The candidate must spend at least three consecutive quarters in residence and must devote at least one quarter in residence to work on his or her final project.

Study Program—The candidate must complete, in addition to the master's degree, a minimum of two years of full-time work which will be planned individually for each concentration. It must be emphasized, however, that the degree will be awarded on the basis of demonstrated achievement rather than on the accumulation of units.

In addition to such independent study and formal course work as may be done, each program will include: (a) four term projects; (b) a final project; and (c) a public lecture-demonstration.

Candidates in performance practice will make an extensive study of historical styles of performance, technique, and repertory, leading to four demonstrations of their ability to give performances of music from different historical periods. Each demonstration is to be supported by a written document covering questions of analysis and performance practice. Candidates who major in voice or an instrument may prepare a number of original works demonstrating their ability to compose in a variety of forms and for the common media of vocal and instrumental music. Insofar as possible, the works submitted will be presented in public performance prepared by the composer.

Final Project—(1) composition: an extended work for instruments, voices, or electronic media; (2) performance: possibilities open to the candidate include (a) preparing a modern performing edition of an early score; and (b) writing an extended critical or historical essay on a selected problem or phase of performance practice.

Public Lecture-Demonstration—This is to be given during the last quarter of residence. It should be about one hour in length, dealing with some aspect(s) of the candidate's final work.

Foreign Language Requirements—All students are required to demonstrate a reading knowledge of French, German, or Italian. Concentrators in performance are further required by the end of their first year of doctoral study to demonstrate reading ability in a second language chosen from the three listed above.

Departmental Examinations—(1) a qualifying examination consisting of written and oral tests in the general field of music history, no later than the fifth quarter of full-time study; (2) a written comprehensive examination in the candidate's special area of concentration, no later than the third quarter after passing the qualifying examination.

DOCTOR OF PHILOSOPHY

A limited number of students with superior qualifications are accepted by the department for work toward the Ph.D. degree in music.

General University regulations regarding this degree are discussed in the "Degrees" section in this bulletin.

Admission—In addition to completing entrance tests, an applicant is asked to submit some evidence of his or her work in the field of music history such as a term paper or a master's thesis.

Basic Requirements—Each candidate must complete a minimum of three years of full-time work. The student may proceed directly to the Ph.D. without taking the A.M. en route. The program will normally include: (1) seminars in musical notation, analysis, performance practice and musicology; (2) readings in music theory; (3) dissertation research to be taken in the third year of residence.

Foreign Language Requirements—A reading knowledge of French or Italian, and German, plus any other language necessary to research in the candidate's field of specialization. The examination will consist of the translation into idiomatic English of excerpts in prose and poetry. The examination in one language must be taken prior to the student's first registration. The second language must be certified before the beginning of the second year of residence.

Departmental Examinations—(1) a qualifying
examination consisting of written and oral tests in the general field of music history, no later than the fifth quarter of full-time residence; (2) a written comprehensive examination in the candidate’s special area of concentration, no later than the third quarter after passing the qualifying examination; (3) the University Oral Examination, to be taken prior to the actual writing of the dissertation at the beginning of the fourth year of residence.

COURSES

FOR THE GENERAL STUDENT

1. Introduction to Music—Musical expression, style, structure explained, illustrated for the listener. (DR:2)
   3 units, Aut (Houle)
   Spr (Ratner)

2A. The Symphony. (DR:2)
   3 units (Barnes)

2B. The Concerto. (DR:2)
   3 units, (Barnes)

2C. Opera. (DR:2)
   3 units (Mahrt)

3C. Medieval Music.
   3 units (Mahrt)

4A. The Music of J. S. Bach. (DR:2)
   3 units, (Nanney)

4B. The Music of Mozart. (DR:2)
   3 units, Spr (Nanney)

4C. The Music of Beethoven.
   3 units (Ratner)

5A. Music in America. (DR:2)
   3 units, (Cohen)

6C. Music in the History of Ideas. (DR:2)
   3 units (Houle)

19. Introduction to Music Theory—A preparatory course in the fundamentals of music notation, basic sight reading, sight singing, ear training, keyboard harmony, and melodic, rhythmic, harmonic dictation. This is a skill oriented course, using piano and voice as basic tools to develop listening and reading skills. Enrollment: for non-music majors and music majors who are unable to pass the proficiency test for entry to Music 21.
   3 units, Win (Barnes)

FOUNDATION COURSES FOR A.B. MAJOR

21. Introduction to the Language and Structure of Western Music—The elements of melody, rhythm, harmony and texture are studied through analysis, composition, and exercises in practical musicianship. Students intending to continue with Music 22-24 who do not have piano proficiency should begin Music 12 (class piano) concurrently. Prerequisite: ability to pass proficiency examination in basic musical skills given on first day of class. (DR:2)
   4 units, Aut (Barnes, J. Berger)
   Win (J. Berger)

22. Elements of Music—A continuation of Music 21, with emphasis on contrapuntal writing: modal and species counterpoint. Use of keyboard, ear training and sight singing will underlie all written work. Lecture and laboratory sections. Prerequisite: 21.
   4 units, Win (J. Berger)
   Spr (J. Berger)

23. Functional Harmony—Advanced tonal harmonic analysis, four-part writing, bass and harmonic harmonizations, including modulation, secondary dominants, augmented sixth chords, and Neapolitan sixth chords. Prerequisite: 22; pass minimum proficiency test in piano, or two quarters prior and concurrent enrollment in 12; or consent of instructor.
   4 units, Aut (Nanney)
   Spr (Barnes)

24. Elementary Tonal Counterpoint—Two- and three-part imitative counterpoint, two- and three-voice inventions, analysis of more complex contrapuntal forms, canon and fugue. Use of keyboard, ear training and sight singing will underlie all written work. Prerequisite: 23.
   4 units, Win (Nanney)

100. Music History: Medieval and Renaissance—Prerequisites: 21, 22. (DR:2)
   4 units, Aut (Mahrt)

101. Music History: Baroque—Prerequisites: 21, 22, 100. (DR:2)
   4 units, Win (Houle)

102. Music History: Classic — Prerequisite: 24. (DR:2)
   4 units, Spr (Ratner)

103. Music History: Romantic—Prerequisite: 102. (DR:2)
   4 units, Aut (K. Berger)

104. Music History and Theory: Modern—Prerequisite: 103. (DR:2)
   4 units, Win (Smith)

MUSIC THEORY AND COMPOSITION

121. Harmonic Materials of the 18th and Early 19th Centuries—Prerequisite: 24.
   4 units, Spr (J. Berger)

122. Harmonic Materials of the 19th and Early 20th Centuries—Prerequisite: 121.
   4 units, Aut (J. Berger)
123. Composition—Individual projects in creative work. May be repeated for credit. Prerequisite: consent of instructor.  
3 units, Aut, Win, Spr (Smith)

125. Modal Counterpoint.  
3 units, (K. Berger)

126. Tonal Counterpoint—Prerequisite: 103.  
3 units (Ratner)

127. Orchestration—Prerequisite: 23.  
3 units, Aut (Barnes)

220A. Fundamentals of Computer-Generated Sound—Introduction to computer sound generation, basic mathematics of signal processing, and computer programming. Prerequisite: experience in musical composition or consent of instructor.  
4 units, Aut (Chowning, Smith)

220B. Compositional Algorithms, Psychoacoustics, and Spatial Processing—Use of high-level programming language as a compositional aid in creating complex musical structures. Studies in the physical correlates to auditory perception, theories of hearing, and review of psychoacoustic literature. Simulation of a reverberant space and the control of the position of sound within the space. Prerequisite: 220A.  
4 units, Win (Chowning, Smith)

220C. Research—Research projects in composition, psychoacoustics, or signal processing. Prerequisite: 220B.  
4 units, Aut, Win, Spr (Chowning, Smith)

220D. Music Typography on the Computer.  
4 units, Spr (Smith)

223. Seminar in Composition—May be repeated for credit.  
4 units, Aut, Win, Spr (Smith)

224,225. Solfege and Score Reading.  
224. 4 units, Spr (Barnes)  
225. 4 units, (Barnes)

228A. 4 units, (Staff)  
228B. 4 units, (Staff)

HISTORY AND LITERATURE OF MUSIC  

Unless otherwise stated, prerequisite for any course in this section is 103.

140. Studies in Medieval and Renaissance Music—Prerequisite: 100.  
140E. The Music of Guillaume Dufay.  
4 units (Mahrt)

4 units (Houle)

142A. String Quartets of Beethoven.  
4 units, (Ratner)  
142F. The Operas of Mozart.  
4 units (Ratner)

143B. The Music of Brahms.  
4 units, Win (Mahrt)

144. Studies in Modern Music—Prerequisite: 104.  
144A. Twelve-Tone and Serial Music.  
4 units, (Smith)  
144B. Innovations in Contemporary Music.  
4 units (Smith)  
144C. The Music of Stravinsky.  
4 units (Barnes)  
144D. Music Since 1945.  
4 units, Spr (K. Berger)

150A. History of Musical Instruments.  
4 units, (Myers)

150C. History of Musical Esthetics.  
4 units (Houle)

153. Organ Literature.  
153A. Organ Music (Cabezón to Bach).  
4 units, (Nanney) given 1984-85  
153B. Organ Music (Bach to Ligeti).  
4 units, Spr (Nanney)

198. Senior Honors Project.  
4 units (Staff)

199. Independent Study—For advanced undergraduates who wish to do work outside the regular curriculum. Before registering for this, a student must present a specific project and must enlist a faculty sponsor. Credit up to 4 units per quarter.

251. Choral Repertory (1500-1750).  
4 units, Win (Ramsey)

252. Choral Repertory (1750 to Present).  
4 units, Spr (Ramsey)

PERFORMANCE  

12. Introductory Piano—Preference to music majors. A special fee of $850 per quarter is charged for enrollment for non-music majors.  
1 unit, Aut, Win, Spr (Gandolfi)

65A. Stringed Instruments Class—For Credential candidates.  
1 unit, Aut, Win (Staff)
SCHOOL OF HUMANITIES
AND SCIENCES

65B. Wind Instruments Class—For Credential candidates.
1 unit, Aut, Win, Spr (Barnes)

65C. Voice Class—For Credential candidates, music majors, and non-majors who are members of departmental performing organizations.
1 unit, Aut, Win, Spr (Wait, Hokin)

65D. Percussion Class—For Credential candidates.
1 unit, Spr (Cirone)

72, 73, 74, 75, 76, 77. Small Group Instruction—A special fee of $50 per quarter is charged for enrollment in any of these groups.
1 unit, Aut, Win, Spr (Staff)

72. Piano Class—For intermediate students.
(Gandolfi)

73. Voice Class.
(Wait)

74A. Stringed Instruments Classes.
(Harrison, Kleyman)

74C. Classical Guitar Class.
(Ferguson)

74D. Harp Class.
(Chauvel)

75A. Wind Instruments Classes.
(Hawley and Staff)

75B. Renaissance Wind Instruments Class.
(Myers)

76. Brass Instruments Classes.
(Staff)

77. Percussion Class.
(Cirone)

172, 173, 174, 175, 176, 177, 272, 273, 274, 275, 276, 277. Individual Vocal and Instrumental Instructions—A special fee of $100 per quarter for majors and $200 for non-majors is charged for enrollment in these courses. Students who wish to enroll in individual instruction must demonstrate, by audition with the appropriate teacher, a minimum proficiency on his or her instrument. Minimum repertory lists for each instrument are available at the Music Department office.
3 units, Aut, Win, Spr

172C, 272C. Harpsichord.
(Fabrizio)

172E, 272E. Early Piano.
(Fabrizio)

(Stuart, Wait)

174, 274. Stringed Instruments.

174A, 274A. Violin.
(Kleyman)

174B, 274B. Viola.
(Kleyman)

174C, 274C. Violoncello.
(Harrison, Rowell)

174D, 274D. Contrabass.
(Epstein)

174E, 274E. Viola da Gamba.
(Staff)

174F, 274F. Classical Guitar.
(Ferguson)

(Chauvel)

175, 275. Woodwind Instruments.

175A, 275A. Flute.
(Blaisdell, Hawley)

175B, 275B. Oboe.
(Matheson)

175C, 275C. Clarinet.
(Staff)

175D, 275D. Bassoon.
(Olivier)

175E, 275E. Renaissance Wind Instruments.
(Myers)

175F, 275F. Saxophone.
(Staff)

176A, 276A. French Horn.
(Klingelhofer)

176B, 276B. Trumpet.
(Burkhart)

176C, 276C. Trombone.
(Williams)

176D, 276D. Tuba.
(Cooley)

177, 277. Percussion.
(Cirone)

130. Orchestral Conducting—Prerequisite: 127.

130A. 3 units, Win (Toth)

130B. 3 units, Spr (Toth)

131. Choral Conducting.

131A. 3 units, (Ramsey) given 1984-85

131B. 3 units, (Ramsey) given 1984-85
4 units, Aut (Houle)

180. Diction for Singers.
180A. Italian.
1 unit, Spr (Stuart)
180D. English.
1 unit, Win (Stuart)

230. Advanced Orchestral Conducting.
4 units, Aut (Toth)

231. Advanced Choral Conducting.
4 units, Aut, Win, Spr (Ramsey)

268. Thorough-Bass Realization.
1 unit, Aut, Win, Spr (Fabrizio)

269. Studies in Performance Practices—Performance studied in the light of musical resources, aesthetic attitudes, and theoretical principles of the various historical periods. Lectures, individual research, and practice sessions leading to concert performances. May be repeated for credit. Prerequisite: 169.
269A. Medieval.
4 units, Spr (Mahrt)
269B. Renaissance.
4 units, Win (Mahrt)
269C. Baroque.
4 units, Spr (Houle).
269D. Classic.
4 units, Win (Ratner)
269E. Romantic
4 units, Spr (Mahrt)

1-4 units, Aut, Win, Spr (Toth)

ENSEMBLE

All courses listed in this section may be repeated for credit, with a maximum of 24 units allowed toward graduation. Membership in these organizations is not limited to students who register in the courses for credit and is open to both men and women. An audition, however, is required for admission to any University musical organization. Audition schedules will be announced in advance of each registration period.

1 unit, Aut, Win, Spr (Cirone)

158. Contemporary Performance Ensemble.
1 unit, Aut, Win, Spr (J. Berger) T 4:15-6:05

159. Early Music Ensembles.
159A. Early Music Singers.
1 unit, Aut, Win, Spr (Mahrt)
GRADUATE RESEARCH AND SPECIAL STUDIES

200. Music Bibliography—Use of bibliographical materials in graduate study; introduction to methods of research.
   4 units, Aut (Persons)

201. Graduate Review in Musical Analysis.
   4 units, Aut (J. Berger)

221. History of Music Theory.
   221A. Ancient Through Renaissance.
   4 units, Win (Cohen)
   221B. Baroque Through Modern.
   4 units, Spr (Cohen)

240. Seminar in Music History.
   4 units, Win (K. Berger)

241. Seminar in Analysis for Performance.
   4 units (Houle and Mahrt)

299. Master of Arts Project.
   4 units, any quarter (Staff)

300. Seminar in Musical Notation.
   300A. 4 units, (Mahrt) given 1984-85
   300B. 4 units, (Mahrt) given 1984-85
   300C. 4 units, (Mahrt) given 1984-85

301. Seminar in Music History and Analysis.
   4 units, Aut, Win, Spr (K. Berger, Ratner, Smith)

302. Research in Musicology.
   Aut, Win, Spr (Staff)
   by arrangement

310. Seminar in Research.
   4 units, Aut, Win, Spr (Mahrt, K. Berger, Houle)

321. Readings in Music Theory.
   3 units, any quarter (Staff)

323. D.M.A. Term Projects in Composition.
   4 units, Aut, Win, Spr (Smith)

330. D.M.A. Term Projects in Conducting.
   4 units, Aut, Win, Spr (Ramsey, Toth)

   any quarter (Staff) by arrangement

369. D.M.A. Term Projects in Performance.
   369A. Early Music to 1800.
   4 units, Aut, Win, Spr (Staff)
   369B. Music From 1800 to the Present.
   4 units, Aut, Win, Spr (Staff)
   369C. D.M.A. Recital.
   4 units, Aut, Win, Spr (Staff)
   399. D.M.A. Final Project.
   any quarter (Staff) by arrangement

Emeriti: John D. Goheen, John L. Mothershead, Jr., Philip H. Rhinelander, James O. Urmson (Professors)

Chairman: Julius Moravcsik
Director of Graduate Study: Nancy Cartwright
Director of Undergraduate Study: Jean Roberts

Professors: Jon Barwise, Nancy Cartwright, Solomon Feferman, Dagfinn Føllesdal (Summer), Georg Kreisel (Winter, Spring), Julius Moravcsik, David Nivison, John Perry (on leave), Patrick Suppes

Associate Professors: Michael Bratman, Thomas Wasow

Assistant Professors: Arnold Davidson, John Dupré, John Etchemendy, Eckart Förster, Peter Galison, Wilbur Knorr, Richard Pruitt, Jean Roberts

Lecturer: James Stockdale

Courtesy Professor: Denis Phillips

Undergraduate Pre-Medical Advisor: John Dupré

Undergraduate Pre-Law Advisor: Arnold Davidson

Undergraduate Pre-Management Advisor: Richard Pruitt

Undergraduate Advisor for Logic and Formal Systems Major: John Etchemendy

OFFERINGS AND FACILITIES

Philosophy concerns itself with fundamental problems. Some of these are rather abstract and deal with such issues as the nature of truth, justice, value and knowledge; others are more concrete and their study may help guide our conduct or enhance our understanding of other subjects. In addition, philosophy examines the efforts of past thinkers to understand the world and our experience of it.

Although it may appear to be an assortment of different disciplines, there are features common to all philosophical enquiry. These include an emphasis on methods of reasoning and the way in which our judgments are formed, on criticizing and organizing our beliefs, and on the nature and role of fundamental concepts.

Students of almost any discipline can find something in philosophy which is relevant to their own specialties. For those interested in the sciences, philosophy provides a framework within which the foundations and scope of a scientific theory can be studied, and it may even suggest directions for future development.

Since philosophical ideas have had an important influence on human endeavors of all kinds—artistic, political, even economic—students
of the humanities will find their understanding deepened by some acquaintance with philosophy.

Philosophy is an excellent major for those planning a career in law, medicine, or business. Philosophy provides analytical skills and a breadth of perspective helpful to those called upon to make decisions about their own conduct and the welfare of others. Philosophy majors who have carefully planned their undergraduate program have an excellent record of admission to professional and graduate schools. There are undergraduate advisors especially for philosophy majors planning careers in law, medicine, and business.

The Special Program in The Philosophy and Logic of Formal Systems allows students to learn the technical side of computer science along with the logical principles and philosophical tradition that underlie it. Students interested in this program should see the special advisor.

The Tanner Memorial Library of Philosophy, situated in the Philosophy Building, contains an excellent working library and ideal conditions for study.

Both the graduate students and the undergraduate majors in philosophy have associations for discussion of philosophical issues and reading of papers by students, faculty, and visitors. These associations nominate the Directors of Graduate and Undergraduate Study and elect student representatives to department meetings.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

There are two programs for majoring in philosophy within the department. One is the "General Program," and the other is the "Special Program in the Philosophy and Logic of Formal Systems." There is also a major program offered jointly with the Religious Studies Department. To declare a major, a student must consult with the Director of Undergraduate Study. The student will be assigned an advisor with whom he or she should work out a coherent plan for the major. The department strongly urges that students have proficiency in at least one foreign language.

GENERAL PROGRAM

1. Course requirements:
   a) Preparation for the major: An introductory course (under 100) and 80, for a total of ten units.
   b) The core: 24 additional units as follows:
      1) Logic: 57 or 160A
      2) Philosophy of Science: 60, or one from 163-169
      3) Ethics: 170A or 170B or 171
      4) Metaphysics and Epistemology: one from 181-186
      5) History: two of 100-103
         c) One undergraduate philosophy seminar from the 194 series.
         d) Electives: 17 additional units, at least 12 of which must be numbered above 99 for a total of 54 units.
   2. At least six courses in the major must be completed at Stanford with a grade of "B" (not including "B-") or better. Units for Tutorial or Directed Reading (Philosophy 196, 197) may not be counted in the 54 unit requirement. No more than ten units completed with grades of "Pass" may be counted in the 54 unit requirement.
   3. Transfer units must be approved by the Director of Undergraduate Studies, in writing, at the time of declaring a major. In general, transfer courses cannot be used to satisfy the five area requirements.

SPECIAL PROGRAM IN THE PHILOSOPHY AND LOGIC OF FORMAL SYSTEMS

This special major in philosophy allows students to learn the technical side of computer science along with the logical principles and philosophical tradition that underlie it. Within the major there is room for specialization in one of several disciplines: philosophy, logic, computer science, or formal linguistics.

1. Course requirements:
   a) Preparation for the major. Three courses as follows, each of which must be passed with a "B-" or better by the end of Winter Quarter of the junior year (hopefully sooner).
      1) Philosophy 80 (normally students will take an introductory philosophy course first)
      2) Computer Science 105 or 106, Introduction to Programming
      3) Philosophy 160A. (Presumes some background in logic or math, i.e. Philosophy 57, or Math 120 or 120S.)
   b) Core requirements
      1) Philosophy:
         a) Two of the following: 163, 184, 186
         b) 164 or 165
         c) 181
      2) Logic:
         a) Philosophy 160B
         b) One of Philosophy 161, 269, 390A, 390B, 391A, 391B
      3) Computer Science and Linguistics:
         a) Computer Science 107
         b) Computer Science 111
         c) Linguistics 130
486 SCHOOL OF HUMANITIES
AND SCIENCES

(d) One of Computer Science 154, 275, Linguistics 202

c) Specialization Electives: Students must have developed prior to the senior year a specialized program of at least five additional advanced courses approved by the program advisor in writing. Any changes in this program must be approved.

2. At least six courses in the major must be completed at Stanford with a grade of “B” (not including “B-”) or better. Units for Tutorial or Directed Reading (Philosophy 196, 197) may not be counted in the requirement. No more than 10 units completed with grades of “Pass” may be counted in the requirement.

3. Transfer units must be approved in writing by the Director of Undergraduate Study at the time of declaring a major. Use of transfer courses to satisfy major requirements will be strictly limited.

HONORS PROGRAM IN PHILOSOPHY

Students who wish to undertake a more intensive and extensive program of study, including seminars and independent work, are invited to apply for the Honors Program during the Winter Quarter of their junior year. Admission will be selective on the basis of letter grade average, demonstrated ability in philosophy, and progress towards satisfying the requirements of the major.

Students applying for the Honors Program should submit an intended plan of study for the remainder of their junior and senior years. This should include an undergraduate philosophy seminar either in the Spring Quarter of the junior year or in the Autumn Quarter of the senior year. It should also include at least five units of Senior Tutorial (196) during the Autumn and/or Winter Quarters of the senior year. In the quarter preceding their senior tutorial, students should submit an essay proposal to the honors committee. A tutor is assigned on the basis of this proposal.

In the senior tutorial, students will write an essay on some philosophical problem. This essay will be usually about 7500 words for those taking one quarter of senior tutorial, and about 12,500 for those taking two quarters of senior tutorial. Of course, length may vary considerably depending on problem and approach. The essay written in the senior tutorial may use work in previous seminars and courses as a starting point.

A completed draft of the senior essay is due to the advisor at the end of the Winter Quarter. If rewriting is necessary, the student may enroll in two units of senior tutorial for the Spring Quarter. Two copies of the essay must be turned in to the honors committee by the end of the fourth full week of the Spring Quarter.

The honors committee will review the applications for honors, assign tutors and second readers, and make the final determination as to whether students receive honors.

The Honors Tutorials represent units in addition to the 54 unit requirement.

The Philosophy Department cooperates with the honors component of the “Humanities Special Program” as described in that section of this bulletin.

JOINT MAJOR IN PHILOSOPHY AND RELIGIOUS STUDIES

The joint major in Philosophy and Religious Studies consists of 60 units of course work with approximately one third in the Philosophy Core, one third in the Religious Studies Core, and one third in either the General Major or the Special Concentration.

Core Requirements:
1. Philosophy Courses
   a) Philosophy 80
   b) 16 units spread over the following areas:
      1) Logic and Philosophy of Science: Philosophy 57, 60, 160A, 163-169.
      3) Epistemology, Metaphysics, and Philosophy of Language: Philosophy 181, 184, 186.
      4) History of Philosophy: Philosophy 100 or 102.
   c) Courses in the Philosophy Core cannot be taken pass/no credit, and at least 3 must be completed with a grade of “B” (not including “B-”) or better.
   d) In general, transfer units cannot be used to satisfy the Philosophy Core. Transfer units must be discussed with the Director of Undergraduate Studies and credited in writing at the time of declaring the major.

2. Religious Studies Courses:
   a) 20 units spread over the following areas:
      1) World Religions: Religious Studies 1A, 1B, 1C, 1D.
      2) Traditions: Religious Studies 11-29, 111-129.
      3) Problems: Religious Studies 31-49, 131-149.

3. General Major Courses
   a) An additional five courses (approximately 20 units) divided between the two departments.
4. Special Concentration

a) With the aid of an advisor, students will pursue a specialized form of inquiry in which the combined departments have strength, e.g., American Philosophy and Religious Thought, Philosophical and Religious Theories of Human Nature and Action, Philosophy of Religion. Courses for this concentration must be approved in writing by the advisor.

5. Directed Reading and Pass/NC Units

a) Units of directed reading for fulfilling requirements of the joint major will be allowed only with special permission.
b) No more than 10 units of work with a grade of Pass will count toward the joint major.

6. Honors in the Joint Major

a) Students pursuing a joint major in Philosophy and Religious Studies may also apply for honors by following the procedure for honors in one or the other department.

COTERMINAL DEGREE

The Philosophy Department offers a coterminal degree at both the undergraduate and master's level. Please see either the Director of Undergraduate Studies or the master's advisor to be admitted to the appropriate level of the program, and have your proposed coursework approved in writing.

GRADUATE PROGRAMS

The members of the department are prepared to direct and supervise individual study and research to supplement instruction offered in courses listed below. In addition, advanced seminars, unlisted in the catalog, are frequently organized in response to student interest. Candidates for advanced degrees are urged to discuss their entire program of study with their departmental advisors as early as possible.

Applications to graduate programs in the Department of Philosophy are obtained from and returned to Graduate Admissions, Stanford University. Applicants are required to take, in their senior year or later, the Graduate Record Examination.

MASTER OF ARTS

There are two sorts of programs leading to the degree of Master of Arts in Philosophy. One is a general program providing a grounding in all branches of the subject. The other provides a special training in one branch. A suitably qualified applicant may arrange a specialized program in any subject, analogous to those in the philosophy of science or philosophy of language described below, provided that the department offers sufficiently intensive teaching in the special subject. All students must meet with the master's advisor upon entering and have their proposed program approved in writing. No fellowships are available for master's students.

Unit Requirements—Though the requirements for the Master of Arts are designed so that a student with the equivalent of a strong undergraduate philosophy major at Stanford might complete them in one year, most students will need longer. Students should also keep in mind that 36 units is the minimum required by the University; quite often more units are necessary for a given student to complete the departmental requirement. Students in a special program may be allowed or required to replace up to nine units of philosophy by nine units in the field of specialization. Up to six units of directed reading in philosophy may be allowed. There is no dissertation requirement. A special program may require knowledge of a foreign language. At least 36 units must be completed with grades of "B-" or better at Stanford.

Students are reminded of the University requirements for advanced degrees, and particularly of the fact that for a Master of Arts, students must complete three full quarters as measured by tuition payment.

Oral Examination—Students in both the general and special programs are required to take an oral examination in the quarter during which the candidate expects to receive the degree. In the event of failure more courses may be required, and then the examination may be attempted one more time only.

GENERAL PROGRAM

The student must have a minimum of 36 units in philosophy, of which 32 must be in courses numbered above 99. The requirement has three parts:

1. Undergraduate core—Students must have when they enter, or complete early in their program, the following core undergraduate courses. (Students entering from other institutions should establish equivalent requirements with the Director of Graduate Studies upon arrival or earlier):
   a) Logic: 57 or 160A.
   b) Philosophy of Science: 60 or one of 163-169.
   c) Ethics: 170A or 170B or 171.
   d) Metaphysics and Epistemology: one of 181-186.
   e) History two of 100-103.

2. Graduate core—Students must take at least one graduate course (numbered over 199) from three of the following five areas:
   a) Logic and Semantics.
b) Philosophy of Science and History of Science.

c) Ethics, Value Theory, and Political Philosophy.

d) Metaphysics, Epistemology, and Philosophy of Language.

e) History.

3. Specialization—Students must take at least three courses (two over 199) in one of the 5 areas.

SPECIAL PROGRAM IN THE PHILOSOPHY OF SCIENCE

Only students with substantial preparation in philosophy or at least one of the sciences will be admitted.

Course requirements:

a) Philosophy of science: at least four of 60, 162-169.

b) The Philosophy of Science seminar: 251A,B. (This is offered alternate years; students completing masters in one year may therefore need to substitute an approved seminar.)

c) At least one approved course in the history of science, or in the natural or social sciences.

d) Two courses in logic, numbered 160A or higher.

SPECIAL PROGRAM IN THE PHILOSOPHY OF LANGUAGE

Only students with substantial preparation in philosophy or linguistics will be admitted.

Course requirements:

a) Philosophy of language: 181 and either 183 or 285.

b) Syntactic Theory and Generative Grammar: 284 and Linguistics 231.

c) Logic: at least two approved courses numbered 160A or higher.

d) A seminar in metaphysics or epistemology numbered above 199.

e) Philosophy 282, 365A, 365B or an approved course in Automata Theory.

PhD MINOR IN PHILOSOPHY

Students wishing to obtain a Ph.D minor in Philosophy must follow these procedures:

1. Consult with the Director of Graduate Studies to establish eligibility, and select a suitable advisor.

2. Design a program of study with the advisor, and give a signed copy of the program to the departmental secretary.

This program must include:

a) 30 units of courses in the Philosophy Department with grades of "B−" or better. No more than 3 units of directed reading may be counted in the 30 unit requirement.

b) At least one course or seminar numbered over 99 must be taken in each of these five areas:

1) Logic
2) Philosophy of Science and History of Science
3) Ethics, Value Theory, and Political Philosophy
4) Metaphysics, Epistemology, and Philosophy of Language
5) History

c) Two additional courses numbered over 199 must be taken in one of these five areas.

3. A faculty member from the Philosophy Department (usually the student's advisor) will serve on the student's doctoral oral examination committee and may request that up to one third of this examination be devoted to the minor subject.

4. Paperwork for the minor must be submitted to the departmental office before the student begins the program.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the doctorate (residence, dissertation, examination, etc.) are discussed in the "Degrees" section of this bulletin. The requirements detailed here are departmental requirements. There are six Basic Areas (Philosophy of Science, Ethics, Metaphysics and Epistemology, Philosophy of Language, Logic, and History) in which students should have proficiency in order to obtain a Ph.D. Demonstrating proficiency will take the form of course work, intensive seminars, and general examinations as detailed below.

Students must have completed this work by the end of their second year and all courses must be passed with a "B−" or better (no pass/no credit) to be advanced to candidacy.

At the end of the first year, the department will review the progress of each first year student to determine whether the student may continue in the program.

PROFICIENCY REQUIREMENTS

1. The four Core Seminars (each lasting one and a half quarters, meeting two times per week for two hours and taught by two faculty members)

   a) Philosophy of Science 251 A and B.

   b) Ethics 270 A and B.

   c) Metaphysics and Epistemology 280 A and B.

   d) Philosophy of Language 281 A and B.

2. Logic 160A and 160B.

3. Six other courses or seminars in the
Philosophy Department numbered over 110, at least two of which must be graduate level seminars on topics in the history of philosophy in two distinct historical periods (i.e. Ancient, Medieval, Modern).

4. History examination covering major figures (list to be determined). This exam will have two parts: a) Ancient and Medieval, b) Modern. Each part will be given alternating years in the Spring. Thus students will normally take a history exam at the end of each of their first two years.

Language Requirements—There is no departmental language requirement, but a dissertation committee may demand that a student demonstrate competence in languages needed for research.

Oral Examination—The University oral examination is taken after completion of an acceptable first draft of the dissertation, and is primarily a dissertation defense.

Dissertations must be completed and approved within five years from the date of approval of candidacy. A candidate taking more than five years will be required to reinstate candidacy through obtaining approval of the whole department.

The dissertation must be submitted to the committee in substantially final form at least four weeks before the University deadline in the quarter in which the candidate receives the degree.

SPECIAL GRADUATE PROGRAMS

The department recognizes that some students may need to spend a large amount of time preparing themselves in some other discipline related to their philosophical goals or in advanced preparation in some area within philosophy. In such circumstances the department is willing to grant an exemption to some of the Ph.D. program requirements. Such an exemption is not automatic; a program must be worked out with an advisor and submitted to the department some time in the student's first year. This proposal must be in writing and must include:

1. The areas to be exempted (see below).
2. A program of additional courses and seminars in the special area (usually at least 12 units).
3. A justification of the program that considers both intellectual coherence and the student's goals.

The department believes there is plenty of room for normal specialization within the program as it stands, and that all students will be specializing to some extent. Thus, the intent is not to exempt courses on a one-to-one basis, but only to grant exemptions when a student plans an extensive and intensive study of some relevant area.

A student may be exempted from two of the following:
1. One of the 4 Core Courses
2. Logic 160A (but 57 must be taken)
3. Logic 160B
4. One seminar and one exam in history
5. One seminar in history

GRADUATE PROGRAM IN HUMANITIES

The Department of Philosophy also participates in the Graduate Program in Humanities leading to the joint Ph.D. degree in Philosophy and Humanities. For a description of that program, see the section "Humanities Special Programs."

GRADUATE FELLOWSHIPS AND ASSISTANTSHIPS

A limited amount of fellowship support is available for Ph.D. students in philosophy. Students request aid by checking the appropriate box on the application form.

The University requires all applicants, whether requesting aid or not to submit a CAPSFA application.

The Department of Philosophy does not offer separate teaching assistantships as part of its support program. Each Ph.D. student is considered a member of the Philosophy Fellows Program. All Fellows, whatever their sources of financial support, are required to do 6 quarters of teaching assistance at 25% time. Details of this program may be obtained from the department. In any term in which he or she is teaching a section, the student may register for 239, "Teaching Methods in Philosophy."

COURSES

Check quarterly time schedules for revised listings.

INTRODUCTORY COURSES

These courses will acquaint the student with some of the most important problems, positions and methods in Philosophy. Some are designed to give the student general preparation for further work in Philosophy. Some apply the philosopher's approach to particular problems and subjects the student may encounter in other areas of study. Courses 10, 20, and 30 are designed to constitute a coherent survey of the main problems of philosophy. Each is self-contained, however, and has no prerequisite. Courses 5A, B, C form a Western Culture Sequence, sponsored by the Departments of...
Philosophy and Religious Studies as part of the Western Culture Program.

5A, B, C. Ideas In Western Culture—This sequence introduces the students to important works in western culture, and attempts to set them in their historical contexts.

5A. Ideas in Western Culture: The Birth of Western Philosophy—This course traces the origin of philosophizing in antiquity and relates classical problems to current issues of human concern. Readings will include: selections from Greek literature and prose, Greek philosophic writings, and selections from the Christian tradition. Recommended for entering students. (DR: 1; three-quarter sequence)

5 units, Aut (Moravcsik) MWF 10 plus 2 hour section

5B. Ideas in Western Culture: Faith and Reason—Near Eastern backgrounds of Christianity; early Christian thinkers; Islam; religious, philosophical, literary works of Middle Ages and Renaissance. Readings include Old Testament, Augustine, Dante, Aquinas, Machiavelli, and Luther. (DR: 1; three-quarter sequence)

5 units, Win (Pruitt) MWF 10 plus 2 hour section

5C. Ideas in Western Culture: The World Demystified—(Enroll in Religious Studies 5C.) The breakdown of traditional Western culture and society under the impact of revolutions in science, industry, politics, literature, and philosophy; the emergence of "modern" thought and institutions; works by Voltaire, Rousseau, Hume, Goethe, Marx, Darwin, Nietzsche, and Freud. (DR: 1; three-quarter sequence)

5 units, Spr (Harvey)

10. God, Self, and World—Students are introduced to basic philosophical concepts and methods of analysis by studying three problems which have been of perennial concern to philosophers: the existence of the external world, the existence of God, and the nature of personal identity. (DR: 3)

5 units, Aut (Dupré) MWF 11 plus section

5 units, Spr (Nissenbaum) MWF 9 plus section

17. From Philosophy to Mathematics—Discuss philosophical origins and quantitative mathematical concepts of three or four selected topics in mathematics that have arisen out of philosophical concerns. Calculus background not required. Possible topics include non-Euclidean Geometry, probability theory, set theory, and game theory. (DR: 6)

4 units, Spr (von Bentham) MWF 1:15

20. Personal Morality: Introduction to Moral Philosophy—Topics will include: What makes acts right? What makes some consequences of some actions better than others? To what extent can disagreements on such matters be rationally settled? Why be moral, anyway? Must one be moral to live a good life? Also: Are there moral constraints on the conduct of war? Should a doctor lie to a patient if he/she is confident it would improve the patient's chances of recovery? Is suicide always wrong? Readings from classical and contemporary philosophers. (DR: 3)

5 units, Win (Bratman) MWF 11 plus section

30. Public Morality: Introduction to Political Philosophy—Natural law and natural rights; justice and equality; liberty and authority; the common good and social utility. What happens when private and public morality conflict? Particular emphasis on the development of social contract doctrines and liberal democratic theory, their modern descendants, and criticisms from the point of view of alternative ideologies. (DR: 3)

5 units, given 1984-85


4 units, Win (Yearley)

42. Philosophy of Religion—(Enroll in Religious Studies 42.) Traditional and modern problems concerned with religion: belief and evidence; omnipotence and evil; foreknowledge and freedom of the will.

3 units, Aut (Gelber)

46. Introduction to Chinese Philosophy—(Same as Asian Languages 46.) The history of Chinese philosophy to 200 B.C., together with a brief introduction to Classical Chinese as used by early philosophers. (DR: 3*)

4 units, Win (Nivison) MTWTh 10

56. Critical Thinking—(Same as Linguistics 90.) An introductory course on reasoning, combining a survey of some relevant philosophical issues with extensive practice in interpreting, analyzing, and criticizing arguments. Special attention will be paid to legal reasoning, examining relevant court opinions.

4 units, Spr (Wasow) MWF 2:15

57. Introduction to Logic

57. Section 1. Computer-based course; no lectures. Axioms and rules of inference for sentential and first-order predicate logic. Elementary applications to a wide variety of domains. Individual choice of topics for a
grade beyond pass. Students progress through course at own pace. First class is organizational meeting only, held at 1:15 on first class day of quarter. (DR:6)

5 units, Aut, Win, Spr (Suppes)

57. Section 2. Lecture course. Study of propositional and predicate logic, emphasizing translating English sentences into logical symbols and constructing derivations of valid arguments. (DR:6)

5 units, Aut, Win, Spr (Staff)

MTWThF 9

60. The Growth of Scientific Knowledge—Introduction to the philosophy of science by way of an historical analysis of philosophical-scientific debates on space, time and anergy. Will study: Descartes, Galileo, Newton, Mach, Minkowski and Einstein. Some discussion of the nature of historical scientific change. Readings from philosophers, scientists, historians and various hyphenated permutations thereof. (DR:3)

4 units, Spr (Galison) MWF 11

76. Moral Dilemmas of War and Peace—The tragic ambivalence of war as a human phenomenon. Topics will include: possible justification for wars; standards for the conduct of war; obligations and responsibilities of leaders, participants and civilians; the status of non-combatants and prisoners; pacifism and the ideal of non-violence, prospects for eliminating war in the nuclear age.

4 units, Win (Rhinelander and Stockdale) MWF 10 plus section

77. Ethics, Justice, and the International Community—Problems of human rights as the basis for discussing (a) cross-cultural views of norms and values, (b) dominant Western conceptions, (c) similarities and differences between problems of domestic and international morality, (d) divergent types of obligations and rights, and (e) implementation of ideals in the international community.

4 units, Spr (Rhinelander and Stockdale) MWF 10

78. Medical Ethics—(Same as Human Biology 173.) The application of systematic ethical theory to problems in medicine and biobehavioral research. Abortion, euthanasia, justice in the allocation of scarce medical resources. Justifications for experimentation on human subjects. Definitions of death, health, and disease.

4 units, Aut (Davidson) MWF 9

80. Mind, Matter and Meaning—Intensive and rigorous survey of some central and perennial topics in philosophy: skepticism and the possibility of knowledge; perception and "the given"; the distinction between analytic and synthetic truths; meaning, verification, sense and reference; induction, causality and explanation; the relation between mental and physical phenomena; our knowledge of other minds. Provides background for advanced work. Prerequisite: one philosophy course or junior standing. (DR:3)

5 units, Win (Etchemendy) MWF 9 plus section

HISTORY OF PHILOSOPHY

Courses 100-105 are survey courses covering the most important figures and movements in Western Philosophy. Other courses cover particular periods, movements, and figures in the history of Eastern and Western Philosophy. Students planning a philosophy major should take as many as possible during the sophomore year.

100. Greek Philosophy—(Same as Classics 65.) An examination of the philosophies of Plato and Aristotle. Some attention will be given to the pre-Socratic background.

4 units, Aut (Roberts) MWF 11

101. Early Christian, Medieval, and Renaissance Philosophy—This course examines medieval developments in philosophy of language, philosophy of religion, philosophy of science, theory of knowledge, and ethics. The readings are arranged by topic; they focus on the work of Augustine, Anselm, Abelard, Aquinas, Scotus, and Occam. Prerequisite: one course in philosophy or permission of instructor.

4 units, given 1984-85

102. Modern Philosophy, Descartes to Kant—An exposition of philosophical contributions by Descartes, Arnauld, Spinoza, Leibniz, Locke, Berkeley, Hume, Reid and Kant. Emphasis on concepts of knowledge, ideas and substance.

4 units, Spr (Prutt) MWF 10

103. Nineteenth Century Philosophy—An examination of some of those ideas and conceptions that shaped nineteenth century philosophy. Thinkers to be discussed, among others: Fichte, Hegel, Marx, Kierkegaard, Nietzsche, Dilthey.

4 units, Win (Forster) TTh 11-12:15


4 units, Aut (Prutt) TTh 11-12:15
111. Plato's Philosophy—A survey of Plato's ethics. (Graduate students register for 211.)
   4 units, Aut (Moravcsik) MWF 1:15

112. Aristotle's Philosophy—The development of Aristotle's metaphysics and its implications for his psychology, ethics, and philosophy of science. Readings from the *Categories, Metaphysics, Posterior Analytics, De Anima, Nicomachean Ethics, and Parts of Animals.*
   4 units, Spr (Roberts) MWF 1:15

113. Hellenistic Philosophy—(Same as Classics 165.) Epicurean and Stoic philosophers and their influence at Rome; the philosophical writings of Ciro and Seneca.
   3-4 units, Spr (Wigodsky)

   4 units, Spr (Nivison) TTh 2:15-4:05

133. Heidegger's *Being and Time*—(Graduate students register for 233.) A careful chapter-by-chapter study of Heidegger's *Being and Time* in English translation, together with selected secondary literature.
   4 units, Aut (Förster) MWF 10

134. Phenomenology and Its Background—A survey of the development of phenomenology and its contemporary philosophical significance. An analysis of the writings of Husserl and others.
   4 units, Sum (Follesdal)

135. Contemporary Philosophers—(Graduate students register for 235.) Courses devoted to important living philosophers. For 1983-84 the topic will be Wilfrid Sellars, the Immanuel Kant Lecturer in Philosophy in 1983-84. Prerequisites: three philosophy courses, graduate status, or consent of instructor.
   4 units, Aut (Cartwright) MWF 2:15

138A,B,C. Introduction to Cosmology—(Same as History of Science 138A,B,C and Classics 138A,B,C.) A three-quarter sequence on the history of the exact sciences, with special emphasis on the field of cosmology. Technical aspects of the classical theories (Ptolemaic and Copernican), including mathematics, astronomy, physics and chemical theory. Also, more speculative aspects in natural philosophy and theology.
   138A. Ancient Period. (DR:3) Completion of 138A and 138B also fulfills (DR:6)
   4 units, Aut (Knorr) MWF 1:15

138B. Middle Ages to Newton—(DR:3) Completion of 138A and 138B also fulfills (DR:6)
   4 units, Win (Knorr) MWF 1:15

138C. Newton to Einstein.
   4 units, Spr (Knorr) TTh 1-2:10

140. Topics in the History of Mathematics: From Antiquity to the 17th Century—(Same as History of Science 140.) Origins and development of concepts and techniques in their social and philosophical context. Special emphasis on ancient Greek geometry, its adoption of the idea of proof and interaction with early philosophy, its application in optics and mechanics, its significance and limitations.
   3 units, Spr (Knorr) MWF 2:15

145. The Scientific Revolution—(Same as History of Science 145.) Social, intellectual and institutional background of the period that established modern science, the 17th century. Stress on theories of matter and motion, especially Descartes, Galileo and Newton. Historical controversies: Yates' thesis on hermeticism and magic; Merton on Protestantism and science; Hessen on the economic basis of scientific change. Readings from 17th century texts and modern historical studies.
   4 units, Win (Galison) MWF 11

155. Freud and Psychoanalytic Theory—An examination of the status of psychoanalytic theory, especially as formulated in the writings of Freud. Special attention to methodological, epistemological, and conceptual issues. Readings from primary and secondary sources.
   4 units, Spr (Cartwright and Davidson) TTh 9-10:30

LOGIC AND PHILOSOPHY OF SCIENCE

156. 20th Century Philosophies in Mathematics—An examination of recent approaches to fundamental questions in the philosophy of mathematics. Readings in Russell, Hilbert and others.
   3 units, Win (Kreisel) TTh 10-11:15

157. Introduction to Logic—For graduate students. (Same as 57.)

159. Popper, Kuhn, and Lakatos—Three controversial figures in recent philosophy of science. Popper: scientific method as openness to refutation and rational criticism. Kuhn: science develops discontinuously via scientific revolutions. Lakatos: scientific research programs have a "hard core" which adherents try to protect by making changes in the "protective belt." Interactions and criticisms.
   4 units, Sum (Phillips) TTh 10-12

160A. First-order Logic—The syntax and semantics of first-order logic. Gödel's Com-
Completeness Theorem which relates formal rules of proof to Leibniz' notion of truth in all logically possible worlds. Consequences like the Löwenheim-Skolem Theorem and the Compactness Theorem will be discussed and applied. Prerequisite: 57 recommended for students with no mathematics or computer science background.

4 units, Win (Etchemendy) MWF 1:15

160B. Computability and Logic—A precise definition of "effective procedure" is given through Turing machines, register machines and recursive functions. Church's Thesis is explained. These are used to develop Gödel's work on the undecidability of arithmetic, culminating in his famous Incompleteness Theorem. Other undecidable problems are also discussed. Prerequisite: 160A.

4 units, Spr (Etchemendy) MWF 1:15

161. Axiomatic Theory — Zermelo-Fraenkel axioms are the basis of the course. Operations on sets, relations and functions. Equivalence and ordering relations. Equipollence of sets and cardinal arithmetic. Topics on ordinal numbers and axiom of choice as time permits. This is a computer-based course; there are no lectures. Each student progresses through the course at his own pace. The first meeting is organizational only, held at 2:15 on the first class day of the quarter.

4 units, Aut, Win, Spr (Suppes)

162. Foundations of Measurement—(Same as Psychology 158A,B,C.) Detailed treatment of fundamental theories of measurement from a formal standpoint. Some attention as well to their empirical adequacy. Basic representation theorems for extensive, conjoint and difference measurements are a main topic. Organizational meeting at 3:15 on the first class day of each quarter.

3 units, Aut, Win, Spr (A. Tversky and Suppes) by arrangement

164. Topics in Philosophy of Science — Detailed analysis of structure and methods of empirical science. Examples range from physics to psychology and sociology. Intended for undergraduate and graduate students and for philosophy majors interested in conceptual problems in the natural and behavioral sciences.

4 units, Aut (Cartwright) MWF 11

165. Seminar in the Philosophy of Natural Science—Seminar on the philosophy of quantum theory. Topics will include: causality and determinism; wave-particle duality; complementarity; the uncertainty relations; the measurement problem. No technical knowledge of quantum theory will be assumed. A background in philosophy or physical science is recommended.

4 units, given 1984-85

166. Introduction to Philosophy of Social Science—(Same as Education 211.) The course will begin by focusing upon the differences various writers have noted between the natural and social sciences, and will move to several topics of importance in the social sciences: explaining human action, the functional explanation of social phenomena, holistic versus reductionist orientations. Examples will be used from contemporary social science research literature to illustrate the relevant issues. For majors in the social sciences and beginning graduate students in related areas such as education.

4 units, Win (Phillips) MW 1:15-3:05

167. Philosophy of Biology—(Graduate students register for Philosophy 267.)

4 units, Win (Dupré) MWF 2:15

168. History of Modern Physics — (Same as History of Science 168.) History of the physical view of the fundamental nature of matter from Maxwell's time to the present. Will discuss the mechanical and electromagnetic world views, special relativity, quantum mechanics and the standard model of elementary particle physics. Will focus on several case studies to illustrate the historical problem orientation of each period, as well as the connection between theory and experiment. Readings: original scientific texts, archival material and secondary sources.

4 units, Aut (Galison) TTh 9:45-11

169. Experimentation in Twentieth-century Physics—(Same as History of Science 169.) Explore several of the formative physics experiments of the 20th century. Will examine changes in the standards of demonstrations over the last 100 years, as well as changes in the type of instrumentation, from torsion balances to drift and bubble chambers. Case studies will include experiments in electromagnetism, quantum theory and particle physics. The fundamental questions of the course: how have experimentalists convinced themselves that they have demonstrated something; have these criteria changed?

4 units, Win (Galison) MW 3:15-4:30

ETHICS, AESTHETICS AND SOCIAL AND POLITICAL PHILOSOPHY

170A. Ethical Theories — A course in normative ethics, examining alternative conceptions of how people ought to act. Consequentialist (mainly utilitarian) theories are compared with non-consequentialist theories that rely on conceptions of individual rights. Readings primarily from 20th century philosophers, including
theoretical discussions and consideration of concrete moral problems (e.g., abortion) that locate them in the moral general theoretical debates. Prerequisite: two courses in philosophy or consent of instructor.

4 units, Aut (Roberts) MWF 2:15

170B. Fact and Value—The possibility of moral knowledge; the connection between “ought” and “is”; the role of observation in ethics; moral nihilism, naturalism, intuitionism and non-cognitivism. Moral dilemmas and the relation between morality and rationality. The ways in which moral experience is depicted in literary works.

4 units, given 1984-85

172. Marx's Social and Political Philosophy—The controversial question of the relationship of the earlier to the later Marx, focusing on development of his thought on species-being, alienation and estrangement, the human essence, freedom and community, historical materialism, dialectic method, theory of revolution, transition to socialism, withering of the state. (DR:3)

3 units, Win (Kain) Th 1:15-3:05

171. Political Argument—What is the source of the authority of the state, and how far does it extend? Emphasis on social contract doctrines and some criticisms of these. Readings from Hobbes, Locke, Rousseau, Rawls.

4 units, (Roberts) MWF 11

174. Aesthetics—Questions about the nature of art. Is there any specifically aesthetic experience? The roles of intention, convention, and expression in works of art. Problems about the objectivity of aesthetic evaluations; is aesthetics merely a matter of taste? Comparison of different theories of beauty. The relation of art and politics, art and psychoanalysis. Problems that arise in particular arts will also be discussed (literature, painting, music, film).

4 units, given 1984-85

175. Aesthetics of Modernism—Examination of prehistory and history of modern art, with special attention to painting. Emphasis on philosophical problems of interpretation created by the phenomenon of modernism. Readings from Michael Fried, Michel Foucault, Stanley Cavell; also Leonard Meyer, Clement Greenberg, Meyer Schapiro and Leo Steinberg. Course will meet during the second half of the quarter; organizational meeting held at noon on first day of classes.

3 units, Win (Davidson)

Days and times to be arranged

176. Seminar on Legal and General Interpretation—(Same as Modern Thought and Literature 237 and Comparative Literature 237.) An inquiry into what light may be shed by comparing theories of how to interpret legal texts and juristic acts (constitutions, statutes, contracts, wills, trusts) with theories of interpretation other disciplines, including literary theory, philosophy of language, philosophical hermeneutics, history and anthropology. For graduate students and advanced undergraduates. Taught in cooperation with the Humanities Center.

3 units, Spr (Grey) W 4:15-6:05

178. Medical Project Development: Ethical and Normative Issues of Intervention—Medical issues such as alternative modalities of intervention, appropriateness and timing of intervention, costs and dependencies, intervention measures, criteria of evaluation.

3 units, Spr (Mazur)

179. Philosophy of Law—Topics include the nature and function of law, the relations between legal and moral norms, the role of the judiciary under different systems, and the nature of legal reasoning. Major theories considered both historically and in their application to selected current problems under the U.S. Constitution. Prerequisite: one course in ethics or political theory or consent of instructor.

4 units, given 1984-85

EPISTEMOLOGY, METAPHYSICS AND PHILOSOPHY OF LANGUAGE

Philosophy 80 or permission of the instructor is a prerequisite for the 180 series.

181. Philosophy of Language—(Same as Linguistics 244.) Issues in the philosophy of language, with special reference to the views of Frege, Russell, and Wittgenstein and problems connected with giving a formal semantics for natural language. Prerequisite: 80 or consent of instructor. (DR:4)

4 units, Spr (Almog) MWF 9

183. Meaning and Experience—A study of the interrelationships between meaning and experience, with particular emphasis on how our judgments concerning meaning may be based on empirical evidence. Philosophers to be discussed will include W. V. Quine and Donald Davidson. The lectures will presuppose some acquaintance with the philosophy of language. Graduate students enroll in 283.

4 units, Sum (Follesdal)

184. Theory of Knowledge—Some central problems of epistemology, including the analysis of knowledge, the quest for certainty, and the objects of knowledge, belief, and perception.

4 units, Aut (Dupré) TTh 3:15-4:30
186. Topics in Mind and Action—The emotions.

4 units, Win (Nissenbaum) MWF 9

194 Series. Undergraduate Seminars in Philosophy—This is a series of advanced undergraduate seminars. Enrollment is limited to 12 in each seminar. Preference is given to undergraduate majors. Students should sign class lists in Philosophy Department office during pre-registration period. For those in the Philosophy Honors Program these seminars will serve as a preparation for writing an honors thesis.

194A. Kant’s Critique of Pure Reason: Aesthetic and Analytic—Part I of a two-quarter study. Kant’s concepts of space and time; view of understanding and experience; proof of the categories of the understanding; concept of the Transcendental Subject and the unity of experience; distinction between appearances and things. Orientation analytic, exegetical, historical.

3 units, Aut (Piper) T 1:15-3:05
and Th 1:15

194B. Language.

3 units, Aut (Almog) M 3:15-5:05

194C. Kant’s Critique of Pure Reason: Dialectic—Part II of a two-quarter study. Prerequisite: 194A or familiarity with the material. Kant’s conception of reason, transcendental illusions; rational ideas of psychology; cosmology and theology. Time permitting, Kant’s moral philosophy. Orientation analytic, exegetical, historical.

3 units, Win (Piper) T 1:15-3:05
and Th 1:15

194D. The Linguistic Turn—Historical-critical study of some aspects of the post World War II “ordinary language” phase of 20th century attempts to provide linguistic solutions to philosophical problems. Readings from later Wittgenstein, Ryle, Austin, Wisdom, others; criticisms of ordinary language philosophy; current practitioners of a modified “linguistic turn” in philosophy.

3 units, Win (Pruitt) T 1:15-3:05

194E. Wittgenstein’s Tractatus—(Graduate students register for 294E.)

3 units, Spr (Etchemendy) T 1:15-3:05

196. Tutorial—Senior year.

5 units, any quarter (Staff) by arrangement

197. Individual Work for Undergraduates.

any quarter, (Staff) by arrangement

COURSES INTENDED PRIMARILY FOR GRADUATE STUDENTS

211. Plato’s Philosophy—(Same as Philosophy 111.) For graduate students.

212. Graduate Seminar on Aristotle—Seminar on Aristotle’s ethics, concentrating on the Nicomachean Ethics, but with relevant parts of Eudemian Ethics, Politics, Rhetoric, and Poetics to be considered as well.

3 units, Spr (Roberts) T 10:40-12:30

226. Kant’s Philosophy of Nature—A critical examination of the development of Kant’s views about nature and the consequences this had for his conception of a transcendental theory. Principal readings from Kant’s Metaphysical Foundations of Natural Science, the Critique of Teleological Judgment, and some shorter essays.

3 units, Spr (Förster) Th 1:15-3:05

228. Nietzsche—Seminar focusing on problems raised by historical and systematic intersection of the centrality of Richard Wagner’s art to all subsequent aesthetic culture and the centrality of Nietzsche’s thought of his ambivalent critique of Wagner. Some prior acquaintance with either Nietzsche or Wagner assumed. The Birth of Tragedy, Thus Spake Zarathustra, The Genealogy of Morals, The Wagner Case. Graduate course; open to undergraduates with requisite background. Given in cooperation with the Humanities Center.

3 units, Aut (McNees) Th 4:15-6:05

233. Heidegger’s Being and Time—(Same as Philosophy 133.) For graduate students.

235. Contemporary Philosophers—(Same as Philosophy 135.) For graduate students.

237A,B,C. Colloquium in History of Science—(Same as History of Science 237A,B,C.) Contemporary issues in the history of science. Guest lecturers from History, History of Science, Philosophy, Physics, Biology and Medicine will address what they see as the important topics in the history of science. A full year course for three units. Each student will pursue an individual research topic in consultation with the instructor.

1 unit each quarter, Aut, Win, Spr, (Galison) Th 4:15-6:05

238. Seminar in the History of Science—(Same as History of Science 238; same as Classics 238.)

Spr (Knorr) days and hours by arrangement

239. Teaching Methods in Philosophy.

1-3 units, any quarter (Staff) by arrangement

240. Individual Work for Graduates.

Any quarter, (Staff) by arrangement

242A,B. Seminar in the Philosophy of Science.

242A. given 1984-85
3 units, Win (Suppes) M 4:15-6:05

3 units, Spr (Cartwright and Suppes) M 4:15-6:05

251A,B. Philosophy of Science—Intensive two-quarter seminar in the philosophy of science, for first and second year students in doctoral program and possibly others with consent of instructor.
4 units, Aut, 2 units, Win, given 1984-85

256. Topics in Philosophical Logic.
3 units, Win (von Bentham) T 1:15-3:05

267. Philosophy of Biology—(Same as Philosophy 167.) For graduate students.

270A,B. Moral Philosophy—Intensive two-quarter seminar in moral philosophy, for first and second year students in doctoral program and possibly others with consent of instructor.
4 units, Aut, 2 units, Win (Bratman and Davidson) MW 3:15-5:05

273. Seminar on the Philosophy of Space Exploration—Study of the justification of space exploration in the face of conflicting needs, with special attention to the role that assumptions about the nature of science play in what appears to be a dispute about values. Significance of planetary exploration, exobiology, search for extraterrestrial intelligence. Philosophical assessment of space science and long-term prospects of space exploration. Graduate; open to advanced undergraduates, particularly in Values, Technology, Science, and Society. Given in cooperation with Humanities Center.
3 units, Spr (Munevar) W 4:15-6:05

275. Aesthetics of Modernism—(Same as Philosophy 175.) For graduate students.

280A,B. Metaphysics and Epistemology—Intensive two-quarter seminar in metaphysics and epistemology, for first and second year students in doctoral program and possibly others with consent of instructor.
2 units, Win, 4 units, Spr (Dupré and Moravcsik) MW 3:15-5:05

281A,B. Philosophy of Language—Intensive two-quarter seminar in philosophy of language, for first and second year students in doctoral program and possibly others with consent of instructor.
2 units, Win, 4 units, Spr, given 1984-85

282. Mathematical Linguistics—(Same as Linguistics 202.) Investigation of mathematical results relevant to empirical issues in linguistics.
4 units, Spr (Peters)

283. Meaning and Experience—For graduate students. (Same as 183.)

284. Introduction to Syntactic Theory—(Same as Linguistics 230.) Introduction to the transformational theory of syntax. Practical experience in forming and testing linguistic hypotheses, reading and constructing rules, etc.
4 units, Win (Bresnan and Sag)

3 units, Spr (Moravcsik) T 7-9

294E. Wittgenstein’s Tractatus—(Same as 194E.) For graduate students.

326. Epistemological Problems of Artificial Intelligence—(Same as Computer Science 226.) Formalisms for representing what a general intelligence program must know about the common sense world including facts about causality, ability, knowledge and action. Modes of rigorous and conjectural reasoning, especially non-monotonic reasoning. Approximate theories and counterfactuals. Connections with philosophy, especially philosophical logic and epistemology. Some familiarity with first order logic will be assumed. Offered alternate years.
3 units, Win (McCarthy) given 1984-85

331. Seminar in Confucian Ethics—(Same as Asian Languages 331.)
3-5 units, Win (Nivison) T 2:15-4:05

346. Seminar on Mind and Action — Discussion of selected problems in the philosophy of mind and action.
3 units, Spr (Bratman) T 3:15-5:05

365A. Semantics of Natural Languages.
3 units, Win (Barwise) Th 3:15-5:05

365B. Semantics of Programming Languages.
3 units, Spr (Barwise) Th 3:15-5:05

366A,B,C. Colloquium in Language and Information.
1-3 units, Aut, Win, Spr (Staff)

390A. 3 units, Win (van den Dries)

392A, B. Set Theory—(Enroll in Mathematics 392A, B.) The cumulative hierarchy. Axiomatic theories of sets (and classes). Inner models, particularly the constructible sets. Models obtained by forcing and generic sets; Boolean valued models. Consistency and independence results for mathematical statements. Prerequisites: 160A, B and 161 or equivalent.

alternate years, given 1984-85


393A.
3 units, Aut (Feferman)

393B.
3 units, Win (Feferman)

394. Topics in Logic—(Enroll in Mathematics 294.) These will vary from year to year. Examples: complexity of decision problems, abstract model theory and generalized quantifiers; recursion in higher types, generalized recursion theory; large cardinals, infinite games; constructive functional interpretations, foundations of constructive and semi-constructive mathematics. Prerequisites: Appropriate background from one of 290A, B through 393A, B or equivalent.

395A, B. Seminar in Foundations of Mathematics.

395A. Units by arrangement, Win (Kreisel) T 4:15-6:05

395B. Units by arrangement, Spr (Kreisel) T 4:15-6:05

450. Thesis.
any quarter (Staff) by arrangement

PHYSICS

Emeriti: Felix Bloch, Paul H. Kirkpatrick (Professors)

Chairman: Stanley G. Wojcicki


Associate Professors: Savas Dimopoulos

Assistant Professors: Richard Bond, Blas Cabrera (on leave Spring), Alan M. Litke (on leave Autumn), C. Jeff Martoff, Brian D. Serot, Karl A. Van Bibber

By Courtesy: Peter Galison

Acting Assistant Professor: Christian Stoller

OFFERINGS AND FACILITIES

The Russell H. Varian Laboratory of Physics, the adjacent Physics Lecture Hall, and the nearby W. W. Hansen Laboratories of Physics (including the High Energy Physics Laboratory and the E. L. Ginzton Laboratory) form a closely related complex which houses a range of physics activities from general courses through advanced research. The facilities include an 18-MeV Tandem Van de Graff accelerator. A superconducting electron linear accelerator is currently under construction and operates at energies over 100 MeV. Separated from this group is the Stanford Linear Accelerator Center (SLAC), a very high-energy physics laboratory which has as its principal tools a two-mile-long, 20-GeV electron accelerator and a 6-GeV electron-position storage ring. A higher energy storage ring (PEF) is under construction. Also located at SLAC is the Synchrotron Radiation Laboratory.

Professor Mason Yearian is the Director of the High Energy Physics Laboratory; Professors Fairbank, Hofstadter, and Schwettman are on the staff of the Laboratory. The staffs of the other branches of the W. W. Hansen Laboratories of Physics and the Stanford Linear Accelerator Center are mentioned elsewhere (see Applied Physics Department, Stanford Linear Accelerator Center).

One of the most important facilities is the Physics Library, which includes current subscriptions and back sets of important journals.
together with textbooks, scholarly treatises in English, French, German, and Russian, and the collected works of the most eminent physicists. It is a center for the reading and study of physics at all levels.

Course work is designed to provide students with a sound foundation in both classical and modern physics. The department also offers courses in gravitation, and students who wish to specialize in this field or in astronomy, astrophysics, or space science should also consult the Astronomy Course Program in this bulletin.

Undergraduates are also offered laboratory work at several levels. Both series of introductory courses include laboratories in which students carry out individual experiments. The Intermediate and Advanced Physics Laboratories offer facilities for increasingly complex individual work, including independent investigations.

Graduate students find opportunities for research in the fields of astrophysics, theoretical physics, low temperature physics, molecular physics, nuclear physics including the Mössbauer effect and atomic collision physics, intermediate energy physics, high energy physics, coherent optical radiation, and solid state physics. The fields of astrophysics, microwave physics, plasma physics, ferrites, biophysics, and others of a similar nature are offered in the Applied Physics Department and in the Biophysics Program.

The number of graduate students admitted to the Physics Department is strictly limited. Students should complete application by January 15, 1984 for the following Autumn. Graduate students may normally enter the department only at the beginning of Autumn Quarter.

UNDERGRADUATE PROGRAMS

The study of physics is undertaken by three principal classes of undergraduates: those including physics as part of a general education; those preparing for careers in professional fields that require a knowledge of physics, such as medicine or engineering; and those preparing for teaching or research careers in physics itself. In this department the courses numbered below 200 are planned to serve all three of these groups. The courses numbered above 200 meet the needs mainly of the third group, but also of some students majoring in other branches of science and in engineering.

BACHELOR OF SCIENCE

Department requirements for the degree of Bachelor of Science are as follows: Physics 51, 53, 54, 55, 56, 57, 105, 106, 107, 110, 111, 120, 121, 122, 130, 131, 132, 161, 170, 171, 200, 201, 41, 42, 43, 44, 101, 130 and 131. Physics 61, 62, and 63 (with 2 units of Physics 100) can replace all of the Physics 50 series requirements. Mathematics 43H, 44H, and 45H may be substituted for Mathematics 43, 44, 101 and 130. The department strongly advises the study of Chemistry 31, 33 and 35 and also the study of a modern language. The requirements of Physics 55, 56, and 57 may be waived upon approval of the Physics Undergraduate Study Committee. Mathematics and physics courses offered to satisfy the Physics Department's major requirements cannot be taken on a Pass/No Credit basis.

Students can follow either of the two course sequences. Sequence II (based on Physics 61, 62, and 63) is deemed preferable for students who have had physics and a year of calculus in high school. In this sequence, Mathematics 41 and 42 are not required. Sequence I (based on Physics 51, 53, 55, and 57) is mainly for students who have had a lesser background in science and mathematics. Students contemplating a major in physics are urged to consult with the instructor of Physics 61 at the earliest possible date to see which sequence would be the most suitable for them. Students who decide to enter the physics program after the freshman year would normally be advised to take the Physics 61, 62, 63 sequence, provided they had previously taken Mathematics 41, 42, and 43.

Sample programs in physics and mathematics under the two sequences are shown below. Students should consult their advisors about the course distribution requirements in other areas. The sequence of courses during the first two years is relatively inflexible, but considerable freedom exists during the upper-class years. Students are urged to work out, in consultation with their advisors, a program which will best fulfill their individual aims. The Undergraduate Office of the Physics Department has more detailed information on how to obtain a bachelor's degree in physics. This should be carefully studied by prospective majors, especially if they intend to make use of Stanford's programs abroad. Under some circumstances the department will permit, by petition, flexibility in the requirements so that the student may fit a period abroad into the program.

SEQUENCE I

FIRST YEAR*

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 51, 53. Mechanics, Electricity</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics 54. Electricity Laboratory</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. 41,42,43. Analytic Geometry and Calculus</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SECOND YEAR*

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 55, 57. Light and Heat, Modern Physics</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics 56. Light and Heat Laboratory</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics 110, 111. Int. Mechanics</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. 44, 101. Advanced Calculus</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. 130, 131, 132. Ordinary Differential Equations</td>
<td>3</td>
<td>3</td>
<td>(3)†</td>
<td></td>
</tr>
<tr>
<td>Partial Differential Equations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### THIRD YEAR*

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 110,111. Int. Mechanics Laboratory Seminars</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Physics 120,121,122. Int. Electricity and Magnetism</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Physics 130,131,132. Atomic and Nuclear Structure</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Math. 106. Complex Variables</td>
<td>(3)†</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### FOURTH YEAR*

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>A</th>
<th>W</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 170,171,172. Thermodynamics, Kinetic Theory and Introduction to Statistical Mechanics, Physics of Solids</td>
<td>3</td>
<td>3</td>
<td>(3)†</td>
<td></td>
</tr>
<tr>
<td>Physics 161. Optics</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics 200,201. Advanced Physics Laboratory</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics 210, 211. Introductory Theoretical Physics</td>
<td>(3) 3)†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. 113, 114, or 120. Linear Algebra and Matrix Theory or Modern Algebra</td>
<td>(3 3)†</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Additional elective units must be added to bring the total number of units to 180 as required by the University. Students should consult their advisors about the course distribution requirements in areas outside of the sciences.

† Not required for degree in physics

### HONORS PROGRAM IN PHYSICS

The Department of Physics offers a program leading to the degree of Bachelor of Science in Physics with Honors:

- **a)** Students should find a physics project — either theoretical or experimental.
- **b)** The student shall submit his or her proposal to the Honors Subcommittee, which will decide on its suitability as an Honors project.
- **c)** Course credit for the project will be assigned by the advisor within the framework of Physics 205.
- **d)** A written report of the work at its completion will be required for Honors.
- **e)** Before the end of the year each Honors candidate shall give a seminar on his or her work. This seminar will be announced publicly and will be open to the general audience. The expectation is that the student's advisor along with all the other Honors candidates shall attend the seminar.
- **f)** The decision as to whether a given independent study project does or does not merit award of Honors shall be made jointly by the Honors Subcommittee and the student's advisor. This decision shall be based on the quality of both the Honors work and the other work in physics.
- **g)** The work done in the Honors Program should not be used as a substitute for regularly required courses.
GRADUATE PROGRAMS

MASTER OF SCIENCE

The Physics Department does not offer a separate program for the Master of Science degree, but this degree may be awarded for a portion of the doctor’s degree work.

University requirements for the master’s degree are discussed in the “Degrees” section of this bulletin. Among the departmental requirements are a “B” average in courses 130, 131, 132, 170, 171, 172, 200, 201, 210, 211, 220, 221, 230, 231, 232, or their equivalent. Up to 06 of these units of requirements may be waived on petition if a thesis is submitted.

DOCTOR OF PHILOSOPHY

The University’s basic requirements for the doctorate (residence, dissertation, examination, etc.) are discussed in the section “Degrees” in this bulletin. The following are departmental requirements:

Minimum requirements for the Ph.D. degree in Physics consist of completing all courses on list “A” and at least 1 quarter from each of 2 subject areas chosen from list “B”. The requirements in list “A” may be fulfilled by passing the course, passing the final examination, or by satisfying the current instructor of prior knowledge of the material.


All Ph.D. candidates must also take the following mathematics courses or have taken their equivalent previously: 106, 113, 114, 130, 131, 132. A minimum grade average of “B” during the last five quarters is required in the courses taken toward the Ph.D. degree.

Prior to making an application for Ph.D. candidacy, each student is required to pass a written comprehensive examination on undergraduate and first year graduate physics. This exam is given annually on the Thursday and Friday preceding the start of the Autumn Quarter. The examination should be taken at the end of the summer after the first year graduate courses have been taken. After completion of the thesis he or she must take the University oral examination (defense of thesis). The Physics faculty believes that it is valuable for a scientist to have facility with a foreign language for cultural reasons and in order to establish better contact at meetings in foreign countries.

The Physics Department does not require a minor, but students are advised that the following mathematics courses have been found useful for graduate study in physics, especially for theoretical work: 206, 210, 220, 254, 256.

Three quarters of teaching are a requirement for obtaining the Ph.D. in physics. This regulation applies to students who entered Stanford in the Autumn Quarter of 1981 and thereafter.

The student interested in applied physics and biophysics research should also be aware of the Ph.D. granted independently by the Applied Physics Department and by the Biophysics Program. Students interested in astronomy, astrophysics, or space science should consult the Astronomy Course Program in this bulletin.

PhD MINOR IN PHYSICS

Minors in physics must take either Physics 210, 211, and one other course above 100, or Physics 130, 131, and 132, or Physics 170, 171, and 172, with the appropriate prerequisites. All prospective physics minors must receive approval of their Physics course program (at least one year before the award of the Ph.D.) from the Physics Graduate Study Committee.

The office of the Physics Department has more detailed information on how to obtain an advanced degree in Physics. This should be consulted by prospective candidates for advanced degrees.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the School of Education section of this bulletin or address inquiry to the Credential Administrator, School of Education.

The degree of Master of Arts in Teaching is offered jointly by this department and the School of Education. The degree is intended for candidates who have a teaching credential and who wish to strengthen further their academic preparation. The program consists of a minimum of 25 units in the teaching field and 12 units in the School of Education. A suggested minimum program in the teaching field of physics would be Physics 57, 100, 105, 110, 111, 120, 121, and Mathematics 130, 131. Detailed requirements for the degree are outlined in the “School of Education” section.

FELLOWSHIPS AND ASSISTANTSHIPS

The Physics Department makes an effort to support all its graduate students. The support is through fellowships, teaching assistantships, research assistantships, or a combination of some of these. Application for financial aid will be sent to students with the application for admission.
There are four series of beginning courses. The Ten Series (11, 14, 15, 19) is recommended for the humanities or social science student who wishes to become familiar with the methodology and content of modern physics. These quarters are independent of one another. The Twenty Series (21, 22, 23, 24, 25, 26) includes courses prescribed or recommended for general students and for students preparing for medicine or biology. The Fifty Series (51, 53, 54, 55, 56, 57, 58) includes courses for students of engineering, chemistry, geology, mathematics, and physics. The Advanced Freshman Series (61, 62, 63) is for the well-prepared student who wishes to advance rapidly in physics.

The Twenty and Fifty Series are similar in content and objectives. Both comprise demonstration lectures on fundamental principles of physics, problem work on application of these principles to actual cases, and laboratory experiments closely correlated with the lectures. Their objectives are not only to give information on particular subjects, but also to provide training in the use of the scientific method. The primary difference between the two series of courses lies in the fact that topics are discussed more thoroughly and are treated with greater mathematical rigor in the Fifty Series.

Courses beyond 63 are numbered in accordance with the following three-digit code. The first digit indicates the approximate level of the course: undergraduate courses (1), first- and second-year graduate courses (2), more advanced courses (3). The second digit indicates the general subject matter: laboratory (0), mathematical physics and mechanics (1), electricity (2), atomic and quantum physics (3), nuclear physics (4), high energy physics (5), structure of matter (7), independent study and research (9).

All undergraduates are offered help with physics problems in the departmental counseling and tutoring center called The Reference Frame. The center is staffed Monday through Friday, 9 a.m. to 5 p.m. and 7 p.m. to 9 p.m. except Fridays when it closes at 3 p.m.

11. Symmetries of Nature—Intended to familiarize humanities and social science students with concepts of atomic and subatomic physics. Explain how physicists have used symmetry principles to discover the laws of Nature on a subatomic scale, and how symmetries determine the behavior of atoms, nuclei, and elementary particles. No prerequisite. (DR:7)

3 units, Win (Peskin) T 2:15-4:05; Th 2:15

13. Modern Physics Through Science Fiction—A seminar course for students in Physics interested in exploring topics in modern physics and related fields through readings in science fiction. Topics to be discussed may include time travel, quantum mechanics, parallel universes, extraterrestrial life, teleportation, neutron stars, black holes, and general relativity. Prerequisite: current or prior enrollment in Physics 25.

2 units, Spr (Staff) not given 1983-84
one hour by arrangement


3 units, Aut (Staff) MWF 1:15
not given 1983-84

discussion by arrangement

15. Cosmic Horizons—This course proposes to familiarize the non-science student with modern cosmology. After discussing the physical laws that govern the universe, its evolution will be traced from the initial primeval fireball, through the formation of galaxies, stars, and planets to the development of life. Exotic astronomical objects, such as quasars, pulsars, and black holes, will be discussed. No prerequisites, but some algebra will be used. (DR:7)

3 units, Spr (Susskind) TTh 2:15;
discussion by arrangement

19. An Introduction to Physics ("Physics for Poets")—A presentation from non-technical, non-mathematical viewpoints of the aims, methods (experimental and theoretical) and achievements in the attempts to understand the basic principles governing the physical world. Each topic is usually introduced through the historical background, but the emphasis is on present knowledge and current problems. Likely topics: classical mechanics, relativity, and quantum mechanics. No prerequisites. (DR:7)

3 units, Aut (Yearian) TTh 9
plus one hour discussion by arrangement


3 units, Aut (Hänisch) MWF 10 or 11
plus one hour discussion by arrangement

Sum (Staff) MTWThF 10-12
plus one hour discussion by arrangement
21H. Honors Mechanics and Heat—Subject matter identical with that of Physics 21 but has advanced discussion. Prerequisite: Mathematics 19 or consent of instructor. (DR:7)

3 units, Aut (Hänisch) MWF 10 or 11
plus one hour discussion by arrangement

22. Mechanics and Heat Laboratory—Concurrent registration in 21 or 21H is required. Mandatory P/NC grading.

1 unit, Aut (Hänisch) by arrangement
Sum (Staff) T or Th 2:15-5:05

23. Electricity and Optics—Electric charges and currents, magnetism, induced currents; wave motion, interference, diffraction, geometrical optics. Prerequisite: 21. (DR:7)

3 units, Win (Schawlow) MWF 10 or 11
plus one hour discussion by arrangement
Sum (Staff) MTWThF 10-12
plus one hour discussion by arrangement

24. Electricity and Optics Laboratory—Concurrent registration in 23 is required. Mandatory P/NC grading.

1 unit, Win (Schawlow) by arrangement
Sum (Staff) T or Th 2:15-5:05

25. Modern Physics—Elementary introduction to modern physics. Relativity, quantum mechanics, atomic theory, radioactivity, nuclear reactions, nuclear structure, high energy physics, elementary particles, astrophysics, stellar evolution and the big bang. Prerequisite: 23 or permission of instructor. (DR:7)

3 units, Spr (Little) MWF 10 or 11
plus one hour discussion by arrangement


1 unit, Spr (Little) by arrangement

54. Electricity Laboratory—Concurrent registration in 53 is required. Mandatory P/NC grading.

1 unit, Spr (Staff) by arrangement

55. Light and Heat—Reflection and refraction of light, lens systems; light and electromagnetic waves; temperature, properties of matter, introduction to kinetic theory of matter. Prerequisites: 53 and Mathematics 43 or 23, or consent of instructor. (DR:7)

4 units, Aut (Schwettman) lee MWF 9 or 10
and discussions by arrangement

56. Light and Heat Laboratory—Concurrent registration in 55 is required. Mandatory P/NC grading.

1 unit, Aut (Schwettman) by arrangement

57. Modern Physics Laboratory—Concurrent or prior registration in 57 is required. Mandatory P/NC grading.

1 unit, Win (Ritson) by arrangement

61, 62, 63. Advanced Freshman Physics—An introduction to some topics in Newtonian mechanics, special relativity, electricity and magnetism, atomic physics and quantum mechanics from an advanced viewpoint. The format will consist of lectures and small discussion sections. This sequence is designed primarily for students contemplating a major in Physics. Prerequisites: high school physics and calculus; prior or concurrent registration in Math 43 (Aut), Math 44 and 130 (Win), Math 101 and 131 (Spr) or equivalent. Physics 61, 62, and 63 are all (DR:7)

61. 4 units, Aut (Cabrera) TTh 9-10:50
62. 4 units, Win (Cabrera) TTh 9-10:50
63. 4 units, Spr (Bond) TTh 9-10:50

100. Intermediate Physics Laboratory — Experimental work in mechanics, heat, electricity and magnetism, optics, atomic and nuclear physics. One set of apparatus for each experiment is available so that one or two students will perform a given experiment during a particular laboratory session. Majors entering through the 60 series (Sequence II) are required to take 2 units of Physics 100; majors entering through the 50 series (Sequence I) normally take Physics 54 and 56 instead of Physics 100. Prerequisites: 62 or 55.

100. 1-4 units, Win (Litke) 1:15-5:05
Spr (Litke) 1:15-5:05

The mini-courses vary in duration between two weeks and eight weeks, depending on the subject matter; courses must be taken in sequence. Subjects included are electronics, detectors and radioactive sources, optics and lasers, statistics and data handling, microwaves, low temperatures and computer interfacing. Physics 105, 106 and 107 are required for all Physics majors. Prerequisites: 100, or 54 and 56; concurrent registration in the 120 series.

105. Laboratory Seminar I — Electronics.  
2 units, Aut (Stoller)

106. Laboratory Seminar II.  
2 units, Win (Ritson, Schwettman, Hänisch)

107. Laboratory Seminar III.  
2 units, Spr (Stoller, Fairbank)

110,111. Intermediate Mechanics—Mechanics of systems of particles and rigid bodies. Coordinate transformation and vectors; Newtonian mechanics; linear and nonlinear oscillations; Hamilton's principle, Lagrangian and Hamiltonian dynamics; central forces, planetary motion; collisions; non-inertial reference systems; rigid body dynamics; coupled oscillations; and introductory fluid mechanics. Prerequisites: 51 and Mathematics 130.

110. 3 units, Win (Yearian) MWF 9
111. 3 units, Spr (Yearian) MWF 9

120,121,122. Intermediate Electricity and Magnetism—Vector analysis, electrostatic fields, including multipole expansion; dielectrics. Special relativity and transformation between electric and magnetic fields. Maxwell's equations. Static magnetic fields, magnetic materials. Electromagnetic radiation, plane wave problems (free space, conductors and dielectric materials, boundaries). Dipole and quadrupole radiation. Wave guides and cavities. Prerequisites: 53 and prior or concurrent registration in 110. Concurrent or prior registration in Mathematics 130 and 131 with Physics 120 and 121, respectively, is required. Concurrent or prior registration in Mathematics 101 is recommended.

120. 3 units, Aut (Martoff) MWF 11
121. 3 units, Win (Martoff) MWF 11
122. 3 units, Spr (Martoff) MWF 11

130, 131, 132. Quantum Mechanics — The origins of quantum mechanics, wave mechanics and the Schrödinger equation, Heisenberg's matrix formulation of quantum mechanics, solutions to one dimensional systems, separation of variables and the solution to three dimensional systems, the central field problem and angular momentum eigenstates, spin and the coupling of angular momentum, Fermi and Bose statistics perturbation theory and other approximation techniques. Scattering theory: partial wave expansion, Born approximation, Green's functions.

161. Intermediate Optics—Electromagnetic waves, superposition, interference, Fraunhofer and Fresnel diffraction, crystal optics, matrix optics, laser beams and resonators, guided waves, quantum aspects of light. Prerequisite: 122.

168. History of Modern Physics—(Enroll in Philosophy 168.)  
4 units, Aut (Galison)

169. Experimentation in Twentieth-century Physics—(Enroll in Philosophy 169.)  
4 units, Win (Galison)

170,171. Thermodynamics, Kinetic Theory, and Statistical Mechanics—Derivation of laws of thermodynamics from basic postulates; determination of relationship between atomic substructure and macroscopic behavior of matter. Temperature, equations of state, heat, internal energy, entropy, reversibility, applications to various properties of matter, absolute zero and low-temperature phenomena. Distribution functions, transport phenomena, fluctuations, equilibrium between phases, phase changes, the partition function for classical and quantum systems, Bose-Einstein condensation and the electron gas. Cooperative phenomena including ferromagnetism, the Ising model and the lattice gas. Irreversible processes. Prerequisites: 55, or admission to Advanced Sequence, and Mathematics 130.

170. 3 units, Aut (Fairbank)
171. 3 units, Win (Little)

172. Physics of Solids—Introduction to the principal types of solids, with emphasis on their thermal, electrical and magnetic properties. Elementary treatment of phonons in solids, electrons in metals, energy bands. Applications to semiconductors, rectification, superconductors, para- and ferromagnetism, magnetic resonance. Prerequisite: 171.

3 units, Spr (Staff) MWF 9

Although 130, 131, 132 are primarily courses in quantum mechanics, frequent reference will be made to problems in atomic and nuclear physics with a view to explaining the basic phenomenology of these disciplines. Prerequisites: 57 or equivalent and 110, 111. Concurrent or prior registration in 120, 121, 122, and Mathematics 130, 131.

130. 3 units, Aut (Van Bibber)  
TTh 1:15-2:30

131. 3 units, Win (Van Bibber)  
TTh 1:15-2:30

132. 3 units, Spr (Van Bibber)  
TTh 1:15-2:30

190. Independent Study—Experimental or theoretical physics under supervision of a fac-
ulty member. Prerequisites: superior work as an undergraduate physics major, approval of the instructor, and of the Undergraduate Study Committee of the Department of Physics. any quarter, (Staff) by arrangement

192. Senior Seminar: Basic Gravitation—An introduction to experiments in gravitation, with applications to problems in astrophysics. Prerequisites: Physics 120, 121, 122 or equivalent. 3 units, Spr, (Fairbank) by arrangement alternate years, given 1983-84

200, 201. Advanced Physics Laboratory—Experiments in atomic physics, nuclear physics, solid state physics, low-temperature physics, optics, and particle physics. Students are urged to take 200 no later than Autumn Quarter of their senior year and 201 no later than Winter Quarter of their senior year. Prerequisites: 105, 121, and 131.

200. 3 units, Aut (Meyerhof) Win (Meyerhof) Spr (Stoller) Sum (Staff) by arrangement

201. 3 units, Aut (Meyerhof) Win (Meyerhof) Spr (Stoller) Sum (Staff) by arrangement

205. Honors Program—Experimental or theoretical honors project and thesis in physics under supervision of a faculty member. Prerequisites: superior work in physics as an undergraduate major and approval of the Honors Committee. It is strongly urged that the student who elects to do an honors thesis begin the planning of the project no later than the middle of the student’s junior year. 1-3 units, Aut (Meyerhof) Win (Meyerhof) Spr (Meyerhof) Sum (Staff)


3 units, Aut (Susskind) MWF 10

211. Continuum Mechanics and Mathematical Physics—The physics of classical continuous media. The course will develop many useful methods of mathematical physics. Physical applications include waves on incompressible fluids. The mathematical methods include complex variables, partial differential equations and special functions of mathematical physics, eigenfunctions and Sturm-Liouville theory, variational methods, perturbation theory, Green’s functions, Fourier and Laplace transforms, and asymptotic approximations. Prerequisite: 210 and preferably Mathematics 106 and 132. 3 units, Win (Susskind) MWF 10

212. Group Theory and Mathematical Physics.

not given 1983-84

220-221. Classical Electrodynamics—Electrostatics and magnetostatics: conductors and dielectrics, magnetic media, electric and magnetic forces and energy. Maxwell’s equations: electromagnetic waves, Poynting’s theorem, electromagnetic properties of matter, dispersion relations, wave guides and cavities, magnetohydrodynamics. Special Relativity: Lorentz transformations, covariant, equations of electrodynamics and mechanics, Lagrangian formulation, Noether’s theorem and conservation laws. Radiation: dipole and quadrupole radiation, electromagnetic scattering and diffraction, the optical theorem, Liénard-Wiechert potentials, relativistic Larmor’s formula, frequency and angular distribution of radiation, synchrotron radiation. Energy losses in matter: Bohr’s formula, Cherenkov radiation, bremsstrahlung and screening effects, transition radiation. Prerequisites: 122 or equivalent; Mathematics 106 and 132, or concurrent registration in Physics 210 and 211.

220. 3 units, Aut (Fetter) MWF 9

221. 3 units, Win (Fetter) MWF 9

222. Classical Gravitation—Concepts in gravitation, equivalence principle and the red shift, tensor analysis, Einstein’s field equations, Schwarzschild solution and observable effects in the solar system, electrodynamics and hydrodynamics in gravitational fields, gravitational radiation, structure of collapsed stars, introduction to cosmology. Prerequisites: 211 and 221.

3 units, Spr (Staff) MWF 9 alternate years, given 1984-85

230, 231, 232. Quantum Mechanics—First quarter reviews limits to classical physics and develops wave mechanics and the Schrödinger equation. Eigenvalues and eigenfunctions are found for simple systems such as the harmonic oscillator, the hydrogen atom, and periodic potentials. Formal developments include matrix mechanics, abstract Hilbert space, and operator methods. The quarter concludes with a discussion of measurement theory and summarizes the postulates of quantum mechanics. Second quarter includes approximation methods for bound states, two-body problem, scat-
tering theory, time-dependent perturbation theory, and electromagnetic radiation. The third quarter continues with electromagnetic radiation including the Wigner-Weisskopf theory of the line width. The quantum theory of angular momentum includes spin, irreducible tensor operators, the Wigner-Eckart theorem, finite rotations, and multipole analysis of the radiation field. Continuous system of the elements. Selected topics in atomic and molecular physics. Prerequisites: 132 and 211, Mathematics 106 and 132, and preferably Physics 221.

230. 3 units, Aut (Wagoner) MWF 11
231. 3 units, Win (Wagoner) MWF 11
232. 3 units, Spr (Wagoner) MWF 11

234. Spectroscopy and Quantum Electronics—Characteristics and techniques for measurement of spectra from radiofrequency, through microwave, infrared, visible, ultraviolet and shorter wavelengths, with examples from atomic, molecular and solid state spectroscopy. Uses of spectral lines in lasers and other quantum electronic devices. New spectroscopic methods using tunable lasers: high resolution saturation spectroscopy, two- and multi-photon spectroscopy, nonlinear mixing of coherent waves, study of coherent transient phenomena. Prerequisite: 230.

3 units, Spr (Hänisch) MWF 2:15 alternate years, given 1983-84

240,241. Nuclear Physics—Strong, weak, and electromagnetic forces in nuclei; properties of nuclei; nuclear models, nuclear structure; nuclear reactions; constituents of nuclear matter. Prerequisites: 132 and 231, or equivalents.

240. 3 units, Aut (Staff) alternate years, given 1984-85
241. 3 units, Win (Staff) alternate years, given 1984-85

250,251 High Energy Physics—Transition probabilities; relativistic treatment of kinematics, spin, phase space; particles and conservation laws (parity, isospin, hypercharge, etc.); quantum numbers of the baryons and mesons; scattering of strongly interacting particles. Unitary symmetry, weak interactions (muon decay and properties), Regge poles, dispersion relations, nuclear-nucleon interactions. Prerequisites: 240 and 330; concurrent registration in 331, 332 recommended.

250. 3 units, Win (Wojcicki) alternate years, given 1983-84
251. 3 units, Spr (Hollebeck) alternate years, given 1983-84

260. Research Activities at Stanford—Review of research activities in the Department of Physics at a level suitable for entering graduate students. Registration required by all entering students.

0-3 units, Aut (Fairbank) by arrangement


3 units, Spr (Dimopoulos) T 1-4

271, 272. Solid State Theory—(Enroll in Applied Physics 239 and 240 respectively.)

271. 3 units, Aut (Harrison)
272. 3 units, Win (Harrison)


3 units, Spr (Beasley, White)

290. Literature of Physics—Intensive study of literature of any special topic. Chiefly preparation, presentation of reports upon topics studied. Prerequisites: 25 units of college physics and consent of instructor. If taken under the supervision of a faculty member outside the department, approval of the Physics Department Chairman is required.

any quarter, (Staff) by arrangement

299. Teaching of Physics—Techniques of teaching Physics by means of lectures and laboratories. All teaching assistants in Physics are required to register for this course.

0 to 3 units, Aut (Staff)

330,331,332. Advanced Quantum Mechanics—Review of quantum mechanics and relativity. Second quantization, relativistic one-particle equations (Klein-Gordon and Dirac), canonical field theory, relativistic scattering theory. Second quarter includes quantum electrodynamics: applications, radiative corrections, renormalization theory, the Lambshift. Unified gauge theories of weak and electromagnetic interactions. Third quarter includes special topics such as symmetry principles, the Heisenberg representation, dispersion relations, current algebras and sum rules, phenomenological field theories, quantum chromodynamics, and grand unified gauge theories. Prerequisites: 211, 221, 232.

330. 3 units, Aut (Walecka) TTh 9-10:50
331. 3 units, Win (Walecka) TTh 9-10:50
332. 3 units, Spr (Walecka) TTh 9-10:50

340. Theory of Many-Particle Systems—Application of quantum field theory to the nonrelativistic, many-body problem including methods of temperature-dependent Green's functions and canonical transformations.
Theory of finite-temperature, interacting Bose and Fermi systems with applications to superfluidity, superconductivity, and the electron gas. Prerequisite: 232; prior enrollment in Applied Physics 241 is recommended.

3 units, Aut (Serot) TTh 1:15-3:05

341, 342. Nuclear Theory—First quarter concerns properties of the nucleus and many-body theory of nuclear structure: nuclear forces, nuclear matter, neutron matter, equation-of-state, nuclear moments, shell-model, Hartree-Fock theory, pairing, collective particle-hole states, deformed nuclei, and nuclear rotations. Also theory of angular momentum, group theory of nuclear structure, quark theory. The second quarter concentrates on various interactions with nuclei: electromagnetic interactions, electron scattering, semileptonic weak interactions with nuclei (β-decay, μ-capture, and neutrino reactions), weak-neutral current effects, muonic x-rays, hadronic scattering, including π-nucleus interactions, theory of the optical potential, isobars, in nuclei, heavy-ion interactions, and nuclear reactions and symmetries. Special topics in intermediate-energy nuclear physics. Prerequisites: 232, 241, 340. Concurrent or prior registration in 331, 332 is recommended.

341. 3 units, Win, (Staff) TTh 1:15-3:05
342. 3 units, Spr, (Staff) TTh 1:15-3:05


3 units, Aut by arrangement, alternate years, given 1984-85


346. 3 units, Aut (Bond) alternate years, given 1983-84
349. 3 units, Win (Bond) alternate years, given 1983-84


3 units, Win (Staff) alternate years, given 1984-85

385A. 3 units, Aut (Staff) alternate years, given 1984-85
385B. 3 units, Win (Staff)
385C. 3 units, Spr (Staff)

389. Research Orientation—The purpose of this course is to allow students to become familiar with the activities of one or more research groups, within the department or outside. Registration is limited to one quarter per research group with an overall limitation of two quarters. Consent of the student's advisor is required for registration.

any quarter, (Staff) by arrangement

390. Research—All work in experimental or theoretical problems in research, as distinguished from independent study of non-research character listed as Physics 190 and 290. Open only to graduate physics major students, with consent of instructor. If taken under supervision of a faculty member outside the depart-
1. Completion of 45 units of political science, including:
   a) A minimum of 25 units of work taught by the Department of Political Science faculty. (No more than 20 units of transfer work may be accepted toward the 45 political science units.)
   b) An advanced course or seminar (numbered 100 or above) in at least three of the following fields: public administration and public policy, comparative politics, international relations, political theory, American politics.
   c) At least one seminar, which may be included in fulfillment of b), above.

2. The completion of 15 additional units which relate in a direct way to one or more of the student’s interests in political science. These courses, which may be in political science (including a departmental honors thesis) or in other departments, must be approved by the student’s advisor.

No more than 10 units of directed reading may be counted as credit toward the major. Directed reading, however, may not be used to fulfill a field requirement. Courses used to fulfill the major requirement must be taken for standard letter grades, although courses in excess of the required 60 units may be taken on a pass/no credit basis.

Public Policy Emphasis—The student who wishes to pursue a program of interdisciplinary study with a focus on public policy may elect a concentration in public policy within the political science major. The program will introduce the student to political and economic institutions and processes, to analytical techniques, and to substantive courses in public policy. All of the requirements of the political science major must be met. A detailed statement of the requirements of the program can be obtained in the department office.

HONORS THESIS PROGRAM IN POLITICAL SCIENCE

The honors thesis program offers qualified students an opportunity to conduct independent research, and to write a thesis of superior quality summarizing the results of their research. The program provides for close contact between students and their advisors, so that students can receive intensive guidance and assistance throughout their research and writing. The aim is to help students go through the process of research, analysis, drafting, rethinking, and redrafting which is essential to excellence in writing.

Because the honors thesis program involves close student-faculty contact, the basic requirement for admission to the program is that students secure the agreement of a regular faculty member to be their thesis advisor. Students should be aware that no faculty member can effectively supervise more than a few honors theses each year. Application to the program should therefore be made as early as possible, and certainly well before the beginning of the quarter in which the student wishes to enter the program. Application forms can be obtained from the department office, should be countersigned by both the student and his or her thesis advisor, and must be turned in to the department office by the deadline specified in the catalog. The thesis advisor then submits the application to the College of Letters and Science Honors Office.
GRADUATE PROGRAMS

ADMISSION TO GRADUATE STANDING

Prospective graduate students should write to the Graduate Admissions Office for application materials. All applicants are required to submit a sample of their writing and to take the Aptitude Test of the Graduate Record Examination. Applicants whose native language is not English or who have not studied in an English-speaking country for at least one and a half years must take the Test of English as a Foreign Language (TOEFL). For details concerning these tests, see the Information Bulletin. Overseas applicants who may not receive the Information Bulletin promptly, should write directly to the Educational Testing Service, Box 955, Princeton, New Jersey 08540. The application deadline is January 15. Admission is offered for the Autumn Quarter only. The department expects all students to pursue a full-time program except for time devoted to teaching or research assistantships.

MASTER OF ARTS

The department offers a terminal Master of Arts program for a limited number of students. Applicants for the A.M. program are selected on the basis of the same criteria as Ph.D. candidates. There is no financial aid available to applicants for the A.M. program. The A.M. degree may be pursued as part of a joint degree program with one of the professional schools within the University. The student should apply for admission to the A.M. program in Political Science during the autumn of the first year in the professional school within the University.

Terminal A.M. students and doctoral candidates who wish to apply, will be awarded the A.M. degree when they have completed the following requirements: completion of at least three quarters of residency as a graduate student, with 45 units of work in political science of which at least 25 units must be taken in graduate seminars of 200-level and above. Not more than 25 units of the 45-unit requirement may be taken in a single field. The student shall take at least two graduate seminars in each of two fields and at least one graduate seminar in a third field. Of the remaining 20 units, not more than ten units of work from related departments may be accepted in lieu of a portion of the work in political science. Courses must be numbered above 100, and a grade of "B-" or better must be attained in each course. Directed reading courses do not apply to the A.M. degree.

The University's basic requirements for the master's degree are discussed in the "Degrees" section in this bulletin. Students receiving the A.M. degree from Stanford are not given preference for admission to the Ph.D. program. They must apply for admission in the regular manner, and are subject to the same selection process as other applicants. The department does not offer a coterminal bachelor's and master's degree program.

MASTER OF ARTS IN THE TEACHING OF POLITICAL SCIENCE

The degree of Master of Arts in Teaching is offered jointly by this department and the School of Education. The degree is intended for candidates who have a teaching credential or relevant teaching experience and wish to further strengthen their academic preparation. The program consists of a minimum of 25 units in political science courses and 12 units in the School of Education. A student's program must be approved by the Director of Graduate Studies before the courses are taken. Detailed
DOCTOR OF PHILOSOPHY

Programs of study leading to the Doctor of Philosophy degree are designed by the student, in consultation with his or her advisors and the Director of Graduate Studies, to serve his or her particular interests as well as to achieve the general department requirements. A student will be recommended to the University Committee on Graduate Studies to receive the degree of Doctor of Philosophy in Political Science when the following program of study has been completed.

1. The candidate for the Ph.D. degree will offer three of the following fields of political science: American politics, comparative politics, international relations, political theory, and public administration. A special field, e.g., public law or urban politics, may also be offered. Students will concentrate on two of these fields by fulfilling, depending on the field, combinations of the following: written qualifying examinations, research papers, quantitative methods course work. The requirement for the third field may be satisfied either by taking a written examination in that field or by offering a minimum of ten units with a grade of "B" or better in the third field from among the formal graduate level courses in the five divisions of the department. Any two courses in the "General" category (courses numbered 200 to 205 or 301 to 305) may be used to fulfill the third field requirement. Students may also use two courses in separate fields but with a common topic to meet the third field requirement, provided that neither course is part of a field in which the student is examined. Students may also use appropriate courses taught in other departments. Selection of either of these options requires prior approval from the student's advisor and the Director of Graduate Studies.

2. The Ph.D. candidate is required to demonstrate competence in a language or a skill that is likely to be relevant to his or her dissertation research. Competence is required in:
   a) a foreign language; and/or
   b) a skill or skills such as statistics, mathematics for social science, computer science, interview techniques or historiography.

   The level of competence needed for successful completion of the research shall be determined by the student's advisor. In consultation with the advisor, the student shall propose a program of preparation in a language and/or relevant research skill. In some cases, it may be necessary for the student to show competence in both a language and relevant research skills.

3. If the candidate has not completed at least one year of previous undergraduate instruction, or 5 quarter units of previous graduate instruction, in political theory, he or she will take 5 quarter units of graduate instruction in political theory.

4. Early in the third quarter in residence, each first-year graduate student will submit to the student's advisor a statement of purpose. This statement will indicate the student's proposed major fields of study, the courses taken and those planned to be taken to cover those fields, the student's plan for meeting language and/or skill field requirements, plans for scheduling of comprehensive examinations, and, where possible, dissertation ideas or plans. This statement will be discussed with, and must be approved by, the student's advisor not later than May 15. At a regular meeting of the department faculty, it will be reviewed, and, if approved, filed with the Graduate Secretary. The main purposes of this procedure are, in order of importance: to advise and assist the student to realize his or her educational goals; to provide an incentive for clarifying goals and for identifying ways to achieve them; and to facilitate assessment of progress toward the degree.

5. Following the plan outlined in (4), when both the student and advisor feel that the student is ready, he or she will take one or two comprehensive examinations or complete one or two research papers, depending on the fields chosen. Examinations are given in the third week of the Autumn and Winter Quarters, and late in the Spring Quarter. Students should expect to complete these examinations and papers by the end of their second year in residence.

6. During a student's sixth quarter, he or she will file an Application to Candidacy for the Ph.D., which encompasses concrete course plans and records. This document, along with a student's examination performance, will be reviewed by the faculty at a regular meeting. If it is approved, a student will then be advanced to candidacy.

7. During the third year, a formal dissertation proposal will be submitted by the student to his or her thesis committee of three faculty members including the principal advisor. The faculty will review these proposals. A list of students, their proposals, and their thesis committees will be circu-
lated to the faculty, who will be asked to comment.

8. A candidate for the Ph.D. in Political Science is required to serve as a teaching assistant in the department for at least two quarters before a Ph.D. can be granted. The department considers teaching experience an essential part of the Ph.D. program. It is not recommended that this requirement be satisfied during the candidate's first year of graduate study, but the requirement will normally be satisfied by the end of the candidate's third year.

9. Doctoral candidates who apply for the A.M. degree will be awarded that degree upon completion of the requirements outlined in the description of the Master of Arts program.

10. The candidate shall pass the University Oral Examination on the area of the dissertation, at a time after the passing of the written comprehensive examinations suggested by the candidate's dissertation committee.

11. The candidate shall complete a dissertation satisfactory to the Dissertation Reading Committee and the University Committee on Graduate Studies.

The University's basic requirements for the Ph.D. degree are discussed in the "Degrees" section in this bulletin.

---

**PhD MINOR IN POLITICAL SCIENCE**

Candidates in other departments offering a minor in political science select two fields in political science in consultation with the Director of Graduate Studies and submit to her or him a program of study for approval. Written approval for the program must be obtained from the Director of Graduate Studies before application for doctoral candidacy. Students are required to complete at least 20 units in political science courses, all of which must be at least 100-level and above. Two of these courses, in separate fields of political science, must be 200-level and above. All grades must be of "B-" or better. Candidates will be examined in their fields in the general oral examination, by a member of the Political Science Department, chosen in consultation with the Director of Graduate Studies.

---

**WEST REFERENCE ROOM**

The department maintains, for its faculty, guests, graduate students and advanced undergraduates, a small reference room that holds political science journals, handbooks, books useful in preparing for Ph.D. examinations, and other materials. Access to West Reference Room is restricted to eligible key holders.

---

**PRIZES**

The attention of undergraduate students is called to three annual prizes—the Edwin A. Cottrell Memorial Prize for the best student in Political Science 1, the Arnaud B. Leavelle Memorial Prize for the best student in an introductory Political Theory course, and the Lindsay Peters, Jr., Memorial Prize for the outstanding student each year in Political Science 10.

---

**SUMMER SESSION**

During the Summer Quarter the Political Science department offers a variety of courses and seminars. The specific offerings depend on the faculty available during the Summer Quarter.

---

**COURSE OFFERINGS**

The department uses the following course numbering system:

- **1-99 Introductory Courses**
- **100-199 Advanced Courses and Undergraduate Seminars (may be open to graduates)**
- **200-299 Undergraduate-Graduate Seminars**
- **300-400 Graduate Seminars**

Course information is accurate when Courses and Degrees goes to press; however, students should be aware that there are sometimes changes and should check the Time Schedule each quarter for up-to-date information.

---

**INTRODUCTORY COURSES**

1. Major Issues of American Public Policy—Mr. Danelski covers the Constitution; civil liberties and civil rights; political socialization, ideology, participation, parties, and elections; the President, Congress, the Supreme Court, and the bureaucracy; public policy and policy analysis. Mr. Manley treats the major institutions of American government (Congress, the Presidency, Supreme Court, parties, and elections) within a critical perspective emphasizing Amer-
ican capitalism, liberal democracy, and the theory of pluralism. (DR:5)
5 units, Win (Manley)
5 units, Spr (Danelski)

25. Colonialism and Nationalism in the Third World — A comparative historical analysis of European exploration, conquest, and colonial rule in Latin America, the Caribbean, Africa, and Asia. Factors affecting the timing, character, and effectiveness of nationalist movements in the Third World. Impact of colonialism on post-colonial political and economic systems. (DR:5*)
5 units, Spr (Abernethy)

35. How Nations Deal With Each Other — Emphasizes a variety of approaches to the study of world politics including realism, idealism, Marxism, and bureaucratic politics. Examines a number of problems such as World War I, superpower intervention since 1945 and international economic relations, and the normative and policy implications of different theories. (DR:5)
5 units, Aut (Krasner)

50. Freedom and Order in Western Political Thought—An introductory survey of political thought since Machiavelli and the Reformation, with particular attention to the major conceptions of freedom and the conditions of the development of political and social freedom. (DR:3)
5 units, Win (Drekmeier)

ADVANCED COURSES AND UNDERGRADUATE SEMINARS

Advanced undergraduate courses are open to undergraduates who have the necessary prerequisites and to graduates where advisable. Undergraduate seminars have limited enrollments, and admission generally requires the consent of the instructor. They are intended for juniors and seniors, but may admit graduates where advisable. Sign-up sheets for undergraduate seminars are posted in the department office at registration time. Undergraduates interested in taking seminars should also consider the undergraduate-graduate seminars, numbered 200-299, listed in the next section.

GENERAL

5 units, Win (Bendor and Taylor)

PUBLIC ADMINISTRATION AND PUBLIC POLICY

The courses and seminars listed below are open to all undergraduates in the University, regardless of major. There are no prerequisites. There are no formal course sequences in public administration.

It should be noted that public administration courses numbered 206-210 are undergraduate-graduate seminars and are open equally to undergraduates and graduates. There are, however, prerequisites for some of these courses. Students interested in enrolling in them should check the course descriptions.

106M. The Politics of Bureaucracy—An introduction to the organization, activity and performance of public bureaucracy. Topics include Presidential and Congressional control, interest group influence, budgetary politics, and bureaucratic routines. 5 units, Spr (Moe)

109. Directed Reading in Public Administration—Advanced individual study in public administration.
any quarter, (Staff) by arrangement

COMPARATIVE POLITICS

Undergraduate courses and seminars in comparative politics generally fall into two groups: those dealing with a particular country or region, and those dealing with major political problems or processes. Students concentrating in comparative politics are encouraged to take courses from both groups, and are also urged to do course work in more than one country or region.

111. Politics and the State in Germany—The formation of two states in post-World War II Germany. Analysis of the role of the state in the Federal Republic of Germany and the German Democratic Republic. Special emphasis: (a) problems of representation; (b) policy conflict (energy, education, environment); (c) legitimacy and governability.
5 units, Spr (Weiler)
given 1984-85

111D. British Politics—An introduction to British politics. Examines the social and cultural context of British politics; parties; elections; and governmental structure. Also examines the substance of decision-making processes for selected public policies in Britain, such as economic policy and policies related to the welfare state. Implications of political socialization for policy-making.
5 units, Aut (Dorfman)

113A. The Politics of Development in Latin America—Survey course on the principal political systems of Latin America. Deals with the three largest countries (Brazil, Mexico, Argen-
SCHOOL OF HUMANITIES
AND SCIENCES

tina) and the major socialist country (Cuba).
(DR:5)

5 units, Aut (Packenham)

114. Japan: Politics of Economic Growth—An introduction to Japan's political system with special emphasis on the relationship between politics and the economy. (DR:5*)

5 units, Spr (Okimoto)

117R. The Role of the Military in Politics—A survey of the interaction between military and political leaders in western-industrial, communist and developing states. Examines the questions of military professionalism, the role of the military in political processes and the problem of the allocation of resources to defense. Draws upon diverse cases including the United States, the U.S.S.R., and countries of the developing world. (DR:5)

5 units, Aut (Rice)


5 units, Aut (Samoff)

119. Socialism in Latin America—An examination of socialist experiences in Latin America. The interrelationships between political, economic, and cultural change will be stressed. Special attention given to the historical and international contexts relevant in each case.

5 units, Win (Fagen)

120N. Seminar: Social Change and Politics in Japan—The impact of urbanization, affluence, and population aging on values, public policy and the political process.

5 units, Aut (Ike)

123D. Culture, Politics and Society in Latin America—(Same as History 80 and Latin American Studies 80.) An interdisciplinary course which surveys the interaction of Amerindian, African, and European cultures in the creation of New World societies from 1500 to the present. The course is organized into four major areas: migration and culture contact; the city and the countryside; relations between state and society; and perceptions and foreign policy. This is a basic introduction to the Latin American courses within several departments. (DR:5)

5 units, Spr (Wirth, K. Durham)

124. Seminar: Latin American Dependency—Assessment of fundamental concepts and theoretical frameworks, single country case studies, and research and political strategies regarding dependency in Latin America.

5 units, Spr (Packenham)

125F. Seminar: Development and the International System—Focus on external constraints on development in the Third World, and the interaction between national and international factors. Prerequisite: 35. In general, previous work in International Relations, Economics, and/or Political Science is highly recommended.

5 units, Win (Fagen)

126. Seminar: Politics in Eastern Europe—Systematic examination of the eight East European political systems in terms of their historical development, their policy-making processes, and their system maintenance and adaptation. Attention will also be paid to Eastern Europe as a region in world politics.

5 units, Aut (Triska)

128R. Seminar: Political Elites—A comparative examination of the behavior of political elites. Emphasis on problems of elite maintenance, recruitment and socialization. Examines the differences in the behavior of elites in western industrial, communist and developing societies. The rise of counter-elites is also explored. Attention to the behavior of different types of elites: legislative, administrative, executive and military.

5 units, Spr (Rice, Eulau)

129. Directed Reading in Comparative Politics—Advanced individual study in comparative politics.

any quarter, (Staff) by arrangement

INTERNATIONAL RELATIONS

Students interested in international relations are encouraged to take Political Science 35, "How Nations Deal With Each Other." While not a formal prerequisite for many of the courses listed below, Political Science 35 is an introduction to international relations and thus provides a desirable background for more advanced work.

The courses in international relations offered by the Political Science Department can generally be divided into two groups: those dealing with global political, military, and economic problems; and those dealing with the foreign relations of specific nations or geographic regions. Students concentrating in international relations are encouraged to select their courses from both these groups.
Students with interests in international relations are encouraged to refer to the "International Relations" section of this catalog, which lists international relations courses in other departments.

130. Introduction to International Law—A broad overview of theories, development, present state and propensities of international law as a policy process in various critical arenas of international interaction. 
5 units, Spr (Triska)
given 1984-85

131. International Dependence—What is meant when it is said that one state is dependent upon another, more powerful state? What are the implications of a dependent relationship for the domestic political economy of both parties? What occurs when a weak state tries to reduce its dependence on a strong state? These questions will be examined through an historical analysis of European colonialism and through contemporary case studies, examining U.S. relations with a Latin American country, France with an African country, and the U.S.S.R. with an Eastern European country. Desirable prerequisite: 35.
5 units, Spr (Abernethy)

131J. American Foreign Economic Policy—A developmental approach is used to analyze aspects of American foreign economic policy. Centers on a historical analysis of the basic issues involved in the formation of American foreign policy over the last 200 years. Issues covered include the evolution of American tariff and trade policy, the development of mechanisms for international monetary management, and American foreign investment policy, all in light of changing political goals pursued by American central decision-makers. Prerequisite: 35 or equivalent.
5 units, Aut (Goldstein)

133R. U.S. and Soviet National Security Policies: The Responsibilities of Empire in the Nuclear Age—Examination of the formulation and execution of national security policy in the United States and the U.S.S.R. Special attention is devoted to the creation and rapid growth of the national security apparatus after 1945 and the attempt by both countries to balance domestic concerns with expanding international responsibilities. Four cases of security policy formulation and conduct are used to provide an analytical basis for comparison: weapons procurement, alliance maintenance, the politics of military intervention and crisis management. Prerequisite: 138A, 117R or 136C are recommended.
5 units, Aut (Rice, Blacker)

137. The World of Superpowers—A comparative and interactional study of the superpowers—U.S., China, U.S.S.R., Western Europe and Japan—in terms of recent major events and development. Emphasis is on political change and formulation of theory of political dynamics.
4-5 units, Spr (Ike, North, Triska)

138A,B. Arms Control and Disarmament—(Same as Values, Technology, Science and Society 154A,B.) The introductory course, 138A, is a general survey of international security relations, the revolutionary development of modern weapons, the arms competition and efforts at arms control and disarmament in the post World War II period. Political, conceptual and technological problems of national security policies and arms controls are stressed. Time is devoted to the evolution of strategic doctrines and negotiations on strategic arms control in SALT I and SALT II. The course is taught by an interdisciplinary faculty. 138A is a prerequisite to 138B. 138B is a tutorial and research course.
138A. Arms Control
5 units, Win (Lewis, Blacker)
138B. Seminar: Arms Control
5 units, Spr (Lewis, Blacker)

138M. Basic Problems in Sociological Theory: European Contributions—(Same as Sociology 171.) Close study of a selected number of contemporary European contributions to sociological theory with special, but not exclusive emphasis on the macro- or societal level of analysis. Main areas include: systems theory (e.g. Luhmann), action theory (e.g. Crozier, Habermas), critical theory (e.g. Offe), historical sociology (e.g. Elias) and Weber's theory of occidental rationalism (e.g. Schluchter).
5 units, Win (Maynz)

138A. Japanese Foreign Policy—Analysis of the postwar evolution of Japanese foreign policy in terms of historical background, external environment, and domestic institutions. Construction of an analytic framework first term; application of that framework to concrete cases, the second term.
5 units, Win (Okimoto)

140A,B,C. Ethics of Development in a Global Environment (EDGE)—(Same as Anthropology 133A,B,C; Education 274A,B,C; Engineering 297A,B,C.) Presents a series of speakers on current development issues with emphasis on problems of poorer nations. Autumn Quarter speakers discuss basic world resources—energy, food, housing, population and environment—and the political development and dependencies of developing regions. Winter Quarter speakers address the international institutions and their roles: international banking, international businesses, U.S. and foreign uni-
versities, East-West political policies, and organizations of developing countries. Spring Quarter speakers address the roles of individuals in national and international institutions dealing with the problems of developing countries. Speakers represent a wide range of political, professional, and national backgrounds and present candid and often differing points of view. Gives students working in developing countries or in institutions dealing with developing countries a better knowledge of the challenges they face and the issues with which they must deal. One unit credit for attendance of the speaker series; three units additional credit for optional workshops treating selected issues in more depth. (Sequential registration not required.)

140A,B,C. 1-4 units, Aut, Win, Spr (Fagen, Fuenzalida, Lusignan, McWhorter, Siegel, Textor) lectures M 7:30-9:30 p.m. workshops by arrangement

141. Seminar: Public Policy and International Law—Analysis of the nature, determinants, and consequences of public policy decisions which impinge upon orderly, sequential development of world community. How states and courts attempt to reconcile rights of particular contestants with general interests of others in the international system. Emphasis on topics such as: the Law of the Sea Treaty and exploitation of the oceans; pollution; terrorism; weather control; arms control of weapons which aggravate suffering; nuclear proliferation, and human rights. Desirable prerequisite: 130 or equivalent.

5 units, Aut (Triska)

141M. Seminar: U.S.-China Relations—Provides an analysis of major issues in U.S.-China relations in the 1980's, and offers opportunities for individual student research. Prerequisite 115 or 139.

5 units, Win (Lewis)

144. Seminar: Force and Diplomacy—Seminar will focus on problems of crisis management and crisis avoidance in the U.S.-Soviet relations since the beginning of the cold war. Students will do research on individual crises. Students taking the seminar for both quarters will be expected to do more substantial papers and to revise them after detailed discussion during the second quarter. Prerequisite: 35 or a course in American Foreign Policy.

5 units, Aut (George)

145J. American Foreign Policy—Introduction to American foreign policy, its formulation and implementation and specific problems which have been influential in its development in the post-World War II era. Begins with the examination of modes of foreign policy analysis and the particular internal and external constraints facing American central decision-makers. Topics covered include the development and evolution of American containment policy, American foreign-economic policy, U.S. national security policy, and important contemporary issues of American foreign policy. Prerequisite: 35 or equivalent.

5 units, Win (Goldstein)

146M. Comparative Policy Analysis—(Same as Sociology 167.) Seminar focuses on the process of public policy development, which will be analyzed in terms of 1) its major phases (e.g. problem definition, instrument choice, program design), 2) the major actors involved (e.g. political parties, pressure groups, top executive, ministerial bureaucracy, commissions), and 3) process characteristics (e.g. incrementalism, conflict transformation, bureaucratic politics). Seminar is comparative both in terms of the approaches used and of the empirical material, which will be drawn from different countries.

5 units, Aut (Mayntz)

149. Directed Reading in International Relations—Advanced individual study in international relations.

Any quarter (Staff) by arrangement

POLITICAL THEORY

(See section on Introductory Courses for P.S. 50 "Freedom and Order in Western Political Thought")

150. Ancient and Classical Political Thought—From the beginnings of political speculation in preliterate societies to the Stoics; Greek thinkers will be emphasized. (DR:3)

5 units, Aut (Drekmeier)

154J. Modern Political Theory—The two most powerful manifestations of modern political theory are liberal democracy and socialism. The course analyzes the fundamental differences in their histories and methodologies. Liberal democracy is traced back to its roots in modern English theory; socialism to its development from eighteenth and nineteenth-century German dialectics. Concludes with the manifestations of those systems of theory in their contemporary modes: Freud's analysis of the individual psyche, and Arendt's consideration of the political crisis of the modern age. Readings include Bentham, Mill, Hegel, Marx, Freud and Arendt.

5 units, Win (Ring)

164J. Seminar: Political Theory and Feminism—This seminar considers how traditional political theory has dealt with "the woman ques-
tion," and how contemporary feminist theory has dealt with traditional theories about women. The parameters of the first part are set by liberal, dialectical, and psychoanalytic theory; of the second, by liberal, socialist, and radical feminism. Readings will include both traditional political theory and contemporary American feminist theory.

5 units, Spr (Ring)

169. Directed Reading in Political Theory—Advanced individual study in political theory. Any quarter, (Staff) by arrangement

PUBLIC POLICY

175. Politics and Public Policy — This course presents a broad historical look at national public policy-making from the New Deal to the present. Competing theories about the rise and development of liberal democratic capitalism are assessed within the general context of domestic policy-making by Congress and the Presidency. Special attention is paid to the role of the national government in the modern American political economy through the examination of selected public policies dealing with employment, economic development, social welfare, and equality. Prerequisite: 10 or 170. (DR:5)

5 units, Spr (Manley)

AMERICAN POLITICS


5 units, Spr (Horn)

183. Civil Liberties In The United States—Civil Liberties in contemporary American culture; theory and history underlying them. Freedom of thought, speech and press; religious liberties and separation of church and state; rights of women and minority groups.

5 units, Win (Danelski)

183K. The Criminal Law and the Criminal System—(Same as Law 109 and Sociology 109.) Exploration of the purposes and processes of the criminal law with emphasis on the actual operation of the system, and application of theory to contemporary problems. Topics will include the police, the trial, sentencing, corrections and "non-victim" crimes.

5 units, Spr (Kaplan) TTh 10-11:30

183F. The Development of American Law—(Same as American Studies 171 and Law 105.) The growth and development of the American legal institutions with particular attention to crime and punishment; slavery and race relations; the role of law in developing the economy; and the place of lawyers in American society, from Colonial times to the present.

5 units, Aut (Friedman) MTWTh 9

187. The Social Sciences and Educational Analysis: Introduction to the Politics of Education—(Same as Education 220B.) Overview of relationships between political analysis and policy formulation in education; focus on alternative models of the political process, the nature of interest groups, political strategies, community power, the external environment of organizations and the implementations of policy. Applications to educational settings and problems emphasized.

4 units, Win (Kirst) MW 11-12:30 and by arrangement

192R. Seminar: The Politics of Policy Toward Unemployment—The policy problem of unemployment is as old as the recognition that forces, apart from the individual's initiative and willingness to work, will from time to time make it impossible for the individual to "make a living." With this recognition has come "public" attempts to solve the problem or mitigate its effects. The "politics" engendered by these attempts stem from questions of "who will pay" "who will benefit"; and "how can the problem of disincentives to honest labor be avoided"?

Seminar will proceed both historically and analytically in order to approach understanding of the problem of unemployment as a public policy problem.

5 units, Spr (Brody)

194D. Seminar: Media and Politics—(Same as Communication 162.) Examines the links between mass media and government, on the one hand, and between media and the individual citizen, on the other. Via an examination of the relevant literature, questions of the role of the "organization" of the media in the formation of "news," "biases," and the "effects" of media on individual "agenda," attitudes and behaviors will be explored.

5 units, Win (Brody, Chaffee) T 2:15-4:05

195. Seminar: Political and Economic Power in the United States—The purpose of this seminar is to explore various theories about the distribution of political and economic power in contemporary America. Among the topics covered are pluralism, elitism, Marxism, and the role of national political institutions in affecting the distribution of economic values. Pre-requisite: 10 or equivalent, and junior standing.

5 units, Win (Manley)

196M. Seminar: Marxian Political Economy—Seminars purpose is to attain an understand-
ing of the political economic theory of Karl Marx, and to explore the utility of Marx’s theory in understanding the political economy of the United States. To be admitted to the seminar students must have achieved junior standing or above and completed one of the following courses: Mr. Manley’s 10, 175, 195, or Economics 120. Enrollment is limited to ten.

5 units, Spr (Manley)

198. Directed Reading in American Politics—Advanced individual study in politics. Prerequisite: 10 or equivalent.

Any quarter, (Staff) by arrangement

UNDERGRADUATE HONORS

199. Senior Honors Thesis.

Any quarter, (Staff) by arrangement

GRADUATE-UNDERGRADUATE SEMINARS

Conducted as seminars or colloquia, and open to both advanced undergraduates and graduates. In most cases non-majors as well as majors are welcome, but enrollments are limited. Sign-up sheets for all 200-level courses are posted in the Departmental Office at registration times. These sheets should be checked for indications of class size and other specific enrollment information.

GENERAL

203A,B. Political Data Analysis I and II—Political Data Analysis I: Introduction to fundamentals of research design, measurement, computing and parametric and non-parametric statistics. Instruction will include lectures, discussions of examples in political science literature, and computer assisted analyses of political data sets. Political Data Analysis II: Examination of special problems encountered in quantitative analyses of political data and methods for alleviating those problems. Instruction will include lectures, computational assignments, and critiques of major political research.

203A. 5 units, Win (Brody, Moe)
203B. 5 units, Spr (Brody, Moe)

204A,B. Seminar: Introduction to Positive Political Theory—Introduces students to concepts and analytical techniques from the theory of games, decision theory, and social choice theory and will examine their use in modelling political institutions. (Open to graduate students in political science and to others with the consent of instructor).

204A. 5 units, Aut (Ferejohn)
204B. 5 units, Win (Ferejohn)

206. Seminar: Bureaucracy and Administration — A broadly based examination of theory and research on public bureaucracy. Topics include organizational behavior; political control and accountability; the politics of the budgetary process; the role of clientele groups, and bureaucratic growth and inefficiency.

5 units, Win (Moe)

207. Seminar: Governmental Decision-Making and Natural Resources—Political, economic, administrative factors affecting public policy for river basin development, soil conservation, management of public domain, related problems. Pressure groups, legislative bodies, administrative agencies in the decision-making process. Recommended: Economics I.

5 units, Win (Marshall) given 1984-85


5 units, Spr (Marshall) given 1984-85

209. Directed Reading in Public Administration.

Any quarter, (Staff) by arrangement

COMPARATIVE POLITICS

211M. Implementation of Public Policy: Comparative Research Perspectives—(Same as Sociology 266.) Study of implementation processes and outcomes and their determinants in a comparative perspective, drawing on material for the U.S. and selected European cases. Research topics refer to specific policy areas (e.g. environmental, education, and employment policies) as well as to specific policy instruments (e.g. grants-in-aid, regulation, persuasion).

5 units, Win (Mayntz)

215A,B. Japan’s Political Economy—Study of the role of state and private enterprise in Japan’s capitalist economy. Coverage of the international economy, political and economic institutions, policies and practices, and performance. First term, readings; second term, research paper.

215A. 5 units, Win (Okimoto)
215B. 5 units, Spr (Okimoto)

221. Education and Political Change—(Same as Education 306B.) Introduction to the analysis of the relations between education and politics from a comparative perspective. Special attention will be given to: different theoretical approaches to the study of education and politics;
questions of legitimacy in educational policy; international factors in educational development; the politics of educational planning and reform; processes and conditions of political learning.

5 units, Win (Weiler) TTh 2:15-4:05 and by arrangement

221S. Education and Radical Change: African Experiences—(Same as Education 395.) Focuses on schools as sites of protest and on education as a core element in development strategy. For the former, considers education and student protest in South Africa. For the latter, considers the experiences of Guinea-Bissau and Tanzania and, through student research presentations, Angola, Mozambique, and Zimbabwe. Explores education in strategies for change by examining the role(s) of schools in society.

5 units, Spr (Samoff)


5 units, Spr (Ward)

228. Seminar: The U.S. and the U.S.S.R. as Regional Powers—A research seminar on the progressive alienation between restive, frustrated social forces and obsolete political structures in Eastern Europe and in Central America and the Caribbean. Focus will be on the dilemma of the two regional powers of how to deal with social change without harming their regional interests.

5 units, Win (Triska)

229. Directed Reading in Comparative Politics.

any quarter, (Staff) by arrangement

INTERNATIONAL RELATIONS

235. Seminar: United States and the Pacific—A research seminar on political, strategic, economic, and cultural aspects of recent and contemporary United States' relationships with major states and regions bordering the Pacific Ocean.

5 units, Win (Ward)

241A,B. International Political Economy—Examines major theoretical approaches emphasizing structural/mercantilism, liberalism, and Marxism. Approaches are applied to a variety of historical and contemporary issues. Includes lectures and class presentations on readings. 241B provides the opportunity to complete a research paper. Class sessions will be based on work being conducted by students and the lecturer.

241A. 5 units, Win (Krasner)
241B. 5 units, Spr (Krasner)

243. Seminar: International Relations Theory—Course identifies major trends in the North-South and East-West conflicts since World War II and examines data and current literature pertaining to projections and possible alternatives between now and the year 2000.

5 units, Aut (North, Goldstein)

244. Colloquium: Global Politics and the Future—Readings and discussions about who gets what, when and how in a world of growing population, advancing technology and finite resources.

5 units, Win (North)

244R. The Politics of Alliances—Seminar will focus on the role of political-military alliances in the international system. Major theories of alliance formation and behavior and issues of alliance utility, the role of alliances in the propagation of conflict are explored. Draws upon cases from both the 19th and 20th centuries, including the two major modern cases, NATO and the Warsaw Pact. Prerequisite: 35 or permission of the instructor.

5 units, Win (Rice)

245J. Seminar: American Foreign Policy—This is a graduate research seminar in American foreign policy. Emphasis will be on alternative explanations for major tenets of American policy which explain in particular the origins of the cold war, the Vietnam war and post-war foreign economic policy. Undergraduates who have taken 145J will be admitted with the consent of the instructor.

5 units, Spr (Goldstein)

249. Directed Reading in International Relations.

any quarter, (Staff) by arrangement

POLITICAL THEORY

Graduate students interested in Political Theory offerings should also see courses numbered 150-169.

254. Essentials of Political Theory—Methods, concepts, and concerns of political theory: problems of valuation and interpretation; recent contributions to the philosophy of political analysis.

5 units, Aut (Drekmeier)

255. Theory of the State—The most influential modern ideas of the function of the state and its relation to the larger social order. Theories of power and authority associated with these con-
ceptions, with emphasis on the private/public discussion in recent social science literature.

5 units, Spr (Drekmeier)

269. Directed Reading in Political Theory.
any quarter, (Staff) by arrangement

AMERICAN POLITICS

288. Seminar: the Politics of Representation
—An exploration of the theoretical, historical and empirical foundations of such major approaches to representation as contractualism, communitarianism, democratic radicalism, liberal individualism and pragmatic pluralism. The implications of these approaches for contemporary issues of representation in the American context—"majority rule" and the representation of minorities (ethnic groups, economic interests, special issue groups, and so on).

5 units, Aut (Eulau)

288K. Educational Evaluation and Federal Education Policy—(Same as Education 323A.)
The formulation and administration of federal education policy. Includes federal/state delivery systems and policy evaluation as well as the key actors of coalitions.

3 units, Spr (Kirst) TTh 3:15-5:05 and by arrangement

291. Seminar: Recent Literature on American National Institutions—An introduction to the general as well as monographic literature on the American Presidency, Congress, Supreme Court and Federalism. Designed especially for prospective college and high school teachers as well as Ph.D. candidates in political theory, comparative and international politics who are not offering American politics as a major field of specialization. Seniors and graduate students only.

5 units, Aut (Danelski, Eulau)
given 1984-85

298. Directed Reading in American Politics.
any quarter, (Staff) by arrangement

GRADUATE SEMINARS

Seminars numbered 300 and above are limited to graduate students. Instructors should be consulted before enrolling.

300. Thesis.
any quarter, (Staff) by arrangement

311. Seminar: Major Theories in Comparative Politics—Various modes of defining, explaining, and evaluating democratic, authoritarian, and totalitarian political systems in national units. Works of Almond, Dahl, Linz, Hunting-
Emeriti: Edith M. Dowley, Ernest R. Hilgard, Douglas H. Lawrence, Quinn McNemar, Lois Meek Stolz, Robert R. Sears (Professors)

Chairman: Ewart A. C. Thomas


Associate Professors: Ellen Markman, Jeffrey J. Wine

Assistant Professors: S. Shirley Feldman, Michael Pavel, George A. Quattrone, Brian A. Wandell, Daniel Weinberger

Senior Lecturer: Barbara Tversky

Lecturer: Lyn Carlsmith


Affiliated Professor: Lee Shulman

Affiliated Associate Professors: Stuart Card, Ronald Kaplan, Thomas Moran, Charles Rebert

Affiliated Assistant Professor: Andrew B. Watson

OFFERINGS AND FACILITIES

The Department of Psychology comprises facilities and personnel housed in Jordan Hall, where it maintains extensive laboratory and shop facilities. Several of the laboratories are equipped with computers and others are linked directly to the University's Computer Center. The department maintains a nursery school close to the Escondido married students' housing area. This provides a laboratory for child observation, for training in nursery school practice, and for research.

The department provides: (1) courses designed for the general student; (2) a major program leading to the degree of Bachelor of Arts; and (3) programs of graduate study and research leading to the degree of Doctor of Philosophy. Applications are not accepted for the master's degree.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

For the bachelor's degree, a total of 65 units in psychology and supporting fields are required; of these, a minimum of 45 units must be completed in psychology itself. A maximum of 20 units in non-introductory courses in supporting fields (i.e., mathematics, computer sciences, physical sciences, biological sciences, and social sciences) may also be counted toward the 65 unit requirement.

Beyond these overall requirements, the 45 units in psychology must include Psychology 1, Psychology 60, and at least two courses from each of two groups listed below: Group A consists of broad content courses in the areas of cognition, perception, physiological psychology, and psycholinguistics. Group B consists of courses in the areas of social, developmental, abnormal and personality.

Group A: 102, 106, 107, 108, 109, 110, 120, 146, 147, 163, 164, 176

Group B: 111, 115, 121, 132, 135, 136

These two lists of courses, it should be noted, may change from year to year, and students are encouraged to check with the Department Secretary for additional information.

No more than 10 units of independent study (104, 182, 184, 188, 257, and 257A) may be counted toward the 45 units. All independent study courses are graded on a no-option pass/no credit basis.

A transfer student must take at least 15 units of course work in the department in order to receive the department's recommendation for graduation. Such students may receive transfer units for courses completed in psychology at any accredited university or college provided that the courses were taught by a regular faculty member. There is no limit to the number of units that may be transferred, but all students must satisfy Group A and Group B requirements through courses completed at Stanford.

Beyond the Minimal Requirement—Many students will wish to complete a "strong" program rather than merely fulfill the minimal requirements listed above. This may be especially true for students who anticipate graduate study in psychology or in closely related fields. Listed below are some recommendations that should help students to strengthen their programs.

1. Research experience, particularly in the junior or senior year, is highly desirable for anyone considering graduate work in psychology. For those interested in clinical psy-
chology, counselling psychology, etc., “para-
professional” experience (e.g., Psychology
184 or some similar program) is highly
recommended.
2. Courses in statistics (beyond Psychology 60),
mathematics, and computer sciences are be-
coming increasingly important and helpful
for graduate work.
3. Courses beyond the introductory level in
fields related to psychology (e.g., sociology,
antropology, biology, physiology, etc.) will
further strengthen students’ programs.
4. Students should seriously consider the ad-
vanced seminars offered by the Psychology
Department, particularly in areas closely
related to the student’s career plans (e.g.,
prospective clinicians might enroll in ad-
vanced seminars in psychopathology, per-
sonality, or behavior modification). Aca-
demic advisors can be particularly helpful in
guiding such choices.
5. Finally, for those students interested in
graduate work in psychology, the senior
honors program is strongly recommended. A
description of this program follows below.

SENIOR HONORS PROGRAM IN
PSYCHOLOGY

A Senior Honors Program is designed for
those exceptionally able students who wish in
their major, to pursue an intensive and some-
what independent study of psychology, and to
engage in psychological research. Admission to
the program will be made at the end of the
student’s junior year on the basis of academic
performance and demonstrated desire to do
research. The program is directed toward the
integrating of a substantial body of theoretical
and factual information, and the development of
creative scholarly skills, by independent study,
small seminars, and extended research experi-
ence. Particular emphasis is laid on the plan-
ing of an individual program for the student
that will combine his or her specialized interests
with the body of basic general psychology
essential for all students who are undertaking
concentrated study in the field. During the
Autumn Quarter, students will participate in a
weekly seminar concerned with the methods
and approaches to psychological research. At
that time, students will initiate an independent
research project under the supervision of an
appropriate faculty member. During Winter
and Spring Quarters, students will be primarily
involved in completing the research and writing
the thesis. Students will present their com-
pleted projects at a convention near the end of
Spring Quarter.

GRADUATE PROGRAMS

There are no specific course requirements for
admission to the doctoral program. However,
an applicant should have research experience as
an undergraduate, as well as the equivalent of
an undergraduate major in psychology. The
major focus of the doctoral program is on re-
search training, and admission is highly selec-
tive.

Applicants for admission must file a report of
their scores (aptitude and advanced psychology)
on the Graduate Record Examination as part of
the application. This examination may be taken
at most universities and colleges (see your regis-
trer for further information).

MASTER OF ARTS

The Department of Psychology offers a
Master of Arts program to students who are
already enrolled in another doctoral or profes-
sional program at Stanford. This is a two-year
program requiring at least 27 units in psychol-
ogy beyond the equivalent of an undergraduate
major, as well as sufficient additional units to
make up a program totaling 45 or more units. In
partial fulfillment of this unit requirement, Psy-
chology 152 must be selected as well as two
other courses from the content areas, one to be
selected from 209, 210, 214, and 215, and one to
be selected from 211, 212, 213, and 254. The
balance of the 45 units may be satisfied by a
master’s thesis if both the student and advisor
feel that is appropriate. For basic university
requirements for the A.M. and Ph.D. see the
“Degrees” section of this bulletin.

DOCTOR OF PHILOSOPHY

In addition to fulfilling the residence require-
ment for the degree, the following require-
ments are stipulated.

1. First-Year Course Requirement—During
the first year of graduate study, the student is
required to take 207 (Pro-seminar for First-Year
Graduate Students), 152 (Analysis of Data), and
153 (Statistical Theories, Models and Method-
ology). In addition, the student must take at
least one core course selected from Group H
and one core course selected from Group S
(listed below).

Group H

206. Behavioral Neuroscience
208. Physiological Psychology
209. Perception
210. Cognitive Psychology
214. Psycholinguistics
215. Mathematical Psychology

Group S

211. Advanced Developmental Psychology
212. Social Psychology
213. Personality
216. Abnormal Psychology
254. Personality Change

It is expected that the student will spend at least one-half of the time in research from the beginning of the first year of graduate study to the completion of the Ph.D. The student will normally take no more than 9 units of course work each quarter. At the end of the first year of graduate study, the student must file with the department a written report of his or her first-year research activities.

2. Second-Year Course Requirement—During the second year of graduate study (or as additional courses during the first year) the student must show competence in three additional areas selected from the core group. Of the five core courses selected during the first and second years of graduate study, at least two are to be selected from Group H and at least two from Group S. The student may meet these requirements either by taking the courses listed above, or by special examination. Further course work prior to admission to doctoral candidacy should be arranged under the guidance of the student’s advisor.

3. Third-Year Major Area Paper—During the first week of the Autumn Quarter of the fourth year, the student will turn in a Conceptual Analysis of the Dissertation Area (CADA). This paper will provide a general framework for the research topic of the dissertation, address the central issues within the specialty area, and review the pertinent literature(s). Typically, the analysis would have the kind of scope found in the opening chapters of the more traditional dissertations, although the exact format and scope of the paper would be a joint decision made by the student and the advisor.

At this same time, the student would select two faculty members to read the paper and give feedback and commentary on it. These should be two faculty members most likely to serve on the later orals committee of the dissertation.

A portion of the paper, revised as appropriate, could then become the first section of the actual dissertation proposal. Thus the student will receive additional feedback on CADA at the oral examination itself.

If the student should radically change the area of the dissertation research after CADA has been written, the procedure will not have to be repeated for the second dissertation topic. It is still expected, of course, that the student will be knowledgeable about the literature and problems of any research topics being pursued for the dissertation; it is only the formal CADA procedure which need not be repeated.

4. Minor Requirements—The candidate shall either complete a University minor, satisfactory to the minor department, or may elect to have the minor waived by selecting 12 approved units outside the department. A student choosing to design his own program of 12 units outside the Psychology Department will be expected to do so in consultation with his or her advisor.

5. Dissertation Reading Committee—The candidate shall select a dissertation reading committee satisfactory to the department. The minimum membership of this committee is to be: (1) the principal dissertation advisor; (2) a second member from within the department; and (3) a third member chosen from Psychology or another department.

6. Orals—The candidate shall pass the University Oral Examination which will be based on the dissertation proposal, not on the defense of the dissertation itself. The reason for the policy is to permit the orals to serve the function of guiding and improving the proposed research. This function can be best served if the orals are scheduled early in the year in which the dissertation research will be conducted. It is therefore expected that the orals will be taken by the end of the Autumn Quarter of the fourth year.

7. Dissertation Requirements—The candidate shall complete a dissertation satisfactory to the Dissertation Reading Committee.

Ph.D. candidacy expires five years after admission to candidacy by the University Committee on Graduate Studies. Reapplication will require departmental reexamination.

PhD MINOR IN PSYCHOLOGY

Candidates for the degree of Doctor of Philosophy in other departments who elect a minor in psychology will be expected to complete at least the equivalent of an A.B. in Psychology, of which at least 15 units must be taken as a graduate student at Stanford. Of these 15 units in the department, at least two courses must be from those numbered 200 or above. These two courses may be cross-listed courses. The program to be followed will be adapted to the needs of each candidate and will be under the direction of the department’s committee on minors.

THE DOCTORAL TRAINING PROGRAM

As indicated by the requirements described above, a student may concentrate in any one of several areas within psychology. Regardless of area, however, the training program places emphasis on the development of research competence, and students are encouraged to develop those skills and attitudes that are appro-
appropriate to a career of continuing research productivity.

Two kinds of experience are necessary for this purpose. One involves the learning of substantial amounts of technical information. A number of courses and seminars are provided to assist in this learning, and a student is expected to work out a program, with his or her advisor, that will permit the student to secure such knowledge in the most stimulating and economical fashion.

A second aspect of training is one that cannot be gained from the courses or seminars. This is the firsthand knowledge of, and practical experience with, the methods of psychological investigation and study. These methods do not exist in the abstract; they are ways of behaving with the people or animals who are being studied. They are skills, and they require guided practice for their perfection. Students are provided with whatever opportunities they need to reach those levels of competence representative of doctoral standing. Continuing research programs, sponsored by members of the faculty, offer direct opportunities for experience in the fields represented by the faculty's many research interests.

Each student will achieve competence in somewhat unique ways and at a somewhat unique rate. Each student and advisor share in planning a program which will lead to the objectives discussed. The student is expected to spend one-half of his or her time on research and will normally take no more than 9 units of course work per quarter.

FELLOWSHIPS, SCHOLARSHIPS, AND ASSISTANTSHIPS

Research and teaching assistantships, United States Public Health Service traineeships, and some University Fellowships are available. The type of support offered may vary from year to year. The department, of course, depends on the fact that a number of its students receive outside awards. Qualified applicants are asked to take the initiative in applying for predoctoral fellowships from the National Science Foundation, the Danforth Foundation, Ford Foundation, and the United States Public Health Service among others. Applications may be made by college seniors planning to work for a higher degree. Students should apply early in the fall of their senior year. For information concerning application forms and procedures, consult representatives from the financial awards office of your home institution.

TEACHING REQUIREMENT

The department views experience in supervised teaching as an integral part of its graduate program. Regardless of the source of financial support, all students are expected to participate in four quarters of teaching. Students will be discouraged from holding teaching assistantships during their first year. The student typically progresses from closely supervised teaching to more and more independent work. Typically, this might involve giving a section in statistics or a lab course in the student's special area initially, then serving as a teaching assistant in introductory psychology, next co-teaching a small advanced course, and finally giving a supervised but essentially independent seminar.

STUDENT EVALUATIONS

First-year evaluation—It is the policy of the department to evaluate the progress of each graduate student at the end of the first year of graduate study. As a part of the evaluation procedure, each student is required to file with the department a report of the first year research activities.

Students should discuss this report and the evaluation procedures with their advisor as early as possible in their first year. The report is due on June 1st.

If the student fulfills the academic promise displayed upon entrance, he or she is invited to continue to the doctorate.

The first-year evaluation is made primarily on the basis of three factors:

1. The quality of research carried out in the first year.
2. Performance in courses (especially required courses).
3. Recommendations of the advisor (including a commitment on the part of that advisor to continue in that role.)

Second-year evaluation—A similar evaluation is conducted at the end of the second year of graduate training. The same criteria are involved in the second year as the first year; however, the student is not required to file a paper with the department. Students who do not make satisfactory progress during the second year may be dropped from the program.

APPLIED COGNITIVE PSYCHOLOGY PROGRAM

The department is establishing a graduate program in applied cognitive psychology, in which the theory and methods of cognitive psychology are applied to practical, real-world problem domains. The domains of interest to psychology are those in which human cognitive activity is paramount—such as medical diag-
nosis, technical instruction and training, and so on—including the domains traditionally covered in “human factors” and “engineering psychology”—Man-machine systems and, more recently, human-computer interaction. The department has established affiliations with research psychologists at the nearby Xerox Palo Alto Research Center, who teach courses in applied cognitive psychology, supervise student research in the area, and provide on-site experience in applied psychology research during the summer and during the academic year. The initial course offering is Psychology 267: ”Applying Cognitive Psychology to Computer Systems.” A second research setting and resource is provided by the nearby NASA/AMES aero-space laboratories; some research psychologists at AMES are affiliated with the department and offer relevant courses for graduate students. The department seeks to expand its contacts with local and national companies, to expand its program of course offerings, and to arrange for research internships for graduate students in these applied research settings.

**PSYCHOLOGY COLLOQUIUM**

The Psychology Colloquium meets on most Wednesday afternoons at 3:45. Topics of current interest are presented by speakers from Stanford and other institutions. Graduate students are expected to attend.

**SUMMER SESSION**

The courses announced for the Summer Session are those regularly scheduled in the department curriculum. Additional courses may be announced in the *Summer Session Bulletin*, to be issued in February, 1984.

**COURSES OPEN TO ALL STUDENTS**

Additional courses not listed here are frequently offered in the areas of their special research competence by selected postdoctoral or terminal Ph.D. personnel. These are listed in the quarterly time schedules, and the course descriptions are circulated in advance.

1. **General Psychology**—A survey of the major topics, theories, and research results of contemporary psychology. Personality development, motivation and emotional adjustment, social behavior, learning, perception, and the physiological basis of behavior are among the topics presented. (DR:4)
   - 4 units, Aut (Ellsworth) MWF 11
   - 4 units, Win (Quattrone) TTh 1:15-2:30
   - 4 units, Spr (Zimbardo and Staff) MWF 11

1A. **General Psychology Discussion Section**—Optional supplement to Psychology 1. Small discussion groups led by graduate teaching assistants. Prerequisite: concurrent enrollment in 1.
   - 1 unit, Aut, Win, Spr (Staff)
   - by arrangement

60. **Statistical Methods**—To acquaint the student with the elements of statistical description (measures of average variation, correlation, etc.) and, more importantly, to develop an understanding of statistical inference. Emphasis is placed on those statistical methods of principal relevance to psychology and related social sciences. NOTE: Students who receive credit for Psychology 60, will not be given credit for Statistics 60. (DR:6)
   - 5 units, Aut (Carlsmith)
   - MTWThF 1:15-2:05
   - Win (Thomas) MTWThF 9
   - Spr (Peake) MTWThF 10

80. **Applications of Social Psychology**—This course surveys the application of social psychological theory and research to a variety of issues and problems, including the following: evaluating the impact of social interventions, strategies and shortcomings in personal and social decision making, effects of mass media and other sources of social persuasion, applications of social psychology in legal, medical, educational, and business settings. Prerequisites: 1 and 60, or permission of instructor
   - 4 units, Spr (Ross) TTh 11-12:30

92. **Psychosocial Effects of the Holocaust**—Seminar will explore the psychosocial effects of the holocaust: victims, victimizers and others by examination of the immediate and long-term effects of genocide. This will include subsequent social adaptation of survivors as well as the role of the reality of the holocaust as an organizing principle for future generations. The course will explore the nature of the relationship between executioner and victim, the effects of that relationship on the matter in which the trauma is worked through and the ways in which this historical event may shape several generations. Examination of these issues will be argumented with taped interviews with these survivors.
   - 3 units, Win (Auerhahn) MW 1:15-3:05

102. **Perception**—A discussion of how our senses both limit and augment our experience of the world around us. Topics will include the perception of color, sound, pain, and smell. Includes a laboratory section to be arranged. (DR:4)
   - 4 units, Aut (Wandell) MWF 10

104. **Special Laboratory Projects**—Independent study. Offered for pass/no credit. Can be
repeated for credit. Prerequisites: 1 and 60, and consent of instructor.

1-6 units, any quarter (Staff) by arrangement

106. Introduction to Cognitive Psychology—A survey and analysis of the major topics in cognitive psychology, including perception, memory and thought, with an emphasis on contemporary research and theory. Prerequisites: 1 and 60.

4 units, Spr (B. Tversky) TTh 11-12:30

107. Introduction to the Nervous System—(Same as Biological Sciences 153.) A survey of neural interactions underlying behavior. Prerequisite: 1 or equivalent and elementary biology.

4 units, Aut (Wine) TTh 1:15-2:30

108. Neuropsychology—An orientation in those facts of brain anatomy and physiology relevant to the analysis of behavioral processes. Prerequisites: 1 or equivalent, and elementary biology.

4 units, Win (Pribram) MWF 10

109. The Neuropsychology of Perception, Attention, and Memory—An analysis of the structure of our sensations and memories as they are determined by physiological encoding mechanisms. Examination of neuronal machines which produce our perception of color, brightness, movement, and shape as well as our memory of those events. Prerequisite: 1 or equivalent.

4 units, Spr (Ganz) TTh 1:15-2:30

111. Developmental Psychology—Psychological development from birth to adulthood, with primary emphasis on the infancy, early childhood, and middle childhood years. A broad introduction to the nature of change during childhood and to theories of development. Prerequisite: 1 or equivalent. (DR:4)

3-5 units, Aut (Flavett) MWF 11

115. Social Development—The child's acquisition of social knowledge and skills is traced and organized theoretically. The period covered ranges from birth to sexual maturity or adolescence. Topics include: early attachment and the development of affection, the development of emotions and the role of other human beings in the process, the development of social attitudes, roles and values, the role of television in social development, and, lastly, the development of individuated identity. Special attention will be devoted to the question of motivation throughout the period of development. (DR:4)

3-4 units, Win (Lepper) TTh 10-11:30

117. Observation of Children—Seminar focus on learning about children through guided observations at Bing School, Stanford Child Development Laboratory School. Physical, emotional, social, cognitive and language development studied. Prerequisite: 111 recommended.

3-5 units, Win, Spr (Bing School Staff) T 3:30-5 and by arrangement

118. Developmental Practicum—Supervised experience with young children at Bing School Stanford's Child Development Laboratory School. Four units involves 7 hours per week in Bing classrooms throughout the quarter; five units involves 10 1/2 hours per week. Weekly seminar focuses on developmental issues in the teaching-learning environment at Bing School. May be repeated for credit up to 15 units of 118. Prerequisite: 111 or 117 or consent of instructor.

4-5 units, Aut, Win, Spr (Bing School Staff) Th 3:30-5 and by arrangement

120. Cognitive Development—A survey of major topics and issues concerned with cognitive development, developmental changes in memory, conceptual organization, logical reasoning, and communication skills will be discussed. Prerequisite: 1.

3-4 units, Spr (Markman) MWF 1

121. Social Psychology—The study of interpersonal behavior. A survey of relevant research concerning attitudes, groups, person perception, and selected topics in social psychology. Prerequisite: 1 or equivalent. (DR:5)

3-4 units, Spr (Quattrone) WF 1:15-2:30

124. The Social Psychology of Politics—The course takes a social-psychological approach to the topics of political attitudes and decision-making. Topics will include the nature of political ideology, the rise of the Nazi party in Germany, political socialization, propaganda, the determinants of voting, and strategic power games among nations.

3-4 units, Win (Quattrone) TTh 1:15-3:05 given 1984-85

125. Psychology and Law—Legal, psychological, and popular views of morality, responsibility, equity, intention, insanity, evidence, crime and punishment; the police; psychological processes in jury deliberation; homicide and aggression; treatment of accused persons.

3-4 units, Win (Ellsworth) MWF

126. Hypnosis—An examination of hypnosis with respect to its history, recent conceptualization, research and clinical application. Prerequisite: 1.

3 units, Aut (Bowers) TTh 9-10:30

127. Emotion and Motivation—(See 292.)
128. Research Methods and Experimental Design — An examination of research methods and principles in social and developmental psychology. Structured research exercises and the design of an individual research project are required. Prerequisite: consent of the instructor.
4 units, Spr (Lepper) TTh 1:15-3:05

129. Person Perception, Self-Perception and Stereotyping — The course examines the psychology of person perception: how does a person form impressions of others, of themselves, and of the members of racial, ethnic, and stigmatized groups. Topics include the attribution process; interpersonal misunderstanding; the determinants of emotional states; unconscious control of behavior; self-deception; self-presentation; racism; and the self-fulfilling prophesy.
3-4 units, Aut (Quattrone) TTh 1:15-2:30

131. Seminar in Cross-Cultural Psychology — (Same as Education 132S.) An examination of how the New World experience has affected the adaptive strategies, acculturation patterns, family structure, predominant stresses, and support systems of Afro-Americans, American Indians, Asian Americans and Hispanic Americans. Intensive analysis of the theory and practice of cross-cultural counseling, cultural adaptation of existing counseling interventions, and present mental health service delivery models with special emphasis on cultural appropriateness, bicultural competence, and clinical efficacy with ethnic minority groups.
3 units, Aut (LaFromboise) TTh 11-12:30

132. Theories of Personality — An introduction to psychodynamic, humanistic, and social learning approaches to understanding the maintenance and modification of personality. The course will examine naturalistic and artificially induced changes in personality and behavior throughout the life cycle. Topics will include normal and abnormal development, education, and psychotherapy. Recommended: 1 or equivalent (DR:4)
3-4 units, Win (Peake) MW 11-12:30

133. Psychological Disorders of Childhood — Focus on developing an integrative bio-psycho-social understanding of various disorders ranging from autism to delinquency. Viewing the child within the family context will be emphasized. Recommended: some background in child development and/or abnormal psychology.
3 units, Aut (Weinberger) TTh 11-12:30

136. Abnormal Psychology — Genetic, psychodynamic, behavioral, and social psychological aspect of positive and negative abnormalities. Approaches to behavior change, including drugs, institutionalization, psychotherapy and behavior modification. Prerequisites: 1 or equivalent.
4 units, Spr (Rosenhan) TTh 2:30-3:45

136A. Abnormal Psychology Discussion Section — Optional supplement to Psychology 136. Small discussion groups led by graduate teaching assistants. Prerequisite: concurrent enrollment in 136.
1 unit, Spr (Rosenhan) by arrangement

137. The Interpersonal Basis of Abnormal Behavior — This course examines the role of interpersonal problems and interpersonal processes in producing different forms of psychopathology, ranging from neurotic reactions to schizophrenia. It combines the clinical (case study) approach with the usual empirical approaches to clarify the origin, nature, and treatment of emotional disorders. Prerequisite: 136.
3 units, Win (Horowitz) TTh 11:00-12:30

138. Carl Jung and Analytical Psychology — As an introduction to C.G. Jung, this course focuses upon the person of Jung himself, his seminal philosophical perspectives and their impact upon modern thought and life. The formation of analytical psychology is considered with regards to Jung's past relationship with Freud and later emergence as a prominent 20th century thinker.
3 units, Aut (Daher) TTh 1:15-3:05

139. Behavior Modification: Introduction — (Same as Education 136.) Examines how principles of learning are used to help people change their behavior. Contrasts alternative theoretical explanations for these principles. Includes laboratory experiences to introduce students to the application of learning principles to actual problems.
3 units, Win (Krantz) MW 11:00-12:30

140. Behavioral Medicine: Psychological Factors in Cure and Care — Prerequisites: 1 or equivalent.
3 units, Spr (Taylor) MF 1:15-2:30

143. Experimental Psychology of Reading — (Same as Education 154.) Survey of literature on the reading process, and acquisition of reading. Review of experiments on reading and reading instruction.
3 units, Win (Calfee) alternate years, given 1984-85

144. Counseling and Therapy: An Introduction — (Same as Education 130.) Some major approaches to counseling and psychotherapy. Primary emphasis on social learning strategies. Case studies on a variety of personal, social, and academic problems. 1 recommended as prerequisite.
3 units, Spr (Krumboltz) alternate years, given 1984-85
145. Psychological Foundations of Education
— (Same as Education 215.) Introductory course in application of psychological principles to educational practices.
4 units, Sum (Gage) MW 1:15-3:05

146. Language and Thought— (Same as Linguistics 170.) Survey of psycholinguistics, including speech perception, sentence structure and sentence processing, language acquisition by children, and the biological bases of language. Consideration of the relationship between constraints on the structure of natural languages and the processes by which they are produced, comprehended, and acquired.
( DR:4)
4 units, Win (Newport)

147. Animal Behavior: Neurobiological Aspects— Ethological studies of behavior with an emphasis on understanding the physiological substrates. Offered alternate years. Prerequisites: 107, 108, or 109, or Biological Science 22, or Human Biology 3A.
4 units, Win (Wine) TTh 1:15-2:30

149. Laboratory Course in Behavioral Neurophysiology— (Same as Human Biology 170.) Selected aspects of behavioral neurophysiology will be covered in group lectures, with a focus on the recording of single neuron activity from the mammalian brain in the context of behavioral learning. Students will then be trained as a group in standard laboratory technique: manufacture of microelectrodes, surgical implantation, recording, behavioral training and histological reconstructions. They will then be divided into smaller working groups (perhaps 3 per group) and each will conduct a mini experiment, in part of their own planning.
3 units, Win (Thompson) TTh 1:15-2:30

152. Analysis of Data—Exploratory data analysis. Robust and resistant measures. The analysis of variance and covariance. This course will offer a nonmathematical approach to the practical issues faced by the data analyst.
3-4 units, Win (Carlsmith) MTWF 9

153. Statistical Theory, Models and Methodology—To review elementary probability theory and the theory underlying the more popular statistical techniques, paying attention to applications of these ideas and methods in psychology and the social sciences. Topics include: random variables, expected value, correlation, Chebyshev and other inequalities; the binomial, Poisson, and normal distributions; limit theorems; small sample distributions; estimation and hypothesis testing; simple analysis of variance; elementary principles of sample design.
3 units, Spr (Thomas) MWF 9

155. Human Abilities— (Same as Education 255.) The nature, development, and measurement of intellectual abilities. Prerequisites: Psychology 1 and Stat 60 or Psychology 60 or equivalent.
3 units, Spr (Haertel) MWF 10

156. Decision Making— (Graduate students register for 256.) This course will review major theoretical developments and empirical findings regarding individual decision making. The course will focus on decision making under risk or uncertainty and the attempt to understand and explain attitudes towards risk. The manner in which observed decisions depart from the rational theory of choice will be examined and their implications will be explored.
2-3 units, Aut (A. Tversky) TTh 11:15-12:15

157. The Psychology of Judgment and Decision Making— This course will explore the strategies and shortcomings of human judgment and decision making. Contributions from cognitive psychology and social psychology will be integrated, with a heavy emphasis on the central question: when and why are people rational or irrational, both in the inferences they make about themselves, their peers and the world around them, and in the courses of behavior they follow. Enrollment limited. Prerequisite: 1.
3 units, Win (Ross) MW 1:15-3:05

158A,B,C. Foundations of Measurement— (Same as Philosophy 162.) Detailed treatment of fundamental theories of measurement from a formal standpoint. Some attention to their empirical inadequacy. Basic representation theorems for extensive, conjoint and difference measurements are a main topic.
3 units, Aut, Win, Spr (A. Tversky and Suppes) by arrangement

159A. Perception, Cognition, and Music— How music is perceived and processed will be examined from the points of view of several overlapping disciplines. Topics include how acoustics, auditory perception, cognitive psychology and music theory bear on the kinds of internalized structures used when listening to music. Course will also show how experimental investigations of music perception and attempts to formalize music theory contribute to a broader understanding of perception and cognition. ( DR:5)
3 units, Spr (Shepard and Kessler) MWF 11

160. Chronic Stress: Theory, Research and Clinical Practice— (Same as Education 235.)
Introduction to conceptual models of chronic stress in home, work, and community environments. Particular attention to methods and programs to assess as well as to alter chronic stress. Using a cognitive social learning model, psychosocial factors will be emphasized in considering the etiology, maintenance, and modification of stress, along with biochemical-physiological processes. The Type A Behavior Pattern will be examined as one perspective of chronic stress in humans. Intended for students (upper division undergraduates or graduates) interested in psychosocial as well as physiological factors in health-related problems, especially intervention methods.

4 units, Win (Thoresen) TTh 2:15-4:05

163. Mathematical Psychology—(See 215.)

164. Mathematical Representation of Structures in Psychological Data—(See 218.)

165. Graduate Seminar: On Selected Topics in Cognition—(See 219.)

170. Identity and Role: A Practicum—(Same as Drama 124.) After initial conferences, instructions and introductions, the class time will be spent primarily in exercises in role-playing with critique and evaluation of their impact. Each student will undertake a personal project on some aspect of behavior modification of goal achievement using role-playing as an aid. Class open to Psychology and Drama majors. Limited enrollment. Prerequisite: Consent of instructors.

3 units, Win (Zimbardo and Ryan)
M 2:15-5:05 and by arrangement

172. Microcomputers in Education: Psychological Issues—An examination of the potential effects of microcomputer technology on children’s lives and learning. How computers are likely to effect the process of education in school and at home. Prerequisite: 1.

3 units, Spr (Lepper) by arrangement given 1984-85

174. Unconscious Processes—(See 274.)

176. Psychology and the Environment—A survey of topics applying psychological theory and findings to the relations between people and their surroundings. How do people perceive and comprehend environments and elements of environments? How do environments constrain their behavior? Relevant topics include: architecture, urban design, media, advertising, climate, stress, noise, crowding. Students will be encouraged to engage in a field research project.

4 units, Spr (B. Tversky) TTh 11-12:30 given 1984-85

180. Undergraduate Seminar: Selected Topics in Psychology—(Refer to quarterly time schedules for seminar listings.)

180A. Human Cognition: Research, Methods, and Laboratory—Course will teach experimental methods in the context of substantive questions about human cognition. Lectures will be interspersed with weekly laboratory experiments. Topics will include basic phenomena of sensory and semantic memory, knowledge representation, and language processing. The nature of scientific questioning will be emphasized as much as the "facts" revealed by investigations. While early labs will be pre-designed and conducted as models, the later part of the class will be devoted to designing and executing an experiment in an area of the class’ choice. Prerequisite: 1. Limited enrollment.

4 units, Aut, (Gerrig) MWF 2:15-3:05

180B. Undergraduate Seminar: Getting into Graduate School in Psychology—How to decide on a graduate program, application strategies, financial aid, and what to expect when you get there. Alternatives to graduate school (e.g. community jobs in psychology). Guest speakers will include faculty and graduate students. Most helpful for those who do not need to submit applications until after course is completed.

1 unit, Aut (Parpal) by arrangement

181A. Judgment and Choice—(See 281A.)

181B. Selected Topics in Judgment and Choice—(See 281B.)

182. Senior Honors Seminar—Limited to students in the Senior Honors Program. During the Autumn Quarter, students will participate in a weekly seminar concerned with methods and approaches to psychological research. At that time, students will initiate an independent research project under the supervision of an appropriate faculty member. During Winter and Spring Quarters, students will be primarily involved in completing the research and writing the thesis. Students will present their completed projects at a convention near the end of Spring Quarter.

4 units, Aut (B. Tversky) T 3:15-5:05
Win (B. Tversky)
Spr (B. Tversky)

184A. Paraprofessional Internship Program — This course is designed primarily for students interested in exploring the areas of counseling, clinical, educational and community psychology through field experience. A variety of programs within the broadly defined areas of Community Mental Health utilize Stanford undergraduates as volunteer "paraprofessionals". Each program provides on-site training and supervision. Students learn to use behavior modification and other techniques in working
with emotionally and behaviorally disturbed youngsters at three children's centers. A number of opportunities for working with troubled adolescents are provided in varied settings: small residential group homes for teenagers; a special education and counseling program at Los Altos High School; and work with young people in and out of Juvenile Hall through the Probation Department in San Jose. Volunteers at the Menlo Park V.A. Hospital work with middle-aged outpatients, both in classroom settings and in “community outreach” programs designed to improve the patients' social skills and confidence. Other adult programs provide experience in working with prisoners, either in jail or on release, and a variety of approaches to understanding the needs and problems of older people.

Each of these internships demands a heavy commitment in terms of time and energy (8 to 12 hours per week) for two consecutive quarters, but each offers an unusual opportunity for mature, responsible and dedicated students. To supplement the field experience, students meet bi-weekly in small groups for a two-hour seminar which will explore specific therapeutic techniques, discuss professional opportunities in the community, and investigate the relevance of clinical field research. The seminar also offers students a chance to discuss the progress and problems in their individual placements. Prerequisite: students must be prepared to take this course for two consecutive quarters; especially recommended for Juniors. Consent of instructor.

3-5 units, Aut, Win, Spr (L. Carlsmith) T 3:15-5:05 and by arrangement

184B. Paraprofessional Internship Program—(Same as 184A.)
3-5 units, Win (L. Carlsmith) T 3:15-5:05 and by arrangement

184C. Paraprofessional Internship Program—(Same as 184A and 184B.)
3-5 units, Spr (L. Carlsmith) T 3:15-5:05 and by arrangement

185A,B,C. Experience-based Study on the Meaning of Being Handicapped—A comprehensive look at a number of handicaps; concerned with the life experience of the individual affected as well as that of his or her family. Also consider the roles of the Doctor, the therapist, the Special Ed. Teacher, the Counselor, and other professionals involved in the life of the handicapped person. In addition to the weekly seminars, students will teach swimming to children and adults with many different handicaps (mental, physical, emotional, learning, etc.) for at least 3 hours each week, keep an ongoing journal, and participate in a final group or individual action project.

3 units, Aut, Win, Spr (L. Carlsmith) Th 7:30-9:30 p.m. and by arrangement

186. Community Psychology—Course will examine issues at the interface of clinical psychology and social policy. One focus will be on approaches (e.g., school consultation, community education, and self-help groups) to the prevention of mental health problems. Another will be an assessment of the mental health care delivery system.

3 units, Win (Weinberger) TTh 11-12:30

188. Reading and Special Work—Independent study. Offered for Pass/No Credit. Can be repeated for credit. Prerequisite: consent of instructor.

1-3 units, any quarter (Staff) by arrangement

189. Endocrines and Behavior—(Same as Human Biology 189.) This course focuses on the influences of hormones on behavior. In particular, the influences of the pituitary-adrenal system on sensory processes, stress hormones, learning and memory will also be discussed. Further, the influences of maternal behavior, courtship and aggression will be discussed in terms of gonadal hormonal influences. The neuroendocrine control of hormonal systems will be covered. Limited enrollment.

3 units, Spr (Levine) TTh 4:15-6:05

190A. Early Experience—(Same as Human Biology 143.) This course focuses on the experimental literature related to the effects of pre- and postnatal environmental factors on development and adult function. The material covers both animal and human research and deals with behavioral and physiological function. Prerequisite: consent of instructor.

3-5 units, Win (Levine) Th 4:15-6:05 alternate years, given 1984-85

191. Undergraduate Seminar: Behavior Change—This seminar will examine social learning approaches to personal and social change. Prerequisite: consent of instructor.

3 units, Win (Bandura) M 2:15-4:05

192. Undergraduate Seminar: Aggression—This seminar will examine the determinants of individual and collective aggression. Primarily intended for majors in psychology. Prerequisites: 1 and consent of instructor.

3 units, Win (Bandura) M 2:15-4:05

193. Undergraduate Seminar: Psychology and Mental Health of the American Indian—(Same as Education 194S.)

3 units, Win (LaFromboise) by arrangement

The 194 seminars are not a series, and may be taken in any order.
194A. Undergraduate Seminar: Parent-child Interaction—Topics of discussion will include: varieties of child-rearing methods; factors influencing the nature of parent-child interaction; mutual influences between parents and children; how family interaction changes with the growth of the child. Prerequisite: Consent of the instructor.

3 units, Spr (Maccoby) T 10-12

194B. Undergraduate Seminar: The Childhood Development of Memory, Comprehension and Communication—Seminar purpose is to provide interested students with the opportunity to learn and think about theory and research on the development of memory, comprehension, and communication in children. Prerequisite: consent of the instructor.

3 units Spr (Flavell) M 1:15-3:05

194D. Undergraduate Seminar: The Psychology of Gender Differentiation—An examination of conceptions of masculinity, femininity and androgyny, as they relate to successive phases of development through childhood and adolescence. The possible roles of biological predispositions, of parents, and of peers in gender development will be discussed. Prerequisite: 111 or equivalent, and consent of instructor. Limited enrollment.

3 units, Aut (Maccoby) T 10-12

196. Human Polysomnography—(Same as Psychiatry 235.) Techniques for human sleep recording including EEC, EMG, respiration, heart rate. Electrode application and polygraph operation are emphasized. Intended for students interested in sleep research projects. Prerequisites: 1 and 107 or equivalent; consent of instructor.

4 units, Win (Carskadon) TTh 11-12 Th 7-10 p.m.

197. The Physiological Psychology of Sleep and Dreaming—A multi-media lecture presentation of current knowledge in the areas of sleep, dreams, and sleep disorders. Goal is to provide essential basic information about sleep that everyone should know. Includes physiology of REM sleep versus NREM sleep, circadian rhythms, daytime sleepiness, developmental and phylogenetic aspects, the insomnias, the hypersomnias, sleepwalking, sleep-talking, night terrors, sleeping pills, dream content, and psycho-physiological correlation. Current research is integral to course material. No prerequisite; mandatory pass/no credit.

2 units, Aut (Dement) M 8-10

COURSES PRIMARILY FOR GRADUATE STUDENTS

Undergraduate students may be admitted only by consent of instructor.

206. Behavioral Neuroscience—The focus of this course is on neurobiological substrates of behavior. Topic areas are for the most part organized in terms of categories of behavior. The neuroanatomical, neurophysiological, neurochemical, hormonal and pharmacological aspects of these behavioral phenomena will be explored.

3 units, Win (Thompson) TTh 1:15-2:45 given 1984-85

207. Pro-seminar for First-Year Graduate Students—A survey of major issues in contemporary psychology with their historical backgrounds. Required of and limited to first-year graduate students in psychology.

3 units, Aut (Thomas) TTh 11-12:30

208. Cognitive Neuropsychology—Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Win (Pribram) MW 1:15-3:05

209. Perception—Advanced treatment of visual perception. Prerequisite: graduate standing in Psychology or consent of instructor.

3 units, Aut (Ganz) TTh 1:15-3:05

210. Cognitive Psychology—Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Win (Staff) TTh 11-12:30

211. Developmental Psychology—Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Win (Flavell, Maccoby and Markman) MW 10-12

212. Social Psychology—Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Aut (Lepper, Ross) MW 1:15-3:05

213. Personality — Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Spr (Staff) M 2:15-5

214. Psycholinguistics—(Same as Linguistics 270.) Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Spr (H. Clark) TTh 1:15-2:30 given 1984-85

215. Mathematical Models of Psychological Processes—(Undergraduates register for 163.) A survey of mathematical theories of choice behavior, decision-making, psychophysical judgments, utility and motivation, learning, memory, and concept formation. Prerequisite: graduate standing in psychology of consent of instructor.

3 units, Win (Thomas, A. Tversky, Wandell) MWF 11, given 1984-85
216. Abnormal Psychology—This course will examine selected literature in abnormal psychology approached from a cognitive and interpersonal perspective. It attempts to integrate psychoanalytic and behavioral views of the nature, origin, and treatment of abnormal behavior. Prerequisite: graduate standing in psychology of consent of the instructor.

3 units, Spr (Horowitz) TTh 11-12:30

218. Mathematical Representation of Structures in Psychological Data—(Undergraduates register for 164.) Theory and methods of multidimensional scaling, hierarchical clustering, and related methods for discovering and representing structures underlying matrices of similarity and multivariate data. Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Win (Shepard) Th 10-12

219. Graduate Seminar on Selected Topics in Cognition—(Undergraduates register for 165.) Prerequisite: consent of instructor.

3 units, Win (B. Tversky) W1-3

222. Writing Articles and Giving Talks—Devoted to the presentation of research, and covers such matters as organization, style, and all the large and small choices one makes in writing and rewriting an article or talking about research to a group. Emphasis will be on the presentation of research in journal article form, but some attention will also be given to writing proposals, reviews, and theoretical papers. Students should have at least one "work in progress"; an article of their own to work on during the course. Much of the time the course will be run as a workshop, with students reviewing each other’s written and oral presentations, and making suggestions.

3 units, Spr (Ellsworth) TTh 1:15

224. Survey of Research Topics in Artificial Intelligence — (Same as Computer Science 224.) Introductory survey of concepts and problems in artificial intelligence research; heuristic processes in problem solving, and heuristic programming; information processing models as explanations of human cognitive and affective behavior. Prerequisite: Computer Science 107 or equivalent.

2 units, Spr (Lenat) TTh 11-12:15

227. Seminar: Cellular Neurophysiological Approaches to Behavior— A detailed consideration of selected examples of current research that have solved or are close to solving persistent problems. Also try to identify problems and preparations which might profitably be explored. Sample topics: the Mauthner cell system; the function of muscle spindles; efferent control of sensory input.

3 units, Spr (Wine) by arrangement given 1984-85

231. The Auditory Process—(Same as Hearing and Speech Sciences 292.) A systematic survey of our current knowledge of the operation of the auditory system. Emphasis is placed on acquiring a knowledge of the acoustic signal, and on an understanding of the methods of measuring a sensory process. Prerequisite: consent of instructor.

3 units, Aut (Schubert) by arrangement

232. Selected Topics in Psychoacoustics—(Same as Hearing and Speech Sciences 392.) A detailed study of the normal auditory mechanisms with particular emphasis on the use of psychoacoustic methods of analysis. Evaluation of current theories regarding auditory processing of information. Prerequisite: consent of instructor.

3-4 units, Aut, Win, Spr (Schubert) by arrangement

233. Peripheral Auditory Mechanisms—(Same as Hearing and Speech Sciences 393.) Study of the mechanisms and electrophysiology of the middle and inner ear. Analysis of the ear as a transducer and of the neural encoding process. Prerequisite: consent of instructor.

3 units, Spr (Schubert) by arrangement

237. Graduate Seminar in Cognitive Science. 3 units, Aut, Win, Spr (Staff) by arrangement

239. Advanced Cognitive Development—A critical examination of current theory and research in cognitive development. Topics will include: Piagetian and other theoretical approaches; developmental aspects of perception, attention, memory, comprehension, communication, and social cognition. Prerequisite: 211 or consent of instructor.

3 units, Win (Flavell) TTh 3:15-5:05

240. Child Language Acquisition I—(Same as Linguistics 265.) Review of present knowledge of processes of language acquisition from a linguistic point of view. Survey of recent ad past literature. Prerequisites: Linguistics 10 or 230, or consent of instructor.

4 units, Aut (Ferguson) MW 3:15-5:05

241. Child Language Acquisition II—(Same as Linguistics 266.) Variable topics selected from semantics, syntax, or phonology.

4 units, Win (E. Clark) by arrangement, given 1984-85

242. Conceptual Organization and Development—Theories of conceptual organization and development will be critically evaluated. Emphasis will be on comparing the underlying
assumptions of traditional theories to those of current theories, including some semantic memory models. Alternative possibilities will be explored.

3 units, Aut (Markman) M 3:15-5:05

243. General Developmental Seminar — Prerequisite: consent of the instructors.
1-2 units, Win (Maccoby, Flavell and Markman) by arrangement

247. Advanced Social Development—Current theory and research on social development will be reviewed and discussed. Topics will include: attachment, aggression, pro-social behavior, moral development, gender differentiation, self-regulation and self-concepts, and parent-child interaction. Prerequisite: 211 or consent of instructor.

3 units, Aut (Maccoby) T 10-12

given 1984-85

248. Introduction to Test Theory—(Same as Education 252.) Concepts of reliability and validity; derivation and use of test scales and norms; mathematical models and procedures for test validation, scoring, and interpretation. Prerequisite: Statistics 60 or Psychology 60 or equivalent.
3-4 units, Aut (Haertel) MW 3:15-5:05

249. Problems in Measurement — (Same as Education 353.) Survey of alternative mathematical models used in test construction, analysis, and equating. The course emphasizes applications of item response theory “latent trait theory” to measurement problems including estimation of item parameters and person abilities, test construction and scoring, tailored testing, mastery testing, vertical and horizontal test equating, and detection of item bias. Prerequisites: 152 and 248 or Education 250B and 252 or equivalent. (PSE)
3 units, Win (Haertel, Rogosa) alternate years, given 1984-85

250. Individual Counseling Methods — (Same as Education 234.) Techniques for helping individual clients learn successful procedures for coping with problems such as shyness, depression, anxiety, obesity and aggression.
3 units, Aut (J. Krumboltz) alternate years, given 1985-86

251. Topics in Language Acquisition: Acquisition of Morphology and Syntax—(Same as Linguistics 267.) Variable topics selected from semantics, syntax, morphology, or discourse structure.
4 units, Spr (Newport)

4 units, Aut (Thoresen) MW 9-11

254. Principles of Personality Change — Prerequisite: graduate standing in psychology.
3 units, Aut (Bandura) M 10-12

254A. Principles of Personality Change—(See 191.)

255. Graduate Seminar: Selected Topics in Personality and Abnormal Psychology—Prerequisite: consent of instructor.
3 units, Aut (Horowitz) by arrangement

256. Decision Making—(See 156.)

257. Individually Supervised Practicum—Can be repeated for credit. Prerequisites: graduate standing in psychology and consent of instructor.
3-5 units, Aut, Win, Spr (Staff) by arrangement

257A. Practicum in Teaching—Enrollment limited to students serving as teaching assistants in selected psychology courses. Can be repeated for credit.
3-5 units, Aut, Win, Spr (Staff) by arrangement

263. Models of Interactive Systems—Course will consider static and dynamic approaches to the study of selected psychological processes, and attempt to understand the differences between the two approaches. Applications will range from (1) Psychophysics, e.g. (a) threshold estimation by static and dynamic methods, and (b) the use of threshold estimates to study trade-offs between stimulus variables; to (2) Information Processing, e.g., (a) fixed sample versus sequential sampling models of reaction time, and (b) the tradeoff between speed and accuracy; to (3) Social Interaction, e.g., (a) models for interrelating two streams of observations. Prerequisite: 215 or equivalent.
3 units, Aut (Thomas) M 1:15-3:05
given 1984-85

264. Selected Topics in Human Learning—Prerequisite: 210 and consent of instructor.
3 units, Spr (Bower) by arrangement

265. Seminar on Text Comprehension and Memory—Examines psychological analyses of how simple texts are understood and remembered. Equal emphasis on psychological studies and computer-simulated models of text understanding and question answering. Class will consist of readings, discussions and writing a paper.
3 units, Spr (Bower and Graser)

T 3:15-5:05
267. Applying Cognitive Psychology to Computer Systems — Prerequisite: graduate standing or consent of the instructor. Limited enrollment.
3 units, Spr (Moran and Card) W 1:15-3:15

271. Seminar in Clinical Processes — (Same as Anthropology 271.) This seminar includes practical training in clinical interviewing and case observation. It is affiliated with a psychiatric ward at the VA Hospital, where each student will conduct interviews and coordinate findings. In weekly case presentations, the seminar will focus on aspects of case formulation as well as on the goals and theories of interviewing. Students should enroll concurrently in Psychology 216. Prerequisite: consent of the instructors.
3 units, Spr (Horowitz, Herdt) Th 1-3

272. Special Topics in Psycholinguistics — Prerequisite: consent of instructor.
3 units, Aut (H. Clark) by arrangement given 1984-85

273. Research Design and Procedure — This course covers the design of experiments, quasi-experiments, and surveys; verbal and behavioral measures; sampling; convergent operations; and a variety of low-level procedural decisions that make the difference between a formally-correct study and a really good study. The last section of the course will deal with writing up research for publication. Students from all areas of psychology are welcome, and the final syllabus will reflect the interest of class members. This course covers all aspects of research except data analysis.
3 units, Spr (Ellsworth and J. M. Carlsmith) MW 11-12:30 given 1984-85

274. Unconscious Processes — (Undergraduates register for 174.) A reconsideration of unconscious influences in light of recent thinking in clinical psychology, social cognition and information processing. Prerequisite: graduate standing or consent of the instructor.
3 units, Aut (Bowers) T 2:15-5:05

275. Graduate Research — Research of intermediate nature whether or not to be used toward master's thesis, to be undertaken with members of departmental faculty. Prerequisite: consent of instructor.
(Staff) by arrangement

277. Induction — (Same as Linguistics 271.) Consideration of the problem of inductive learning in language acquisition and concept formation; discussion of issues and possible solutions to the induction problem, e.g. through domain-specific constraints on inductive outcomes vs. domain-general constraints on inductive procedures.
4 units, Win (Newport) by arrangement

278. Graduate Seminar: Internal Representation—Can be repeated for credit. Prerequisite: consent of instructor.
1-3 units, Aut (Shepard) by arrangement

280. Doctoral Research — For dissertation. Prerequisite: consent of instructor.
(Staff) by arrangement

281A. Judgement and Choice — (Undergraduates register for 181A.) This course reviews recent theoretical and experimental research that sheds light on the manner in which lay people and experts make judgements, predictions and choices under conditions of risk and uncertainty. Prerequisite: consent of instructors.
2 units, Aut (A. Tversky and Ross) Th 3:15-5

281B. Selected Topics in Judgement and Choice — (See 281A.)
2 units, Win (A. Tversky and Ross) Th 3:15-5

282. Research Seminar on the Analysis and Representation of Similarity Relations — This seminar will review new theoretical and empirical developments regarding the perception and representation of similarities. The geometric approach to similarity will be contrasted with alternative approaches based on feature matching and clustering.
1-3 units, Win (A. Tversky) T 3:15-5:05 given 1984-85

283A. Interdisciplinary Seminar in Decision Analysis — (Same as Economics 386A, Graduate School of Business 494A, and Operations Research 366A.) Seminar aims to study normative and descriptive decision making, particularly in the face of uncertainty. Examines general studies on the way decisions are made and the problems arising in making decision analysis in applied policy contexts. Meets once every two or three weeks throughout the autumn and winter quarters.
1-2 units, Aut (Arrow, A. Tversky and Wilson) T 3:15-5:05

283B. Interdisciplinary Seminar in Decision Analysis — (See 283A.)
1-2 units, Win (Arrow, A. Tversky and Wilson) T 3:15-5:05

290. Linear Systems in Psychology and Physiology — This course will include an introduction to the mathematical concepts and tech-
niques of linear systems theory. Also under discussion will be a number of applications of linear systems theory in psychology and physiology, including such topics as retinal ganglion cells, apparent motion, and color vision.

1-3 units, Win (Watson) by arrangement

291. Applied Topics in Perception—Seminar consists of invited talks by research scientists from local industrial laboratories. Provides an opportunity in which applied scientists, students and faculty can discuss common research goals in perceptual research.

3 units, Win (Wandell) by arrangement

292. Emotion and Motivation—(Undergraduates register for 127.)

3 units, Spr (Landy) 9-10:30

305. Research Seminar in Cognitive and Mathematical Psychology—Can be repeated for credit. Prerequisite: consent of instructor.

1 unit, Aut, Win, Spr (Staff) F 3:15-4:30

306. Seminar in Brain Substrates of Learning and Memory — Prerequisite: consent of the instructor.

1-3 units, Aut (Thompson) W 12:15


1-3 units, Spr (Goodman and Wine)

308. Research Seminar in Neuropsychology—Can be repeated for credit. Prerequisite: consent of instructor.

1-3 units, Win (Pribram) F 1:15-3:05

316. Graduate Seminar: Topics in Social Psychology — The seminar presents ongoing research addressing two major topics. First, an attempt is made to construct a theoretical integration between normative models of attribution and the host of biases and errors in social inference. Second, the relationship between inference and action will be explored. Special emphasis is given to the nature of verbal reports on the cognitive processes that mediate action.

3 units, Spr (Quattrone)

351. Children and the Law: A Policy Analysis — (Same as Law 242.) This course will be a seminar limited to 20 graduate and law students. Admission by consent of instructors. The course will focus on how information from psychology and other behavioral sciences can be utilized in the development of legal policies affecting children. Areas focused on will include child custody decisions, "children's rights," definitions of child abuse and neglect, informed consent in experimentation with children, laws regarding family structure. An attempt will be made to apply existing knowledge about child development to the resolution of policy issues in each of these areas and to design research projects that will provide new data relevant to policy makers.

3 units, Win-Spr (Wald and Maccoby)

by arrangement, given 1984-85

353. Psychopathology and Mental Health Law—(Same as Law 338.) Prerequisite: consent of instructor.

4 units, Win (Rosenhan) by arrangement

354. Law and Behavioral Science — (Same as Law 307.) Prerequisite: consent of instructor.

3 units, Win (Rosenhan) by arrangement

360. Family Influences on Cognitive Functioning and Educational Achievement—(Same as Education 259.) Analysis of the influence of family background, structure, and interaction on cognitive development and school achievement. Attention is given both to direct influences (through school-related skills) and indirect effects (motivation, cognitive style, problem-solving strategies).

3 units, Win (Hess) T 9, Th 9-10:50


3 units, Spr (Krantz) M 1:15-3:05

and by arrangement

362. Research Seminar in Child Development and Early Education—(Same as Education 411.) This seminar is oriented toward current research in child development and early education. Ongoing projects, dissertation proposals, results of recently completed studies and trends in research will be the focus of discussion.

0-3 units, Aut, Win, Spr

(Hess and Ford) TTh 12-1:15

and by arrangement
STATEMENT OF PURPOSE

A central aspect of contemporary American society is the expanded role of government. With this expanded role has come an increased complexity of government in its organizational forms, in the nature of its policies, and in its informational requirements. Public policies rely for their effectiveness upon the nature of the responses of actors and organizations in the private sector; hence effective public policy analysis and operation needs to be based on a thorough understanding of social, political, and economic factors. Similarly, private sector decision-makers must increasingly deal with public sector responses to private initiatives.

The Public Policy Program offers undergraduates an interdisciplinary approach to the analysis, management, and design of public sector programs and institutions. The core courses of the program are designed to provide a strong background in analytical skills, an appreciation for the operation of large organizations in the implementation of public programs, and training in humanistic studies to prepare the student to understand the sharp conflicts in values that unavoidably pervade many policy issues.

UNDERGRADUATE PROGRAM

BACHELOR OF ARTS

Students planning formally to undertake the Bachelor of Arts in Public Policy should submit proposed courses of study to the Public Policy Program office for approval. Proposals should be made on application forms available from the Public Policy Program office, and should be designed with the assistance of an advisor, selected from among the affiliated faculty or program staff.

Completion of the program in Public Policy requires 75 units of coursework:

1. 35 units of prerequisite courses: Political Science 10 or Political Science 170, Industrial Engineering 100 or Sociology 160, Statistics 60 and 61, and Economics 1, 51, and 52.

2. The 25-unit sequence of core courses (see below for descriptions).

3. Following the core courses, majors must complete 15 units of coursework in some problem-focused area, such as energy policy, health care, food and nutrition policy, or the economics of regulation.

The core courses are open to all students who have fulfilled the prerequisites for a specific course. The 15 units of post-core coursework will be chosen by students in consultation with their advisors from the program. At least one of the courses comprising these 15 units should be a small seminar course, involving a piece of individual research. A maximum of 10 units may be taken on a pass/no credit basis in fulfillment of the major requirements. Students wishing to write an honors thesis in the program should contact program staff.

COURSES

101. Politics and Public Policy—(Enroll in Political Science 175.) This course presents a broad historical look at national public policy-making from the New Deal to the present. Competing theories about the rise and development of liberal democratic capitalism are assessed within the general context of domestic policymaking by Congress and the Presidency. Special attention is paid to the role of the national government in the modern American political economy through the examination of selected public policies dealing with employment, economic development, social welfare, and equality. Prerequisite: Political Science 10 or Political Science 170. (DR:5)

5 units, Spr (Manley)

102. Organizations and Public Policy—(Enroll in Sociology 16B.) This course provides concepts and methods for analyzing the influence of organizations on the setting and implementation of public policy. Varying conceptions of organizations, both as corporate actors and as social contexts, will be reviewed and evaluated. The several roles of organizations in relation to public policy will be examined, including organizations as decision makers and problem solvers, as change agents, and as clients. Prerequisite: Industrial Engineering 100 or Sociology 160.

5 units, Win (Scott)

103. Philosophical and Ethical Issues in Public Policy—(Enroll in VTSS 110.) Philosophical and ethical aspects of public policy. Analysis of ethical and value conflicts in policy-making and use of case studies to explore their complexity
and role in the design of socially responsible public policy. Topics: "freedom," "rights," "justice," "the public interest" and other key terms in public policy discourse. Applications to cases from biomedical policy (abortion, euthanasia, in vitro fertilization), environmental policy (wilderness, energy, amenity rights), and public policies with international dimensions (food and hunger, population). (DR:3)

5 units, Aut (McGinn)

104. Economics and Public Policy—(Enroll in Economics 150.) An examination of the reasons for, the varieties of, and the consequences of government policies in economic affairs. This course will explore the means of policy formation and the means and effects of policies by focusing on specific case materials in three topic areas—market regulation policies (antitrust and commission regulation), tax and income redistribution policies, and macroeconomic stabilization policies. Prerequisites: Economics 1, 51 and 52.

5 units, Win (Bresnahan)

105. Quantitative Methods and Their Application to Public Policy—(Enroll in Statistics 209.) Focusing upon applications of statistical methods, rather than methodology per se, this course will consider such topics as risk assessment in the evaluation of biohazards and medical techniques and technologies; comparisons of such information-gathering techniques as surveys, experiments, or simulation studies; methods of expressing and evaluating uncertainty; and the interpretation of such quantitative techniques of data analysis as regression. Prerequisites: Statistics 60 or equivalent and Statistics 61.

5 units, Spr (Staff)

198. Directed Readings in Public Policy.

RECOMMENDATIONS FOR THE MAJORS

RELIGIOUS STUDIES

Chairman: Van A. Harvey

Professors: Lawrence V. Berman, William A. Clebsch (Religious Studies and Humanities); (on leave Autumn, Winter 1983-84), Edwin M. Good (on leave 1983-84), Van A. Harvey, David S. Nivison (Asian Languages and Philosophy and Religious Studies), Lewis W. Spitz (History and, by courtesy, Religious Studies)

Associate Professor: Lee H. Yearley

Assistant Professors: Carl W. Bielefeldt, Hester G. Gelber, Diana Y. Paul

Lecturers: Rose Ann Christian (Western Culture), Joseph Eckenrode (Western Culture), Paul H. Mosher

Consulting Professor: Robert G. Hamerton-Kelly

Mellon Fellow: Michael A. Sells

Visiting Professor: Henry W. Bowden

Visiting Assistant Professor: Robert L. Cohn

OFFERINGS

The study of religion aims to understand and interpret the history, literature, thought, and social structures of various religious traditions and cultures. The department offers courses at several levels, indicated by course numbers and units:

1  World Religions (3 or 4 units)
5  Western Culture (5 units)
11-89 Introductory (3 or 4 units)
101-189 Intermediate (5 units)
197-199 Undergraduate Directed Reading (variable units)
201-299 Graduate Courses (4 units)
301-399 Graduate Seminars, Research, and Teaching (variable units)

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The major in Religious Studies is designed to give the student a broad knowledge of major religious traditions, several different approaches to the study of religion, and appreciation for the diversity and depth of the problems that religions seek to solve.

The following departmental requirements are in addition to the University's basic requirements for the bachelor's degree: 60 units of course work in the department (no more than 10 units of which can be taken pass/no credit),
including at least two courses on World Religions, three courses on Traditions, two courses on Problems, and two courses on Thinkers.

The bachelor's degree with honors in Religious Studies may be earned by students who are endorsed by their advisors and by the undergraduate director and who meet additional requirements, available from the undergraduate director.

MAJOR IN RELIGIOUS STUDIES AND PHILOSOPHY

The Departments of Religious Studies and Philosophy jointly nominate for the A.B. students who have completed a major in the two disciplines according to guidelines available from the undergraduate director of either department.

GRADUATE PROGRAMS

MASTER OF ARTS

University regulations pertaining to the Master of Arts are listed in the "Degrees" section in this bulletin. The following requirements are in addition to the University's basic requirements for the A.M. Complete information is contained in the Handbook of Graduate Religious Studies, available from the departmental secretary.

Each student completes at least 48 units of graduate work at Stanford beyond the Bachelor of Arts degree, including the two required graduate seminars (RS 302 and 304). Residence may be completed by four quarters of full-time work or the equivalent.

The student's plan of courses is subject to approval by the graduate director. No field of specialization is expected, but students may focus their work in particular areas. As many as 12 units of the 48 may be taken as a coherent program in advanced and graduate courses in other departments of the University. No thesis is required; a thesis, if elected, may count for as many as 9 units.

Each student demonstrates reading knowledge of at least one foreign language before enrolling for the second required graduate seminar.

DOCTOR OF PHILOSOPHY

University regulations regarding the Ph.D. are found in the "Degrees" section in this bulletin. The following requirements are in addition to the University's basic requirements. Complete information is contained in the Handbook of Graduate Religious Studies, available from the departmental secretary.

Residence — Each student completes three years (nine quarters) of full-time study, or their equivalent, in graduate work beyond the Bachelor of Arts degree, to a minimum of 90 units of graduate work in addition to the dissertation, of which the last 60 units must be taken at Stanford.

Field of Study — The Ph.D. signifies special knowledge of a field of study and potential mastery of an area of specialization within it. The faculty of the department has established certain fields of study in which its strengths and those of other departments in the University cohere. They are: East Asian religions, Western religions, modern Western religious thought, and American religions. Students who propose other substantial fields must have early approval by the faculty.

Stages of Advancement — There are four stages through which the student advances to the degree: (1) in the first year the student acquires a general knowledge of the chosen field of study; (2) in the second year the student deepens and refines acquaintance with the field of study in preparation for the Candidacy Examination; (3) after attaining candidacy, the student concentrates on a more specialized area within the chosen field in preparation for the Qualifying Examination; (4) the student writes a dissertation and defends it in the University Oral Examination.

Languages — Each student demonstrates a reading knowledge of two foreign languages, including French or German, before beginning the second full year of graduate work. Each student demonstrates reading knowledge of other ancient or modern languages necessary for the field of study. Area of specialization and dissertation topics may require knowledge of additional languages.

Courses — Each student completes satisfactorily the two graduate seminars (RS 302 and 304) before the Candidacy Examination. Other courses are taken with the approval of a faculty advisor and in consideration of the student's field of study.

Candidacy — At the end of each academic year, the departmental faculty identifies those second-year students whom it recommends for candidacy on the basis of all relevant information but especially on the student's Candidacy Dossier, which includes the approved declaration of an area of specialization; faculty course evaluations; three prescribed essays; and a record of the student's performance on the Candidacy Examination in the sixth quarter of graduate study.

Teaching Internships — At least two teaching internships under the supervision of designated faculty members are undertaken at a time negotiated with the chairman. Students receive aca
ademic credit for the required internships, which are projects of academic training and not of employment.

**Qualifying Examination** — In order to qualify for writing a dissertation, the student must successfully pass a Qualifying Examination on the subject matter deemed relevant for the student’s dissertation.

**Dissertation** — The dissertation contributes to the humanistic study of religion and is written under the direction of the candidate’s dissertation advisor and at least two other members of the Academic Council. The University Oral Examination is a defense of the completed dissertation.

**JOINT Ph.D. IN RELIGIOUS STUDIES AND HUMANITIES**

Religious Studies participates in the Graduate Program in Humanities leading to the joint Ph.D. in Religious Studies and Humanities. For a description of that program see the section “Humanities Special Programs” in this bulletin. Doctoral students in Religious Studies taking the Graduate Humanities Program thereby meet the requirement of a “supporting program” described above.

**COURSES**

Until the beginning of the last four weeks of the quarter, a student may add units of credit to a fixed unit course provided the student’s total registration does not exceed the normal load limits. The increase, subject to the approval of the instructor, may be up to one hundred percent of the published unit value of the course.

**WORLD RELIGIONS**

Comparative study of religions such as Buddhism, Christianity, Confucianism, Hinduism, Islam, Judaism. 1A focuses on the ways in which rituals express, bind, and elicit forms of religious community. 1B compares religions by studying the lives of similar and different religious persons. 1C compares religions by studying forms of thought exploring relationships among people, divinities, and the world. 1D compares the religious philosophies of India, China, and Japan. 1E compares models of the self in different traditions.

1A. *Comparative Religious Communities.*
(Staff: 5*)
3 units (Staff) given 1984-85

1B. *Comparative Religious Personalities —* Comparison and contrast of founders, reformers, mystics, saints, and thinkers selected from Buddhism, Christianity, Islam, and Judaism. Attention will be paid to religious biography as a genre and methods of analysis of personality. (DR:3)
3 units, Spr (Berman) MWF 10

1C. *Comparative Religious Thought.*
4 units (Staff) given 1984-85

1D. *Religions of the East —* (Formerly Religious Studies 12.) The religious philosophies of India and China. Theories of self and self-cultivation in Hinduism, Buddhism, Confucianism, and Taoism. (DR:5*)
4 units, Aut (Bielefeldt) MWF 10

1E. *Eastern and Western Conceptions of the Self—* (Formerly Religious Studies 40A) Analysis of and comparison among models of the self in various traditions, notably classical Greek, Christian, Confucian, Buddhist, Taoist, and Freudian. (DR:4*)
4 units, Win (Yearley) MWF 10

**WESTERN CULTURE**

Ideas in Western Culture. This sequence introduces the students to important works in Western culture, and attempts to set them in their historical contexts. It fulfills the Western Culture requirement.

5A. *Ideas in Western Culture: The Birth of Western Philosophy—* (Enroll in Philosophy 5A.) This course traces the origin of philosophizing in antiquity, and relates classical problems to current issues of human concern. Readings will include: selections from Greek literature and prose, Greek philosophic writings, and selections from the Christian tradition. (DR:1; three-quarter sequence)
5 units, Aut (Moravcsik)

5 units, Win (Pruitt)

5C. *Ideas in Western Culture: The World Demystified—* The breakdown of traditional Western culture and society under the impact of revolutions in science, industry, politics, literature, and philosophy; the emergence of “modern” thought and institutions; works by Voltaire, Rousseau, Hume, Goethe, Marx, Darwin, Nietzsche, and Freud. (DR:1; three-quarter sequence)
5 units, Spr (Clebsch and Harvey)
MWF 10 plus 2-hour section by arrangement

**INTRODUCTORY AND INTERMEDIATE COURSES**

Courses listed below numbered 11-89 expect work at an introductory level. Those numbered
101-189 expect work at an advanced undergraduate level. (Units are stated in the order of the course numbers.)

TRADITIONS

13/113. Hinduism—Major Hindu doctrines, myths, and symbolic expressions from Vedic times to the present: the Krishna cults, Yogic experience, and images of the feminine and masculine. (DR:3*)
3/5 units, Spr (Paul) MWF 10

14/114. Buddhism—The philosophical and religious heritage of Indian and Chinese Buddhism. (DR:3*)
4/5 units, Aut (Paul) MWF 11

3/5 units (Bielefeldt) given 1984-85

19. Hindu and Buddhist Meditation—The history of Indian psychology and the development of the meditative discipline known as yoga. The history of Zen Buddhism and the practice of sitting meditation (zazen). How to meditate according to traditional methods. Definition of meditation and mysticism through reading and criticism of meditation theories.
3 units, Win (Paul) MWF 1:15

21. Old Testament—Survey of the literature of Ancient Israel (Torah, Prophets, Writings) in its historical and religious context. (DR:2)
3 units, Aut (Cohn) MWF 1:15

22/122. Greek Religion and Society — (Same as Classics 117.)
3/4 units (Jameson) given 1984-85

3 units, Win (Cohn) MWF 9

24A/124A. Christianity — Historic types of Christian religiousness from early martyrs to current activists. (124, by permission of instructor.) (DR:5)
3/5 units, Aut (Bowden) MWF 9

24B/124B. Christianity to the Year 1000—(Formerly Religious Studies 17A.) The beginnings of Christianity, the Patristic Age, and the development of monastic culture. (DR:3)
3/5 units, Spr (Gerber) MWF 11

24C/124C. Medieval and Renaissance Christianity (Formerly Religious Studies 17B.)
3/5 units, (Gerber) given 1984-85

27. Islam—Forms of Islam from the beginning to the present day: interpretations of Muhammad and the Koran; the legal, mystical, and rationalistic foci of Islamic thought, feeling, and behavior; modern movements of reform and their contact with the West. Comparison and contrast with forms of Christianity and Judaism. (DR:5*)
3 units, Aut (Berman) MWF 11

28/128. The Land of Israel in Jewish Life and Thought—The role of space and place in Judaism: the wilderness and the land, exile and diaspora, temple and synagogue, pilgrimage and Zionism.
3/5 units, Spr (Cohn) MWF 9

PROBLEMS

31. Founders in Myth and History—Moses, Jesus, Muhammad, Buddha, and the Baal Shem Tov as historical figures and their transformations in history. (DR:3)
3 units, Win (Berman) MWF 11

32/132. Jesus in the Gospels—Varying interpretations of Jesus and his teaching.
3/5 units, Win (Hamerton-Kelly)
TTTh 11 plus section by arrangement

34/134. Women, Religion, and Politics—How men and women in various religious traditions have identified themselves through personal experience as "religious"; sexual identities, political goals, and images of the sacred; the holy man and woman, prophet, sage, mystic, virgin, homosexual, woman ruler, witch.
3/5 units, Spr (Paul) MWF 1:15

35. Buddhist Views of Death and the Afterlife—Old age, death, rebirth, Pure Land, and hell in Buddhist texts and rituals.
3 units, Win (Paul) MWF 10

42/142. Philosophy of Religion—Traditional and modern problems connected with religion: belief and evidence, omnipotence and evil, foreknowledge and freedom of the will. (DR:3)
3/4 units, Aut (Gerber) MWF 10

46. Religion in American History—Interaction between religious impulses and other aspects of American culture from colonies to industrialization. Denominationalism, religious freedom, social reform, urbanization, and ecumenism in Judaism and Christianity.
3 units, Win (Bowden) MWF 9

47/147. Modern Christian Thought. (DR:3)
3/5 units, (Harvey) given 1984-85

THINKERS

66/166. Theology of Paul.
3/5 units, (Hamerton-Kelly) given 1984-85

74/174. From Kant to Kierkegaard—(Same as German 174.) Development of Protestant thought from Kant to Kierkegaard. Prerequisite: consent of the instructor.
3/5 units, Win (Harvey) MWF 9
Religious Existentialists — Kierkegaard and his influence on modern religious thinkers.

3/5 units, (Harvey) given 1984-85

78. American Religious Thought—Puritan, Rationalist, Romantic, and Pragmatic thinkers from pre-Revolutionary times through World War I. (DR:3)

3 units, Spr (Bowden) MWF 9

OTHER INTERMEDIATE COURSES

Courses listed below are not offered at the introductory undergraduate level.

TRADITIONS

116. Japanese Buddhism—Systems of Buddhist thought in Japan. (DR:3*)

5 units, Win (Bielefeldt) TTh 8:30-9:50

118. Zen Buddhism—History, teachings, and practices of the Zen tradition in China and Japan. Prerequisite: consent of the instructor. (DR:3*)

5 units, Spr (Bielefeldt) TTh 8:30-9:50

125. The Medieval Church.

5 units, (Mosher) given 1984-85

126. Age of the Reformation—(Same as History 110.).

5 units, Win (Spitz)

PROBLEMS

130. Problems in Zen Buddhism.

5 units, (Bielefeldt) given 1984-85

133. The Art of Biblical Narrative—Examination of techniques and themes of biblical storytelling through intensive study of selected narratives.

5 units, Win (Cohn) MW 2:15-4:05

134B. Mary and Images of the Feminine in Western Christianity.

5 units, (Gelber) given 1984-85


5 units, Spr (Bielefeldt) TTh 2:15-4:05

137. Jewish Responses to Catastrophe—The problem of suffering in Judaism. The practical and theological reactions of Jews to catastrophes from the Babylonian exile to the Nazi era.

5 units, Aut (Cohn) MW 3:15-5:05

141A. Luther and the Radicals—(Same as History 213A.)

5 units, Win (Spitz)

144. Religious Self-Cultivation—Philosophical issues in the analysis of religious self-cultivation with examples from the Christian and Confucian traditions. The character of desire and will and the problems presented by self-deception, failures to act as one intends, and the attempt to change one’s beliefs. Limited enrollment.

5 units, Aut (Yearley) MWF 1:15

145. Comparative Religious Ethics—Theoretical issues in comparing religious ethics with examples drawn mainly from Western and Chinese sources. Prerequisite: consent of the instructor.

5 units, Spr (Yearley) TTh 2:15-4:05


5 units, Spr (Bowden) MW 2:15-4:05


5 units, Aut (Berman and Sells) TTh 2:15-4:05

THINKERS

154. Confucianism Since Wang Yang-ming—(Same as Asian Languages 144 and Philosophy 124.) History of Confucian moral philosophy in China and Japan since the death of Wang Yang-ming in 1529.

4 units, Spr (Nivison) TTh 2:15-4:05

158. Japanese Buddhist Studies: Metaphysical and Religious Writings of the Thirteenth-century Zen Master Dogen—Readings in Japanese and/or Kambun texts by arrangement. Prerequisite: consent of the instructor.

5 units, Win (Bielefeldt) TTh 2:15-4:05

163. The Book of Job.

5 units, (Good) given in 1984-85

168. Francisc of Assisi—His Life and thought and the formation of the Franciscan Order. Problems of hagiography, text traditions, and aspects of medieval piety.

5 units, Spr (Gelber) MW 2:15-4:05


5 units, Win (Sells) TTh 2:15-4:05
171. Augustine—Transitions in Augustine’s life and thought from the Manichaean rhetorician to the Christian bishop of Hippo; his Neoplatonic thought and the effects of his infighting with the Donatists, Pelagians, and other Christian splinter groups.
5 units, Aut (Gelber) TTh 2:15-4:05

172. Maimonides—Interactions of law, religious symbols, and philosophic thought; conflicting modern and medieval interpretations. Comparisons with contemporary Jewish and Islamic developments in philosophy, theology, and mysticism.
5 units, Spr (Berman) MW 2:15-4:05

174A. Sigmund Freud—Theoretical analysis of the late Freud’s theory of the self and of his explanation of behavior, especially religious behavior. Prerequisite: consent of the instructor.
5 units, Win (Vearley) MW 2:15-4:05

UNDERGRADUATE DIRECTED READING

197. Senior Essay—Prerequisite: consent of the instructor and of the department.
Aut, Win, Spr (Staff) by arrangement.

198. Honors Essay—Prerequisite: consent of the instructor and of the department.
Aut, Win, Spr (Staff) by arrangement

199. Individual Work—Prerequisite: consent of the instructor and of the department.
Aut, Win, Spr (Staff) by arrangement

GRADUATE COURSES

218. Zen Buddhism.
4 units, Spr (Bielefeldt) TTh 8:30-9:50

230. Problems in Zen Buddhism.
4 units, (Bielefeldt) given 1984-85

233. The Art of Biblical Narrative.
4 units, Win (Cohn) MW 2:15-4:05

234B. Mary and Images of the Feminine.
4 units, (Gelber) given 1984-85

236. Buddhist Meditation.
4 units, Spr (Bielefeldt) TTh 2:15-4:05

237. Jewish Responses to Catastrophe.
4 units, Aut (Cohn) MW 3:15-5:05

238. Confucian Ethics—(Same as Chinese 331 and Philosophy 331.)
4 units, Win (Nivison) T 2:15-4:05

241A. Luther and the Radicals—(Same as History 213A.)
4 units, Win (Spitz)

245. Comparative Religious Ethics.
4 units, Spr (Yearley) TTh 2:15-4:05

248. Church History in Contemporary Times.
4 units, Spr (Bowden) MW 2:15-4:05

249A. Comparative Mysticism.
4 units, Aut (Berman and Sells) TTh 2:15-4:05

4 units, Spr (Nivison) TTh 2:15-4:05

4 units, Win (Bielefeldt) TTh 2:15-4:05

268. Francis of Assisi.
4 units, Spr (Gelber) MW 2:15-4:05

270. Neoplatonism and Christianity.
4 units, Win (Sells) TTh 2:15-4:05

274A. Sigmund Freud.
4 units, Win (Yearley) MW 2:15-4:05

299. Individual Work—Prerequisite: consent of the instructor and of the department.
Aut, Win, Spr (Staff) by arrangement

GRADUATE SEMINARS

302. Problems in the Interpretation of Religion—Required of all graduate students in Religious Studies. Enquiry into historical and conceptual methods in the study of religion; may be repeated for credit. Prerequisite: consent of the instructor.
4 units, (Staff) given 1984-85

304. The Historical Tradition in the Academic Study of Religion—Required of all graduate students in Religious Studies; may be repeated for credit. Topic for 1983-84: Max Weber. Prerequisite: consent of the instructor.
4 units, Aut (Harvey) MW 2:15-4:05

GRADUATE RESEARCH AND TEACHING

Topics vary from year to year based on student initiatives and faculty research interests.

319. East Asian Religions.
(Bielefeldt, Nivison, Paul, Yearley) by arrangement

(Berman, Cohn, Hamerton-Kelly, Sells) by arrangement

339. Medieval Western Religions.
(Berman, Bowden, Gelber, Mosher, Sells, Yearley) by arrangement

349. Modern European Religions.
(Harvey, Yearley) by arrangement
359. American Religions.
(Bowden, Harvey) by arrangement

369. Social and Psychological Aspects of Religion—Prerequisite: consent of the instructor and of the department.
(Staff) by arrangement

379. Religious Thought—Prerequisite: consent of the instructor and of the department.
(Staff) by arrangement

389. Theory of Religion—Prerequisite: consent of the instructor and of the department.
(Staff) by arrangement

4 units, Aut, Win, Spr (Staff) by arrangement

392. Candidacy Essays and Examination—Prerequisite: consent of the instructor and of the graduate director.
10 units, Spr (Staff) by arrangement

(Staff) by arrangement

CENTER FOR RUSSIAN AND EAST EUROPEAN STUDIES

Committee in Charge: The Committee on Russian and East European Studies, a subcommittee of the Committee on International Studies.

Chairman: Wayne S. Vucinich (History)

PROGRAM OF STUDY

The Center for Russian and East European Studies administers a coterminous A.B./A.M. program in Russian and East European Studies. The program is established for two types of students:

1. Advanced undergraduate students who need a coherent interdisciplinary program of study to assemble the skills and credentials necessary for admission to a Ph.D. program in the Russian and East European field.

2. Those students who wish to specialize in Russian and East European Studies as preparation for careers in government, law, journalism, business, or teaching at other than the college or university level.

The degree program is administered by a Master’s Committee of faculty members constituted as a subcommittee of the Committee on Russian and East European Studies. The Master’s Committee reviews each student’s program and advises him or her as to the distribution of courses most appropriate to his or her interests and preparation.

The basic prerequisite for admission to the coterminous program is completion of a minimum of one year’s study of Russian language (First-Year Russian). Two years of the language (Second-Year Russian) or the equivalent are to be completed before the awarding of the A.M. degree.

To qualify for simultaneous awarding of the A.M. degree, the student must, in addition to completing university requirements for the A.B. degree:

1. Petition the Master’s Committee for admission to the program no earlier than the beginning of the eighth quarter of undergraduate work. The petition, to be accepted, must be approved by both the Master’s Committee and the Chairman of the department in which the student is a candidate for the A.B. degree.

2. Include in the petition a schedule of the proposed program, by quarter, to its completion. The student should seek the advice of members of the Master’s Committee in drafting this schedule.

3. Complete fifteen full-time quarters or the equivalent, or three quarters after completing 180 units.

4. Complete, in addition to the 180 units required for the bachelor’s degree, a minimum of 40 units for the master’s degree. These units must be distributed as follows:

(a) A minimum of five graduate courses in the program field, three of which are to be taken in at least two departments other than that of the undergraduate major.

(b) The remaining courses required to make up the 40 units may include advanced undergraduate courses and may be taken in various departments, but all are to be in the Russian or East European field.

Note: At some time prior to completing the A.M. unit requirements, the student should take the basic undergraduate courses in Modern Russian History, Modern Russian Literature, Soviet and East European Politics. This course work may be applied to the units required for the A.M. only when doing so does not interfere with completion of language or graduate course requirements. Ordinarily, a student admitted to the program will do course work on both Soviet and East European topics. Stu-
students wishing to specialize in one or the other alone may do so subject to the prior approval of their programs by the Master’s Committee.

5. Apply for each degree at the appropriate time.

Inquiries concerning this program should be addressed to the Chairman, Center for Russian and East European Studies, 220 History Building, Stanford, California 94305.

COURSES

Slavic 184: Introduction to Slavic Bibliography. 2 units, Aut (Zalewski)

SLAVIC LANGUAGES AND LITERATURES

Emeriti: Edward J. Brown, Jack A. Posin (Professors); Elisabeth Stenbock-Fermor (Assistant Professor)

Chairman: William Mills Todd III

Professors: Joseph A. Van Campen (on leave Spring Quarter), Lawrence L. Stahlberger

Associate Professors: Richard Schupbach (on leave Winter Quarter), William Mills Todd III

Assistant Professors: Gregory Freidin, Monika Frenkel

Lecturer: Wojciech Zalewski (Curator, Russian and East European Collection, Stanford Libraries)

OFFERINGS AND FACILITIES

The department accepts candidates for the degree of Bachelor of Arts, Master of Arts, and Doctor of Philosophy. Particular requirements for each degree are described below.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Candidates for a major in Russian must have completed the first- and second-year courses in reading, composition, and conversation (or their equivalent).

1. Concentration in Literature. Candidates are expected to complete a minimum of 35 units, selected with the approval of their advisor, to include in any case courses numbered 111, 112, 113, 145, 146, 147, 187, 188.

2. Concentration in Russian Language. In addition to basic first- and second-year sequence or its equivalent, candidates should complete a minimum of 35 units selected with the approval of their advisor, to include in any case courses numbered 111, 112, 113, and either 195, 196, 197 or 211, 212, and 213. The remaining units are to be selected from among the following: 114, 115, 116, 167, 169, 187, 188.

In addition to the 35 units mentioned above, students majoring in literature or language who are not enrolled in the Honors program in Humanities (for a description see “Humanities Special Programs” in this bulletin) are to select with the help of their advisor a minimum of three general courses (9 units) in support of their major program.

HONORS PROGRAM IN SLAVIC

 Majors with a minimum grade average of “B+” in Russian courses are eligible to participate in the department’s Honors Program. Students may do honors work in Russian Literature or in Russian Language. Requirements are listed below.

RUSSIAN LITERATURE

1. Language prerequisites: Three years of Russian, and a reading knowledge of French, German, or second Slavic language, to be demonstrated by passing an examination.

2. Requirements in Russian literature: Slavic 145, 146, 147, 187, 188, 200 (the last to be taken during the candidate’s senior year).

3. Requirements in other literatures (minimum): Humanities 61, 62, 63, or three courses in one West European literature to be selected in consultation with the student’s faculty advisor.

4. Slavic 199: Individual Work, 5 units per quarter during the Winter and Spring quarters of the candidate’s senior year. To receive honors, the candidate must receive a grade of “B” or better on a thesis written during this period.

5. Strongly recommended courses in other disciplines: A course sequence in Russian History and/or Russian Intellectual History.

RUSSIAN LANGUAGE

Required

1. Four years of Russian, including Slavic 111-116, 187 or 188, and 167-169.

2. At least two additional courses within the department to be chosen from among the following: 191, 195, 196, 197, 211, 212, 213.

3. Slavic 199: Individual Work, 6 to 9 units during the candidate’s senior year. To receive honors, the candidate must receive a
grade of “B” or better on a thesis or project conducted under the close supervision of a member of the professorial staff.

**Recommended**

4. Strongly recommended courses in Russian literature: 145, 146, 147, 187, 188.
5. Recommended courses in other departments: Communications 100, 102, 107; Computer Science 105, 106, 109A, or 111; History 120; Linguistics 010, 200, 206, 215, 230, 240, 253; Mathematics 3; Philosophy 57, 181.

**GRADUATE PROGRAMS**

**MASTER OF ARTS IN TEACHING**

The degree of Master of Arts in Teaching is offered jointly by this department and the School of Education. The degree is intended for candidates with a teaching credential or relevant teaching experience who wish to further strengthen their academic preparation. Detailed requirements for the degree are outlined in the School of Education section of this bulletin. The program includes 45 units of which 25 must be in the teaching field and 12 in education. Specific language requirements are established in consultation with the department.

**MASTER OF ARTS**

*Admission to Candidacy—* The requirements for admission to candidacy for a master's degree in Russian are:

1. A Bachelor of Arts degree (or its equivalent) from an accredited college or university.
2. A command of the Russian language sufficient to permit the student to do satisfactory graduate work in his or her area of specialization.
3. A familiarity with Russian literature sufficient to permit the student to perform adequately in courses at the graduate level.

The applicant's previous academic training in Russian language and literature must normally serve as a tentative indication of competence. Accordingly, the department will not ordinarily consider applications from students who have not had at least three years of college Russian and some undergraduate training in Russian literature of the 19th and 20th centuries.

However, before registering for the first quarter's work in the department, all entering graduate students are required to take placement examinations in language and literature. Students who fail to perform satisfactorily on such examinations will be required to register for remedial courses in the area or areas in which they are deficient. Such remedial courses, which must normally be completed within the first three quarters of residence, will carry no credit toward either the A.M. or the Ph.D. degree.

**Course Requirements—** Candidates for the A.M. who are not also candidates for the Ph.D. should plan their course load to ensure that they will be adequately prepared for the A.M. Final Examination by the end of their third quarter of work. Those who are also candidates for the Ph.D. degree with a concentration in language and linguistics should include in their first year's work any courses needed for the A.M. examination in that area. Candidates for the Ph.D. with a concentration in literature should attempt to include as many of the department's basic course offerings as possible in their first-year program in order to insure that they have sufficient time to complete the A.M. thesis during their fourth quarter of registration. In any case, the course work should be planned in consultation with the graduate advisor whose written approval of the overall course load is required.

Candidates for the A.M. degree must complete a program of 36 units, of which 27 units must be selected from the courses given by the department. The other 9 units may, with the approval of the candidate's advisor, be selected from courses in related fields. Of the 27 units based on the department's courses, a minimum of 9 must be in language courses, a minimum of 9 must be in literature courses, and the remaining 9 may be distributed in accordance with the needs and interests of the individual student, with the advice and approval of the student's departmental advisor.

It should be noted that no credit toward the A.M. degree will be allowed for first- or second-year courses in non-Slavic languages required for the Ph.D. degree.

**Final Examination—** Students not enrolled in the Ph.D. program may either submit an A.M. thesis or take a final examination. In the latter case, regardless of the area of specialization, the student will be required to demonstrate on a written examination (1) command of the phonology, morphology, syntax, and lexicology of contemporary Standard Russian sufficient to allow him or her to teach beginning and intermediate courses at the college level; (2) an ability to read contemporary Standard Russian sufficient to permit him or her to be a reliable guide to students studying contemporary Russian poetry or literary prose; and (3) sufficient familiarity with Russian literature of either the 19th or 20th century to handle successfully survey courses dealing with his or her chosen period.
The examination should be passed at the end of the final quarter or required course work.

DOCTOR OF PHILOSOPHY: SLAVIC

Students enrolled in the Ph. D. Program in Slavic Languages and Literatures at Stanford University are expected to fulfill the following requirements:

1. Minor or Related Field. During the course of study, students must develop substantial expertise in a field contiguous to their main area of specialization. A candidate may elect to present a full minor or, in consultation with the graduate advisor, develop a special program. In either case, a student is required to complete a sequence of basic courses (12 units) in a chosen discipline outside the Department of Slavic Languages and Literatures. The choice of patterns given below may be offered.

   either

   (a) A sequence of three courses in one West European literature, to be selected in consultation with the advisor, or

   (b) Three basic courses in Comparative Literature to be selected in consultation with the graduate advisor and the Comparative Literature department, or

   (c) A course sequence in Russian History.

If the student elects to present a minor in French, German, or Spanish he or she should take six graduate courses in that department. Students considering minors in other areas, such as Asian Languages, English, Comparative Literature, or History, should consult with the advisor, the chairman of the Slavic Department, and the chairman of their minor department.

2. Admission to Candidacy. Candidates should read carefully the general regulations governing the conferring of this degree, as described in the "Degrees" section in this bulletin. For specific departmental requirements and recommendations, the student should consult with the departmental chairman. No student is accepted as a candidate until he or she has completed the equivalent of the training represented by the requirements for the Master of Arts degree as described above. Admission to candidacy for the Ph. D. degree will be determined at the end of the fourth quarter of graduate studies. The candidate must by that time (1) have demonstrated a commitment to graduate studies by having successfully completed a minimum of 48 quarter units of credit with an average grade of B+ or better; (2) In the case of students wishing to specialize in literature, written an acceptable A.M. thesis, to be completed before the end of the 4th quarter, or, in the case of students wishing to specialize in Slavic linguistics, passed a written examination based on course materials and a reading list. Failure to comply with the above two requirements will result in termination of candidacy for the Ph. D. degree. The terminated student may, at the discretion of the faculty, be given the opportunity to take the A.M. written examinations. If successful, the student will then be awarded the A.M. degree, but will not be accepted as a candidate for the Ph. D. degree.

3. Proficiency Test. Administered for all entering graduate students, this test is designed to determine whether the student's knowledge of Russian falls below the departments standard. Students who fail this test will be asked to complete the appropriate courses.

4. Course Requirements. Before qualifying for the departmental oral and written examinations a Ph. D candidate is expected to accumulate at least 72 quarter units of credit for courses taken while in graduate school. No less than half of this course work (36 units) has to be done at the Department of Slavic Languages and Literatures, Including at least 12 units of credit for seminar-level courses. (All entering graduate students are expected to enroll in Slavic 200.)

5. Foreign Languages. A candidate must have a reading knowledge of French and German to be demonstrated by passing a written examination.

6. Examinations. A candidate must pass written and oral departmental general qualifying examinations covering the following areas:

   a) The history and structure of the Russian languages and its relationship to the other Slavic languages; (Students specializing in literature will be excused from this portion of the examination if they have completed Slavic 211, 212, and 213 with grades of "B -" or better.)

   b) The history of Russian literature including its relationship to the development of other slavic literatures, or of European literature; or to Russian intellectual history. (Students specializing in Slavic linguistics will be excused from this portion of the examination if they have completed, with a grade of "B -", Slavic 221, 222, and either Slavic 187 or Slavic 188. They should also have taken Slavic 145, 146, and 147 or show equivalent training.)

   Following the departmental examinations, a candidate has to pass a University Oral Examination in the defense of a dissertation proposal.
covering content relevant to the area of study, rationale for the proposed investigation, and strategy to be employed in the research.

Specialization—Candidates in Slavic Languages and Literatures specialize either in language and linguistics or literature. Candidates may draw up individual programs of study and research in close consultation with the graduate advisor. Requirements will thus vary according to the nature of the specialized program requested.

Continuation—Continuation in the Ph. D. program will be contingent upon the following: for first-year students, a high quality of performance in course work (decided by departmental evaluation); for second-year students in literature, an A.M. thesis, and for linguistics students a written examination based on course materials and a reading list. Both the thesis and the written examination should be completed no later than the end of the first quarter of the second year.

Course Work and Overall Scheduling—
1. Candidates for the Ph. D. degree are allowed as much freedom as possible in the selection of their course work to suit their individual program of study. However, candidates will be held responsible for all the areas covered by the general examinations, regardless of whether they have registered for the department's offerings in a given field. It should be noted that students may not normally register for individual work in a given area until they have covered the basic course offerings in that area. First-year students will be permitted to register for individual work only under special circumstances and must obtain the written approval of the graduate advisor. Those candidates who are also candidates for the A.M. degree should consult the section dealing with course requirements for that degree in planning their first year's work. For University residence requirements, see "Advanced Degrees" section of this bulletin. The A.M. thesis or written examination should be completed by the end of the fourth quarter of graduate study at the latest. The remainder of the second year of graduate study should be devoted to course work designed to prepare the student for the general qualifying examination and to fulfill the requirements for his or her minor, if any. The department general qualifying examinations must be taken by the end of the first quarter of the third year of study; they may be taken during the second year if the student and the advisor feel this is appropriate. During the two quarters following the general qualifying examination the student should be primarily concerned with preparation for the University Oral Examination. (The latter should take place no later than the end of the third quarter of the third year.) However, students may, if necessary, do limited amounts of course work not directly related to the dissertation proposal. The fourth year should be devoted to the completion of the dissertation.

2. Students possessing the equivalent of the Stanford A.M. will normally be expected to adhere to the schedule for the second, third, and fourth years of work outlined under 1, above.

3. Students in the Ph.D. program will be required to do four quarters of teaching in partial fulfillment of the requirements of the Ph.D. degree.

Note on Non-Slavic Language Requirements — It should be noted that no credit toward either the A.M. or the Ph.D. degrees will be granted for first- or second-year courses in non-Slavic languages. It is assumed that on entering the program the student will have a reading knowledge of both German and French or, at the very least, of one of these languages. The reading examination in one of these languages must be passed by the end of the first year of study. The reading examination in the second language must be passed by the end of the second year of study. Both language examinations must be passed before the candidate takes the University Oral Examination, i.e., before the end of the third year.

JOINT Ph.D. IN SLAVIC LANGUAGES AND LITERATURES AND HUMANITIES

The Department of Slavic Languages and Literatures participates in the Graduate Program in Humanities leading to the joint Ph. D. degree in Slavic Languages and Literatures and Humanities. For a description of that program, see the "Humanities Special Programs" section in this bulletin.

GENERAL COURSES

Courses in this category may be of interest to students in other literatures, in comparative literature and in Russian area studies. These courses are primarily for undergraduates; however, by special arrangement with the department they can be taken for graduate credit.

143. Medieval Russian Art and Architecture — (Same as Art 109/209.) Emergence of a Muscovite Russian "national" style based on Byzantine and Kievan Rus' cultures, European and oriental influences, native traditions and re-
546 SCHOOL OF HUMANITIES AND SCIENCES

gional schools, 11th-17th centuries. Slide illustrated. Open to all students.
4 units, Spr (J. Kollmann) MWF 1:15

145. Survey of Russian Literature in English Translation I: the Age of Experiment — The first part of a three-quarter survey of the Russian prose tradition will cover the first forty years of the nineteenth century. Considerable attention will be paid to the formative period of Russian prose, the lesser known contributions of poets and Romantic and popular writers. The recognized "classics," Pushkin's Eugene Onegin, The Belkin Tales, "The Queen of Spades," The Captain's Daughter; Lermontov's Hero of Our Time; Gogol's Petersburg Tales and Dead Souls, will then be considered in the context simultaneously of "local" literary and stylistic developments and of contemporary European trends. Open to all students, including freshmen. (DR:2)
4 units, Aut (Frenkel) MWF 10

146. Survey of Russian Literature in English Translation II: "The Novel and Beyond" — Close reading of selected novels and short fiction by Turgenev, Chernyshevsky, Dostoevsky, Tolstoy, Chekhov and Bely. This course is a continuation of Slavic 145 but may be taken independently of it. Open to all students, including freshmen. (DR:2)
4 units, Win (Todd) MWF 10

147. Survey of Russian Literature in English Translation III: A Fractured Culture — The survey's third quarter will trace some of the major movements in the extraordinary historical and cultural ferment of twentieth-century Russia: literature in exile (Nabokov, Solzhenitsyn, Brodsky); underground literature (Pasternak's Dr. Zhivago, Zamyatin's We, Sinyavsky); and the best of literature officially published (Mayakovsky, Babel, Olesha, Rasputin, Tironov). This course is a continuation of 145 and 146, but may be taken independently of them. Open to all students, including freshmen. (DR:2)
4 units, Spr (Brown) MWF 10

149. Introduction to the Culture and Literature of the Slavic Peoples—No foreign language required.
4 units (Stahlberger) given 1984-85

150. Romanticism Among the Slavs—Concentrates on three representative romantic writers of the first half of the 19th century; Adam Mickiewicz, the Pole, Karel H. Macha, the Czech, and Aleksandr Pushkin, the Russian.
4 units (Stahlberger) given 1984-85

151. Fyodor Dostoevsky—Reading of major works in English translation. Open to all students. (DR:2)
4 units (Todd) given 1984-85

153. Leo Tolstoy—Reading of major works in English translation including War and Peace, Anna Karenina, and Resurrection. Discussions will also correlate materials from Tolstoy's social and religious thought. Some comparative reference to the European novel in general, English and French. Open to all students. (DR:2)
4 units (Stahlberger) given 1984-85

154. The Russian Drama—A survey of the major Russian plays in English translation from Fonvizin to Mayakovsky, including Gogol and Chekhov. Particular attention will be paid to tradition and innovation in the development of Russian dramatic comedy. Open to all students. Readings and lectures in English.
4 units (Stahlberger) given 1984-85

SLAVIC UNDERGRADUATE COURSES

By special arrangement with the department, courses numbered 100-159 can be taken for graduate credit. The department urges students to take all three quarters of first-year, second-year, and third-year language series in the same academic year.

1. First-Year Russian A—Completion of Russian 1, 2, and 3 fulfills (DR:4)
5 units, Aut (Schupbach, Staff)
MTWThF 9, and 1:15

2. First-Year Russian B—Completion of Russian 1, 2, and 3 fulfills (DR:4) Continuation of 1.
5 units, Win (Schupbach, Staff)
MTWThF 9, and 1:15

3. First-Year Russian C—Completion of Russian 1, 2, and 3 fulfills (DR:4)—Continuation of 2.
5 units, Spr (Schupbach, Staff)
MTWThF 9, and 1:15

3 units, Aut (Van Campen, Staff)
MTWThF 9, and 1:15

51A. 2 units, Aut (Van Campen, Staff) TTh 12 and 1:15

52. Second-Year Russian—Continuation of 51 with focus on vocabulary building, syntax and the reading of selected texts from twentieth-century authors.
3 units, Win (Van Campen, Staff)
MTWThF 9, and 1:15
52A. 2 units, Win (Van Campen, Staff) TTh 12 and 1:15

53. Second-Year Russian—Continuation of 52. Reading centers on selected texts from nineteenth-century authors.
   3 units, Spr (Van Campen, Staff) MWF 12 and 1:15

53A. 2 units, Spr (Van Campen, Staff) TTh 12 and 1:15

111-113. Third-Year Russian—Emphasis on reading, vocabulary building and textual analysis. It is strongly recommended that students take 114-116 in conjunction with this series. Prerequisite: 53 or equivalent. (with 114-116 only)
   3 units, Aut (Schupbach) Win (Freidin) Spr (Frenkel) MWF 2:15

114-116. Third-Year Russian Conversation and Composition—Coordinated with and to be taken in conjunction with 111-113. These courses, focusing on reading, writing and conversation, are conducted entirely in Russian. Students will be expected to prepare written and oral reports on assigned texts as well as engage in class discussions.
   2 units, Aut (Freidin) Win, Spr (Staff) TTh 1:15

ADVANCED AND GRADUATE COURSES

167-169. Fourth-Year Russian Seminars I-III—Designed for students who would like to perfect their verbal and written skills while concentrating on major problems in Russian cultural history, as reflected in that country's literature. Following an introduction to critical reading, the students are expected to approach selected texts systematically both as "literature" and as "documents" in the social and intellectual history of Russia. Open to all majors; the seminars are conducted in Russian (oral reports and short compositions are required).
   3-4 units, Aut (Freidin) TTh 2:15-3:45

167. Fourth-Year Russian Seminars I—Fundamentals of literary analysis and topics in Russian intellectual history. The course is divided into three parts: (1) a discussion of basic categories of text analysis and their application to specific works; (2) reading and discussion of a single work of fiction; and (3) selected texts from Russian intellectual history. Students are expected to prepare and discuss several written and oral reports. A short final paper is required. (DR:2)
   3-4 units, Aut (Freidin) TTh 2:15-3:45

168. Fourth-Year Russian Seminars II—Selections from the Nadezhda Mandelshtam’s Vesominaniya will be juxtaposed with readings from the lyrical poetry of the Acmeists. (DR:2)
   4 units, Win (Frenkel) TTh 2:15-3:45

169. Fourth-Year Russian Seminars III—The idea of the writer in Russian poetry, fiction, and criticism from Pushkin to the early twentieth century. Close reading and discussion of selected works in historical context. Weekly oral and written reports and a final paper are required. (DR:2)
   4 units, Spr (Freidin) TTh 2:15-3:45

172. Pushkin.
   4 units, (Stahlberger) given 1984-85

184. Introduction to Slavic Bibliography—Historical and evaluated analysis of Slavic bibliographic and research tools, with emphasis on Russian and Soviet materials. Application of bibliographic search methodology. Final bibliography project required. Knowledge of Russian and/or another Slavic language is helpful. Open to graduate and undergraduate students.
   3 units, Aut (Zalewski) TTh 2:15-4:05

187. Russian Poetry of the Nineteenth Century—A study of the major representatives of Sentimentalism, Romanticism, Realism, Pushkin, Lermontov, Tjutchev and others. Lectures and discussions in English. Readings in Russian. Graduate students may earn 4 units. (DR:2)
   3 units, Aut (Stahlberger) MWF 11

188. Russian Poetry of the Twentieth Century—A study of the major representatives of Symbolism, Acmeism and Futurism. Blok, Mandelstam, Mayakovsky, Esenin and others. Lectures and discussions in English. Readings in Russian. Graduate students may earn 4 units.
   3 units, Win (Stahlberger) MWF 11

189. Old Russian Literature — A study of Russian literature and thought from the earliest times through the 17th century (some readings will be in the original).
   4 units, (Todd) given 1984-85

190. Russian Literature of the Eighteenth Century—Emphasis on poetry; theory of genres, the satire, the ode, the mock-epic.
   4 units, Spr (Stahlberger) MWF 11

191. Grammatical Categories of Russian—Major grammatical categories of Russian: case, gender, number in the noun and aspect, tense, voice, mood as well as prefixation and transitivity in the verb are analyzed in some detail. Comparisons are drawn between the Russian and English systems.
   3 units, (Schupbach) given 1984-85

195. Advanced Topics in Russian Grammar I: Phonetics and Phonology of Russian — Emphasis is divided between development of correct
pronunciation and a theoretical overview of the Russian sound system. Flexional morphology: Russian grammar is reviewed from the standpoint of the forms of, and relationships between grammatical endings.

3 units, (Schupbach and Van Campen) given 1984-85

196. Advanced Topics in Russian Grammar II: Syntax — Emphasis is on correct usage of the case system. Derivational morphology and lexicology: the derivation of words and problems of their usage are reviewed in detail, focus then shifts to problems of correct word-choice.

3 units, (Van Campen and Schupbach) given 1984-85

197. Advanced Topics in Russian Grammar III: Dialects of Russian — Survey of the Slavic languages.

3 units, (Schupbach and Van Campen) given 1984-85

199. Individual Work—Open to Russian majors or students working on special projects. May be repeated for credit. Consent of instructor required.

1-5 units, any quarter (Staff) by arrangement

200. Proseminar in Russian Literature—Literary scholarship as a profession: languages of literary criticism; rhetoric, poetics, and reception. Students in this course should also register for Slavic 184, Slavic Bibliography. Required of all entering graduate students and all honors majors in Russian literature.

4 units, Aut (Todd) W 2-4

211. Introduction to Old Church Slavie.

3 units, Aut (Van Campen) MWF 2:15

212. Reading of Old Church Slavic and Old Russian Texts. Prerequisite: 211.

3 units, Win (Van Campen) MWF 2:15

213. History of the Russian Literary Language—A survey of the major structural and semantic changes from the tenth to the nineteenth centuries. Prerequisites: 211 and 212.

3 units (Schupbach) given 1984-85

214. History of the Russian Language from a Social Perspective—The development of the structure of the Russian language from the sixteenth to the twentieth centuries as a process correlated with Russian history and culture; this survey will provide the basis for typological study of Russian in comparison with English and other West European languages.

4 units (Staff) given 1984-85

220. Literary Translation—The translation into English of Russian literary texts as an exercise in critical analysis. Readings in the theory of translation, and criticism of existing translations. Each student produces as his principal course work a publishable translation of a literary text.

4 units (Brown) given 1984-85

221. Studies in Russian Fiction: The Age of Realism—The development of realism over the first two-thirds of the nineteenth century, with special attention to problems of structure as well as to social and philosophical contexts, both Russian and European.

4 units (Todd) given 1984-85

222. Early Soviet Prose: Osip Mandelstam, Isaak Babel and Mikhail Zoschenko—A study of these three writers in the literary, social and historical context of the decade following the 1917 Revolution.

4 units (Freidin) given 1984-85


4 units (Staff) given 1984-85

225. Problems of Romanticism in Russia.

4 units (Staff) given 1984-85


4 units, Win (Freidin) M 4-6

230. Russian Formalism and Structuralism—The Russian Formalists' contribution to literary criticism and theory; the relationship of Russian Formalism to critical movements in the West; the Prague School, and the Soviet Structuralists. No knowledge of Russian is required.

4 units, (Brown) given 1984-85

271. Solzhenitsyn—Study of the major work of Solzhenitsyn in the novel, short story, drama, and essay forms, as well as in the genre most characteristic of him: "literary investigation." No knowledge of Russian is required, but concentrators in Slavic will be expected to do a major portion of the reading in Russian.

4 units, (Brown) given 1984-85

272. Osip Mandelstam — Examination of poetry, prose and critical writings in the cultural, social and political context of the period (1908-1938). Approaches will vary from structural, psychoanalytic and archetypal to inter-
textual and ideological. Poetry will be read in the original, and a good knowledge of Russian is highly desirable.

4 units (Freidin) given 1984-85

277. Gogol—A study of his fiction, drama and essays with attention to problems of structuration and refraction of cultural contexts. Also open to undergraduates with advanced training in Russian.

4 units (Todd) given 1984-85

278. Tolstoy.

4 units (Staff) given 1984-85

279. Dostoevsky—A study of Dostoevsky's shorter works in the context of European thought and literature.

4 units (Todd) given 1985-86

299. Individual Work—Exclusively for graduate students in Slavic working on theses or engaged in special work. Prerequisite: written consent of instructor.

1-12 units, any quarter (Brown, Schupbach, Stahlberger, Van Campen, Todd, Frenkel, Freidin) by arrangement

300. Graduate Seminar: Theory of Narrative—Studies of narrative (fictional, historical, sacred) as verbal structure, representation, rhetoric, and social institution. Readings will include theoretical writings by Jakobson, Barthes, Bakhtin, Iser, Lukács, and others. Discussions will analyze these readings and relate them to selected works of Russian and European literature. A seminar for graduate and advanced undergraduate students. Prerequisite: consent of instructor.

4-5 units, (Todd) given 1985-86

300A. Graduate Seminar: Russian Literature as an Institution—A study of literary production, dissemination, and reception in selected periods of Russian literature, from the Middle Ages to the present. Readings in social theory, literary criticism, and imaginative literature. Open to students without Russian only by permission of instructor.

4 units, Spr (Todd) MW 2-4

300B. Graduate Seminar: The Poetics of the Lyric in the Pushkin Period—Zhukovsky, Batjuskov, Baratynsky, Pushkin, and Lermontov will be read "interactively," with the aim of elucidating the systematic features of 19th century Russian lyric verse (genre, meter, "fixed styles," lyrical hero, cycles).

4 units, Win (Frenkel) W 2-4

For additional offerings in literature, see Comparative Literature.

Students interested in languages not listed for a specific language department should contact the Special Language Program, Department of Linguistics.
AREAS OF CONCENTRATION

1. **Applied Sociology**
   - This field of study emphasizes the contributions which sociological knowledge — both theory and methods — can make to the solution of social problems. Problem areas considered include: deviance, poverty, mental illness, alcoholism, as well as problems in the definitions of sex roles and the relations among ethnic groups. Foundation courses emphasize the special skills involved in applying sociological explanations and the special methodologies used in evaluation and policy-relevant studies. Careers linked to this area of study include social work, parole and probation, clinical sociology, evaluation and policy research positions.

2. **Social Psychology and Interpersonal Processes**
   - This field of inquiry focuses on the social organization of individual identity, beliefs, and behavior; and upon social structures and processes which emerge in and define interpersonal interactions. Processes studied include social acceptance and competition for prestige and status, the generation of power differences, the development of intimacy bonds, the formation of expectation states which govern performance in task oriented groups, and social pressures to constrain deviance. Foundation courses introduce students to one or more of these perspectives as well as to specific institutional areas. Careers related to this area of study include law and governmental service.

3. **Family Structures and Processes**
   - This area focuses attention on one of our most important and rapidly changing social institutions. Courses within this area will give attention to the variety of structural forms exhibited by families, both historically and cross-culturally; as well as to the vital processes encompassed within this setting, including socialization and social support. Courses also deal with internal and external forces generating changes in these systems, and with the emergence of "alternatives" to conventional family systems. Careers which relate to this topic include couple and family counseling, social work and law.

4. **Organizational Behavior**
   - This area encompasses both the study of individual behavior within organizations as well as the behavior of organizations as collective actors and the factors which affect their functioning. Organizations are the primary tool by which specialized goals are pursued in modern societies; they are found in every sector of modern life. Organizations studied include private profit taking firms and public organizations; voluntary associations and total institutions such as prisons; small, single purpose companies as well as giant diversified corporations. Foundation courses stress the environmental and technological factors which shape the structure of organizations and the social psychological and interpersonal processes which shape the behavior of individuals within organizations. Careers which relate to this study include all areas of management and administration — public, business, education; management consulting and analysis and organizational development.

5. **Comparative Social and Political Institutions**
   - This field of study encompasses all of the major types of social institutions — family, stratification, political, religious — that make up societies. Attention is also focused on the emergence over time of nation states and the processes which lead to convergence or similarity in institutional arrangements as well as the processes which produce diversity. Evolutionary, ecological, and comparative perspectives are utilized. Foundation courses introduce students to one or more of these perspectives as well as to specific institutional areas. Careers related to this area of study include law and governmental service.

6. **Research Methods**
   - This field of study emphasizes the acquisition of research and analytical skills relating to the collection, reduction and interpretation of data. Students are encouraged to acquire facility with a variety of research gathering techniques — e.g., participant observation, survey research, laboratory studies — as well as to acquire competence in the processing of data, including the acquisition of statistical and computer skills. Direct involvement in a research project is required as a part of this training. Careers related to this type of training include positions as data analyst, jobs in planning and evaluation departments and in applied research organizations.

Most of the courses offered by the department can be categorized as primarily oriented to one of these five areas; a few courses are relevant to more than one area of concentration. And within the four substantive areas, one or more Foundation Courses are identified which
provide a general introduction to the area or some portion of it. Courses for the current academic year, classified by area, are as follows:

1. **Applied Sociology**
   - Foundation Courses: 100, 101.
   - Other Courses: 102-119; 125, 145, 150, 155.

2. **Social Psychology and Interpersonal Processes**
   - Foundation Courses: 120, 121.
   - Other Courses: 122-134; 220-239; 102, 104, 106, 161.

3. **Family Structures and Processes**
   - Foundation Courses: 142
   - Other Courses: 103, 104, 107, 110, 154

4. **Organizational Behavior**
   - Foundation Courses: 160, 161.
   - Other Courses: 162-169; 260-269; 125, 140, 143, 148, 240.

5. **Comparative Social and Political Institutions**
   - Foundation Courses: 140, 141, 142, 143, 144.
   - Other Courses: 135-159; 240-259; 109, 111, 119, 282, 283.

6. **Research Methods**
   - Courses: 180A, 180B.

**BACHELOR OF ARTS**

The department offers two basic programs leading to the A.B. degree in Sociology: the general sociology major and the specialized sociology major. Both programs are designed around a core curriculum, the intent of which is to insure adequate coverage of basic sociological knowledge, but provide enough flexibility to enable each student to tailor the degree program to fit her or his individual needs and interests. These programs, and the requirements for each, are described below.

**CORE CURRICULUM**

All recipients of the A.B. degree in sociology must complete a minimum of 60 units of course work in the major. Related coursework from other departments may fulfill part of this requirement, but such work must be approved in advance by the departmental adviser and must not exceed 20 units. In addition, all degree candidates must fulfill the following core requirements:

1. Sociology 195, Departmental Seminar for Undergraduate Majors. This course is offered each Autumn Quarter, and it is recommended that students take it early in their program. This course is also suggested for students who are considering a major in sociology.
2. Sociology 180A and 180B, Introduction to Sociological Research, or its equivalent.

3. At least three foundation courses, one each from three of the four substantive areas of concentration (see areas 2-5 above).

**GENERAL SOCIOLOGY MAJOR**

This program is designed for the student who wishes a broad, general exposure to the various facets of sociology. To qualify for this degree, the student must:

a. complete the core curriculum requirements, and
b. Take a minimum of 20 units in sociology courses numbered 100 or above.

**SPECIALIZED SOCIOLOGY MAJOR**

The department recognizes that some students may wish to engage in more in-depth study than that provided by the major in general sociology. The specialized sociology major permits students to pursue a more concentrated program of study. To complete the requirements for the A.B. degree in Sociology with a specialization in Applied Sociology, Comparative Social and Political Institutions, Family Structures and Processes, Organizational Behavior or Social Psychology and Interpersonal Processes the student must:

a. Complete the core curriculum requirements (one of the three foundation courses must be taken from the proposed area of specialization), and
b. Take a minimum of 20 additional units from courses listed under the proposed area of specialization.

Undergraduate students who have a special interest in data analysis and research methods may complete the A.B. degree with a specialization in Research Methods. Students specializing in Research Methods must:

a. Complete the core curriculum requirements,
b. Take Sociology 381A, Sociological Methodology: Design and Analysis, and
c. Take 10 units of Sociology 190 or Sociology 192, Undergraduate Directed Research or Undergraduate Research Apprenticeship.

**HONORS PROGRAM IN SOCIOLOGY**

The Honors Program is designed for those energetic and interested students who are capable of carrying out an intensive, individualized program of study. Such programs involve close contact with one or more faculty as the student carries out an independent research project. Projects can often be developed in association with ongoing faculty research.

To be eligible for the Honors Program, the
student must have completed an acceptable proposal endorsed by a member of the departmental faculty no later than the end of the Autumn Quarter of his or her senior year.

To qualify for Honors in the department, the student must:

1. Take Sociology 180A and 180B, Introduction to Sociological Research or its equivalent.
2. Take Sociology 195, Departmental Seminar for Undergraduate Majors.
3. Complete an Honors Thesis, for which up to 15 units of credit will be granted.
4. Complete a minimum of 60 units of course work in the major, 20 units of which may consist of related courses in other departments if approved in advance by the departmental advisor.

MAJOR IN SOCIAL SCIENCES (SOCIOL

This degree is designed for students interested in interdisciplinary work with some emphasis on Sociology. The requirements for the bachelor’s degree in Social Sciences (Sociology) are 60 units of course work with 40 units from Sociology including an introductory course in Sociology and a course in methodology (Sociology 180A and B, for example). The remaining 20 units are chosen from related departments (Communication, Economics, Political Science, Psychology, Anthropology, and Linguistics).

COTERMINAL MASTER’S PROGRAM

Stanford undergraduate students who wish additional training in sociology may apply to the coterminal masters program as described in the “Degrees” section of this bulletin. Information may be obtained from the department secretary.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the School of Education section of this bulletin or address inquiry to the Credential Secretary, School of Education.

GRADUATE PROGRAMS

ADMISSION TO GRADUATE STANDING

Although it is desirable to have had undergraduate preparation in sociology, the department does consider for admission to its graduate program students without such preparation.

Admissions forms and forms for requesting financial assistance may be obtained from the Office of Graduate Admissions and, once completed, should be returned to that office. Applicants are required to submit results to the Graduate Record Examination, both the quantitative and the verbal tests. The GRE Advanced Test in Sociology may also be taken, but is not mandatory.

MASTER OF ARTS

Ordinarily, the department does not admit students who are candidates solely for the master’s degree in Sociology. This degree is granted as a step toward the fulfillment of Ph. D. requirements. To receive it, the student must complete 45 units of approved work with an average grade of “B” or better. All course work should be at level 100 or greater and at least 30 of the course units must be taken within the department.

Graduates enrolled in law, medicine, business, education or any other advanced degree program at Stanford may wish to obtain a master’s in Sociology. In this instance the usual admission requirements are waived, but course requirements are determined in consultation with the departmental advisor for doctoral candidates of other departments and schools. Interested students should contact the department secretary for further information. Students may also apply for the co-terminal master’s program as described in the “Degrees” section of this catalogue. Information may be obtained from the department secretary.

DOCTOR OF PHILOSOPHY

The department presumes that all students admitted will be recommended for admission to candidacy. For the first three quarters in residence all students have probationary status. During the Spring Quarter the department decides whether each student not yet admitted to candidacy will be: (1) admitted to candidacy; (2) terminated; or (3) continued on probation for an additional year. This decision is made by the entire faculty of the department and is based upon whether the student is making satisfactory progress toward the goal of a professional career of teaching and research in sociology. The decision to admit the student to candidacy implies that the student’s position in the department is secure, subject only to continued satisfactory progress toward completion of remaining departmental and University requirements.

After admission to candidacy for the Ph. D., the student must: (a) have a master’s degree or its equivalent; (b) complete a research apprenticeship, working for three quarters in a faculty research program and collaborating in associated publications or preparing a report of
professional quality based on his or her experiences; (c) complete a teaching apprenticeship, working for three quarters as a teaching assistant under the supervision of a faculty member; (d) develop a thorough grounding in sociological theory and research methods (to accomplish this, five graduate courses are required: Sociology 370A, 370B, 381A, 381B, and 381C. In addition, students entering with little background in statistics are required to take an elementary course in the first quarter after entering); (e) finally, each student must select two fields in sociology as his or her areas of special competence, and pass written examinations in these fields in order to complete the requirements for candidacy. Examples of such fields are Small Groups, Socialization, Family and Kinship, Sociology of Education, and Comparative Institutions. Theory or Methods may be offered as a field only when the candidate has an exceptional grasp of material in the area, since competence is assumed for all graduate students.

Finally, the student must pass the University Oral Examination, and following this, complete a doctoral dissertation. For basic University requirements see the “Degrees” section of this bulletin.

MASTER OF ARTS IN TEACHING

This degree is offered jointly by the department and the School of Education. The degree is intended for candidates with a teaching credential or relevant teaching experience who wish further to strengthen their academic preparation. The program consists of a minimum of 25 units in the teaching field and 12 units in the School of Education. Detailed requirements are outlined in the School of Education section of this bulletin.

JOINT PROGRAM WITH THE LAW SCHOOL

The faculties of the Law School and the Department of Sociology conduct joint programs leading to either a combined J.D. or J.M. degree with an A.M. degree in Sociology or to a combined J.D. or J.M. degree with a Ph.D. in Sociology.

Normally, the student interested in pursuing an A.M. degree in Sociology will complete one full year of his or her law program, applying for admission to the Department of Sociology during the first year of law school. If admitted, the student would be expected to complete 45 semester units (for the J.D. degree) in the Law School and meet the Sociology Department requirements. Applications for a joint program must be approved by the Research and Interdisciplinary Studies Committee of the Law School and by the Sociology Department. Faculty advisors from both the department and the school will participate in the planning and supervise the study program of students admitted to joint degree status.

The joint J.D.-Ph.D. degree program is designed for students who wish to prepare themselves for research or teaching careers in areas relating to legal and sociological concerns. Participation in this program requires application for admission to both the Law School and the Department of Sociology and acceptance by each. Upon admission, the student may elect to begin his or her study program in either the Law School or the Sociology Department. Normally, the student will spend the first full year in one program and the second full year in the other. Thereafter, the student may take courses concurrently until requirements for both degree programs have been met.

COURSES OPEN TO ALL STUDENTS

BASIC COURSES

**1A,B,C. Introduction to Sociology**—An introduction to the study of social forms and processes and their impact on individual behavior. Emphases vary from quarter to quarter as described below:

- **5 units**
- **1A. Introduction to Sociology**—Surveys the main theoretical approaches and problems in the study of social life. Topics include: social origins of the "self," class and stratification, political power, religion, education, organizations, and family. Emphasizes continuing interaction between theory and methods in sociology. Readings include classic sociological theory (Marx, Weber, Durkheim) and contemporary case studies. (DR:5)
- **5 units, Aut (Swidler) MWF 1:15** one section by arrangement
- **1B. Introduction to Sociology**—This course is designed to explore for each student how he or she developed in a changing social environment. The emphasis is on the interaction between individuals and the groups to which they belong. Topics include: internalizing society's norms, developing images of oneself in relation to others, and problems of fit between the individual and the organizations and institutions of the society. Abstract theories will be presented and discussed as they enhance an understanding of oneself and the social world. (DR:5)
- **5 units, Win (Dornbusch) MWF 11** one section by arrangement
1C. Introduction to Sociology—An examination of how humans connect themselves and thereby structure their experience. Topics include: small intimate relations, family groups, organizational and institutional settings, deviance, and the myth of personality. The rules and processes which determine the nature of our personal experiences will be examined. (DR:5)
5 units, Spr (Talley) MWF 10
one section by arrangement

5. Status, Friendship, and Social Pressure: An Experiential Approach—Examines basic social processes that structure the individual’s experience in interpersonal situations. Processes studied include (1) group pressure on individual choices, (2) social control of deviants, (3) operation of status distinctions (such as sex and race), (4) formation of friendships and, (5) formation of intimate relationships (such as love relationships). Through structured exercises and simulation gaming the student first has the opportunity to experience these processes in section meetings. Following these laboratory experiences, lectures provide the chance to examine these processes in terms of the theoretical ideas, empirical research, and clinical strategy. Enrollment limited. (DR:4)
3-5 units, Spr (Berger) MWF 10
one 2-hour section M or T 2:15-4:05

SOCIAL ISSUES IN CONTEMPORARY SOCIETY

100. Applied Sociology for Professional Practice — Although careers such as law, business, or even medicine would seem to have their own concerns quite apart from the social sciences, topics such as family law, management practice, and family disorders like anorexia and schizophrenia highlight the overlap between sociology and the major professions. Careers in governmental policy, organizational consulting, or family therapy only reinforce the relevance of sociology in a broad range of careers. But to solve problems in a complex, irrational, and unjust world requires not only a command of various disciplines, it also requires a mastery of the problem-solving process, at its most general level. This course provides an understanding of that process as well as the powerful contribution sociology can make in these professions. It is an excellent background for anyone anticipating an applied career; it also lays the groundwork for utilizing other courses in sociology.
5 units, (Talley) alternate years, given 1984-85

101. The Structure of Intimate Groups—This course examines the ways in which basic social processes organize the behavior of individuals in intimate social settings: marital relationships, living-together units, and long-term lover relationships. Among the problems that will be studied are: How are status distinctions (such as sex) used to structure the individual’s behavior in intimate groups? How do affect processes (processes of love and hate) operate in such groups? How do the members of such groups exercise social control and act to define each other’s everyday world? How are social objects (persons) constructed and maintained in such relationships? Extensive use will be made of structured exercises and simulations to help students understand the operation of social processes. Prerequisites: 5, or with special permission of instructor. Enrollment limited.
3-5 units (Berger) alternate years, given 1984-85

102. Women’s Situation—(Same as Feminist Studies 101.) The course draws together materials from history, philosophy, sociology, anthropology, and literature as they jointly contribute to the understanding of women’s consciousness.
5 units, Aut (Tuchman) alternate years, given 1984-85

103. Intimacy, Marriage, and Social Structure—In contrast to the colloquial view that intimate relations are somehow “private” and separate from the larger social world, this course examines how the cultural environment extends into even our most personal relationships. Numerous interpersonal processes, ideologies, and larger social structures can shape, distort, and inhibit personal intimacy and family life. The course will explore topics such as (1) the role of sex in intimacy, (2) the tenuous link between love and marriage, (3) gender differences in patterns of intimacy, (4) the nature of intimate communication, (5) the delicate balance of career, love, and family, and (6) the relevance of feminist thought to understanding intimacy. Use will be made of role-plays and discussions to expand on the readings and lectures. The course is open to all students and does not presuppose any experience in sociology.
3-5 units, Win (Talley) TTh 2:15-4:05
one section by arrangement

104. The Sociology of Gender—This course considers the social definitions of masculinity and femininity and examines social inequalities which are based on gender-specific social roles. Specific topics include inequalities in interpersonal behavior, the family and work organizations, and implications of inequality for illness behavior, family violence, sexual harassment and rape.
3-5 units, Win (Walker) MWF 9
one section by arrangement

105. Poverty and Public Policy in America—Why does large-scale poverty persist in America
and what are the effects of poverty on the individual? Through lectures, class discussions, and individual projects students will explore the facts, myths, and theories around this important social issue.

3-5 units, Win (Staff) MWF 10

106. Deviance and Social Control—This course focuses on deviance of all sorts: sexual deviance, drug abuse, mental illness, crime in the streets and crime in the suites (corporate and governmental abuses). The social foundations of the detections, labeling and processing of people as "deviants" will be explored. Examine various institutions and agencies mandated to keep "the public order," how labeled persons are separated from the rest of society both physically and symbolically, and the consequences for those individuals and for society.

3-5 units, Spr (Staff) MWF 11

107. Alcohol, Drinking and Alcoholism—Deals with the use of alcohol in the United States and its impact on interaction. Cross-cultural studies are also drawn upon and some comparisons of alcohol with other drugs of social use are made. Reading lectures, class discussions, and individual and group projects permit students to become informed about the uses and effects of this social drug and the ways in which it is studied and understood.

3-5 units, (Barchas)
alternate years, given 1984-85

109. The Criminal Law and the Criminal System—(Same as Law 109 and Political Science 183K.) Exploration of the purposes and processes of the criminal law, with emphasis on the actual operation of the system, and application of theory to contemporary problems. Topics will include the police, the trial, sentencing, corrections and "non-victim" crimes.

5 units, Spr (Kaplan) TTh 10-11:30

110. Interpersonal Aggression—Interpersonal aggression is a multifaceted phenomenon. This course is concerned with aggression which takes place in a social context. Major conceptualizations and observational methods are compared, and specific aspects of face to face group interaction which may act to enhance or inhibit occurrence of aggression are considered. Brief consideration is given to institutionalized aggression and to putative alternative "pathways" or "behavioral mechanisms", such as humor. Students are encouraged to incorporate their special interests, curiosities, or expertises into the course.

3-5 units (Barchas)
alternate years, given 1984-85

111. Social Issues in Health Care—(Same as FCPM 250.) Provides an overview of major social issues and policy problems in health care and their practical application to the present and future roles of physicians. Sociological perspectives and research findings are contrasted with other approaches; discussions stress critical evaluation of alternative viewpoints and evidence. Areas covered include social factors influencing illness and use of health services, patient-provider relationships, education and professionalization of physicians and other providers, incentive structures in various health institutions, the drug industry, and alternative health care reform strategies.

5 units, Win (Dutton)

112. Sex and Education—(Same as Education 170.) This course examines gender as a critical variable in educational institutions and labor markets. It takes an interdisciplinary approach to issues such as the distribution of power in schools, the determinants of occupational choice, the relative payoff of schooling for women and men, the causes of differential behavior and treatment between the sexes in schools and in the work force, and the legal redress of inequalities. The course will include readings, lectures and discussions on theoretical, empirical and policy materials and will be coordinated with the Center for Research on Women (CROW) Wednesday noon lecture series. The three primary disciplines in the course will be economics, history and sociology, but professors of psychology and law will also take part in the analysis.

3-4 units, Spr (Cohen, Strober and Tyack)
alternate years, given 1984-85

113. Social Structure of the Life Cycle—This course examines the effects of the institutions of society on the individual at different stages of the life cycle. The major thrust of the course will be an analysis of the relationship of such social institutions as the economic, educational and political systems, the family, religion and culture of the life stages of childhood/adolescence, youth/young adulthood, middle age and aging. For example, there will be an exploration of the differences of educational attainment, and marriage, work and retirement patterns within appropriate age-related stages, based on race, socio-economic status and gender. Life stages in the U.S. will be compared with those in other cultures and other historical periods. The life cycle approach provides a framework within which to organize the sociological experience of people of different generations, cultures and socio-economic status.

5 units, Aut (Staff) TTh 10-11:30

114. Corporate Competence—This course is designed for the student anticipating professional work in a corporate setting. Even when one's well-prepared to practice a profession
(business management, law, human services, medicine, and so on) the dynamics and pitfalls of organizational life can shape career experience more than one's desires or skills. Combining the instructor's experience as a sociologist, organizational consultant, and therapist, this course presents the insights of the social sciences into the tactics of corporate survival. Topics will include understanding individual differences (decision-making, time management, creativity), one-on-one encounters (delegation, communication skills), managing groups (team development, effective meetings, R&D management and maneuvering in the corporate culture.) Simulations and exercises will be used, as well as general lectures and discussions.

5 units, Win (Talley) TTh 10-11:50

118. Groups, Teams and Organizations—Examines questions such as: what makes groups productive? What is an effective group member? How does "team spirit" affect individual performance? How do organizations both expand and constrain individuals? The course will provide direct experience with group and organizational phenomena through extensive use of simulation games, structures exercises and case studies. Lectures and reading will provide tools for analyzing these experiences based on empirical research and theoretical ideas.

5 units, Spr (Cohen) MW 2:15-4:05

119. Great Issues in American Society—This course is issue-centered rather than theory-centered. The most pressing social issues confronting our society and its relation to the rest of the world — population pressures, equality and inequality, women's and minority movements, bureaucratization and constraints on freedom, war and violence in American society — are examined from a sociological perspective. Two faculty members provide continuity, but lectures are also given by other faculty and guest lecturers selected for their expertise on each topic. This course assumes no prerequisites and is a valuable first course for someone interested in a sociological analysis of critical issues in American society.

5 units, Spr (Meyer, Inkeles, and Staff) TTh 11; one 2-hour discussion by arrangement

SOCIAL PSYCHOLOGY AND INTERPERSONAL BEHAVIOR

120. Interpersonal Relations—This course is concerned with power, exchange, coalition formation, status, conformity, and deviance. Important traditions of research have developed from basic theories of these processes. Emphasis will be on (1) understanding the basic theories, and on (2) drawing out their implications for change in a broad range of situations, such as families, work groups, and friendship groups. (DR:4)

5 units, Aut (Staff) MWF 9

121. Introduction to Social Psychology—The main objective of this course is to promote understanding of the individual's relationship to social groups, from the intimate two-person group to the society at large. Both theoretical and experiential perspectives will be employed to illuminate these relationships. The course will include simulation and observation exercises. Among the topics covered will be social pressure and conformity, racism, and sexism, self-evaluation, equity and justice, and the social self. (DR:5)

5 units, Win (Cohen) MWF 10 one section by arrangement

122. Introduction to Sociophysiology — The course will focus on the interaction of social and physiological events with particular attention given to small group settings. The illustrative literature, class discussions and lectures are based on both human and animal studies. Enrollment is limited. Prerequisite: at least one 100 level course in Sociology and junior to senior standing, or consent of the instructor. (DR:4)

5 units, Spr (Barchas) TTh 11-12:30

126. Evaluation and Social Control—Evaluation is the basic process by which persons control themselves and control others. Examine evaluation processes within the individual, in small groups, in organizations, and in the institutions of a society. Study how evaluations control behavior, and also how and why groups struggle to keep themselves from being evaluated. There will be some attention to issues of moral choice and individual freedom in relation to societal pressure.

3-5 units, (Dornbusch) alternate years, given 1984-85

127. Power in Interpersonal Relations — This course examines concepts of power and influence, sources of power, dynamics of power-dependence relations, authority and the legitimation of power. Specific topics include the role of power in face-to-face interactions, the influence of individuals on groups and of groups on individuals; applications to families, task groups, other small groups, and implications for the study of power in larger social units. The course includes laboratory exercises which alternate with lectures.

3-5 units, (Walker) MW 1:15-2:45

128. The Social Construction of Emotions — In this course, students examine the ways in
which and extent to which social forces shape the occasion, meaning and expression or non-expression of affective experience. Attention will be paid to particular emotions, such as jealousy, shame, love, humor, gratitude, indignation and envy as well as to several theoretical orientations which deal with social processes common to diverse emotional experiences. These include cultural diffusion, symbolic interactionism and structural analysis. The physiological substrate of emotion is also discussed. Consequences of socially molded sentiments for the individual and society will be explored. Enrollment is limited. Prerequisite: at least one 100 level course in Sociology and junior or senior standing, or consent of instructor.

5 units, Win (Barchas) TTh 11-12:30

129. Status, Expectations, And Rewards — Deals with a wide range of problems concerning the effect of status characteristics, such as race and sex, on the individual’s interpersonal behavior: how status distinctions are maintained; how status distinctions determine an individual’s performance expectations and expectations for rewards; how these performance and reward expectations can be changed. Theoretical and empirical research on Status Characteristics Theory will be closely examined for an understanding of the dynamics that link status, performance and reward expectations, and behavior in interpersonal situations. Prerequisites: 5, 120 or by permission of instructor.

5 units, (Berger) alternate years, given 1984-85

COMPARATIVE SOCIOLOGY: SOCIAL INSTITUTIONS AND SOCIAL CHANGE

130. American Society in Film and Literature — Plays, films, and novels by American social realists are used to analyze some of the fundamental social processes underlying the structure of American society. Emphasis is given to two topics: Social control, including courses of conformity and deviance and mechanisms producing them; and stratification, including class, sex, and ethnic/racial inequalities. It should be emphasized that the course is a course in sociology, not in film or literature. It uses film and literature to try to understand central features of American society but it does not study film or literature as such. Reading includes work by Ellison, Faulkner, Fitzgerald, James, Miller, Steinbeck, Styron, and Wharton. Films include A Thousand Clowns, Hester Street, A Long Day’s Journey into Night, One Flew Over the Cuckoo’s Nest, The Little Foxes, Adam’s Rib, Streetcar Named Desire, and Harland County, USA. Films will be shown Wednesday nights.

3-5 units, Spr (Zelditch) TTh 10, W 7-9 p.m., and one section Th 1:15, 2:15, 3:15 or 4:15

135. Culture, Economy and Politics in Western Societies— Examines major sociological interpretations of the history of modern Western societies, tracing the role of cultural, economic, social, and political factors in shaping modern industrial society. Focus is on England, France, and the United States. Topics include love and individualism in Western culture; political revolution and the origins of the modern state; class conflict and authority relations in industrial society; and changing ideologies of poverty, madness, and crime. (DR:5)

5 units, Aut (Swidler) MWF 2:15

137. Status Attainment, Education and Work — (Same as Education 172.) Introduction to sociological research on educational, occupational and economic attainment processes. Special attention is focused on gender differences in work careers over the life cycle and on organizational and institutional structuring of careers. The U.S. status-attainment research tradition is contrasted with alternative theoretical and empirical perspectives on educational and work- career processes.

4 units, Spr (Talbert) alternate years, given 1985-86

140. Ecology, Evolution and Society— Considers a variety of strategies for explaining order and change in social institutions using general principles of evolutionary and ecological theory. Perspectives covered include socio-biology, cultural materialism, Marxist theory, and sociological ecology. Topics covered include the division of labor between the sexes, evolution of the modern state, ethnic boundary dynamics, and the ecology of collective movements. (DR:5)

3-5 units, (Hannan) alternate years, given 1984-85

141. Politics and Society— A review of the main themes of political sociology: the origins and expansion of the modern state; the linkages between state and society; the impact of the modern world system on national polities; the internal distribution of power and authority; and the structure of political group formation and individual participation in modern states. Emphasizes the modern empirical literature. (DR:5)

5 units, (Meyer) alternate years, given 1984-85

142. The Family— A cross-cultural analysis of family organization and processes in different societies, and over time, with some special attention to the urban family of Western society. Divorce, illegitimacy, courtship, changing sex roles, and the relations between family
patterns and social class will be discussed. (DR:5)
5 units, alternate years, given 1984-85

143. Education and Society—(Same as Education 220C) The effects of schools and schooling on individuals, on the stratification system, and on society. The distinction between education as socializing individuals and as legitimizing social institutions. Social factors affecting the expansion of schooling, individual educational attainment and the organization of schooling. (DR:5)
5 units, Spr (Meyer) MWF 9

144. Social Inequality and Social Stratification—The first part of the course describes concrete structures and processes of stratification in America: Class, status, and power systems at the community and national level and social mobility in America. The second part assesses alternative theoretical explanations of inequality and stratification: How inequalities in status, resources, and resources emerge; how they are organized into systems; how stratification (formation of social groups) is based on these inequalities; how it is maintained once it emerges; and dynamics of change (including especially revolution). In addition to classical theories (Marx, Weber, various functionalists), attention is given to recent developments (such as Althusser, Habermas, Wright). Brief attention is given in a third part of the course to international systems of stratification, including world-systems theories (Wallerstein), dependency theories, and theories of imperialism.
5 units, Spr (Zelditch) MWF 11

145. Race and Ethnic Relations — A systematic study of racial and ethnic relations in contemporary perspective. The course will examine the social behavioral implications of attributions of race and ethnicity in small group interactions, the world of work and the larger society. Specific topics will include race and IQ, interracial dating and marriage, inequalities in employment and income, affirmative action and ethnic political mobilization. (DR:5)
3-5 units, Aut (Walker) MWF 10

146. Work in Comparative Perspective: Japan and the U.S.—This course compares and contrasts the arrangement of work in the United States with that in Japan in order to reveal how U.S. history and culture have influenced labor institutions. Topics to be considered include the relationship between primary and secondary labor markets, the place of women, human capital, democratization in the workplace, and labor politics.
3-5 units, Aut (Conell) MWF 1:15

147. Class and Politics—A discussion of the relation between class and politics which will deal with parties, social movements, voting behavior, class organizations and power. The course will treat the applicability of different classical social class theories, e.g., Marx, Weber, Durkheim, to contemporary political analysis. (DR:5)
5 units (Lipset)
alternate years, given 1984-85

149. Youth in Modern Society—A study of the ways the lives of adolescents and youth are organized in modern society, how this situation is changing, and how it influences experience in later life. Special focus is on how institutional arrangements (organizations, legal structures, normative systems) structure the status of “adolescent” and “youth.” Of particular interest for students anticipating careers in education, problems of juveniles, social work, or other helping professions. (DR:4)
3-5 units, (Meyer)
alternate years, given 1984-85

150. Urban Sociology—Over the last 200 years the scale of the ecological communities in which people are embedded has increased enormously — more rapidly than the psychological communities with which people identify themselves and the political communities within which they are governed. This course explores all three of these kinds of communities and the impact on the ability of people of govern themselves of the disparity between the scales of the ecological, psychological and political communities. (DR:5)
3-5 units, (Conell)
alternate years, given 1984-85

152. Social Structure of World Society—(Same as Education 231 and Values, Technology, Science and Society 155.) This course pursues a sociological analysis of human society on a world-wide basis, that is, all the people inhabiting the earth and the institutions through which their lives are organized are treated as participants in one global social system. Competing models of the emerging world order and its dynamics will be reviewed and compared. Special attention will be given to the question of whether once distinctive societies and cultures are converging on a common standard. Among the topics to be covered will be worldwide population dynamics, the nature of the world economy, communication and exchange of persons on a global scale, socio-economic stratification of the world population, and education, science and technology as global systems. The course will utilize a mixed lecture-discussion format, with Thursdays from 10-11 set aside for discussion only. (DR:5).
5 units, Aut (Inkeles) TTh 10-12
and by arrangement

5 units, Spr (Tuchman) TTh 3:15-5:05

154. Urban Growth and Change—Cities and towns are continually changing; in size, density, composition and internal organization. This course examines causes and consequence of these changes. It will be divided into two main units: one will focus on processes of change in a city as a whole; the other will concentrate on processes of change in a sub-area of a city (i.e., in a neighborhood). The course will consider consequences of these changes for individuals, families, organized groups and voluntary associations, firms and public institutions.

5 units, Aut (Tuma) MWF 1:15-3 one section by arrangement

155. Power Elites in American Society—Analysis of conflicting views on the reality and importance of "power elites" in American society, including Domhoff’s Who Rules America?, Mills’ The Power Elite, Dahl’s A Preface to Democratic Theory and Lowi’s The End of Liberalism. The basic premises of each view are analyzed and compared with available evidence. The last lecture attempts to assemble whatever survives this examination into a coherent view of power in America. (DR:5)

3-5 units, (Zelditch) alternate years, given 1984-85

156. Sociology of Culture—How do art, literature, music and such popular cultural forms as movies and television reflect and shape social experience? Course includes: Sociological approaches to the study of culture; cultural markets and culture-producing organizations; popular culture vs. high culture; form and meaning in art; and the sociological study of aesthetic experience.

5 units (Swidler) alternate years, given 1984-85

157. Women and the Production of Culture —(Same as Feminist Studies 104.) In recent years, sociologists and communications researchers have focussed upon the processes through which culture is shaped within organizations. To a great extent, they have examined the coordination of individuals performing bundles of tasks in institutional settings. To a lesser extent, they have also looked at the significance of gender and class. This course will consider the role of women in these cultural processes, paying special attention to women writers and artists, past and present, and to workers in contemporary mass media. It will also examine how the gender of these workers affects the depiction of women.

5 units, Spr (Tuchman)

158. Social Movements and Social Protest—This course explores the underside of electoral politics, often referred to as “the politics of disorder.” The questions considered include the following: How do new issues get placed on political agendas? What determines whether a given grievance leads to collective protest, and, in particular, what role does formal organization play in the process? What determines whether protest leads to amelioration of the underlying grievances, to proto-revolutionary foment or to incorporation of new interest groups into the polity? What role do the procedures for channeling protest which are associated with the liberal state play in preserving that state, and is that role sufficient to justify the charge that the liberal state’s response to protest is essentially repressive? (DR:5)

3-5 units, Aut (Conell) MWF 11

159. Revolutionary Processes—A comparative, historical examination of social processes in classical as well as other types of revolutions. Causal theories of revolutions will be reviewed, as well as the dynamics of force and force-threat. The changing roles of peasants and of the military will be analyzed, along with family changes, terrorism, problems of legitimation, and the consequences of revolution.

5 units (Goode) alternate years, given 1984-85

FORMAL ORGANIZATIONS


5 units, Aut (Scott) MWThF 9 one section by arrangement

162. Organizational Cultures—(Same as Graduate School of Business 373A.) Organizations have cultures which include, for example, an institutional mythology, jargon, rituals, ceremonies, humor. Through these cultural mechanisms, organizational members communicate their philosophies of management, values, and expectations. This course will draw on recent research on this topic to address such questions as: exactly what is a culture? How do the cul-
tasures of major corporations or agencies differ? Can charismatic entrepreneurs or leaders create cultures? Does cultural inertia prevent the deliberate management of culture. Students will participate in research projects, including a diagnosis of the culture of a public or private sector institution.

4 units, (Martin)
alternate years, given 1984-85

163. Organizational Decision Making—(Same as Political Science 107.) Business decision making in complex organizations, such as universities, schools, hospitals, business firms, and public bureaucracies. Information, power, resources, organizational structure, and the environment. Alternative models of choice and their implications.

5 units, (Martin)

166. Organizations and Public Policy—This course provides concepts and methods for analyzing the influence of organizations on the setting and implementation of public policy. Varying conceptions of organizations, both as corporate actors and as social contexts, will be reviewed and evaluated. The several roles of organizations in relation to public policy will be examined, including organizations as decision makers and problem solvers, as change agents, and as clients. Prerequisite: Industrial Engineering 100 or Sociology 160.

5 units, Win (Scott) MWF 9 and one section T or Th at 9

167. Comparative Policy Analysis—(Same as Political Science 146M.) The focus of the seminar is the process of public policy development, which will be analyzed (1) in terms of its major phases (e.g. problem definition, instrument choice, program design), (2) in terms of the major actors involved (e.g. political parties, pressure groups, top executive, ministerial bureaucracy, commissions), and (3) in terms of process characteristics (e.g. incrementalism, conflict transformation, bureaucratic politics). The seminar is comparative both in terms of the approaches used and in terms of the empirical material, which will be drawn from different countries.

5 units, Aut (Mayntz) T 1:15-3:05

168. Industrial Organization — Explores sociological approaches to understanding the structure of industries, especially change in industrial organization. The main themes concern the effects of broadscale changes in technology, social organization, and politics on the forms of enterprise. Topics covered include: evolution of industrial strategies, changing forms of labor organization and protest, internal labor markets and careers, innovation and the structure of the firm, and cross-national comparisons of industrial forms. Prerequisite: 160 or consent of instructor.

5 units, Win (Hannan) TTh 8:30-10

SOCIOLOGICAL THEORY

170. Classics of Modern Social Theory—An in-depth introduction to the works of Marx, Durkheim, Weber, Freud, and Tocqueville. Examination of the questions these theorists pose and the answers they offer to fundamental problems of the relationship of individuals to society, the distinctive characteristics of modern societies, and the sources of reason and freedom in social life. (DR:3)

5 units, Win (Swidler) MWF 1:15

RESEARCH METHODS

180A. Introduction to Sociological Research — The aim of this course is to provide the consumer of social research with standards by which to evaluate the findings of sociological studies; to present a critical analysis of some basic notions and theories used in sociological analysis. Required of all sociology majors.

3 units, Aut (B. P. Cohen) MWF 11; for associated laboratory, see Sociology 180B

180B. Introduction to Sociological Research: Laboratory—Laboratory exercises consider problems of collecting observations, constructing theory, testing hypotheses and generalizing research results. Required of all sociology majors. Students must enroll concurrently in 180A.

4 units, Aut (B. P. Cohen) by arrangement

181A,B. Practicum in Social Research—Social scientific data are used increasingly by policy analysts, business executives, lawyers and market researchers as well as by social scientists. This two-quarter sequence gives instruction in and intensive experience of basic skills useful in such applications. In 181A the class will select a topic and collect data relevant to it by interviewing people and constructing and admin-
In 181B the class will organize and analyze the data collected in 181A. The LOTs computer will be used for the analysis. Enrollment limited to 20. 180A, B are prerequisite to 181A, B and 181A is prerequisite to 181B.

5 units, Win, Spr (Tuma) TTh 2:15-4:05

INDIVIDUALIZED LEARNING EXPERIENCES, PRIMARILY FOR UNDERGRADUATE MAJORS

190. Undergraduate Directed Research—Provides an opportunity for a student to work on a project of his or her own choice under the close supervision of a faculty member who has agreed to do the supervision. Prior arrangement required.

1-6 units (Staff) by arrangement

192. Undergraduate Research Apprenticeship—Provides an opportunity for a student to work in an apprentice-like relationship to a specific faculty member or members in an ongoing research project. Prior arrangement required.

1-10 units (Staff) by arrangement

193. Undergraduate Honors Seminar—Designed for students participating in, or expecting to apply to the Honors Program.

1-3 units, Win, Spr (Staff) by arrangement

194. Senior Thesis—Provides the opportunity to work intensively on an honors thesis project under faculty supervision (see description of Honors Program). It is assumed that this project will be arranged early in the year of graduation, if not before.

3-10 units (Staff) by arrangement

195. Departmental Seminar for Undergraduate Majors—Designed to introduce students to Sociology as an academic discipline, to acquaint them with career opportunities in the field, and to expose them to current faculty research interests. Required of all sociology majors.

2 units, Aut (Staff) (six weeks course) W 12

COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATE STUDENTS

210. Sociology of Education—(Meets with Sociology 310.) (Same as Education 210.) Introduction to sociological approaches to educational phenomena. Topics include school organization and environment, the relationship of education to adult roles, the impact of social class and ethnicity on classroom learning and the social structure of the classroom. Course work includes reading and evaluating social science research. Features short written assignments and individual feedback.

4 units, Win (E. Cohen) MW 1:15-3:05

211. Seminar: Social Issues in Health Care — (Same as FCPM 254.) Course analyzes selected social and policy issues in health and medical care, such as the role of social factors in illness and medicine, health care for the disadvantaged, patient-provider interactions, and alternative approaches to health care reform. Discussions focus on the sociological perspective but stress critical evaluation of alternative viewpoints, methodologies, and evidence. Students will design, conduct and present a major research project. Prerequisites: Sociology 111 or similar background. Open to undergraduates with permission of instructor.

3-5 units, (Dutton) alternate years, given 1984-85

212. Theories of Social Psychology — This course examines major theoretical perspectives in interpersonal processes and social psychology. The basic principles and assumptions of each perspective will be examined as well as techniques of investigation and methodological issues. Specific perspectives will include symbolic interaction, field theory and exchange and particular problems associated with perspectives will be treated, e.g., power and influence, development of the self or attribution. Open to undergraduates with consent of instructor.

5 units, Spr (Walker) MW 2:15-3:45

240. Seminar: Social Stratification.

5 units, Win (Tuma) F 2:15-5:05

242B. Interaction Processes in Education: Design and Evaluation—(Same as Education 312B.) Educational applications of sociological/social psychological theory and research to classroom processes, staff relations, teams and task forces. Course will cover principles for design and evaluations of groupwork for students and teamwork for teaching staff. Topics include social processes of influence, role differentiation and evaluation. Methods of systematic evaluation and observation are included; students will receive practical experience in using these methods.

4 units, Aut (E. Cohen) MW 2:15-4:05

244. The Social Structure of Science—The objective of this course is to analyze science as a social institution, to look at the way science and scientific research are organized, and the im-
pact of this organization on the development of scientific knowledge.

5 units, Spr (B. P. Cohen) T 2:15-5:05

245. Seminar: Comparative Studies of Politics and Society—This seminar will focus on analysis of social and political developments in advanced or post-industrial society, with particular emphasis on western Europe and the United States. It will examine the ways in which changes in the technological and class structures have produced new bases for political cleavage and have affected the role of the state.

5 units, (Lipset) alternate years, given 1984-85

248. Seminar: Topics in the Theory of Social Stratification—Historical and comparative inquiries on class systems, including prestige factors as elements in class processes, the role of peasants in agrarian societies, relations between ideas of justice and class systems, terrorism as a model of control and persuasion, and revolutions (both successful and unsuccessful) and their consequences.

5 units, (Goode) alternate years, given 1984-85

255. Seminar: Life-Cycle Processes—Intrasocietal and cross-cultural variations in age related patterns or organization of individuals' lives.

5 units, (Tuma) alternate years, given 1984-85

260. Formal Organizations: Lectures and Seminar—Same lectures as 160 plus seminar session for graduate students.

5 units, Aut (Scott) MWF 9; M 3:15-5:30

261. Seminar: Social Psychology of Organizations—(Same as Business 471.) This seminar focuses on social psychological theories and research relevant to interaction in organizations. Topics will include current research on organizational myths, scripts, and schemas; social comparison process, equity and perceptions of injustice as they relate to income inequality and sex and race discrimination. Other topics of interest, time permitting, will be selected by students. Consent of instructor required.

4 units, Spr (Martin)

262. Organization and Environment—(Same as Business 472.) This course is intended to introduce students to the topics of interorganizational relations and the external control of organizational behavior and to provide them with some experience in analyzing and thinking about organization-environment issues. Topics considered include the dimensions of organiza-

263. Power and Politics in Organizations—(Same as Business 377.) The definition and usefulness of power and politics in organizational settings for understanding actions and outcomes are explored. The topics of the relative power of subunits and individuals will be considered both in terms of vertical power and authority differences and from the perspective of power differences that arise among subunits formally on the same hierarchical level. Topics to be covered include the definition of power and politics, and whether power is a measurable and meaningful concept; the sources and determinants of both individual and subunit power; how power is used in organizations, the conditions under which power and politics dominate organizational activity; the consequences of power and political activity; political tactics; and the implications of a political perspective for issues or organizational structure and design, the stratification of positions within the organization, and for organizational adaptation and change. (Enrollment is limited: Undergraduates or graduate students in sociology who wish to take this course should sign the class list in the Sociology Department office.)

5 units, Win (Pfeffer)

264. Topics in Human Resource Management—(Same as Business 300.) Changes in the labor force, the growth of “high technology” industries, and government’s increased role in dictating employment practices are among the factors making career management increasingly salient to organizations. This course examines how personnel practices affect organizational members and how firms, in turn, are constrained by their workforces. The impact of organizational arrangements on workers’ careers is discussed, as well as how personnel practices affect organizational functioning. The impact of unions, technological change, and affirmative action on human resource manage-
ment are also examined, as are some recent innovations affecting employment relations, such as "comparable worth" and quality of work life programs.

4 units, Win (Baron)

266. Implementation of Public Policy—(Same as Political Science 211M.) Study of implementation processes and outcomes and their determinants in a comparative perspective, drawing on material for the U.S. and selected European cases. Research topics refer to specific policy areas (e.g., environmental, education and employment policies) as well as to specific policy instruments (e.g., grants-in-aid, regulation, persuasion).

5 units, Win (Mayntz)

269. Seminar: Medical Innovation and Public Policy—Course will focus on the histories of four controversial medical innovations (DES, the swine flu vaccination program, the artificial heart program, and recombinant DNA research) and the general social and policy issues they raise. Discussions will be based on manuscripts currently in preparation and will consider the political economy of innovation, the assessment and management of risks and benefits, distributive justice, compensation of injured victims, and public participation in policy decisions. Selected faculty will join the class for discussion of their work. Students will be expected to contribute actively to discussions, and conduct and present independent research relating to the material covered. Limited to 10 students, by consent of instructor. Pre-registration required.

3-5 units, (Dutton, Bunker) alternate years, given 1984-85

270. Seminar: Topics in Sociological Theory—Close study of a selected number of contemporary theoretical approaches to sociology, including examples drawn from ethnomethodology, functionalism, critical theory, exchange theory, structuralism and conflict theory.

5 units (Goode) alternate years, given 1984-85

280. Sociology of Religion—This course examines central problems in the sociology of religion. Topics include: definitions of religion and the domain of religious experience; dynamics of religious change; forms of religious organization; religion and economic life; religion and politics; religiosity and secularism in modern societies.

5 units, Win (Swidler) Th 2:15-5:05

282. Seminar: Topics in Comparative and Historical Sociology—A seminar applying comparative and historical approaches to sociological analysis. Topics vary from year to year. In 1983-84, the seminar will explore the employment relationship. Variation in the nature of careers and in the way work is controlled will be emphasized.

5 units, Spr (Conell) T 12:30-3:05

284. Demographic Methods—(Same as Food Research 286.) Methodology of population analysis, stressing demographic research methods which are widely applicable in economics, sociology, and public health.

3-5 units, (Staff) alternate years, given 1984-85

285. Seminar: Political and Economic Organization of the World System—Reviews current theory and research on the structures of the world economy and polity as they affect the organization and development of national societies. Covers dependency theories, current world-economy theories, and especially world effects on the evolution, dominance, and modern forms of states and regimes.

5 units, Aut (Meyer) Th 2:15-5:05

286. Seminar: Ethnic Relations—Considers recent theories and empirical research on ethnic relations, emphasizing ethnic conflict and the rise of ethnic social and political movements. Theories considered include split labor market theory, internal colonialism theories, and competitive-ecological theories. Considerable attention will be devoted to issues of research design and analysis.

5 units, Win (Hannan) T 2:15-5:05

287. Seminar: Convergence and Divergence in Industrial Societies—Focus on the question of whether, and how far, the industrial and the "developing" societies are converging or diverging in their social and cultural patterns. The special theory of convergence will be reviewed and evaluated in relation to more general theories of social change. Particular attention will be given to the family and kinship, education, social stratification and mobility, but other institutional complexes of interest to the students will also be considered.

5 units (Inkeles) alternate years, given 1984-85

300A,B,C. Graduate Proseminar—Limited to first-year graduate students in Sociology.

2 units, Aut (Staff) 12

Win (Staff) 12

Spr (Staff) 12

310. Sociology of Education—(Same as Education 310.) For doctoral and master's students. Meets with Sociology 210 (See course description.) Emphasis on conceptualizing and analyz-
ing applied sociological research in education. Features short written assignments, individual feedback and work with actual research data.

4-6 units, Win (E. Cohen)
MW 1:15-3:05

320A,B,C. Seminar: Frontiers in Social Psychology — This seminar will deal with most recent developments in social/psychological research. It is open to all interested graduate students and advanced undergraduates. It is required of trainees in the NIMH program on evaluational structures and processes.

2 units, Aut, Win, Spr (Dornbusch)
M 12-1:30

360A,B,C. Trainee Seminar: Organizations and Mental Health—An ongoing seminar devoted to examining the impact of organizations on mental health of their participants; and the organization of mental health services. Required of trainees but open to other interested students.

2 units, Aut, Win, Spr (Scott, Staff)
T 3:15-5:05

365. Seminar on Advanced Organization Theory—Topics in organization theory for advanced students. Prerequisite: Permission of instructor.

5 units, (March)
alternate years, given 1984-85


4 units, Win (Pfeffer)

369A,B. Workshop on Organizational Ecology—A year long workshop on theoretical and research issues in population and community ecology of organizations. Topics covered include specialization-generalism, r and k selection, life cycle effects. Students will be required to prepare and present major research papers. Consent of instructor required for registration.

5 units, (Hannan)
alternate years, given 1984-85

370A,B. Basic Problems in Sociological Theory—A two-quarter course on (1) the logical analysis of theories and (2) basic strategies of sociological analysis. Basic concepts required for the logical analysis of theories are introduced in a preliminary way in the first four weeks of the course. These tools are then used for the analysis of various strategies of sociological analysis in the last six weeks of the Autumn and first six weeks of the Winter Quarter. Each strategy is illustrated by the study of one program of theoretical research starting with its origins in the classical literature and carried up to one or more contemporary formulations. The strategies studied vary from year to year but will be selected from among functionalism, historical materialism, human ecology, the theory of action, interactionism, behaviorism, decision-theory, and phenomenology. The last four weeks of the course are used to refine and extend the tools of theory construction, and require a self-directed computer course in logic. Prerequisite: consent of the instructors.

5 units per quarter, Aut (Zelditch)
MW 3:15-5:05; Win (B. P. Cohen)
M 2:15-5:05, and one section by arrangement (each quarter)

380A. Introduction to Sociological Research—(Same as 180A but restricted to Ph.D. candidates in Sociology or Sociology of Education.) For associated Laboratory see 380B.

3 units, Aut (Cohen) MWF 11

380B. Introduction to Sociological Research—(Laboratory, Same as 180B but restricted to Ph.D. candidates in Sociology or Sociology of Education.) Students must enroll concurrently in 380A.

4 units, Aut (Cohen) by arrangement

381. Sociological Methodology: Design and Analysis—Considers the basic principles of experimental and non-experimental design and applies them to the various observation plans used in sociological research. Introduces measurement theory. Reviews statistical foundations, including exploratory data analysis and the general linear model. Prerequisite: Statistics 160 or equivalent.

4-6 units, Win (Tuma) TTh 10-1

382. Sociological Methodology: Quantitative Outcomes — Examines methods for systematic analysis of quantitative features of social processes. The first half of the course treats analysis of static relationships, using structural equation methods. The second half addresses the study of social dynamics. Prerequisite: 381A or equivalent.

4-6 units, Spr (Conell and Hannan)
MW 1:15-2:45

383. Sociological Methodology: Discrete Variables — Rationale for and interpretation of various quantitative methods of analyzing discrete variables, such as tabular analysis, log-linear and logit analysis, probit analysis and event history analysis. Prerequisite: 381A, or equivalent.

4-6 units, Aut (Conell and Tuma)
given 1984-85
GRADUATE INDIVIDUAL STUDY

390. Graduate Individual Study. 
(Staff) by arrangement

391. Special Colloquia. 
(Staff) by arrangement

392. Graduate Research. 
(Staff) by arrangement

393. Teaching Apprenticeship. 
(Staff) by arrangement

394. Research Apprenticeship. 
(Staff) by arrangement

(Staff) by arrangement

CENTER FOR SPACE SCIENCE AND ASTROPHYSICS

Emeriti: William A. Bonner, Alan T. Waterman
(Professors)

Acting Director: Robert A. Helliwell

Acting Associate Directors: Peter M. Banks, Peter A. Sturrock, Robert V. Wagoner


Associate Professors: Bruce B. Lusignan

Assistant Professors: J. Richard Bond, Lambertus Hesselink, Umran S. Inan


The Center is an interdepartmental organization coordinating teaching and research in space science and astrophysics. Its members are drawn from the Applied Earth Sciences Department and Geology Department in the School of Earth Sciences; the Department of Aeronautics and Astronautics, Electrical Engineering Department and Mechanical Engineering Department in the School of Engineering; and the Applied Physics Department, Chemistry Department and Physics Department in the School of Humanities and Sciences.

Research now in progress covers a very wide field and is approached in a variety of ways, including experiments flown on rockets, satellites and space probes; ground-based observations made from the Stanford Solar Observatory and from national observatories; and theoretical research including computer modeling. Specific topics currently being studied include: technical aspects of space projects such as guidance and control; the application of information sciences to the transfer and analysis of space data; planetary sciences; solar-terrestrial phenomena; solar physics; stellar structure; infrared astronomy; X-ray and extreme ultraviolet astronomy; gamma-ray astronomy; high-energy astrophysics; theoretical astrophysics; gravitation theory and experiments; cosmology; and the study of life in the universe. Many of these projects involve collaboration with scientists at the NASA-Ames Research Center. For administrative purposes, the Center comprises a number of smaller units with specialized research activities. It also has a close working relationship with the Center for Aeronautics and Space Information Sciences (Director, Professor Peter M. Banks), which is the primary vehicle within the University for research on information systems in their application to space programs.

Stanford is a member of the Universities Space Research Association, a consortium of universities which operates the Lunar Science Institute in Houston, Texas, and also of the University Corporation for Atmospheric Research, which operates the National Center for Atmospheric Research in Boulder, Colorado.

The facilities of the Center are available to any interested and qualified student, who must be admitted by and registered in a department. The Departments of Aeronautics and Astronautics, Electrical Engineering, Mechanical Engineering, Applied Physics and Physics offer opportunities leading to an M.S. or Ph.D. degree for work in space science or astrophysics. The Center also offers opportunities to undergraduates who may, for instance, participate in research projects in their junior or senior years, either on a part-time basis during the school year or on a full-time basis during the summer. The Astronomy Course Program operates a small student observatory where students may gain practical experience in astronomical observing. The course list at the end of this entry includes courses of interest to undergraduates as well as courses primarily of interest to graduates. For descriptions of these courses, see their listing under Aeronautics and Astronautics, Applied Physics, Electrical Engineering, Geophysics, Mechanical Engineering, Physics, and also under the Astronomy Course Program.

Further information is available from the Acting Director.
## COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Term</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISA. The Nature of the Universe—(Enroll in Applied Physics 15.)</td>
<td>3</td>
<td>Win (Walker)</td>
<td></td>
</tr>
<tr>
<td>15B. Cosmic Horizons—(Enroll in Physics 15.)</td>
<td>3</td>
<td>Spr (Wagoner)</td>
<td></td>
</tr>
<tr>
<td>50. Astronomy Laboratory and Observational Astronomy—(Enroll in Applied Physics 100.)</td>
<td>4</td>
<td>Aut, Sum (Walker)</td>
<td></td>
</tr>
<tr>
<td>100. Introduction to Observational Astronomy and Astronomy Laboratory—(Enroll in Applied Physics 100.)</td>
<td>4</td>
<td>Spr (Walker)</td>
<td></td>
</tr>
<tr>
<td>106. Planetary Exploration—(Enroll in Electrical Engineering 106.)</td>
<td>3</td>
<td>Spr (Eshleman)</td>
<td></td>
</tr>
<tr>
<td>110. Introduction to Stellar and Galactic Astrophysics—(Enroll in Applied Physics 110.)</td>
<td>3</td>
<td>Aut (Petrosian and Walker)</td>
<td></td>
</tr>
<tr>
<td>111. Extragalactic Astrophysics and Cosmology—(Enroll in Applied Physics 111.)</td>
<td>3</td>
<td>Win (Petrosian)</td>
<td></td>
</tr>
<tr>
<td>190A,B,C. Independent Study in Astrophysics and Honors Thesis—(Enroll in Astronomy 190A,B,C.)</td>
<td>1-9</td>
<td>Aut, Win (Staff)</td>
<td></td>
</tr>
<tr>
<td>190A. 1-9 units, Aut (Staff)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>190B. 1-9 units, Win (Staff)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>190C. 1-9 units, Spr (Staff)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>195. Physics of Planetary Interiors—(Enroll in Geophysics 195.)</td>
<td>3</td>
<td>Spr (Sleep)</td>
<td></td>
</tr>
<tr>
<td>212. Introductory Aerothermodynamics—(Enroll in Aeronautics and Astronautics 212.)</td>
<td>3</td>
<td>Win (Bershader)</td>
<td></td>
</tr>
<tr>
<td>222. Classical Gravitation—(Enroll in Physics 222.)</td>
<td>3</td>
<td>Spr (Staff)</td>
<td></td>
</tr>
<tr>
<td>227. Atmospheric and Space Physics—(Enroll in Aeronautics and Astronautics 227.)</td>
<td>3</td>
<td>Spr (Spreiter)</td>
<td></td>
</tr>
<tr>
<td>235A,B. Space Systems Engineering—(Enroll in Engineering 235A,B.)</td>
<td>3</td>
<td>Win, Spr (Breakwell, Banks, Lusignan, Mayers.)</td>
<td></td>
</tr>
<tr>
<td>279A. Space Mechanics—(Enroll in Aeronautics and Astronautics 279A.)</td>
<td>3</td>
<td>Win (DeBra)</td>
<td></td>
</tr>
<tr>
<td>279B. Advanced Space Mechanics—(Enroll in Aeronautics and Astronautics 279B.)</td>
<td>3</td>
<td>Spr (Breakwell)</td>
<td></td>
</tr>
<tr>
<td>297B. Advanced Space Mechanics—(Enroll in Aeronautics and Astronautics 279B.)</td>
<td>3</td>
<td>Spr (Breakwell)</td>
<td></td>
</tr>
<tr>
<td>297C. Optimal Space Trajectories—3 units, Spr (Breakwell) alternate years, given 1983-84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>348. Ionospheric Processes—(Enroll in Electrical Engineering 348.)</td>
<td>3</td>
<td>Spr (Banks)</td>
<td></td>
</tr>
<tr>
<td>350. STAR Laboratory Seminar in Radioscience.</td>
<td>1</td>
<td>Aut, Win, Spr (Vesecky)</td>
<td></td>
</tr>
<tr>
<td>352. Electromagnetic Waves in the Ionosphere and Magnetosphere.</td>
<td>3</td>
<td>Spr (Helliwell)</td>
<td></td>
</tr>
<tr>
<td>354. Introduction to Radio Wave Scattering—(Enroll in Electrical Engineering 354.)</td>
<td>3</td>
<td>Spr (Tyler)</td>
<td></td>
</tr>
<tr>
<td>356. Astrophysics Laboratory I—(Enroll in Applied Physics 356.)</td>
<td>3</td>
<td>Sum (Walker)</td>
<td></td>
</tr>
<tr>
<td>359. Remote Probing of Atmospheric Environment—(Enroll in Electrical Engineering 359.)</td>
<td>3</td>
<td>Win (Buneman)</td>
<td></td>
</tr>
<tr>
<td>364. Plasma Physics—(Enroll in Applied Physics 364.)</td>
<td>3</td>
<td>Spr (Sturrock)</td>
<td></td>
</tr>
<tr>
<td>366. Cosmology and Extragalactic Astrophysics—(Enroll in Applied Physics 366.)</td>
<td>3</td>
<td>Spr (Petrosian)</td>
<td></td>
</tr>
<tr>
<td>368, 369. Gravitation—(Enroll in Physics 368, 369.)</td>
<td>3</td>
<td>Aut (Wagoner)</td>
<td></td>
</tr>
<tr>
<td>368. 3 units, Aut (Wagoner)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>369. 3 units, Win (Wagoner)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 units, Spr (Walker)

3 units, Win (Sturrock) alternate years, given 1983-84

392. Magnetospheric Physics—(Enroll in Electrical Engineering 392.)
3 units, Spr (Banks) alternate years, given 1983-84

SPANISH AND PORTUGUESE

Emeriti: Aurelio M. Espinosa, Jr., Ronald Hilton, Juan B. Rael, Isabel Magaña Schevill (Professors); Grace Knopp (Assistant Professor)

Chairman: Fernando Alegria

Professors: Fernando Alegria, Alban K. Forcione, Bernard Gicovate (on leave Winter and Spring), Sylvia Wynter (on leave 1983-84)

Associate Professor: Mary Pratt

Assistant Professors: Hector Mario Cavallari, Tomás Ybarra-Frausto

Senior Lecturers: María-Paz Haro (Director, Undergraduate Language Program), Karin Van den Dool

Lecturer: Frances Aparicio

Visiting Professors: Antonio Cornejo Polar (Autumn), Beatriz Pastor (Winter), Ana María Fagundo (Spring)

The Department of Spanish and Portuguese accepts candidates for the degree of Bachelor of Arts, Master of Arts in Spanish and Portuguese, and Doctor of Philosophy in Spanish and Portuguese.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Recognizing that students have different interests and reasons for pursuing a major in the Department of Spanish and Portuguese, we have designed the following major paths. Each has different objectives and requirements. Students will wish to consider in conjunction with a faculty advisor, which major path corresponds most closely to their own personal and professional objectives.

Literature Emphasis—This path is recommended for those students who enjoy reading literature and wish to acquire a knowledge of the variety of poetry, prose, and drama in the Hispanic world. Courses are intended to provide historical perspective and develop critical skills in approaching literature. Candidates are expected to complete a minimum of 45 units from courses in the department numbered 100 or higher.

Requirements: Spanish 140 (Introduction to Methods of Literary Analysis); 180 (Undergraduate Winter Colloquium); 201 and 202 (Advanced Grammar and Composition); two courses in Peninsular Literature; two courses in Latin American Literature. Of all the courses taken, two should be literature prior to 1750.

Recommended: Courses in Chicano Literature, Linguistics, and Literary Theory.

Literature and Society Emphasis—The aim of this path is to permit more flexibility to students by allowing them to plan a broader major than is possible in the other areas of concentration. The student can combine the study of Spanish, Portuguese, or Latin American Literature with such fields as Political Science, History, Anthropology, and Economics. Students must complete a minimum of 35 units in the department from courses numbered 100 or higher, and 25 units in related fields with advisor approval.

Requirements: Spanish 140 (Introduction to Methods of Literary Analysis); 180 (Undergraduate Winter Colloquium); two courses in Peninsular Literature; two courses in Latin American Literature.

Chicano Studies Emphasis—The aim of this path is to permit more flexibility to students in Chicano Studies, allowing them to take courses in, for instance, the Departments of Literature, Linguistics and History, including optional courses in Chicano Studies. Students must design their program in conjunction with Prof. Ybarra-Frausto. Students will also be expected to acquire an adequate knowledge of the roots of Chicano literature. Candidates must complete 35 units in Chicano Studies. In addition, they must take 25 units in Latin American or Peninsular Literature from courses numbered 100 or higher in the department.

Requirements: Spanish 140 (Introduction to Methods of Literary Analysis); 180 (Undergraduate Winter Colloquium); two courses in Chicano Literature; four courses in Latin American and Peninsular Literature.

Language Emphasis—This path is intended for students whose primary interest is in the structure and use of the Spanish language. Students must complete a minimum of 45 units from courses in the department numbered 100 or higher.
Requirements: Spanish 201, 202, (Advanced Grammar and Composition); Spanish 140 (Introduction to Methods of Literary Analysis); Spanish 180 (Undergraduate Winter Colloquium); one course in introductory linguistics (in Linguistics Department); three courses in Spanish linguistics.

Recommended: Spanish 203; two literature courses in one area; Portuguese 109 (Portuguese for Speakers of Spanish).

SUGGESTED SEQUENCE

The department offers a series of core courses designed to fulfill the requirements for all the major paths. All majors are required to take Spanish 140 and 180. Courses numbered 151-152 (Peninsular Literature) and 161-162 (Latin American Literature) are introductory survey courses. These satisfy the minimum literature requirements for all the paths. It is recommended that majors enroll directly in 151-152 or 161-162. It is also expected that they will go on to take courses at the 200 level. The core courses will be offered each year in the following sequence:

<table>
<thead>
<tr>
<th>Autumn</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>180</td>
<td>152</td>
</tr>
<tr>
<td>161</td>
<td>151</td>
<td>162</td>
</tr>
</tbody>
</table>

Courses numbered 130, 131, 132 (130B, 131B, 132B) are recommended for students who do not wish to make literature their major area of concentration but wish to continue studying Spanish beyond the second year level.

It is also recommended that majors take Portuguese 109 (Portuguese for Speakers of Spanish) so as to acquire a basic reading knowledge of Portuguese. This is not a substitute for First or Second Year Portuguese but is intended to build skills for conducting research in the language.

EXTENDED MAJORS

Candidates for the A.B. in English and Spanish Literature should register with the Department of English.

Extended majors in Spanish and Portuguese may be arranged through the advisor with other departments by taking a minimum of 40 units in Spanish and Portuguese from courses numbered 100 and higher, plus 15 or 20 units in a related field such as History, Latin American Studies, etc.

For students in the Honors Program in Humanities, up to six units of that program may be applied toward completion of the Spanish major.

STANFORD PROGRAMS ABROAD

SALAMANCA, SPAIN

Students with two years of college Spanish or the equivalent may spend two quarters in Spain as participants in the Stanford Program at the University of Salamanca. Students reside in residencias de estudiantes and attend University courses and courses given and organized by the Director in Residence. Application forms may be obtained from the Overseas Studies (Room 112, Old Union).

Courses taught at Salamanca: Spanish Civilization; Spanish Literature from 1870 to the Present; History of Spain. Students also enroll in courses given in the Facultad de Filosofía y Letras at the University of Salamanca.

Students may take up to 20 units at Salamanca to apply toward their majors.

For information consult Overseas Studies.

LIMA, PERU

SAO PAULO, BRAZIL

Stanford participates in two consortium-based programs in South America: one in Lima, Peru, and one in Sao Paulo, Brazil. Each is a full-year program beginning early in the summer and continuing through the following June. Students enroll in the Pontificia Universidad Católica del Perú in Lima or at the Universidade de Sao Paulo in Brazil. For credits in these and other programs abroad, consult your advisor.

INTENSIVE SUMMER PROGRAM

Stanford University offers first year intensive language study in Spanish during the summer.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the "School of Education" section of this bulletin and the Credentials Administrator, School of Education.

COURSES FOR BILINGUAL STUDENTS

The department offers a series of courses especially for bilingual students who need to concentrate on special problems of language or who have particular cultural interests. For specific courses consult the course offerings section. The suffix B indicates bilingual courses.

UNDERGRADUATE HONORS

Majors in the department who wish to be considered for honors at graduation may take an oral examination in the second to the last quarter of their senior year, on a 15-book reading list developed by the student in conjunction with a faculty advisor. The exam will be given by
the student's advisor and two other faculty members.

**GRADUATE PROGRAMS**

**MASTER OF ARTS IN SPANISH**

This program is designed for those students who do not intend to continue their studies through the Ph.D. degree. By University regulation, students desiring the A.M. degree must complete a minimum of 45 units, 36 of which must be completed at Stanford.

Requirements: Spanish 201, 202, (Advanced Grammar and Composition; can be waived in special cases); Introduction to Literary Theory or an equivalent course; four courses in the department numbered 200 or above which form a coherent program (to be worked out with advisor); reading knowledge of one foreign language other than Spanish (this language may be Portuguese).

In addition, students may take further units of graduate courses in Spanish or Portuguese and/or approved courses in related fields such as Linguistics, Comparative Literature, Philosophy, History of Art, Education. Students planning a career in language teaching may also take part in the University's teacher training program.

**COTERMINAL A.B. AND A.M.**

The requirements for the Coterminal A.M. are the same as those outlined above for the A.M. No course can count for both the A.B. and A.M. degrees.

**GRADUATE PROGRAM IN HUMANITIES**

The Department of Spanish and Portuguese participates in the Graduate Program in Humanities leading to a joint Ph.D. degree. For a description of that program see the section “Humanities Special Programs” in this bulletin.

Additional courses in literature that may be of interest to graduate students in Spanish may be found in the sections “Comparative Literature” and “Modern Thought and Literature” of this bulletin.

Students who choose a minor in Comparative Literature should consult with Professor John Freccero, Chairman, Comparative Literature. Students who choose to minor in Modern Thought and Literature should consult with Professor David Halliburton, Chairman, Modern Thought and Literature.

**DOCTOR OF PHILOSOPHY**

The requirements of the Ph.D. are: (1) a minimum of 36 graduate units during the first year of graduate study and a minimum of 9 units per quarter during six quarters following the first year; (2) completion of the requirements for the A.M. degree; (3) a reading knowledge of Portuguese and one other foreign language; (4) the Qualifying, Comprehensive and University Oral Examinations, as described below; (5) the teaching of at least two courses in the department; (6) the writing of a dissertation. For basic residency and candidacy requirements, please see “Advanced Degrees” section at the beginning of this bulletin.

In consultation with the advisor, students will select one major field of study from the following: (1) Spanish Literature to 1700, (2) Spanish Literature from 1600, (3) Spanish American Literature, (4) Chicano Literature, (5) Latin American Studies, (6) Luso-Brazilian Studies.

In addition, candidates will select two secondary areas of study outside the major field from the following: (1) Spanish Medieval Literature, (2) Spanish Literature of the Golden Age, (3) Modern Spanish Literature, (4) Portuguese Literature, (5) Brazilian Literature, (6) Linguistics, (7) Spanish American Literature of the Colonial Period, (8) Spanish American Literature from Independence, (9) Chicano Literature, (10) Literary Theory, (11) Hispanic Civilization, (12) Portuguese and Brazilian Civilization. One secondary area of concentration may be taken outside the department in consultation with the advisor.

Ph.D. students who will be working as teaching assistants in their second and third years will participate in a teacher apprenticeship program in the Spring Quarter of the first year.

After the first year of study, each student is evaluated by the faculty to determine whether continuation to the Ph.D. is recommended and whether there are particular areas where improvement is needed. For this evaluation, students submit a sample term paper on the first day of the Autumn Quarter of their second year. This evaluation constitutes the Qualifying Examination.

After the Qualifying Examination, students concentrate on the major field of study. After completion of course work requirements at the end of the third year of study they will take the Comprehensive Examination. Before taking the Comprehensive Examination, and after completion of the course work, students will hand in a long research paper. The Comprehensive Examination is based on a comprehensive list of readings in the candidate's major field. (For further information, consult the departmental Guidelines for Graduate Students.)

Ph.D. candidates must fulfill the requirements for the A.M. before proceeding to the Comprehensive Examination.
A University Oral Examination will be taken usually one or two quarters after taking the Comprehensive Examination. This examination will cover plans for the dissertation based on a prospectus approved by the advisor. (For further information consult the Departmental Guidelines for Graduate Students.)

The candidate should file a formal application for candidacy as prescribed by the University no later than the end of the second year. As early as possible Ph.D. candidates will be expected to find a topic requiring extensive original research and to choose a member of the department as his or her advisor. The advisor will request the Chairman to appoint a committee to supervise the dissertation. The committee may well advise extra preparation within or outside the department, and time should be allowed for such work. Ph.D. dissertations must be completed and approved within five years from the date of filing the application. Candidates taking more than five years will be required to re-instate their candidacy.

The dissertation must be submitted to the advisor in substantially final form at least four weeks before the University deadline in the quarter during which the candidate expects to receive the Ph.D. degree and may not be submitted during the Summer Quarter.

OVERVIEW OF COURSES

A. General Courses (given in English)
B. First and Second Year Spanish (1-99)
C. Intermediate Courses (100-199)
   Culture (130-132, 130B-132B)
   Literature (140-199)
D. Courses for Advanced Undergraduates and Graduates (200-299)
   Advanced Language and Linguistics (200-209)
   Peninsular Literature (210-245)
   Genre Survey Courses (210-213)
   Medieval and Golden Age Literatures (214-235)
   Modern and Contemporary Literatures (236-245)
   Latin American Literature (246-279)
   Genres and Literary Movements (246-259)
   National Literatures (260-275)
   Individual Authors (276-279)
   Chicano Literature (280-289)
   Special Topics (290-298)
   Individual Work (299)
E. Graduate Seminars (300-399)
   Literary Theory and Methodology (300-313)
   Peninsular Literature (314-345)
   Latin American Literature (346-379)
   Chicano Literature (380-389)
   Special Topics (390-398)
   Individual Work (399)
F. Portuguese Program (1-399)
   Language (1-199)
   Portuguese Literature (210-245)
   Brazilian Literature (246-279)
   Graduate Seminars (300-399)

INFORMATION

Students interested in languages not listed for a specific language department should contact the Special Language Program, Department of Linguistics.

GENERAL COURSES

The courses in this section are given in English and do not require a knowledge of Spanish or Portuguese, although in some instances a reading knowledge may be recommended. Majors taking these courses as a part of their requirements must do assigned work in the language. These courses are open to all students. When registering, students are advised to add the identifying letter A to the course number.

See “Courses offered, but not during 1983-84” at end of this department’s listings.

SPANISH LANGUAGE PROGRAM

Maria-Paz Haro
Director

Unless otherwise specified, all courses are offered Autumn, Winter and Spring. Students registering for the first time in a first or second year course must take a placement test if they have studied Spanish before entering Stanford. For courses 11B, 12B, and 13B see special section for bilingual students. (No auditors permitted in language courses.)

INTRODUCTORY COURSES

1. First-Year Spanish (1st quarter)—An introductory course with emphasis on speaking and oral comprehension.
   5 units, MTWThF, plus additional work in the Language Laboratory
2. First-Year Spanish (2nd quarter) — As above, with additional development of reading and writing skills, and cultural readings. Prerequisite: Spanish 1 or equivalent.
   5 units, MTWThF, plus additional work in the Language Laboratory
3. First-Year Spanish (3rd quarter) — As above, with additional cultural and/or literary readings. Prerequisite: Spanish 2 or equivalent.
5 units, MTWThF, plus additional work in the Language Laboratory

5. Intensive First-Year Spanish—An all in Spanish method is used, offering preparation in listening, speaking, reading and writing the language with oral presentations and small group conversation sections. Written exercises, short compositions, and daily work in the language laboratory are also an integral part of the course. (Classes limited to 15 students. No auditors permitted.)
9 units, Sum (Staff)

10. Elementary Conversation—Conversation practice offered as a supplement to Spanish 2 or Spanish 3. May also be taken when student intends to continue in first year series but current course load does not permit it. Prerequisite: Spanish 1 or equivalent. Given Pass/No Credit only.
2 units, (Staff) TTh

11. Second-Year Spanish (1st quarter) — Intensive review of grammatical concepts; composition and conversation based on primarily cultural readings. Prerequisite: Spanish 3 or equivalent.
4-5 units, (Staff) MTWTh (F optional)

12. Second-Year Spanish (2nd quarter)—As above, with composition and conversation based on primarily literary readings. Prerequisite: Spanish 11 or equivalent.
4-5 units, (Staff) MTWTh (F optional)

13. Second-Year Spanish (3rd quarter)—Application of grammatical concepts to composition, conversation, and oral presentation. Prerequisite: Spanish 12 or equivalent.
4-5 units, (Staff) MTWTh (F optional)

50. Intermediate Conversation — Recommended as a complement to Second Year courses. Prerequisite: Spanish 3 or equivalent. Given Pass/No Credit only.
3 units, (Staff) MWF

100. Advanced Conversation—Prerequisite: Spanish 13 or equivalent. Given Pass/No Credit only. (May be counted only once for the major.)
3 units, (Staff) MWF

SPECIAL COURSES

1S,2S,3S. First-Year Individualized Spanish — These courses are particularly suited to students who wish to complete more or less than five units a quarter, have a spotty background in Spanish, have scheduling conflicts, or simply prefer to work independently. Students proceed at their own pace, working on their own with the text and tapes. The instructor is available for consultation on a regular basis. It is advisable that students also take Spanish 10 for conversational practice.
1-15 units, Aut, Win, Spr (Staff)

15. Reading Spanish—Intensive course designed for those seeking to fulfill the University requirement of a reading knowledge of Spanish. Students must earn at least a grade of "B."
3 units, Spr (Staff)

21M. Spanish for Medical Personnel—Course is geared to achieving a practical, rapid, and immediately useful command of spoken Spanish. It covers such essential topics as the human body, hospital procedures, diagnostics, food, and essential phrases for on-the-spot reference when dealing with Spanish-speaking patients.
3-5 units, Aut (Staff)

22M. Spanish for Medical Personnel—Same as above. Prerequisite: Spanish 21M or equivalent.
3-5 units, Win (Staff)

23M. Spanish for Medical Personnel—Same as above. Prerequisite: Spanish 22M or equivalent.
3-5 units, Spr (Staff)

99. Individual Work—Cannot be taken as a substitute for any of the regularly scheduled language courses.
1-5 units (Staff) by arrangement

CULTURAL READINGS

Courses will emphasize composition and structured discussion based on the readings. Especially designed for students who do not anticipate a literature major but want to continue beyond the second year. Prerequisite for each: Spanish 13 or equivalent. For courses 130B, 131B, 132B see special section for bilingual students.

See “Courses offered but not during 1983-84” at end of this department’s listings.

COURSES FOR BILINGUAL STUDENTS

11B. Second-Year Spanish for Bilingual Students—Designed for students of Hispanic background who are at or above the oral comprehension level of Spanish 3 but would benefit from emphasis on grammar and composition. Readings and topics for conversation practice are chosen with special regard to interests of the bilingual student. Prerequisite: determined by interview with instructor. (DR:2)
5 units, Aut (Aparicio) MTWThF

12B. Second-Year Spanish for Bilingual Students—Continuation of 11B. Prerequisite: 11B or interview with instructor. (DR:2)
5 units, Win (Aparicio) MTWThF
13B. Second-Year Spanish for Bilingual Students—Continuation of 12B. Prerequisite: 12B or interview with instructor. (DR:2)
5 units, Spr (Aparicio) MTWThF

The following courses are designed to meet the specific linguistic and cultural needs of the bilingual student above the second year level. Readings and topics for conversation and composition begin with a focus on the Mexican-Chicano, Puerto Rican and Cuban heritages, and expand to include socio-cultural and historical material from Latin America and Spain. The aim of this sequence is to develop a critical perspective on issues affecting a bilingual-bicultural reality. Prerequisite: permission of instructor. For special courses in Chicano literature and history see courses numbered 280-289.

130B. Mexican and Chicano Cultural Readings—Includes selected grammatical problems and emphasis on oral expression.
3-5 units, Aut (Aparicio and Ybarra-Frausto)

131B. Latin American Cultural Readings and Composition—Includes selected grammatical problems and introduction to literary texts. (DR:2)
3-5 units, Win (Aparicio)

132B. Hispanic Cultural Readings and Composition—Selected grammatical problems and emphasis on composition. (DR:2)
3-5 units, Spr (Aparicio)

LITERATURE

Courses will emphasize a broad perspective on Hispanic literature and provide an introduction to literary studies. Prerequisite: Spanish 13 or equivalent.

140. Introduction to Methods of Literary Analysis—Designed for students with little or no background in literary analysis. Introduces basic terminology of literary criticism and examines a variety of critical approaches to literature. Specific literary texts will be discussed in detail in light of readings in literary theory and criticism. Emphasis will vary with individual instructors, but the general purpose of this course is to teach students to read, write, and think about literature. Given annually. Prerequisite: Spanish 13 or equivalent. (DR:2)
3-5 units, Win (Ybarra-Frausto)

151,152. Spanish Literature—These courses make up the basic introduction to Spanish Peninsular literature. They deal with major works from several periods and genres, and are designed to prepare the student for more specialized 200 level courses. Though designed as a sequence, they need not be taken in sequence. Exact composition of courses will vary from year to year. Given annually. Prerequisite: Spanish 13 or equivalent.

151. Spanish Literature I—Major works of the Middle Ages and the Renaissance. (DR:2)
3-5 units, Win (Forcione)

152. Spanish Literature II—Major works of prose (novel, short story, essay) in Spain from 1800 to the present. (DR:2)
3-5 units, Spr (Forcione)

161,162. Spanish American Literature—These courses make up the basic introductions to Spanish American literature. They deal with major works from several periods and genres, and are designed to prepare the student for more specialized 200 level courses. Though designed as a sequence, they need not be taken in sequence. Exact composition of courses will vary from year to year. Given annually. Prerequisite: Spanish 13 or equivalent.

161. Spanish American Literature I—Readings in 20th century Latin American fiction and drama. (DR:2)
3-5 units, Aut (Cavallari)

162. Spanish American Literature II—"Contemporary Latin America: Poems and Songs." Readings in outstanding poets (Vallejo, Neruda, Guillén, Cardenal, Benedetti) and song-writers (Violeta Parra, Dorival Caymi, Atahualpa Yupanqui, Chico Buarque, Silvio Rodriguez, etc.) in their corresponding social context. (DR:2*)
3-5 units, Spr (Cavallari)

180. Undergraduate Winter Colloquium—This course is chiefly designed to provide a forum where Spanish majors of all paths can come together to do collective reading and research on a selected topic in Hispanic culture. Topics will vary widely from year to year, but will usually involve areas of interest which students would be unlikely to encounter in regular course work. Students are also encouraged to suggest topics for this colloquium. Open to non-majors by consent of instructor. Prerequisite: Spanish 13 or equivalent.

Contemporary Expressive Forms in Latin America—An examination of traditional and new forms of popular culture in Latin American society. Analysis of popular culture theories and their limitations. (DR:2*)
3-5 units, Spr (Ybarra-Frausto)

199. Individual Work—Open only to majors in Spanish, or with special permission by the Department.
1-12 units (Staff) by arrangement
COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES (200-299)

ADVANCED LANGUAGE AND LINGUISTICS

201. Advanced Grammar—Problems of grammar at an advanced level.
3 units, Aut (Aparicio)

3 units, Win (Haro)

203. Problems in Translation—A workshop for advanced language students.
3 units, Spr (Aparicio)

PENINSULAR LITERATURE

226. Don Quijote I—A close study of Don Quijote and selected Novellas Ejemplares in relation to the principal literary traditions and cultural forces of the European Renaissance. Graduates enroll in 326.
3-5 units, Win (Fordone)

3-5 units, Spr (Fordone)

249. The Novel of the Andes—A study in depth of Arguedas and other fiction writers.
3-5 units, Spr (Cornejo Polar)

251. Myth, Literature and Reality in the Spanish Conquest.
3-5 units, Win (Pastor)

252. La Novela en la cultura del Franquismo—Analysis of narrative production within the context of the Franco Period.
3-5 units, Win (Pastor)

265. Contemporary Peruvian Literature.
3-5 units, Aut (Cornejo Polar)

267. Escritura y experiencia trágica—Close readings of narrative and poetic texts from Latin American literature of the 60's and 70's which rehearse different forms of "borderline" inscription: the disintegration of closed, traditional structures of values; the problematical search for personal and national identity; the decentering of metaphysical and historical fields of contradiction objectified in key authoritative/authoritarian discourses; the status of "literature" itself, and the limits of representation and "expression"; the deconstruction of fundamental forms of the network of power. Readings in Puig, L.R. Sánchez, Cardenal, Paz, Piglia and others.
3-5 units, Win (Cavallari)

269. Contemporary Women Novelists of Chile—Reading and discussion in Spanish of major works by Brunet, Bombal, Valdivieso and Echeverría. Short and long narrative dealing with women's problems in contemporary Chile.
3-5 units, Win (Alegria)

CHICANO STUDIES

280. Introduction to Chicano Literature—Study of selected works by major Chicano writers of the 20th century, including poetry, fiction, and drama. General introduction to questions of genre and textual interpretation with an emphasis on the socio-historical and cultural context of Chicano literature.
3-5 units, Win (Ybarra-Frausto)

SPECIAL TOPICS

281. Twentieth Century Spanish and Latin American Poetry—Reading and analysis of poems by Machado, Lorca, Jimenez, Neruda and Vallejo.
3-5 units, Spr (Fagundo)

296. Western Views of the Non-West Through the Literature of Travel—The western traveler in the Third World as cross-cultural mediator and interpreter, and on the ideological appropriation of foreign contexts as related to developments in world history and economy. Course materials include travelogues, journals, letters, essays, works of fiction, documentary and ethnographic writings, and film. Open to all students; no prerequisites. Readings will be in English.
3-5 units, Win (Pratt)

297. Modernismo and the Generation of '98—A study of the revolutionary changes in the poetry and prose at the turn of the century in Spanish America and their counterpart in the early 20th century in Spain. Rubén Darío, Antonio Machado, Juan Rampon Jiménez, and Federico García Lorca will be the main authors discussed.
3-5 units, Aut (Gicovate)

298. Creative Writing in Spanish and English: A Workshop.
3-5 units, Spr (Fagundo)

299. Individual Work—May be repeated for credit. Open to undergraduates or graduates who are majoring or minoring in Spanish.
1-12 units, any quarter (Staff) by arrangement

GRADUATE SEMINARS (300-399)

Open to undergraduates by permission of instructor.
301. Methods of Teaching Spanish—(Same as Education 292.) A practical guide to the teaching of language. Analysis and discussion of classroom practices and instructional material.
   3-5 units, Spr (Haro) MWF

306. Introduction to Narrative Theory—Narrative as a form of cognition and meaning-making. Literary narrative in relation to other varieties and genres of narrative (history, autobiography, testimonio, oral anecdote, etc.). The idea of the novel as a representation. The study of literary narrative in a social and historical context. Theoretical readings will be combined with a study of criticism on particular literary works.
   3-5 units, Aut (Pratt)

307. Semiotics Textuality and Deconstruction—Readings in contemporary critical theory, including Derrida, Foucault, Barthes, Kristeva, and others. Special attention will be given to the impact on textual hermeneutics of the writings of Lacan and Deleuze.
   3-5 units, Spr (Cavallari)

310. Discourse and Ideology—(Same as Linguistics 207.) Creation of meaning as a social process, ways in which ideology is produced, reproduced, and transformed in linguistic interaction, whether and how American competence models can interlock with theories that see language as constituting social reality and self. Readings on the concept of socially determined meaning, discursive practices in the French tradition, British empirical analyses, American sociolinguistics.
   3-5 units, Spr (Cavallari)

355. Contemporary Spanish American Poetry—Close reading of major texts articulating Latin American poetic discourse after Neruda’s Canto General (1950). Works by Alegría, Benedetti, Cardenal, Deigo, Orozco, Parra, Paz, Peri-Rossi and Rojas will be analyzed as specific forms or writing and as historiocultural inscriptions.
   3-5 units, Aut (Pratt)

356. Latin American Literature of the Colonial Period.
   3-5 units, Win (Pratt)

399. Individual Work—Exclusively for graduate students in Spanish engaged in special work.
   1-12 units, any quarter (Staff) by arrangement

1. First-Year Portuguese (1st quarter)—An introductory course with emphasis on speaking and oral comprehension.
   5 units, Aut (Van den Dool) MWTWF, plus additional work in the Language Laboratory

2. First-Year Portuguese (2nd quarter)—As above, with additional development of reading and writing skill. Prerequisite: Portuguese 1 or equivalent.
   5 units, Win (Van den Dool) MWTWF, plus additional work in the Language Laboratory.

3. First-Year Portuguese (3rd quarter)—As above, with additional cultural and/or literary readings. Prerequisite: Portuguese 2 or equivalent.
   5 units, Spr (Van den Dool) MWTWF, plus additional work in the Language Laboratory

11. Second-Year Portuguese (1st quarter)—Emphasis on reading, discussion, and composition. Grammar review included. Prerequisite: Portuguese 3 or equivalent.
   4-5 units (Van den Dool)

12. Second-Year Portuguese (2nd quarter)—Continuation of 11. Prerequisite: 11 or equivalent.
   4-5 units (Van den Dool)

13. Second-Year Portuguese (3rd quarter)—Continuation of 12. Prerequisite: 12 or equivalent.
   4-5 units (Van den Dool)

99. Individual Work—Cannot be taken as a substitute for any of the regularly scheduled language courses.
   1-5 units (Van den Dool) by arrangement

100. Advanced Portuguese Conversation—Given pass/No credit only. (May be counted only once for the major.)
   3 units, Spr (Van den Dool)

109. Portuguese for Speakers of Spanish—Accelerated course for beginners with advanced knowledge of Spanish. Designed to give reading competence in Portuguese for research and courses in Luso-Brazilian studies. Includes some practice in speaking and comprehension.
   3 units, Aut (Van den Dool)

199. Individual Work—Enrollment only by permission. Prerequisite: 13 or equivalent.
   1-5 units (Staff) by arrangement
COURSES OFFERED, BUT NOT DURING 1983-84

GENERAL COURSES

120A. Don Quixote in Translation.
3-5 units

121A. Spanish Drama in Translation.
3-5 units, (Gicovate)

123A. Spanish-American Literature in Translation — Analysis, discussion of representative works.
3-5 units (Ybarra-Frausto)

162A. Contemporary Chicano Literature — (Same as English 162A.) An intensive examination of Chicano and Mexican American prose writers from 1959 to the present.
5 units, (Islas)

162B. Chicano Literature: Creative Writing for Bilingual Students—(Same as English 162B.) A basic creative writing course in which students will be encouraged to draw from their bicultural, bilingual experience. Knowledge of Spanish and familiarity with barrio dialects essential. (Not open to graduate students of freshmen.)
3-5 units, (Islas)

SPANISH LANGUAGE PROGRAM

CULTURAL READINGS

135. Chicano Culture — Interdisciplinary approach to the study of Chicano life and culture. Topics will include formation of the barrio; labor conflict, folklore and beliefs; forms and figures of cultural resistance (corridos, bandits, popular leaders); patterns of immigration; and stereotypes and self-images in fiction, poetry and teatro.
3-5 units

COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES (200-299)

ADVANCED LANGUAGE AND LINGUISTICS

200. Spanish Pronunciation and Phonetics.
3 units

204. Introduction to Spanish Versification.
3 units, (Gicovate)

3-5 units

PENINSULAR LITERATURE

3-5 units

211. Masterpieces of the Spanish Baroque — This survey course includes such writers as Calderón, Quevedo, Lope, Cervantes, and Gracián.
3-5 units

212. Poetry in Spain from the Beginnings through 1970.
3-5 units

213. Literature, Literary Theory and Abduction Systems: The Case of the Spanish Golden Age Comedia—This course sets out to propose a new approach to the comedia and its related critical literature by arguing that both discourses find their referential constant not in the social context, but rather in the abduction systems from which all three "texts," i.e. the literary, the critical and the social are generated. Knowledge of Spanish and of the Golden Age comedia would be helpful, but it is not a requirement. The texts used will be those which also have been translated into English. Where there are no translations, translated extracts will be provided.
3-5 units, (Wynter)

222. Golden Age Drama from Gil Vincente to Calderón.
3-5 units, (Staff)

223. The Spanish Picaresque Novel and its Sequels in Latin America—This course examines the following works: El Lazarillo, Guzman de Alfarache, Al Buscon, Periquillo Sarniento and Pito Pérez.
3-5 units, (Staff)

225. Introduction to the Lyrical Poetry of Camões — (See Portuguese 225.)
3-5 units

237. Spanish Post-War Novel — Social, political and ideological processes in Spain after 1950 as reflected in specific changes in world view and novelistic form in the nation's narrative production Goytisolo, Martín Santos, Marsé, and others.
3-5 units

LATIN AMERICAN LITERATURE

248. The Carribbean-Americas: An Introduction to Their Literature, Thought and Cultural Worlds—(Same as African and Afro-American Studies 248.) This course provides a general introduction to the literature, thought and pop-
ular cultures of the Caribbean Basin area within the context of an overview of its multiple cultural and linguistic worlds.

3-5 units, (Wynter)


3-5 units, (Wynter)

251. Taller de Teatro: Theater Workshop — Investigation of current theater aesthetics in the dramatic production of Latin America and of Spanish-speaking groups within the United States. Special focus on both popular theater and vanguard experiments. A group class in which the participants will experience the many aspects of mounting a production.

3-5 units (Ybarra-Frausto)

253. Western Culture and the Latin American Experience. The Semiotics of Self and Other — This course will explore, in their socio-historical context, the relations of the imagination between Western culture and that of the New World experience designated as Latin America, in relation to the complex Indian/European/African sociocultural reality which it designates, will serve as the point of departure for the analysis of a dual process — the impact of the New World upon Western conceptual thought and imaginative literature, and the impact of Western culture upon the emerging reality of the Southern and Caribbean areas of the Americas.

3-5 units (Wynter)

264. Contemporary Cuban Fiction — Isolation, description, and analysis of the fundamental questions implicitly and/or explicitly advanced by Cuban narrative discourse since the Revolution.

3-5 units (Cavallari)

266. Contemporary Argentine Fiction — The disintegration of traditional structures and the search for personal and national identity; the status of writing and the limitations of knowledge; the deconstruction of power, and other outstanding themes. Readings in Arlt, Mallea, Sábat, Marechal, Viñas, Puig and others.

3-5 units


3-5 units

282. Literature of Spanish Speaking Groups in the United States — Introduction to selected works from contemporary Chicano, Nuyorican, Carribbean, Central American and South American authors living in the U.S. Points of contact and divergence in literary production within a socio-cultural context.

3-5 units

283. Chicano Poetry — Main trends and tendencies in the evolution of Chicano poetry. Examination of some of its singular characteristics: bi-linguality, social context, and relationship to Anglo American and Latin American poetics.

3-5 units.

284. Chicano Narrative — Aspects of narrative theory related to principal Chicano authors in the short story and the novel. Historical development of Chicano fiction from the nineteenth century to the present.

3-5 units

285. Chicano Theatre—Study of the contemporary Chicano theater movement, with an emphasis on the idea of popular theater. Course will focus on Teatro Campesino and Teatro de la Esperanza.

3-5 units (Ybarra-Frausto)

286. 19th Century Chicano Literature — Course will examine the various genres of Chicano literature from the 19th Century, both oral and written. Emphasis will be on the impact of Mexican and Anglo-American literary expressions on the development of Chicano literature.

3-5 units

287. Chicano Literature in a Comparative Context — Course situates and analyzes Chicano literature within the context of diverse world literatures.

3-5 units

288. Undergraduate Colloquium: Chicano History — (Same as History 262.)

3-5 units (Camarillo)

288A. Undergraduate Colloquium: Chicano Literature and Culture—Topics will vary widely from year to year, but will usually involve areas of interest which students would be unlikely to encounter in regular course work. Students are also encouraged to suggest topics for this colloquium.

3-5 units (Ybarra-Frausto)

289. Chicano Creative Writing Workshop — (Knowledge of Spanish required.)

5 units

294. Hispanic Poetry of the Twentieth Century I.

3-5 units, (Gicovate)

295. Hispanic Poetry of the Twentieth Century II.

3-5 units, (Gicovate)
304. Proseminar in Problems and Methods of Research in Hispanic Literature I.  
3-5 units (Gicovate)

305. Proseminar in Problems and Methods of Research in Hispanic Literature II.  
3-5 units, (Gicovate)

GRADUATE SEMINARS (300-399)

308. Contemporary Problems in Aesthetics — The intersection of Marxism and Post-Structural discourse will be explored through critical readings in the epistemological, structural, and heremeneutical problems of the culture/power relations network. Readings in Althusser, Della Volpe, Deleuze, Foucault, Kristeva, Williams, and others.  
3-5 units (Cavallari)

311. Drama in Spain from 1492 to the Present — See 211 for description.

312. Poetry in Spain from the Beginnings through 1970 — See 212 for description.

3-5 units

351. Twentieth Century Latin American Narrative II: Narrative, Myth and History.  
3-5 units

3-5 units

353. Poetics of Modernism.  
3-5 units

3-5 units, given 1983-84

358. Latin American Writing in the Nineteenth Century II.  
3-5 units

370. The Luso-Brazilian Short Story — For description see Portuguese 370. Enroll in Portuguese 370.  
3-5 units

3-5 units

380. Interdisciplinary Research Seminar in Chicano Literature — (Same as English 380.) Interdisciplinary approaches to Chicano literature. Open to graduate students from various disciplines throughout the university. Designated to afford an intellectually coherent framework for participants to discuss their areas and problems of research as they relate to Chicano literature. Permission of instructor required.  
3-5 units

381. Problems and Methods of Research in Chicano Literature — Course will investigate original texts and manuscripts along with literary production and performance in a social context. Traditional research tools as well as other methods of research will be emphasized. Students will be expected to contribute to the growing body of research and criticism of Chicano literature.  
3-5 units

382. Seminar on Chicano Literature—Topics of theoretical and methodological interest in Chicano Literature.  
3-5 units, (Ybarra-Frausto)

383. Hispanic Linguistics and Bilingualism — Course will focus on sociolinguistics and various modes of communication in Chicano communities.  
3-5 units

398. Recent Research Trends in Latin American Literature and Culture Criticism.  
3-5 units

PORTUGUESE

GENERAL COURSES

126A. Brazilian Literature in Translation—Analysis, discussion of representative works.  
3-5 units (Staff)  
by arrangement

ADVANCED UNDERGRADUATE AND UNDERGRADUATE COURSES (200-299)

225. Introduction to the Poetry of Camões.  
3-5 units

240. Portuguese Literature — Main currents of the literature of Portugal. Major authors and socio-esthetic ideas from the 12th century to the present.  
3-5 units

267. Brazilian Literature I — Survey of literary trends and authors of Brazilian literature.  
3-5 units (Coelho)

ADVANCED UNDERGRADUATE AND GRADUATE COURSES (200-299)

268. Brazilian Literature II—Survey of literary trends and authors of Brazilian literature.  
3-5 units, Win
299. Individual Work—May be repeated for credit. Open to graduates or undergraduates who are majoring in Spanish.
1-12 units (Staff) by arrangement

GRADUATE SEMINARS
(300-399)

341. Seminar on Fernando Pessoa.
3-5 units

370. The Luso-Brazilian Short Story—A seminar on the shorter narrative of Portugal and Brazil with special emphasis on modern and contemporary writers. Reading knowledge of Portuguese required.
3-5 units, Win

378. Seminar on Brazilian Modernism.
3-5 units

399. Individual Work—Exclusively for graduate students in Portuguese engaged in special work.
1-12 units, by arrangement

STATISTICS

Emeriti: Quinn McNemar, Rosedith Sitgreaves
Chairman: David Siegmund


Professor of Biostatistics: Byron W. Brown
Assistant Professors: James A. Fill, Iain M. Johnstone

OFFERINGS AND FACILITIES

The department's goals are to acquaint students with the role played in science and technology by probabilistic and statistical ideas and methods, to provide instruction in the theory and application of techniques that have been found to be commonly useful, and to train research workers in probability and statistics. There are courses for general students as well as those who plan careers in statistics in government, business, industry, and teaching.

The requirements for a degree in statistics are flexible, depending on the needs and interests of the students. Some students may be interested in the theory of statistics and/or probability, whereas other students may wish to apply statistical and probabilistic methods to a substantive area. The department has long recognized the relation of statistical theory to applications. It has fostered this by encouraging a liaison with other departments in the form of joint faculty appointments: Economics (T. W. Anderson), Education (I. Olkin, R. Sitgreaves, H. Solomon, P. Suppes), Electrical Engineering (T. Cover), Family, Community and Preventive Medicine (B. W. Brown, B. Efron, R. G. Miller, L. E. Moses), Geology (P. Switzer), Operations Research (G. J. Lieberman), Stanford Linear Accelerator (Persi Diaconis, Jerome Friedman). The research activities of the department reflect an interest in both applied and theoretical statistics and probability. There are workshops in biology-medicine and in environmental factors in health. The department offers a special master's program in Data Analysis and Statistical Computing.

In addition to courses for statistics majors at the undergraduate or graduate level, the department offers a number of service courses designed for students in other departments. These tend to emphasize the application of statistical techniques rather than their theoretical development.

A candidate considering graduate work in statistics may be interested in the brochure "Careers in Statistics," which is available upon request from the American Statistical Association, 806 15th St., N.W., Washington, D.C. 20005.

Computer facilities are available at the Center for Information Processing, which maintains an IBM 30-33 computing system. A DEC 20 system is also available for students' computer related course work. For use in research and teaching, the department maintains terminal units and its own VAX 750 computer. The Mathematical Sciences Library serves the Statistics Department jointly with the Mathematics and Computer Science Departments.

The department has always been a center for visitors from other countries and universities. As a consequence, there is usually a wide range of seminars offered by both the visitors and our own faculty.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The department requires that the student take 45 units of work from offerings in the Statistics Department or from authorized courses in other departments. If advanced statistics courses are included in the program, the total number of units may be reduced. A thesis is not required.

Each student will normally fulfill the following requirements for the Master of Science degree:

1. Statistics 116, 217, 218, 219, 220. Courses previously taken may be waived, in which case they must be replaced by other approved courses.
2. Mathematics 113 or 113S and Computer Science 106. Substitutions of other courses in Mathematics and Computer Science may be made with consent of the advisor.

3. Three additional courses from offerings in the Statistics Department. These are normally taken from the group of courses 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 227, 228.

4. Additional units to complete the requirements chosen from offerings in the Statistics Department or from authorized courses in other departments.

There is sufficient flexibility to accommodate students with interests in applications to operations research, social sciences, engineering, computing, business, economics, and health.

Students with a strong mathematical background who may wish to go on to a Ph.D. in Statistics should consider applying directly to the Ph.D. program.

A 2.75 letter grade indicator will be required for all Statistics courses which are taken for an M.S. degree. All Statistics courses required for the M.S. degree (116, 217, 218, 220, and 3 additional courses) which are offered for letter grades must be taken for letter grades.

There is sufficient flexibility to accommodate students with interests in applications to operations research, social sciences, engineering, computing, business, economics, and health.

Students with a strong mathematical background who may wish to go on to a Ph.D. in Statistics should consider applying directly to the Ph.D. program.

A 2.75 letter grade indicator will be required for all Statistics courses which are taken for an M.S. degree. All Statistics courses required for the M.S. degree (116, 217, 218, 219, 220, and 3 additional courses) which are offered for letter grades must be taken for letter grades.

The program normally takes one calendar year to complete.

DOCTOR OF PHILOSOPHY

Students with strong undergraduate mathematics backgrounds are encouraged to apply for the Ph.D. in Statistics. The department offers about 10 graduate fellowships and assistantships each year to incoming doctoral students. Students are also strongly encouraged to apply for external fellowships. The doctoral program normally takes four years after a bachelor's or master's degree. Applicants for the Ph.D. program are required to take the Aptitude Test and the Advanced Test in Mathematics of the Graduate Record Examination. Applicants are urged to take the Graduate Record Examination between July and November in order to afford time for receipt of the scores before January 15. For details concerning this test see the Information Bulletin. Overseas applicants, who may not receive the Information Bulletin promptly, should write directly to the Educational Testing Service, 20 Nassau Street, Princeton, New Jersey 08540.

The specific course and examination requirements for the Ph.D. are given below. In addition, students are encouraged to avail themselves of the advanced course offerings which may vary from year to year, as well as advanced courses related to statistical topics which may be offered in other departments.

1. Probability and Statistics. Statistics 230A, 230B, 233A, 233B, 236A, 236B, and 317-318. These courses provide familiarity with the mathematical theory of probability, stochastic processes, and the major topics of statistical theory. In addition, a Ph.D. candidate must offer at least six quarter courses from the advanced courses offered in specialized fields
such as Decision Theory, Sequential Analysis, Large Sample Theory, Multivariate Analysis, Nonparametric Inference, Time Series, Robust Estimation, Geometric Probability, Stochastic Processes, Pattern Recognition, Statistical Complexity. Ph.D. students are encouraged to take as many advanced topics courses as can be fitted into the program of studies.

2. Mathematics. Mathematics 206A (or equivalent) and one of the following alternatives: (a) two 200-level quarter courses in Mathematics, or (b) two doctoral level quarter courses in Mathematics, Computer Science, or Operations Research together with demonstrated competence in topology and modern algebra as indicated by a grade of "B" or better in graduate or advanced undergraduate courses in these subjects. In general, it is advisable for students to obtain as strong a mathematical background as is feasible.

3. Examinations. In addition to course examinations, two written qualifying examinations in probability and statistics are given at the end of the first year—an elementary examination and an advanced examination based on Statistics 230A,B,C, 233A,B,C, and 236A,B,C. These tests are intended to assess the student's problem solving ability and understanding of the basic course work. They are designed to serve as prognoses of the student's chances of success in the program. After completion of two to three years course work students are given an oral examination which covers both the general theory of statistics and probability as well as selected special topics.

4. Experience. All candidates for the Ph.D. in Statistics are required as part of their program to obtain experience in research, consulting, and computer programming. In addition, all candidates for the Ph.D. in Statistics are required to serve as a teaching assistant in the department for at least four quarters.

A. INTRODUCTORY COURSES

Introductory courses for general students with an interest in the problems of descriptive statistics and statistical inference are: Statistics 10, 40, 60, 61, 70. These courses have no mathematical prerequisites; Statistics 40, 60 are approved for the Mathematical Science distribution requirement for undergraduates. Statistics 10 is designed to familiarize the student with the general ideas of descriptive and inferential statistics as used in daily life, e.g., newspaper and magazine reports, polls, etc. It is a terminal course and does not serve as a prerequisite for further work. Statistics 40 covers discrete probability theory, game theory, decision theory, and applications to statistics. The sequence 60, 61, emphasizes mainly the techniques and methods of statistical inference. Statistics 70 is designed for students interested in biological and medical applications of statistics.

The courses 110, 116, 119-120, (219-220), 217-218 are introductory but have a calculus prerequisite. Statistics 110 covers the most important techniques used in the analysis of experimental data in engineering and science. Statistics 116 provides a general introduction to the theory of probability. It may be followed by 119 and 120 (219, 220), which deal with statistical theory, or by 217 and 218, which deal with stochastic processes. The sequence 116, 119, 120 is a basic one-year course in mathematical statistics; the sequence 116, 217, 218 is a basic one-year course in probability theory.

10. Basics of Descriptive and Inferential Statistics—Designed for students who wish to gain familiarity with statistical ideas; a course on statistical literacy. Emphasis on descriptive measures such as mean, median, percentiles, mode, variance, correlation, and methods for presenting data. Interpretation of data which occur in daily life, e.g., in newspapers, magazines, etc., is stressed. This is a terminal course and is not acceptable as a prerequisite for later courses.

4 units, Win (Staff) MWF 11

40. Chance and Strategy—Precalculus course for nonmathematical students in probability theory and game theory. Permutations and combinations, conditional probability, expectation, two-person games, risk and minimal theory, simple gambling and other games. (Graduate students enroll in 140.) (DR:6)

3 units, Aut (Solomon) MWF 11

60. Introduction to Statistical Methods I—A nonmathematical study of statistical methods. Emphasis on statistical techniques. Organization of data, averages, variability, and association. Statistical inference, tests of hypotheses, estimation, and confidence intervals. Computer statistical packages will be used. (Grad
61. Introduction to Statistical Methods II—
Treats chi-square tests, analysis of variance, regression, correlation, nonparametrics, sample surveys, elementary design of experiments. Prerequisite: 60 or consent of instructor. (Graduate students enroll in 161.)

5 units, Win (Johns) MTWF 1:15
116. Theory of Probability—
Probability spaces as models for phenomena with statistical regularity. Discrete spaces (e.g., binomial, hypergeometric, Poisson). Continuous spaces (e.g., normal, exponential) and densities. Random variables, expectation, independence, conditional probability. Introduction to the Laws of Large Numbers and Central Limit Theorem. Prerequisite: Mathematics 44 or equivalent. (DR:6)

3 or 4 units, Aut (Diaconis) MTWF 10

119. Chance and Strategy—
For graduate students. Lectures same as 40.

3 units, Aut (Solomon) MWF 10

152. Introduction to Operations Research I—
(Enroll in Operations Research 152.) Theory and computation of optimal selection of decisions under certainty. Linear programming (simplex method and duality theorem), network flows, dynamic programming, convex programming (convex sets and functions, Lagrange multipliers, Kuhn-Tucker conditions, algorithms), integer programming. Applications drawn from problems in pricing resources, production planning, inventory control, transportation, pollution control, personnel assignment, construction management, capacity expansion, and financial management. Prerequisite: Mathematics 43 or consent of instructor.

4 units, Aut (Hillier)

153. Introduction to Operations Research II—

4 units, Win (Taksar)

B. CONTINUATION COURSES

Courses in this category have been designed for particular use in applications. Generally, they have introductory statistics or probability as prerequisites.

201A. Data Analysis I—
tions. Nonparametric multiple regression. The linear model: Interpolation, diagnosis, robust fits, variable selection. All topics are illustrated on actual case material. The computer will be used. Prerequisites: 60 and 116, Mathematics 113 or 113S, (or equivalent).
3 units, Win (Staff) MTWThF 2:15

201B. Data Analysis II—Classification and discriminant analysis. Dimensionality reduction. Principal components, factor analysis, multi-dimensional scaling. Cluster Analysis. Treatment of missing values. Analysis of categorical data. Topics will be discussed from the point of view of their application and the emphasis will be on conceptual rather than theoretical understanding. Prerequisites: Statistics 201A or equivalent.
3 units, Spr (Friedman) MWF 2:15

202. Introduction to the Theory of Games—Game trees, strategies, equilibrium points; two-person zero-sum games, matrix games, min-max solutions, infinite games, games of timing (duels); non-zero-sum games, the Nash solution; n-person games, the Shapley value. Pre- or corequisites: 116 and Mathematics 113 or 113S.
3 units, Aut (Cover) MWF 1:15

203. Introduction to Analysis of Variance and Design—The most widely used statistical technique. The proper design for and interpretation of observational data. Topics include regression, one- and two-way factorial experiments, orthogonal contrasts, model II. Prerequisites: a basic course in Statistics (Statistics 61, 110, or 120).
3 units, Win (Staff) MWF 1:15

204. Sampling from Human Populations—An introduction to the theory of sampling from finite populations. Simple random sampling, stratified sampling, cluster sampling, efficiency of various designs, nonresponse models; particular emphasis on applications. Prerequisite: A basic course in statistics (Statistics 61, 110, or 120).
3 units, Win (Staff) MWF 1:15

205. Introduction to Nonparametric Statistics—Nonparametric analogs of the one- and two-sample t tests and analysis of variance: the sign test, median test, Wilcoxon's tests, and the Kruskal-Wallis and Friedman tests, tests of independence. Nonparametric confidence interval estimates. Prerequisites: A basic course in statistics (61, 110, or 120). (Concurrent registration in 120 is permitted.)
3 units, Aut (Johns) MWF 11

206. Applied Multivariate Analysis—Introduction to statistical analysis of several quantitae-

207. Introduction to Time Series Analysis—Time series models used extensively in economics, engineering, physics, geology, etc. Trend fitting, autoregressive schemes, moving average models, periodograms, second order stationary processes, spectral analysis. Prerequisites: Statistics 116 and a basic course in statistics (Statistics 61, 110, or 120). (Concurrent registration in 120 is permitted.)
3 units, Spr (Johns) MWF 11

208. Mathematical Models in Behavioral Sciences: Psychometrics—Examination of mathematical models and applications in psychometrics. Illustrative topics are factor analysis, mental testing, clustering and classification, multidimensional contingency tables. Prerequisite: 60, 61.
3 units
alternate years, given 1984-85

209. Quantitative Methods and Their Application to Public Policy—Focusing upon applications of statistical methods, rather than methodology per se, this course will consider such topics as risk assessment in the evaluation of biohazards and medical techniques and technologies; comparisons of such information-gathering techniques as surveys, experiments, or simulation studies; methods of expressing and evaluating uncertainty; and the interpretation of such quantitative techniques of data analysis as regression. Prerequisites: 60 and 61.
5 units, Spr (Staff) MTWThF 3:15

210. Selecting and Ordering Populations—Normally statistical techniques have been developed to determine whether a number of treatments, say, differ with respect to some parameter. Ranking and selecting procedures are statistical techniques for comparing these populations where the goal may be to select the single best population, or perhaps to rank all the populations. These techniques will be illustrated by using actual data from a variety of fields. The course will concentrate on the ideas underlying the material and not on derivations; the course requires knowledge of a first course in statistics.
3 units
alternate years, given 1984-85

217, 218. Introduction to Stochastic Processes—Simple random walk, Markov chains in di-
discrete and continuous time, renewal theory, point processes with emphasis on the Poisson process. Also, Wiener and Gaussian processes, and second order processes. Prerequisite: Statistics 116.

217. 3 units, Aut (Karlin) MWF 2:15
     Win (Stein) MWF 3:15
218. 3 units, Win (Fill) MWF 2:15
     Spr (Stein) MWF 3:15
217, 218. 6 units, Sum (Staff)
     MTWThF 10-11:50

219, 220. Statistical Inference—For graduate students. Lectures same as 119, 120.
219. 3 units, Win (Bock) MWF 11
220. 3 units, Spr (Bock) MWF 11
219, 220. 6 units, Sum (Staff)
     MTWThT 8-9:50

     3 units, Spr (Golub) TTh 11-12:15

228. Statistical Computer Packages—Comparison, evaluation, and use of statistical computer packages. Emphasis on an organized approach to data analysis. Statistical methods discussed include univariate and multivariate techniques. Prerequisites: Statistics 120 or a 200 level statistics course.
     3 units, Win (Staff) MWF 10

229. Selected Topics in Data Analysis—In this seminar each student will choose a topic in the area of statistical computing or data analysis. He/she will read relevant journal articles and give an expository one hour presentation to the class.
     3 units, Spr (Friedman) Th 1:15-3:05

251. Stochastic Models in Operations Research—(Enroll in Operations Research 251.) Introduction to stochastic modeling. Orientation is applied and directed to students who anticipate doing project work in government or industry which involves stochastic modeling. Emphasis on stress formulation, solution, and analysis of stochastic models in operations research. Topics include queuing theory, inventory theory, Markov decision processes, dynamic programming, reliability theory. Prerequisite: 217.
     3 units, Spr (Iglehart)

257. Simulation—(Enroll in Operations Research 257.) Generation of uniform and nonuniform random numbers, discrete event simulations, simulation languages, design of simulations, statistical analysis of the output of simulations, applications to modeling stochastic systems in computer science, engineering, and operations research. Prerequisites: A working knowledge of FORTRAN, BASIC or PASCAL; Statistics 217 or the equivalent.
     3 units, Spr (Iglehart)

299. Literature of Statistics—Intensive study of literature of any special topic, usually culminating in the preparation and presentation of reports upon topics studied.
     (Staff) by arrangement

C. COURSES PRIMARILY DESIGNED FOR DOCTORAL STUDENTS

The 230A,B,C, 233 A,B,C, and 236 A,B,C, sequences comprise the fundamental sequence which serves as a general introduction to and prerequisite for further work. Subsequent courses are special topics courses and delve more deeply into these areas.

230A. 3 units, Aut (Staff) MWF 10
230B. 3 units, Win (Staff) MWF 10
230C. 3 units, Spr (Siegmund) MWF 10

233A,B,C. Applied Statistics—Analysis of variance, multiple regression, components of variance, experimental design, failure of assumptions, randomization, exploratory data analysis, nonparametric methods, robust point and interval estimation, contingency tables, analysis of quantitative data, censored data, and actual case histories. Prerequisite: 220 and Mathematics 113 or 113S, or consent of instructor.
233A. 3 units, Aut (Miller) MWF 2:15
233B. 3 units, Win (Miller) MWF 2:15
233C. 3 units, Spr (Moses) MWF 2:15

236A,B,C. Theoretical Statistics—Decision theory; minimax and Bayes solutions, the concepts of admissibility and invariance. Bounds for the variance of estimators, maximum likelihood estimation, exponential families, tests of hypotheses, confidence intervals. Neyman-
Pearson theory, large sample theory, sequential analysis, multiple decision problems. Prerequisite: 220.

236A. 3 units, Aut (Johnstone) MWF 1:15
236B. 3 units, Win (Johnstone) MWF 1:15
236C. 3 units, Spr (Stein) MWF 1:15

240. Linear Programming—(Enroll in Operations Research 240.) This course will survey linear programming, emphasizing standard model formulation, fundamental theorems, variations of the simplex method and parametric programming. Corequisite: Mathematics 113.

236A, 3 units, Aut (Eaves)
236B, 3 units, Win (Eaves)
236C. 3 units, Spr (Eaves)


3 units, Win (Eaves)

260A,B,C. Workshop in Biostatistics—Applications of statistical techniques to current problems in medical science. Intended primarily for doctoral students in statistics. Enrollment for more than two units of credit will involve extra reading or consulting and requires permission of the instructor.

260A. 1 to 5 units, Aut (Brown, Efron, Miller, Moses) Th 1:15-3:05
260B. 1 to 5 units, Win (Brown, Efron, Miller, Moses) Th 1:15-3:05
260C. 1 to 5 units, Spr (Brown, Efron, Miller, Moses) Th 1:15-3:05

262A,B,C. Workshop in Environmental Statistics—A seminar dealing with statistical aspects of pollution and related health effects.

262A. 1 to 3 units, Aut (Switzer) W 4:15-5:30
262B. 1 to 3 units, Win (Switzer) W 4:15-5:30
262C. 1 to 3 units, Spr (Switzer) W 4:15-5:30

266A,B,C. Workshop in Statistical Consulting — Purpose is to provide Statistics Ph.D. students with a broad base of skills that are required of practicing statistical consultants, as well as exposure to a wide range of statistical applications. Students will participate as consultants in the drop-in consulting service operated by the department. Seminar will provide students with supervised experience in short term consulting. Prerequisites: course work in applied statistics or data analysis and permission of the instructor. No previous consulting experience is necessary.

266A. 1 to 3 units, Aut (Friedman) M 4:15-5:30
266B. 1 to 3 units, Win (Friedman) M 4:15-5:30
266C. 1 to 3 units, Spr (Friedman) M 4:15-5:30

314. Inequalities: Theory and Applications—Presentation of underlying themes to the development of a theory of inequalities with particular emphasis on applications in reliability, probability, and statistics (as well as economics, matrix theory, combinatorics). (a) Totally positive functions. These arise in a variety of contexts; they possess reproductive and smoothing properties that make them exceedingly useful. (b) Schur functions and majorization. Majorization is a partial ordering that is extremely rich. Applications from a broad class of fields are discussed. (c) Convexity in stochastic orderings. Some of the types of inequalities discussed are: matrix inequalities, moment inequalities, stochastic inequalities, norm inequalities, extreme inequalities.

3 units, alternate years, given 1984-85


317. 3 units, Aut (Fill) MWF 3:15
318. 3 units, Win (Fill) MWF 3:15

324A. Multivariate Analysis—General theory of multivariate distributions; multivariate normal distribution and related distributions such as the Wishart distribution and Hotelling’s $T^2$. Tests for means, variances and covariances, multivariate analysis of variance, multiple regression, principal components, canonical correlations. General problems of classification and clustering of high dimensional data.

3 units, Aut (Efron) MWF 10

326A. Sequential Analysis—The Wald sequential probability ratio test, operation characteristics and applications. General theory of optimal stopping with applications to sequential statistical decision problems.

3 units, Win (Siegmund) TTh 10-11:15

328A. Nonparametric Statistical Inference—Statistical inference without strong model assumptions; hypothesis testing and estimation using permutations and ranks; nonparametric model-fitting, tolerance limits, discriminant analysis, and analysis of variance.

3 units, alternate years, given 1984-85
332. Asymptotic Methods in Statistics—Concepts of efficiency, the asymptotic efficiency of maximum likelihood estimators, best asymptotically normal (BAN) estimators, asymptotic behavior of likelihood ratio tests, optimal designs, empirical Bayes methods.

3 units, Win (Johns) MWF 11

333. Robust Estimation—Procedures which continue to be effective when the usual parametric assumptions are violated. The estimation of location for symmetric distributions: M, L, and R estimators, asymptotics, the influence curve. Robustness in hypothesis testing. Survey of recent literature. Prerequisite: Statistics 218. 3 units, alternate years, given 1984-85

333A, B. Decision Theory and Statistical Inference—Minimax theorem, admissibility and complete class theorem, formulation of statistical decision problems, sufficient statistics, testing hypotheses, estimation, comparison of experiments, and sequential problems.

336A. 3 units, alternate years, given 1984-85

336B. 3 units, alternate years, given 1984-85


343A. 3 units, alternate years, given 1984-85

343B. 3 units, alternate years, given 1984-85

351. Geometrical Probability and Applications—Distribution of points in Euclidean space, random lines in a plane and in space, coverage problems, packing problems, measure and density for sets of geometrical objects, integral geometry for functions of convex plane figures and surfaces. Application of ideas in astronomy, atomic physics, biology, crystallography, physical chemistry, traffic flow and others.

3 units, Spr (Solomon) TTh 11-12:15

353. Random Number Generation and Monte Carlo Techniques—A careful analysis of the most widely used techniques for generating, testing, and using pseudo random numbers. Congruential generators, spectral test, efficient generation for specific distributions, Monte Carlo "swindles," importance sampling, stratification, topics in cryptography, number theoretic uniformity distributed sequences, discussion of "what is random sequence?" Some use of the computer anticipated. Prerequisites: Elementary number theory, knowledge of probability and statistics at the level of 217/218, 219/220.

3 units, Spr (Diaconis) MWF 11


3 units, Spr (Cover) TTh 2:45-4


3 units, alternate years, given 1984-85

399. Research—Research work as distinguished from independent study of nonresearch character listed in 199 and 299. (Staff) by arrangement
THE PROGRAM IN STRUCTURED LIBERAL EDUCATION

Faculty: Mark Mancall, Director (Professor, History), George Cattermole (Assistant Professor, Philosophy), John Goheen (Professor Emeritus, Philosophy), Efrain Kristal (Acting Instructor), Jon Reider (Lecturer), Lawrence Ryan (Professor, English) (on leave 1983-84), Amy Sims (Lecturer), and Staff

STATEMENT OF PURPOSE

The Program in Structured Liberal Education (SLE) is designed specifically for freshmen interested in an integrated and interdisciplinary approach to the liberal arts and sciences. The program emphasizes intellectual rigor and individualized contact between faculty and students. SLE has three basic purposes: to present a coherent program of instruction for the freshmen year; to develop students' ability to ask effective questions of texts, teachers, the culture, and themselves; and to develop students' intellectual skills in logical reasoning, critical reading, expository writing, and group discussions.

SLE stresses inquiry, criticism, and a tolerance for ambiguity. Neither the faculty nor the curriculum provide "ready-to-serve" answers to the questions being dealt with; rather, they encourage a sense of intellectual challenge, student initiative and originality.

APPLICATION AND ADMISSION PROCEDURES

Interested freshmen should apply for SLE during the summer preceding the academic year in which they will enroll.

SLE is designed as a three-quarter sequence, and all students applying should be willing to make a commitment for the entire program, although a student can withdraw from the program at any time.

Correspondence regarding the program should be addressed to Program in Structured Liberal Education, P. O. Box L, Stanford University, Stanford, California 94305.

OFFERINGS

SLE is a demanding program which consumes approximately 60% of the average academic workload first year students usually carry. Each quarter deals with a separate period of western culture in the form of a nine-unit course. Autumn Quarter concentrates on the Greeks from Homer through Aristotle; Winter Quarter focuses on the Renaissance through the Scientific Revolution; and Spring Quarter treats the modern Western world. Completion of the SLE Program satisfies the Western Culture Requirement (DR:1), the Literature and Fine Arts Requirement (DR:2), the Philosophical, Social and Religious Thought Requirement (DR:3), and the Writing Requirement that all undergraduates entering in 1980 and thereafter must fulfill for graduation.

091. SLE: 9 units, Aut (Staff)  
TWTh 3:15-5 and TWTh 7-9 p.m.

092. SLE: 9 units, Win (Staff)  
TWTh 3:15-5 and TWTh 7-9 p.m.

093. SLE: 9 units, Spr (Staff)  
TWTh 3:15-5 and TWTh 7-9 p.m.

WESTERN CULTURE PROGRAM

Chairman, Western Culture Program Committee: Marsh H. McCall, Jr., Professor of Classics

The Western Culture Requirement is part of the system of Distribution Requirements instituted in 1980-81. Since 1980, entering students must complete a three-quarter sequence of courses which are expressly designed to introduce them to major works and historical movements in Western Culture. The seven courses that constitute the Western Culture Program are sponsored by different departments and programs; however, they share a core of readings, insuring that all students will be exposed to certain great works.

The sequences have different formats, but in addition to the core readings they share another important feature. Each sequence provides at least two hours per week of small group instruction with an experienced teacher—often a regular member of the Stanford faculty.

Students are strongly encouraged to fulfill the Western Culture Requirement during their freshman year, however some students may choose to defer it. Since the sequences do not all proceed at the same pace, or cover the material in the same order, students must complete one entire sequence to satisfy the Western Culture portion of the Distribution Requirements. The following courses are available in 1983-84. The courses are organized to accommodate all entering freshmen and transfer students, and every effort will be made to assign students to the specific courses that they elect. However, it is not possible to place all students in the courses they list as first choice.
GREAT WORKS OF WESTERN CULTURE

Track Chairman: Ronald A. Reboltz, Professor of English

Students meet for four hours per week in classes of seventeen or less to discuss great works of philosophy, religion, imaginative literature, history and science. These discussions are led by members of the faculty from departments and programs throughout the University. Once a week a lecture by an outstanding scholar helps analyze these works and place them in their historical contexts.

1. From the Beginnings to the End of the Ancient World—The great writings of the Jews, Greeks, Romans and Christians from Genesis to St. Augustine. (DR:1; three-quarter sequence)
5 units, Aut (Staff)

2. From the Middle Ages to the Enlightenment—Great works of imaginative literature and religious, philosophical and scientific writings of the Medieval, Renaissance, Reformation and Enlightenment periods of European history. (DR:1; three-quarter sequence)
5 units, Win (Staff)

3. From the Enlightenment to the Present—Major political treatises, works of imaginative literature, historical documents and scientific works, from the late eighteenth through the twentieth century. (DR:1; three quarter sequence)
5 units, Spr (Staff)

EUROPE: FROM THE MIDDLE AGES TO THE PRESENT

Track Chairman: Carolyn C. Lougee, Associate Professor of History

(Enroll in History 1, 2, 3). This sequence explores the inter-relationships between the literary and philosophical masterpieces of Western culture on the one hand and political, social, and economic developments in Europe since the Middle Ages on the other. Special attention is focused on the rediscovery of classical learning in the age of the Renaissance and Reformation, the consolidation of the European state system, intellectual innovations emerging with modern industrial society, and the global consequences of the breakdown of traditional Europe. Students meet three hours a week with lecturers from the regular history faculty and two hours a week in small discussion sections (eighteen or fewer) led by postdoctoral fellows.
5 units, Aut, Win, Spr, MTWTh 10

WESTERN THOUGHT AND LITERATURE

Track Chairman: Paul A. Robinson, Professor of History

(Enroll in Humanities 61, 62, 63). This sequence, offered by Humanities Special Programs, has been taught at Stanford continuously for nearly forty years. It emphasizes the inter-connection of literature, the arts, and philosophical and social thought in shaping the Western cultural traditions from the ancient to the contemporary world. Three lectures per week are given by faculty members from various departments, particularly in Classics and English; students also attend one two-hour discussion section per week led by postdoctoral lecturers or advanced doctoral candidates from one of the humanities departments.
5 units, Aut, Win, Spr, WThF 11 plus section

IDEAS IN WESTERN CULTURE

Track Chairman: Van A. Harvey, Professor of Religious Studies

(Enroll in Philosophy or Religious Studies 5A, 5B, 5C). This sequence, developed by the Philosophy Department and the Religious Studies Department, offers each week three lectures by faculty and a two-hour discussion classes taught by younger scholars. The courses are titled "The Birth of Western Philosophy", "Faith and Reason, and "The World Demystified". The emphasis is placed on the development of philosophical and religious ideas.
5 units, Aut, Win, Spr, MWF 10 plus section

MAJOR TEXTS IN WESTERN CULTURE

Track Chairman: Herbert S. Lindenberger, Professor of English

(Enroll in Comparative Literature 21, 22, 23) This sequence, developed by faculty from various literature departments, approaches Western culture thematically rather than chronologically through the study of closely-related literary and philosophical texts. Each quarter's reading will stress a particular set of problems dominant throughout the history of Western culture. The courses are titled "The Literature of Interaction and Conflict," "The Literature of Introspection," and "The Literature of Speculation". Recommended for highly motivated students. Limited to 20 students per quarter.
5 units, Aut, Win, Spr, MTWTh 10

WESTERN CULTURE AND TECHNOLOGY

Track Chairman: Paul S. Seaver, Associate Professor of History

(Enroll in Values, Technology, Science, and Society 1, 2, 3) This sequence, designed by faculty in the Program in Values, Technology,
Science, and Society, studies the development of Western culture by exploring the changing interconnections among the three major realms of culture: the intellectual (i.e., ideas and worldviews), the material (i.e., technological devices and systems), and the societal (i.e., organizations and institutions). This course is designed to be of equal appeal to all entering students, whether their present academic interests center on the humanities, the social sciences, natural sciences, medicine, or engineering. The course will not require the use of mathematics. Three one-hour lectures per week and a weekly two-hour seminar discussion section.

**5 units, Aut, Win, Spr**

MTW 10 plus section

The Structured Liberal Education (SLE) program is also designated as a Western Culture sequence. For details see the SLE section in this bulletin.

### SPECIAL PROGRAMS

#### PROGRAM FOR INDIVIDUALLY DESIGNED MAJORS

This program is intended for undergraduates who are interested in pursuing an area of scholarly inquiry which falls outside the purview of an established academic department or program of the University. It permits intellectually coherent majors designed by the students themselves with the assistance of faculty members of their choice. The Program for Individually Designed Majors is **not** an honors program. Any student in good academic standing is free to participate.

In designing a major, the student will consult with at least three faculty members from at least two separate departments or programs of the University; one of the faculty members will be selected as the student’s “primary” advisor. In helping the student design the major and in signing the proposal requesting approval from the Dean’s Advisory Committee on Individually Designed Majors, the faculty members are committing themselves to act as a regular academic advisory group for the student until graduation. The Dean’s Advisory Committee on Individually Designed Majors will not consider proposals (or changes in previously approved proposals) unless they have the approval of the faculty advisory group.

#### THE “COMMITTEE IN CHARGE”

The Program for Individually Designed Majors is administered by the Dean’s Advisory Committee on Individually Designed Majors and the Academic Information Center.

The Committee acts in lieu of a regular department of the University. This role involves certifying the scholarly merit of the program and includes the obligation to consider, approve, and recommend changes in each proposed major.

In carrying out its role, the Committee reserves the right to reject proposals which in its opinion lack scholarly merit or which are not clearly interdisciplinary. Occasionally, the Committee must reject a proposal which, though of considerable academic merit, requires resources not available at Stanford. The Committee also reserves the right to recommend additions to each student’s faculty advisory group.

#### THE PROPOSAL

The proposal should begin with a statement which describes the major, articulates the motivation for and the justification and ultimate goal of the major, and shows how the courses listed relate to and fulfill the major’s goal. This statement should be followed by a list of the proposed core courses to be counted toward the major and, as far as possible, the sequence in which they are to be taken. The proposal must be signed by at least three faculty members; their signatures certify that they endorse the major as described in the proposal and agree to serve as the student’s permanent advisory group. The proposal must also be accompanied by a statement from the primary advisor giving his or her appraisal of the academic viability of the proposed major.

All members of the student’s advisory group must be members of the Academic Council at Stanford. Proposals may not be submitted until a student has actually registered at Stanford and is present on the campus.

#### THE GUIDELINES

To defend the Program for Individually Designed Majors as being fully equivalent to a Stanford Bachelor of Arts or Bachelor of Science degree in an established department or program, the Senate of the Academic Council has established these specific requirements:

1. Each major shall consist of at least sixty (60) units, all in courses at or above the 100 level (or their equivalent);
2. A maximum of fifteen (15) of these sixty (60) may be taken on a Pass/No Credit basis;
3. A maximum of five (5) units of these sixty (60) may be taken in individual study or directed reading;
4. Students proposing an Individually Designed Major must have at least two quarters' undergraduate work remaining at Stanford after the date on which the proposal is to be discussed by the Committee.

These specific requirements are in addition to the general guidelines discussed in "The Major" in the "Degrees" section of this bulletin. Since each proposal is considered individually, the student and the faculty advisory group may request exception to the specific requirements. Such a request must be included in the statement which justifies the major.

Several extradepartmental programs have administrative offices that provide advising services to students interested in individually designed majors of an interdisciplinary nature. Examples of such programs are Acoustics and Noise, Feminist Studies, Medieval Studies within Humanities Special Programs, Urban Studies and Values, Technology, Science and Society. These programs do not grant undergraduate degrees, but encourage interested students to propose majors to the Dean's Advisory Committee for Individually Designed Majors. Students should see the relevant sections of this bulletin for information on these programs. Additional information about the Program for Individually Designed Majors may be obtained at the Academic Information Center.

PROGRAM ON URBAN STUDIES

Director: Leonard Ortolano, Professor of Civil Engineering, Lyna Wiggins, Assistant Professor of Civil Engineering-Acting Director
Autumn/Winter 1983-84

The Committee on Urban Studies: Clay Carson, Assistant Professor of History, Chairman; Nancy Tuma, Professor of Sociology; Paul Turner, Associate Professor of Art; Lyna Wiggins, Assistant Professor of Civil Engineering; Sylvia Yanagisako, Assistant Professor of Anthropology

Lecturers for Adjunct Courses: Marlou Belyea, Tim Campbell, Gerry Cast, Susan Goltsman, Daniel Iacofano, Randall Rossi, George Sipel, Frederic Stout

GENERAL INFORMATION

The Program on Urban Studies is an undergraduate program that brings together students, faculty members, and outside specialists who are concerned with the people and problems of urban life. The program is sponsored by the Office of the Dean of Undergraduate Studies and stresses two basic themes: developing a critical understanding of how cities evolve and thereby shape urban life, and developing the practical and analytical tools which can help improve the quality of urban life. The program's curricular philosophy is based on the perception that our society's core problems have increasingly become urban problems, and on the belief that only disciplinary cross-fertilization can provide an adequate grasp of the complex interaction of forces which shape the urban setting. It draws not only on the strength of the University's curriculum in these areas, but also on the expertise of outside practitioners who can bring the insights of their careers to bear on urban issues. Urban Studies offers students two important opportunities: it enables undergraduates to examine our society's core problems through a number of disciplinary lenses, and it allows them to engage these problems in a practical way.

The Program on Urban Studies has five components: introductory core courses, advanced departmental courses, adjunct Urban Studies courses, the core seminar, and some form of fieldwork (internships, special projects, honors thesis). The courses are organized into three areas of emphasis within urban studies: social sciences/policy analysis, engineering/planning, and architecture/urban design. Students planning their program in urban studies generally begin by taking appropriate core courses, and
then choose a selection of advanced departmental and adjunct courses based on each student's individual area of interest. After completion of the introductory and concentration phases of the program, the Core Seminar provides an intensive process of synthesizing different disciplinary approaches to the city. Finally, most students will undertake some form of fieldwork. Urban Studies provides many opportunities to engage in research problems, and encourages training in research methods in preparation for the experience.

Although Urban Studies is not a degree granting program, any student may propose an individually designed major in Urban Studies. The Individually Designed Major Program is administered by the Dean's Advisory Committee, which reviews proposals that are unique and interdisciplinary in nature. See the "Program for Individually Designed Majors" section of this bulletin for additional information. The committee and the staff of the Program on Urban Studies assists students in formulating an interdepartmental major in Urban Studies, which involves preparing a proposal describing a self-designed program of study, for the approval of the Committee on Individually Designed Majors. Proposals must be completed by the beginning of a student's first quarter as a senior; however, please note that students contemplating a major in Urban Studies should consult Leonard Ortolano, Director of the Program, well in advance of this deadline.

Guidelines for Individually Designed Majors are available at the Academic Information Center. In addition to those guidelines, students should be aware of the guidelines of the Urban Studies Program, which require students proposing individually designed majors in Urban Studies to complete a minimum of sixty units of courses above the 100 level, including five core courses and both quarters of the Core Seminar. The remainder of the units will consist of the student's own selection of departmental courses, Urban Studies adjunct courses, and fieldwork, comprising an elective concentration in a disciplinary or interdisciplinary area. Students interested in exploring their interests in Urban Studies are encouraged to take "Introduction to Urban Studies" (Urban Studies 105.) This course provides a general introduction to the study of cities and the process of urbanization.

HONOR'S PROGRAM IN URBAN STUDIES

The honors program offers qualified students an opportunity to conduct independent research, and to write a thesis of superior quality summarizing the results of their research. The program grants honors at graduation to those students who have successfully completed a thesis of honors quality, attained a 3.5 letter grade average in their major, and who have successfully completed all the course requirements for their major. Details as to admission, application and procedures can be obtained from the Office of the Director of the Program on Urban Studies, Bldg. 370, Room 371.

THE CORE COURSES

Group A:

Anthropology 146. "Urban Problems in Anthropological Perspective."

History 152A. "The Making of Urban America" or 152B. "U.S. Urban Life and Culture."

Sociology 150. "Urban Sociology."


Group B:

Applied Earth Sciences 130 or 131 or 132. "Environmental Earth Sciences I, II, III."

Civil Engineering 133. "Introduction to Urban Planning" or 234 "Land Use Planning."

Civil Engineering 171. "Environmental Planning."


Majors in Urban Studies must complete two or three courses from Group A, and two or three courses from Group B, for a total of five core courses.

CORE SEMINAR

188. The Politics of U.S. Urban Development

—(Same as History 255.) An interdisciplinary course in Urban Studies. Examines modern urban life from a variety of perspectives with particular emphasis on urban planning and politics. Uses Palo Alto and surrounding communities as laboratory to examine issues and problems. Students expected to participate in weekly discussions and a class project involving a study of the power structure of Palo Alto.

5 units, Win (Carson) M 3:15-5:05

189. Utopia and Reality in Modern Urban Planning

—(Same as Art 280.) Examines the origins of the contemporary urban situation with particular emphasis on the city as a cultural phenomenon. Interdisciplinary methodology which focuses on a number of key interrelationships: between the city as an economic machine and the city as a human community; between-
the city's architectural form and its social and political functions; between the perceptions/descriptions of the city characteristic of statistical analysis and those common to literature, art, and film; between the short term projections of policy analysis and the visions of urban futurists.

4 units, Spr (Turner and Stout) W 2:15-5:05

**ADJUNCT COURSES**

In order to supplement departmental offerings, the program offers seven adjunct courses a year taught by working professionals. These courses are designed to help students see how concepts and techniques can be put to practice.

105. **Introduction to Urban Studies**—Provides students with a generalized introduction to the study of cities and the process of urbanization. Reviews the various disciplinary approaches to urban studies—history, geography, sociology, economics, and politics—and examines the interdisciplinary perspectives that are inherent in the practice of urban planning, urban design, urban public administration and urban public policy formation.

4 units, Aut (Stout) TTh 1

141. **Environmental Psychology in Urban Design and Planning**—A seminar emphasizing critical reading and discussion of environment/behavior literature; and a workshop training students in environmental research procedures. Examines the major theories and methods of environmental psychology and their application to the fields of architecture, urban planning and design. Topics include ecological psychology, behaviorism, phenomenology, environmental symbolism, psychology of place, personal space and personalizations, workspaces, public/private institutions, neighborhoods and communities, and environmental assessment.

5 units, Spr (Iacofano and Goltsman) Th 1:15-4:05

150. **Process Management in Urban and Environmental Decision-Making**—Workshop teaching a variety of techniques for involving clients, users, communities, and consultants in the environmental planning and design process. Through an examination of case studies and a quarter-long project involving a campus or community group made available through ARLO, students will develop, plan and manage a participatory decision-making process having some urban environmental focus. Course topics include process management; data-gathering methods for public involvement; workshops, facilitation graphics; group dynamics and process design; theories of leadership effectiveness; environmental mediation and conflict management; and public involvement media.

5 units, Aut (Iacofano and Goltsman) Th 2:15-5:05

152. **The Influence of Environmental Regulations on Urban Planning and Design**—Examines effects of environmental regulations, land use laws and discretionary powers of reviewing and permitting agencies on the form of buildings and the shape of urban spaces. Case studies from San Francisco Bay Area exhibit planning and design responses to various types of regulation including micro-climatic effects; traffic and transit service, historic preservation, energy use and conservation; and low cost and subsidized housing. Site visits to illustrate particular problems and solutions.

4 units, Spr (Rossi) M 3:15-5:05

153. **Ethnicity in American Cities: Past and Present**—(Same as History 262A.)

5 units, Spr (Camarilla) W 2:15-4:05

154. **San Francisco and Los Angeles: A Comparative History**—(Same as History 256A.)

5 units, Win (Kazin) Th 1:15-3:05

155. **Redoing the Welfare State: Urban Social Policy Development**. Examines the dynamics of social service delivery systems through a focus on children's problems answered by social programs. The history and effectiveness of programs proposed as solutions to child labor, runaways, urban recreation, delinquency, poverty, abuse, neglect, and inadequate education, studied through written material and presentations of working planners and administrators. Students will design a social service program.

4 units, Aut (Belyea) F 1:15-3:05

156. **Urban Growth and Change**—(Same as Sociology 154.) Cities and towns are continually changing: in size, density, composition and internal organization. This course examines causes and consequences of these changes. It will be divided into two main units: one will focus on processes of change in a city as a whole; the other will concentrate on processes of change in a subarea of a city (i.e., in a neighborhood). The course will consider consequences of these changes for individuals, families, organized groups and voluntary associations, firms and public institutions.

5 units, Aut (Tuma) MW 1:15-3

plus section by arrangement

157. **Urban Planning in Latin America**—(Graduate students register for Civil Engineering 233.) Seminar examining phenomenon and problems of rapid urban growth and centralization in important Third World urban centers including Mexico City, Sao Paulo and Rio de
Janiero. Will survey problems in housing, population, social services, transportation, and infrastructure and analyze the variety of planning strategies applied on both the metropolitan and national level in order to deal with them. Topics will include the economics and diseconomies of agglomeration, intersectoral competition for urban investment and planning and administrative jurisdiction.

4 units, Spr (Campbell) TTh 4:15-5:30

160A. Urban Design Studio—Introduction to urban design and planning process through application to a ten-week comprehensive design and planning project taken from an actual problem in the region. Course develops student's problem-solving ability, including an understanding of the step-by-step process used to solve an urban design or planning problem. Graphic and diagrammatic methods of analysis and communication introduced and applied within context of study problem. No prerequisites. Enrollment limited to 14 students.

5 units, Win (Gast) TTh 2:15-5:05

168. Media Production Workshop for Urban Affairs—Emphasizes hands-on experience in individual and group projects. Using various media, students uncover, research and document urban issues including neighborhood preservation, energy conservation, urban forestry and urban open-space. Training in print media, black and white photography, audio-recording, 35mm slide and tape/slide formats. Quarter long project with local citizen group or public agency. Topics include use of storyboard and scripting techniques, structuring of effective presentations, basic layout and graphic design and issues of media bias.

5 units, (Iacofano and Goltsman) alternate years, given 1984-85

175. Managing Local Government—Examines urban administration using the urban executive as a focal point. Topics include the mission and structure of government; policymaking processes in urban government; the respective roles of legislators and administrators; and the role and function of the city manager. The manager's role as a "change agent" discussed vis-a-vis contemporary urban problems such as productivity, declining resources, housing and transportation. Prominent elected and appointed officials from the area will guest lecture.

4 units, Win (Sipel) W 3:15-5:05

176. Urban Services and the Private Sector—Focus on the provision of urban services through cooperative efforts between government and business. Explores the environmental forces changing the relationship between business and government sectors; reviews the theoretical and historical roots of the cooperation; examines perceived and actual differences between the two; and considers examples of current joint involvement. Methodology includes presentations from individuals currently involved in collaborative public-private projects and a team field research project.

4 units, Win (Sipel) alternate years, given 1984-85

180. Seminar on Planning and Design Professions—Informal luncheon seminar. Explores vocational possibilities in urban planning, urban design, and architecture. Bay Area professionals lecture and respond to questions concerning the nature of his or her day-to-day work, impressions of the field in general, and academic background each would recommend for that career. One session will be devoted to graduate school admissions and the degree relevant to these fields.

1 unit, Win (Ortolona) alternate years, given 1984-85

184. Women in Cities: A Cross-cultural Perspective — Explores the range of women's experiences in cities throughout the world and the determinants of the similarities and differences in those experiences. A series of hypotheses and key concepts that have emerged primarily from research in North America and Western Europe will be critically evaluated in light of research on women in Latin America, Asian, and African cities. Topics include women and urban migration, changing forms of the sexual division of labor, the transportation of gender domains, changing family and kinship structures, women's access to 'public' space and activities in cities, and the interrelationship among urbanism, political activism and feminism.

5 units, Spr (Yanagisako) MWF 11

Further descriptions and details of current adjunct courses are available prior to each quarter from the Program offices in Room 371 of the outer quad (or call 497-3452). These courses are also listed in each quarter's Time Schedule.

DEPARTMENTAL COURSES

The following list of suggested departmental courses has been compiled to serve as a guideline for students designing a major in Urban Studies. However, each student in conjunction with his or her advisors will select courses according to the student's own area of interest within the field of urban studies, and may choose courses that are not included in this list. Full descriptions of the courses will be found in the relevant departmental listings.

Suggested departmental courses by area of concentration:
Anthropology: 146, 164
Art: 3, 107, 128D, 174, 175A,B, 176, 277, 278, 279
Civil Engineering: 114, 130, 133, 170, 171, 176, 180, 221, 224, 227, 229, 230, 233, 234, 235, 236, 237, 238
Drama: 130
Human Biology: 103
Psychology: 102
Sociology: 156
Values, Technology, Science, and Society: 125, 126, 158

ENGINEERING/PLANNING
Applied Earth Sciences: 1, 130, 131, 132, 133
Civil Engineering: 130, 133, 170, 171, 176, 220, 221, 222, 223, 224, 225, 226, 227, 229, 230, 231, 233, 234, 235, 236, 237, 238, 239
Industrial Engineering: 100
Mechanical Engineering: 101, 102, 115A, 137, 138, 180
Operations Research: 151, 152, 153, 154, 180
Public Policy: 101, 102, 103, 104, 105

SOCIAL SCIENCE/POLICY ANALYSIS
Anthropology: 146, 147, 148, 164, 260
Applied Earth Sciences: 1, 100
Communications: 140/240, 157, 158, 159, 162, 167, 169
Computer Science: 107
Economics: 113, 130, 131, 141, 145, 147, 148, 150, 154, 156, 170, 171, 225, 249
School of Education: 105, 172, 220A, B, C, 221A, B, C, 248
Human Biology: 103, 162, 178, 112, 177
Political Science: 106M, 106R, 107, 170, 175, 176, 180, 195, 206
Psychology: 121, 176
Public Policy: 103, 104, 105
Sociology: 002, 105, 106, 107, 111, 119, 135, 140, 141, 142, 143, 144, 145, 146, 147, 149, 150, 155, 158, 160, 163, 166, 261, 262, 381A
Statistics: 116, 119, 120, 153, 209

FIELDWORK

Urban Studies students are encouraged to participate in internships or research projects, either by initiating and designing their own, with Program support, or by taking advantage of the numerous workshop and internship opportunities in the field of urban studies that are made available by ARLO and SWOPSI. (Accreditation for ARLO projects can be arranged through Urban Studies.) Interested students should consult the Program on Urban Studies, Room 371 of the quad, or telephone 497-3452.

ACTION RESEARCH LIAISON OFFICE (ARLO)

Director: Cissie Rafferty

The Action Research Liaison Office brings together faculty, students and non-profit community organizations and governmental agencies in research that enriches the Stanford educational program and serves the needs of the community groups. ARLO students map trails, design computer programs, work with handicapped children and implement varieties of program research in energy, environment, and related fields. ARLO puts undergraduate and graduate students in touch with agencies who are offering projects in their area of interest, and helps them to find faculty who are willing to supervise this research in conjunction with their teaching. The students receive 1 to 5 units of academic credit per quarter for their work, and may participate in a project for one or more quarters. Independent projects may also be developed.

ARLO promotes action research, as opposed to volunteer work or internships, and the scholarly value of the projects undertaken is guaranteed by the close contact the student maintains with the faculty sponsor. These field education opportunities give the students valuable experience in developing and using their skills in the solution of real problems while satisfying credit requirements. In pursuing this research, students often discover or deepen their vocational direction, and gain practical experience which enhances their professional training. At the same time, ARLO stimulates the growth of a University-community partnership in the solution of social problems.

Students who are interested in exploring an ARLO project should come by the ARLO office, Monday through Thursday, 8-12 and 1-5, room 120, Old Union, or call 497-1568.
EXTRADEPARTMENTAL UNDERGRADUATE PROGRAMS

The programs below are extradepartmental undergraduate programs sponsored by the Dean of Humanities and Sciences. They include the Freshman-Sophomore Seminar Programs, the Learning Assistance Center (LAC), the Stanford Workshops on Political and Social Issues (SWOPSI), the Student Center for Innovation in Research and Education (SCIRE), and the Undergraduate Special Program. These programs are governed by University advisory committees and offer a variety of courses and services to undergraduate students. An undergraduate is limited to a total of twelve courses or thirty-six units of these courses combined to count toward graduation, with the exception of Freshman Seminars. No more than twenty-seven (27) of these thirty-six (36) units may be taken in SWOPSI and/or SCIRE. See the program descriptions below for additional information.

FRESHMAN-SOPHOMORE SEMINAR PROGRAMS

Dean’s Advisory Committee in Charge: John D. Coheen (Director of the Program), Amy Hayes, Carolyn Lougee (ex officio), Thomas Moser, Benjamin D. Paul, Richard Scott, David K. Stevenson, Steven St. Lorant, Kathryn Thoelecke (ex officio)

Freshman seminars, with topics drawn from many fields, provide stimulating small-group learning experiences. They are taught by qualified members of the Stanford community and are offered for one or two quarters. Sophomore seminars offer approximately 45 courses taught by members of the Stanford community.

Approximately 60 seminars will be offered 1983-84; each seminar will have eight to twelve students. The seminars are for three, four, or five units of credit per quarter. The two-quarter seminars are continuing courses, and students are expected to complete both quarters. All 1983-84 Freshman seminars fulfill part or all of the Writing Requirement, and Sophomore seminars count as units toward graduation.

APPLICATION AND ADMISSION PROCEDURES

Enrollment in Freshman seminars is limited to freshmen. All incoming freshmen will receive a copy of Approaching Stanford in June which includes descriptions of the seminar offerings for the following academic year. Students register for seminars by mail during the summer.

Correspondence regarding the Freshman Seminar Program should be addressed to the program coordinator: Kathryn Thoelecke, Old Union 306, Stanford, Ca 94305.

Enrollment in Sophomore Seminars is open to students of sophomore standing; See the Time Schedule for enrollment information. Inquiries may be directed to the Sophomore Seminar Program, (see address above).

LEARNING ASSISTANCE CENTER (LAC)

Director: Carolyn Walker
Lecturers: Bernie Rihn, Susan Wyle
Acting Instructors: David Elias, Jack Prostko

The Learning Assistance Center (LAC) offers courses designed to teach study, reading, tutoring, and peer counseling techniques. Students may enroll in credit courses or noncredit workshops, or drop in at the Center any time during the quarter for individual help. The LAC is located at 123 Meyer Library (telephone: 497-2207) and is open 8:30-12 and 1-4:30 Monday through Friday.

COURSES

None of the courses may be repeated for credit.

Graduate students who enroll in lower division courses may sign up for 100 level courses (e.g., 106 instead of 6) for a limited number of units. They will be expected to complete additional work.

1. Learning Skills—Teaches time management, self-management, notetaking, techniques for understanding and remembering what is read, concentration and memory, mapping, how to prepare for and take exams, flexible problem solving strategies, relaxation techniques and other strategies for dealing with test anxiety, library research, and the theory and usefulness of speed reading.

   2 units, Aut, Win, Spr, Sum

   (Staff, Rihn)

4. Reading Rate Improvement Workshop—The goal of this class is to double the students’ reading rate without loss of comprehension.
Students develop flexibility in reading speed which enables them to vary reading rate according to familiarity, difficulty, and purpose. Class meets twice a week.

0 units, Aut, Win, Spr, Sum (Rihn)

Note: This course is available in a self-managed format. See "Services" below.

6. Effective Reading—Teaches effective reading techniques by focusing on two important areas: Literal comprehension and retention, and critical analysis of argument. Students learn to understand and remember what they read in textbooks, articles, and essays in the sciences, humanities, and social sciences. They also learn to identify the implicit and explicit assumptions in an argument, the generalizability of evidence, and logical and statistical fallacies. Includes vocabulary development and the study of the theory of reading rate improvement and its bearing on comprehension improvement. (Not open to students enrolled in LAC 8, 9 or 10, 11.)

2 units, Aut, Win, Spr (Rihn)

8, 9. Critical Reading and Writing: Popular Culture, Popular Arts—(Same as English 1D-2D, section 1.) The subject for thinking, reading and writing will be popular culture and the popular arts in America. Read relevant critical essays, journalism, stories, and poems, and write about what is read as well as movies, contemporary music, and other popular arts. The course will culminate in a research paper. There will be an opportunity to deliver a short talk. Each student will meet weekly in an individual tutorial with one of the instructors. The goal: to develop effective reading and study skills and a lively, persuasive writing style. Satisfies the Writing Requirement. (Not open to students enrolled in LAC 6.)

5 units, Aut, Win (Walker, Phayer, Mark)

(LAC 8 offered Summer.)

10, 11. Critical Reading and Writing: Contemporary Issues—(Same as English 1D-2D, Section 2.) Through the study of controversial issues like the death penalty, nuclear power, and discrimination, students will learn to read, write and think with a questioning, critical attitude. First quarter will emphasize logical argumentation (evaluating premises, detecting fallacies, building our own strong, persuasive arguments), public speaking, and significant study skills (memory, concentration, vocabulary development). Second quarter will focus on one or two important current issues and reading of related essays, newspapers, poems, and short stories. The course will culminate in a research paper. Each student will meet weekly in an individual tutorial with one of the instructors. Satisfies the Writing Requirement. (Not open to students enrolled in LAC 6.)

5 units, Aut, Win (Elias, Rico)

112. Basic Writing—Course is appropriate for students, graduate or undergraduate, who wish to improve their writing skills. It is designed for students who find writing difficult and want to enroll in a small class and work on a one-to-one basis. The thesis of the course is that through practice, sound criticism, and better understanding of what makes for good prose, students will find writing a satisfying experience. Class meets twice a week and students also meet with the instructor for a ½ hour tutorial once each week. Does not fulfill the writing requirement. Limited to 15. No auditors.

3 units, Sum (Walker) TTh 11 plus hours by arrangement

120. Peer Tutoring—Teaches learning skills and theory to students who wish to tutor in the University. Includes instructor interviews and video-taping of tutoring.

1 unit, Aut, Win, Spr (Prostko)

140. Advising Associates—Teaches the theory and practice of undergraduate advising to students who wish to serve as advising associates in the university. Includes some training in peer counseling skills.

1 unit, Spr (Staff)

170 Series. Peer Counseling Techniques—Courses in this series are designed to teach the principles and practice of basic attending skills and their application to specific contexts. Students may enroll in only one course in the series for credit.

170. Basic Attending Skills—Designed to teach verbal/non-verbal attending and communication skills through instruction, role-play, and video-taped practice. Open only to RA’s and students enrolled in Psychology 184.

1 unit, Aut, Win, Spr (D’Andrea, Staff)

171. Peer Counseling: Learning Effectiveness—Same as 170 with additional instruction in the theory and practice of counseling others who need to develop more effective study skills and habits. These students will work closely with the instructors of LAC 1.

2 units, Win, Spr (Staff)

172. Peer Counseling: Bridge—Same as 170 with additional instruction in the theory and practice of peer counseling in the Bridge Community.

2 units, Aut, Win, Spr (D’Andrea, Staff)

173. Peer Counseling: Chicano—Same as 170 with additional instruction in the theory and practice of peer counseling Chicanos.

2 units, Aut, Win, Spr (Martinez)
174. Peer Counseling: Asian Americans—
Same as 170 with additional instruction in the
theory and practice of peer counseling Asian
Americans.
2 units, Aut, Win, Spr (Staff)

175. Peer Counseling: Career Development
—Same as 170 with additional instruction in the
theory and practice of career counseling.
2 units, Spr (Campbell)

176. Peer Counseling: Contraception—Same
as 170 but open only to students who are en-
rolled concurrently in the Contraception Peer
Counseling course, Medicine 299, Section 39.
1 unit, Aut, Win (McClenahan, Staff)

230. Directed Writing: Foreign Graduate Stu-
dents—Designed to familiarize students with
composing and editing strategies which facili-
tate clearer written English. Topics include
editing, learning how to reread a paper, self
diagnosis, and use of references. Individual
tutorial, once a week.
3 units, Sum (Elias, Wyle)

SERVICES
1. Undergraduate peer tutors in specific aca-
demic subjects; Graduate peer tutors by
special arrangement.
2. Short noncredit workshops on time-manage-
ment, grammar, test preparation, text
anxiety, and vocabulary.
3. A quarter-long classroom or self-managed
reading rate improvement course. Not for
credit.
4. Individual meetings with staff and peer
study skills counselors available on an ap-
pointment or a drop-in basis.
5. Reference material and handouts on reading
and study skills.

STANFORD WORKSHOPS
ON POLITICAL
AND SOCIAL ISSUES
(SWOPSI)

Stanford Workshops on Political and Social
Issues (SWOPSI) is an extradepartmental pro-
gram initiated by students in 1969 to harness
the research capabilities of Stanford in search-
ing for solutions to urgent social and political
problems.

SWOPSI workshops are led by community
members and Stanford students, faculty, and
staff; each course is sponsored by a faculty
member. The program offers credit for approx-
imately 15 workshops each quarter. SWOPSI
classes are small; enrollments of 8 to 10 students
per instructor allow for personal contact be-
tween students and instructors and for high
student involvement.

Workshops combine academic analysis with
direct exposure to the issue. Some workshops
conduct community-based research and publish
the research findings and policy recommenda-
tions. For example, one workshop developed a
solid waste recycling plan for the campus. In
other workshops, students have worked in a
school for children with learning disabilities, on
a rape crisis hotline, or at the Stanford Women's
Center. All workshops seek to acquaint the
community-at-large with the issue under study;
workshop findings form the basis of publica-
tions, public forums, or concrete legal, political,
or community action. Public events such as
symposia or film series are frequently generated
by workshops; SWOPSI also sponsors or co-
sponsors public events that deal with political or
social topics of interest to the Stanford commu-
nity.

SWOPSI classes are innovative educational
experiences. One goal of the program is to
introduce alternative topics and methods into
the standard university curriculum. Workshops
take an interdisciplinary approach to problem
solving, give students a substantial voice in the
conduct of workshops, and encourage coopera-
tive group work.

Workshops are open to both undergraduates
and graduates as well as to interested members
of the community. Participation by people with
diverse backgrounds and differing perspectives
enhances the possibility of a comprehensive
analysis of the issue and the development of
imaginative solutions to problems.

Any person interested in organizing, leading,
or participating in a workshop or in exploring
possible sponsorship of a public event should
contact the SWOPSI office at 497-4305. Work-
shops for Autumn Quarter are listed in a catalog
distributed in the reg packets. Winter and
Spring Quarter catalogs are available during advance registration through the residences or the SWOPSI office, 590-A Old Union.

THE STUDENT CENTER FOR INNOVATION IN RESEARCH AND EDUCATION (SCIRE)

The Student Center for Innovation in Research and Education (SCIRE) is a student-initiated, extradepartmental program in the School of Humanities and Sciences. The program's overall objective is to support the educational needs of undergraduate students by assisting individual students, and by working to expand the learning opportunities available to undergraduates.

Best known among SCIRE's activities is its support of individual or small group student-initiated projects. SCIRE facilitates these projects in several ways. The staff works with interested students in developing and refining project ideas. Members of the academic community and other qualified individuals with interests similar to the students' are sought out by the staff and students jointly. Academic credit is then granted to those project proposals which receive the approval of the SCIRE Policy Board and the Associate Dean in Humanities and Sciences for undergraduate programs. The Board consists of five students and four faculty members.

SCIRE projects enable undergraduates to directly affect their education by giving them the opportunity to experiment with new subject matter, creative research and learning approaches, and unique field experiences. The number of units granted for a project may range from 2 to 5 per quarter. This flexibility allows students to test initial interest in a new field through small introductory projects or to engage in intensive study in an area to which the student is already committed.

In addition to encouraging students to take responsibility for planning their own academic programs, SCIRE works to foster the growth of new programs in undergraduate education. Individual students and small study groups can work with staff in new areas relevant to undergraduate education. Policy Board members can identify educational problem areas and organize projects, classes or special programs and task forces to work on ways to resolve them.

SCIRE welcomes the support of students and other University community members in its endeavors, in both identifying problems and working toward their resolution.

Another area of emphasis at SCIRE is the development of opportunities for students to work and learn off campus. SCIRE's Internship Program enables undergraduates who are not first year students to earn credit for off-campus learning experiences which significantly augment or extend an area of faculty instruction. The internship program consists of a part-time field placement and related coursework, which may be taken prior to or simultaneously with the fieldwork. SCIRE publishes a quarterly Clearinghouse Catalog of Internship and Research Opportunities.

A different type of off campus study encouraged by SCIRE is field research in oral traditions, which may include work such as collecting folktales, researching folk medicine, or undertaking oral history and family history projects.

In past years, SCIRE has provided sponsorship and support for a number of exciting projects which have improved undergraduate education at Stanford. Projects such as the Urban Studies Program, the Undergraduate Program in the School of Education (UPSE) and the Optical Observatory were all initiated with SCIRE sponsorship. Current SCIRE activities continue to support projects such as these. The program has developed an Innovation Fund which is used to make grants of "seed money" to support innovative educational projects developed by students. The stress of the fund is on projects which are likely to have a long-term impact upon undergraduate education, although funding to support selected individual, short-term undergraduate research projects (e.g. in oral history) has been granted.

Students who have academic project ideas, an interest in task forces, a desire to work and learn off campus, or innovation fund proposals should come by the SCIRE office, 590-A Old Union, or call 497-4504. The office is open Monday through Friday. Because of its special review process, SCIRE deadlines for student applications are as follows: Applications for self-designed projects and internships are due mid-quarter of the quarter preceding the quarter in which the student intends to register for credit. Applications for internships publicized in the quarterly SCIRE Clearinghouse Catalog of Internship and Research Opportunities are due the Wednesday of the first full week of classes each quarter. Specific dates will be publicized. Special arrangements can be made for projects evaluating internships or fieldwork done when a student is not registered.
UNDERGRADUATE
SPECIAL PROGRAM

Director: Laura S. Selznick

Undergraduate Special courses are sponsored by the Dean of Humanities and Sciences. They widen the range of options open to undergraduate students by drawing upon the educational resources of the entire University community, including some parts which customarily have not participated in undergraduate work. Members of the faculties of the graduate professional schools may offer courses. These courses are not intended to introduce the technical content of the professional schools into the undergraduate curriculum, but rather are to be general in character. Undergraduate Special courses may be taught, under suitable arrangements, by persons who are not members of the Academic Council, under the sponsorship of a Council member. The administrative structure of this program of courses is intended to encourage innovation, the introduction of experimental and interdisciplinary courses, and other types of offerings which for various reasons might not appear under the auspices of a particular department or school.

The maximum number of students who may enroll for credit in any Undergraduate Special course in one quarter is 40. In some of these courses, the enrollment is limited to fewer students.

Grades in these courses are given in the normal manner, with the Pass/No Credit option available upon the instructor's approval.

A student may take 12 Undergraduate Special courses, or 36 units of Undergraduate Specials, whichever is lower.

The list of all Undergraduate Special courses to be offered in any given quarter is available to students in advance of registration in the separately published program catalog. Enrollment of individual students in all courses is determined by the Registrar's class lists. (Sign-ups handled in accord with the regular University system of alphabetical rotation on regular advance registration or registration days at the location established by the Registrar.) Courses which are approved as part of a residence's program of residential education may reserve no more than 75 percent of the total places available in the course for students who live in that residence. In such cases, the Registrar will maintain separate class lists for residents and for non-residents according to established procedures.

Prerequisites and other enrollment restrictions for Undergraduate Special courses must be approved by the Committee in charge at the time the course proposal is reviewed. No enrollment restriction based on race, creed, sex, or national origin will be approved.

A proposal for an Undergraduate Special course may be initiated by a student, staff member, faculty member, or other member of the academic community. The proposed instructor—the person doing the actual teaching or presentation of course materials—should file a proposal with the Committee using forms obtained from the Program Office, 590-A Old Union, indicating:

1. A statement of course objectives.
2. The planned approach and an outline of general requirements and/or prerequisites.
3. Specific requirements, definition of special projects, method of evaluation and intended grading system.
4. A reading list identifying required and suggested readings.
5. A week-by-week syllabus which is as detailed as possible and which links readings, lectures, discussions and projects.
6. The name of the instructor(s) and any others who will assist in teaching the course, and statement of the qualifications of these individuals.

Instructors who are not members of the Academic Council must obtain a sponsor's statement from a Council member indicating support for the course and the qualifications of the proposed instructor(s). The sponsor will be responsible to the Dean's Advisory Committee on Undergraduate Special Courses for the quality of the course, the performance of the instructor, and the evaluation of individual student performance, in accord with the course description as approved by the Committee.

Academic credit is granted only if the course proposal receives a favorable evaluation from the standing committee, composed of faculty members and students. Proposals are due by the fifth week of the quarter preceding the one in which the proposed course is to be offered.

Undergraduate Specials satisfy neither the Writing nor the Distribution requirements.

The Program Catalog is available each quarter at the Registrar's Office and at the Academic Information Center and in 590-A Old Union.
SCHOOL OF LAW

Dean: John Hart Ely

Professors: Mauro Cappelletti, Marc A. Franklin, Lawrence M. Friedman, John Kaplan, John H. Merryman, Robert L. Rabin, David Rosenhan, Michael Wald

THE WORK OF THE LAW SCHOOL

The School of Law was established as a department of the University in 1893. Its purpose is to provide a thorough legal education for students who are fitted by their maturity and their previous academic training to pursue professional study under university methods of instruction. The curriculum leading to the first professional degree in law (J.D.) constitutes an adequate preparation for the practice of law in any English-speaking jurisdiction. Graduate work leading to the degrees of Master of the Science of Law and Doctor of the Science of Law is also offered. (For full Law School Curriculum and Faculty see the School of Law Programs of Study.) The Law School is on a two-term academic calendar. Registration for the autumn term will be held on September 7, 1983, and spring term will end on June 6, 1984.

COURSES

GRADUATE

The following courses are open to qualified graduate students of other departments of the University upon permission of the instructor:

236. Art and the Law—An examination of the range of problems that arise at the intersection of law and the visual arts (painting, sculpture, and graphic art) including: the protection of works of art in time of war, occupation and civil strife; the international traffic in stolen and smuggled cultural treasures; censorship, criticism, selection, and artistic freedom; copyright, moral right, and the proceeds right; art forgery, fakes, and consumer protection in the visual arts; legal relations between artists, dealers, museums, collectors, and auction houses; tax and estate problems of artists and collectors; legal services for artists; artnapping and insurance; legal problems of art museums, etc. Merryman and Elsen, Law, Ethics and the Visual Arts (1979).

3 term units, Spr (Merryman, Elsen)

242. Children and the Law: A Policy Analysis—(Same as Psychology 351.) This course will be a seminar, limited to 20 graduate and law students. Admission is by consent of the instructor. The course will focus on how information from psychology and other behavioral sciences can be utilized in the development of legal policies affecting children. Areas focused on will include child custody decisions, "children's rights," definitions of child abuse and neglect, informed consent and experimentation with children, laws regarding family structure. An attempt will be made to apply existing knowledge about child development to the resolution of policy issues in each of these areas and to design research projects that will provide new data relevant to policymakers.

2 term units, Spr (Wald and Maccoby)

247. Comparative Constitutional Law—Course focuses on developments that, particularly in the last three decades, have radically transformed systems of government in large portions of the world, especially in Europe — new bills of rights, the establishment and growing importance of new constitutional courts, and the European Convention of Human Rights (now binding in 20 Western European nations and increasingly enforced in various domestic courts). The course is divided into two parts. The first examines particular issues in the enforcement of constitutional law—the kinds of courts best suited to hear constitutional cases; the effects of decisions; retroactivity and/or prospectivity. The second part examines particular constitutional law topics, with primary emphasis on decisions in France, Germany, and Italy; decisions under the European Convention of Human Rights and analogous decisions in the U.S. Specific topics: constitutional rights to fair procedure; constitutionality of laws regulating abortion. Cappelletti and Cohen, Comparative Constitutional Adjudication: Cases and Materials. (1978).

3 term units, (Merryman)

251. Comparative Law—An introduction to the civil law tradition and a description of the modern legal systems in Europe and Latin America that have grown out of it. This course also provides a systematic foundation for subsequent study of international business transactions, Soviet and East European law, private international law, and the law of major international organizations. Merryman and Clark, Comparative Law: West European and Latin American Legal Systems (1978).

3 term units, Aut (Merryman)

307. Law and Behavioral Science—(Same as Psychology 354.) The implications of psycho-
logical research and theory for law and legal processes will be explored. Issues to be examined include the notions of responsibility and intention; the reasonable man; insanity; group processes and their effects on juries; stereotyping and arrest; eyewitness testimony; the social psychology of institutions.

2 term units, Spr (Rosenhan)

316. Law in Radically Different Cultures—(Same as Anthropology 157 and 257, Human Biology 147.) Comparison of legal systems in Western capitalist, secular, industrialized democracies with legal systems in radically different cultures. Using American law as a benchmark, this course examines comparable issues in the law of the Peoples Republic of China (Eastern law), Republic of Egypt (religious law), and the Republic of Botswana (traditional law) in order to identify the historical, philosophical, social, and cultural factors which contribute to the development of different attitudes and practices regarding law. Issues considered are the passing on of status and property rights—especially at death, the punishment of embezzlement, the handling of promises and contracts, and the use of law as an instrument of social change in the introduction of family planning. Brooks, Law, Psychiatry and the Mental Health System (1974) and Supplement (1980).

3 term units, Spr (Franklin) not given 1983-84

105. American Law, Development of—(Same as American Studies 171, and Political Science 183F.) The growth and development of American legal institutions with particular attention to crime and punishment, slavery and race relations, the role of law in developing the economy, and the place of lawyers in American society, from colonial times to the present.

5 units, Aut (Staff) may not be given 1983-84

109. The Criminal Law and the Criminal System—(Same as Political Science 183K and Sociology 109.) Exploration of the purposes and processes of the criminal law, with emphasis on the actual operation of the system, and the applications of theory to contemporary problems. Topics will include the police, the role of the attorney, the trial, sentencing, corrections, and “non-victim” crimes. (Open to all undergraduate and graduate students other than law students.)

5 units, Spr (Kaplan) TTh 10-11:30

149. Communication Law—(Same as Communication 149.) This course introduces nonlaw students to the issues surrounding government regulation of the mass media. These issues emerge in virtually every aspect of the operation of the print and broadcast media—getting permission to begin broadcasting; what media may do to get a story; legal controls on what media may publish—or must publish; constraints on dissemination of the final product. Major attention will be given to decisions of the Supreme Court involving First Amendment issues and to the functioning of the judicial and administrative processes.

5 units, Franklin) not given 1983-84

150. Regulation, Welfare and Public Policy—This course has two principal objectives: (1) to develop an understanding of the role administrative agencies are currently playing in the resolution of major issues of socioeconomic conflict, and (2) to explore the practical and theoretical limitations of the administrative process as a tool for implementing social change. The core of the course is an examination of the impact of various constituencies in shaping administrative policy in areas such as product safety and environmental protection. In addition, the role of the courts in controlling administrative discretion will be explored.

4 units, Aut (Rabin) not given 1983-84

NONPROFESSIONAL

The following nonprofessional courses, open to juniors and seniors, as well as to graduate students in other departments, may be counted toward the A.B. degree but may not be counted toward professional degrees in law.

105. American Law, Development of—(Same as American Studies 171, and Political Science 183F.) The growth and development of American legal institutions with particular attention to crime and punishment, slavery and race relations, the role of law in developing the economy, and the place of lawyers in American society, from colonial times to the present.

5 units, Aut (Staff) may not be given 1983-84

109. The Criminal Law and the Criminal System—(Same as Political Science 183K and Sociology 109.) Exploration of the purposes and processes of the criminal law, with emphasis on the actual operation of the system, and the applications of theory to contemporary problems. Topics will include the police, the role of the attorney, the trial, sentencing, corrections, and “non-victim” crimes. (Open to all undergraduate and graduate students other than law students.)

5 units, Spr (Kaplan) TTh 10-11:30

149. Communication Law—(Same as Communication 149.) This course introduces nonlaw students to the issues surrounding government regulation of the mass media. These issues emerge in virtually every aspect of the operation of the print and broadcast media—getting permission to begin broadcasting; what media may do to get a story; legal controls on what media may publish—or must publish; constraints on dissemination of the final product. Major attention will be given to decisions of the Supreme Court involving First Amendment issues and to the functioning of the judicial and administrative processes.

5 units, (Franklin) not given 1983-84

150. Regulation, Welfare and Public Policy—This course has two principal objectives: (1) to develop an understanding of the role administrative agencies are currently playing in the resolution of major issues of socioeconomic conflict, and (2) to explore the practical and theoretical limitations of the administrative process as a tool for implementing social change. The core of the course is an examination of the impact of various constituencies in shaping administrative policy in areas such as product safety and environmental protection. In addition, the role of the courts in controlling administrative discretion will be explored.

4 units, Aut (Rabin) not given 1983-84
The School of Medicine was established as a department of the University in 1908, when the Cooper Medical College in San Francisco was acquired by Stanford University. Until 1959 clinical teaching and some teaching of the basic medical sciences were carried out in San Francisco, while the remainder was conducted on the University campus near Palo Alto.

In 1953 the Trustees of the University determined that the School of Medicine should be consolidated on the University campus in new facilities. Following the development of a new program of medical education, and the construction of the Stanford Medical Center buildings for teaching, research and patient care activities, the school began its operation at Stanford in September 1959.

The Stanford University School of Medicine provides an educational environment that encourages intellectual diversity and offers stimulation and opportunity for self-motivated students who are interested in developing a scholarly, investigative approach to problems in medicine.

Accordingly, the school offers a curriculum with a two-fold purpose: To develop in all students the capacity for leadership in the clinical practice of scientific medicine, and to provide opportunities for as many students as possible to prepare themselves for careers in research and teaching in the various branches of basic, clinical and social medicine.

The admissions process is directed to the selection of individuals who will most benefit from this environment. Recognizing that minorities and women are underrepresented in the medical profession, and especially in academic medicine, the school has a strong commitment to identify, recruit and educate such students.

The curriculum which has been adopted to serve the objectives of the school, is an elective one in which students must register for a minimum of 13 quarters following which a student may take additional quarters of instruction for a nominal University registration fee. The required period of registration may be reduced to as few as 10 quarters for those students who have already completed appropriate graduate level work approved by the Committee on Academic Credit.

The curriculum, being elective, is one which provides the student with relative flexibility in formulating an individualized curriculum which best takes into account the student's past experience and future career goals. Additionally, this electivity offers the student the time to take advantage of some of the special investigative opportunities available at the school through such programs as the Medical Science Training Program, the Stanford Medical Alumni Scholars Program, Cancer Biology Program and the Research Assistantship Program. The school participates to an exceptional extent in the intellectual life of the University, and counts among its strengths interdisciplinary research and teaching at the interface between physical and social sciences and medicine.

Students interested in the combined MD/Ph.D. programs must first apply for admission to the M.D. program. Subsequent and separate application to a specific department is then required for candidacy for the Ph.D.

Provided an applicant to medical school has completed the basic courses in physics, chemistry and biology, the choice of an undergraduate major may reflect other interests, including the arts and humanities. Course work in mathematics and the behavioral sciences is highly recommended because of its importance in understanding medicine. Extracurricular activities and breadth of interests and experiences play an important role in the selection of students from among those applicants having superior academic records. The general requirements for admission are in the Medical School Bulletin. For application materials write: Chairman, Committee on Admission, Stanford University School of Medicine, Stanford, California 94305.

ALLIED MEDICAL SCIENCES
DIVISION OF PHYSICAL THERAPY
Emeriti: Lucille Daniels (Professor), Sarah Semans (Associate Professor)
Acting Director: John M. Medeiros
Adjunct Professors: Helen Blood, Barbara E. Kent
Assistant Professors: John Medeiros, Katherine F. Shepard
Senior Lecturers: Ann Hallum, Gail J. Jensen, Rochelle Parker
Clinical Instructors: Hazel V. Adkins, Kerry Besmehn, Marlene Bonham, Dextra Christiansen, Frances Lupi, Margaret V. Peterson, Kathleen J. Manella, Rosalie Lopopolo, Judith A. Sebring, Diana Stumm, Linda Van Hoesen
OFFERINGS AND FACILITIES

The Division of Physical Therapy in the Stanford University School of Medicine offers two distinct master's degree programs: 1) an entry-level master's degree for students entering the profession of physical therapy, and 2) a post-professional master's degree for graduate physical therapists who wish to pursue research and advanced work.

Classes are held at the Stanford Medical Center, which houses physical therapy lecture, laboratory, seminar and research rooms. Elective courses are available in departments in the School of Medicine and other schools on campus. Clinical affiliations are arranged with a variety of health care facilities in California. Graduate students from other departments may attend courses in the Division with the consent of the instructor. Any one of the following courses may not be offered if an insufficient number of students enroll.

PROGRAMS OF STUDY

ENTRY-LEVEL MASTER'S DEGREE PROGRAM

The entry-level program encompasses two academic years (6 quarters) and a summer internship between the two years. Students must complete 90 quarter units which include: the courses preparatory for state licensure, selected advanced study courses, and research requirements.

Students have two two-week periods of direct clinical experience during the first year, a 12 week internship during summer quarter and a four-week practicum during the Spring of the second year at Stanford Medical Center and/or affiliating health care facilities in California. This clinical sequence provides the opportunity for students to move toward the full utilization of their knowledge and skill in evaluating, planning, and implementing physical therapy programs. Electives related to the student’s program may be selected primarily in the second year. The curriculum is accredited by the American Physical Therapy Association.

ADMISSION

Requirements for admission are 1) a bachelors degree, 2) completion of prerequisite courses: human anatomy, human physiology, chemistry, physics, psychology (2), sociology, and statistics. Mathematics, biology, and courses in oral and written communication are highly recommended and 3) filing of an application including scores from the Aptitude Test of the Graduate Record Examination. The application must be completed by January 15 including letters of recommendation and transcripts. The last possible date for the Graduate Record Examination to be taken to meet this deadline is the prior December. Upon request of the Division, a personal interview and the completion of the supplemental admission tests and forms may be required. Applicants will be considered without regard to race, color, creed, religion, handicap, sex, age or national origin.

Students are admitted Autumn Quarter each year. Registration for entering students and commencement of classes will take place two weeks earlier than the published registration and matriculation dates. Dates for registration and general information will be found in the Information Bulletin of the University.

POST PROFESSIONAL MASTER'S DEGREE PROGRAM

The post-professional program encompasses one academic year (45 quarter units) and can be designed to meet the individual needs of students who find it necessary to combine full and part-time study. The student must complete an approved plan of study including a minimum of 23 quarter units which fulfill Division requirements: research (10 units), directed teaching (assistantship) (3 units), course(s) in either administration or education (5 units) and advanced clinical approaches (5 units). Required courses may be selected from courses numbered 231, 232, 257 and above. Courses offered by the Division of Physical Therapy, School of Medicine and other University Departments may be selected to provide an individualized program of study. For more information regarding this program write directly to the Division of Physical Therapy in the Stanford University School of Medicine.

ADMISSION

Requirements for admission are: 1) completion of a bachelors degree or Certificate in Physical Therapy of equivalent education in a foreign country and possess qualifications for Licensure as a physical therapist in the United States; 2) have at least one year and preferably 3 years, of clinical experience in physical therapy; 3) complete the requirements for admission to the Division of Graduate Studies at Stanford University including a recent (within 5 years) Aptitude Test, Graduate Record Examination; 4) Submit a proposed Plan of Study including;
long-term career goals, learning objectives, and desired content areas relative to your course work, directed teaching and research and 5) an indication of full or part-time study. A student may be admitted any quarter but application must be completed 3 months in advance of desired admission date.

Upon request of the Division, a personal interview and the completion of supplemental admission tests and forms may be required. Applicants will be considered without regard to race, color, creed, religion, handicap, sex, age or national origin.

FINANCIAL AID

The resources for any type of financial assistance, such as scholarship assistantships or traineeships awarded by the Scholarship Committee of the Division of Physical Therapy are extremely limited and vary from year to year.

The Marian Williams Memorial Scholarship and the Stanford Physical Therapy Alumni Scholarship are awarded each year by the Committee, and a few private agencies offer special scholarships for physical therapy students.

The Western States (including Hawaii and Alaska) without a physical therapy program provide part of the tuition of legal residents through WICHE (Western Interstate Commission for Higher Education).

The Stanford Information Bulletin lists the long-term loan policies of the University and the details of the National Defence Student Loan Program.

COURSES

Any one of the following courses may not be offered if an insufficient number of students enroll.

220. Human Motion and Therapeudic Procedures—Functional anatomy; biomechanics of body motion, analysis and practice of therapeutic exercise procedures; tests for and evaluation of physical disability, prosthetics and orthotics, and basic medical lectures in specialty areas, with emphasis on problems of patient care.

4-6 units, Aut (Kent, Jensen, Staff)

221. Human Motion and Therapeutic Procedures II—Continuation of Human Motion and Therapeutic Procedures I. Prerequisite: 220.

4-6 units, Win (Hallum, Jensen, Staff)

222. Human Motion and Therapeutic Procedures III—Continuation of Human Motion and Therapeutic Procedures II. Prerequisites: 220, 221.

4-5 units, Spr (Medeiros, Jensen, Staff)

225. Neurophysiological Basis of Human Motion I—Basic neuroanatomical and neurophysiological principles of normal and pathological motor control, pre- and post-natal development of motor activity and related assessment skills; current treatment principles for the infant and adult neurological patient; evaluation, treatment, and program planning for patients with neuromuscular disabilities.

4-5 units, Aut (Parker, Staff)

226. Neurophysiological Basis of Human Motion II—Continuation of Neurophysiological Basis of Human Motion I. Prerequisite: 225.

4-5 units, Win (Parker, Staff)

227. Neurophysiological Basis of Human Motion III—Continuation of Neurophysiological Basis of Human Motion II. Prerequisites: 225, 226.

4-5 units, Spr (Parker, Staff)

229. Basic Skills and Physical Agents I—Functional activities; analysis of the principles underlying the use of electrotherapy, massage, and hydrotherapy; introduction to kinesiologic electromyographic techniques.

2 units, Aut (Parker, Medeiros)

230. Basic Skills and Physical Agents II—Continuation of 229.

2 units, Win (Parker, Medeiros)

231. Electromyography—Analysis of human motion using electromyography techniques; clinical electromyography; clinical application of electromyographic procedures and techniques.

3 units (Medeiros) by arrangement

240. Clinical Medicine—Lectures, demonstrations and discussions presented by pathologists, physiologists, and medical and surgical specialists with emphasis on abnormalities, caused by disease or trauma, which produce or contribute to disorders of movement.

3 units, Spr (Physicians)

244. Directed Clinical Experience in Physical Therapy I—Students are assigned for a select period full time during a portion of the quarter to health care facilities for a clinical laboratory; includes ethics and selected basic skills. Prerequisites: 220, 225, 229.

2-3 units, (Kent, Staff) by arrangement

245. Directed Clinical Experience in Physical Therapy II—Continuation of Directed Clinical Experience in Physical Therapy I. Prerequisites: 221, 226, 230, 244.

2-3 units, (Kent, Staff) by arrangement

247. Internship in Physical Therapy—Students are assigned to treatment facilities for full-time clinical experience. Prerequisites: 222, 227, 245, 250.

3-8 units, (Kent, Staff) by arrangement
248. Advanced Practicum—A practicum planned by the student, advisor and preceptor from an approved facility. Prerequisites: 247 and 2 quarters of advanced study.

2-3 units (Staff) by arrangement

250. Social and Psychological Aspects of Illness and Disability—Perspectives on illness and wellness behaviors from the health care consumers and providers viewpoints; effective patient-family therapists relationships; emphasis on awareness of total patient needs relative to specific physical disabilities and unique life styles.

5 units, Spr (Shepard)

255. Physiology of Exercise—Basic concepts of the function of the human body including bioenergetics, oxygen transport and utilization, exercise, cardiovascular disease, body composition, and environmental physiology as related to physical therapy.

3-4 units, Aut (Staff) by arrangement

257. Organizational Behavior and Physical Therapy—Major perspectives on organizational theory; macro and micro-level structure of health care organizational settings; interpersonal relations, leadership roles and group dynamics related to physical therapy practice within the health care system.

3-4 units, Win (Shepard) by arrangement

258. Special Topics—Current issues and problems related to developing physical therapy knowledge, techniques and practice.

2-5 units, (Staff) by arrangement

259. Organization and Delivery of Health Care—Basic concepts of organization and delivery of physical therapy in relation to total health care; includes budgeting, supervision, consultation, and regulation.

3-4 units, Spr (Blood) by arrangement

ADVANCED STUDY AREAS

Course 247 and all prerequisites or equivalent courses must be satisfactorily completed before enrollment in the Advanced Study component of the program.

Administration and Community Health—260, 261

Advanced Approaches to Neuromuscular Dysfunction—265, 266

Advanced Approaches to Musculoskeletal Dysfunction—270, 271

Academic and Clinical Education—275, 276

260. Administration and Community Health in Physical Therapy I—Program planning, budgeting, cost analysis, selected management techniques; systems for delivery of health care; community strategies; economic, sociocultural, legal, and political impacts on care. Includes projects and field work.

4-6 units, Aut (Blood) by arrangement

261. Administration and Community Health II—Continuation of 260.

4-6 units, Win (Blood) by arrangement

265. Advanced Approaches to Neuromuscular Dysfunction I—Normal processes of growth, development, and aging related to neurological dysfunction; includes the physiological and functional ramifications of pathology, patient evaluation, and analysis of treatment approaches.

4-6 units, Aut (Staff) by arrangement

266. Advanced Approaches to Neuromuscular Dysfunction II—Continuation of 265.

4-6 units, Win (Staff) by arrangement

270. Advanced Approaches to Musculoskeletal Dysfunction I—Advanced kinesiology and biomechanics; in depth study of selected evaluation and treatment procedures for patients with musculoskeletal dysfunction.

4-6 units (Hallum, Staff)

271. Advanced Approaches to Musculoskeletal Dysfunction II—Continuation of 270.

4-6 units (Jensen, Staff) by arrangement

275. Academic and Clinical Education I—Philosophical orientations to and alternative educational designs for professional health care curricula; unique problems of education within clinical settings; designing, implementing and evaluating lecture, seminar, laboratory and clinical coursework. Includes practicum experiences.

4-6 units, Aut (Shepard) by arrangement

276. Academic and Clinical Education II—Continuation of 275.

4-6 units, Win (Shepard) by arrangement

278. Directed Teaching—Practicum in teaching physical therapy in professional, academic, and clinical education programs and/or physical therapists assistant curricula.

1-4 units, Win, Spr (Shepard, Staff) by arrangement


1-5 units, any quarter (Staff) by arrangement

RESEARCH COURSES

Research requirements of the Division must be satisfied by completing the following:
Research Methodology — Overview of research includes critical evaluation of research literature, clinical and nonclinical research designs, proposal development, and writing for professional journals.

4 units, Aut (Shepard) by arrangement

Research.

1-8 units, any quarter (Staff) by arrangement

---

BIOCHEMISTRY

Chairman: Dale Kaiser


Associate Professors: Douglas Brutlag, James Rothman

OFFERINGS AND FACILITIES

The Department of Biochemistry is part of the Graduate Division of the University and a department of the Medical School. Departmental offices and laboratories are located in the Stanford Medical Center. Courses offered by the department may be taken by undergraduate, graduate, and medical school students. Postdoctoral fellows as well as house staff members are also welcome to attend. A basic series in biochemistry (200, 201) is taught by the entire staff as well as by a number of guest lecturers from the campus and from other institutions. Students who elect to enroll in either of the above courses should have a good background in general and organic chemistry, as well as in cell biology, equivalent to the core series offered by the Department of Biological Sciences. For those medical students who have taken biochemistry courses at other universities, the Biochemistry teaching staff presents a spring quarter course (202) which relates basic principles in biochemistry to problems in physiology and medicine.

Advanced courses in more specialized areas are offered as well, and they emphasize the most recent developments in biochemistry, cell biology, and molecular biology. These courses include the physical chemistry of proteins and nucleic acids, membrane biology and biochemistry, mechanisms and regulation of nucleic acid metabolism, the biochemistry of bacterial and animal viruses, the molecular basis of morphogenesis, and the structure and function of both eukaryotic and prokaryotic chromosomes. The Department of Biochemistry conducts a noon research seminar in the departmental library on Thursdays, and special seminars by guest investigators from other institutions are presented on Tuesdays.

Opportunities exist for directed reading and research in biochemistry and molecular biology, utilizing a small but excellent departmental library as well as the most advanced research facilities, including those for light and electron microscopy, chromatography and electrophoresis, enzyme purification and analysis, analytical and preparative ultracentrifugation, and amino acid and radioisotope analysis. Computer and text editing facilities are available. Laboratories are equipped for research with bacteria and bacteriophage, animal cells and their viruses, as well as with yeast and Drosophila.

GRADUATE PROGRAM

The Department of Biochemistry offers a Ph.D. program which begins in the fall quarter of each year. The program of study is designed to prepare men and women for productive careers in biochemistry; its emphasis is training in research, and each student works closely with members of the staff. In addition to the requirement for a Ph.D. dissertation based upon original research, students are required to enroll in six advanced courses in biochemistry and related areas, and at least three of these courses must be taken in the Department of Biochemistry. Selection of these courses is tailored to fit the background and interests of each student. A second requirement involves the submission of three research proposals, which are presented by the student to a small advisory committee of departmental faculty members, who are also responsible for monitoring the progress of the curricular and research programs for each student. All Ph.D. students are expected to participate actively in the department noon seminar program and are also given the opportunity to attend, as well as to present papers at regional and national meetings in biochemistry and molecular biology. Teaching experience is an integral part of the Ph.D. curriculum and is required for the degree. During each year of study, every student assists in teaching sections in the basic or advanced courses, and such activities involve at least one afternoon per week during each quarter, with assignments scheduled by both the appropriate course director and the students.

General University regulations concerning the Ph.D. degree are summarized in the “Degrees” section in this bulletin. The department offers neither master’s nor undergraduate degrees.

Men and women interested in pursuing a career in biochemical research and teaching are invited to apply directly to the Department of
Biochemistry for admission to the Ph.D. program. Those applying should have at least a baccalaureate degree, and should have completed work in cell and developmental biology, basic biochemistry and molecular biology, and genetics. Also required are at least one year of university physics, differential and integral calculus, as well as analytical, organic, inorganic, and physical chemistry. The department is especially interested in those applicants who have research experience in biology or chemistry. Students must complete a preliminary application form, submitting it to the department before December 1. Those students subsequently invited to submit a formal application must see to it that all materials pertinent to the formal application are received by the Department of Biochemistry before January 15. All applicants will be notified by April 15 of a decision on the application. Stanford University requires scores from the Graduate Record Examination (verbal, quantitative, and analytical) and in addition applicants must submit scores from the GRE Advanced Test in either Biology or Chemistry.

All applicants are urged to compete for non-Stanford fellowships or scholarships, and American citizens must complete application for a National Science Foundation Predoctoral Traineeship. Students are usually provided with financial support adequate to meet their normal expenses. In addition Stanford tuition costs will be paid by the department.

All applicants for admission to the Department of Biochemistry will be considered without regard to race, color, creed, religion, sex, age, national origin, or marital status.

Postdoctoral research training is available to graduates who hold a Ph.D. or an M.D. degree. Qualified individuals may write to individual faculty members for further information.

At present the primary research interests of the department are: proteins and nucleic acids, including their enzymatic synthesis, chemical structure, physical chemistry, and function; the biochemistry of bacterial and animal virus infection; structure and function of chromosomes; control and regulation of gene expression; the biochemistry and control of developmental processes; and the structure, function, and biosynthesis of cellular membranes and organelles.

COURSES

200. Biochemical Structure, Metabolism, and Energetics—The structure and function of biochemical molecules, enzyme kinetics and mechanisms, bioenergetics, pathways of intermediary metabolism and their control, and membrane structure and function. Alternative lectures dealing with special topics also presented. Prerequisites: organic chemistry, cell biology (equivalent to Biology 41).

5 units, Aut (Baldwin, Kaiser, Lehman, Rothman, Stark) MTWThF 11

201. Advanced Molecular Biology—Lectures providing the most recent information about rapidly developing frontiers in polynucleotide metabolism and its control, chromosome structure and function, transcription and translation, hormone action, and virus biochemistry, all with emphasis on the eukaryotes. Prerequisite: Biochemistry 200 and an understanding of basic molecular biology.

5 units, Win (Berg, Brutlag, Davis, Hogness, Lehman, Kornberg) MTWThF 11

202. Cellular and Molecular Basis of Disease —A continuation of the 200-201 series, or to be taken separately by those students who have completed a senior level course in biochemistry elsewhere. Designed to show how current biochemical concepts can be applied to problems in physiology and pathology. Consideration of a specific disease or disease process, along with a brief review of the relevant biochemistry, followed by a discussion of the molecular basis for the disorder.

3 units, Spr (Berg, Kaiser, Kornberg, Lehman, Stark and Staff)

204. DNA Repair, Recombination and Replication—Emphasis on enzymes and molecular mechanisms, and will consider how some physiological aspects of these DNA transactions may be explained at the molecular level. Prerequisites: Biochemistry 200, 201.

2 units, Win (Kornberg, Lehman) by arrangement

210. Advanced Topics in Membrane Biochemistry —Structure, function, and biosynthesis of cellular membranes and organelles. Based upon the current literature, with extensive student participation. Prerequisites: 200, 201 or equivalent, as well as permission of the instructors. Also listed as Biology 211.

4 units, Aut (Baldwin, Kaiser, Kornberg, Lehman, Rothman, Stark) MTWThF 11

217. Advanced Tutorial in Special Topics—Readings and tutorial in membrane biochemistry, enzyme mechanisms, chromosome structure, biochemical genetics, bacterial and animal viruses, and nucleic acid enzymology. Conducted under the guidance of advanced graduate students and post-doctoral fellows.

1-3 units, any quarter (Staff)

218. Chromosome Structure and Function—Correlation of chromosomal structure and gene expression. Topics include structure and topology of DNA in solution; DNA topoisomerases; histone-histone and histone-DNA
interaction; assembly, transcription and replication of chromatin; folding of mitotic chromosomes. Student participation includes critical evaluation of the literature. Prerequisites: biochemistry 200, 201, or its equivalent and consent of instructor.

3 units, Spr (Brutlag) MWF 10

221. The Teaching of Biochemistry—To be taken by all students as teaching assistants in Biochemistry 200, 201, or 217. Emphasizes practical experience in teaching on a one-to-one basis, as well as in problem set design and analysis. Familiarization with current lecture and text material is expected, along with evaluations of class papers and examinations. Prerequisites: enrollment in the Ph.D. program in the Department of Biochemistry.

3 units, Aut, Win, Spr (Staff) by arrangement

222. Research Techniques in Biochemistry and Molecular Biology—Lectures, demonstration, and laboratory practice, including growth of bacteria and viruses, and analysis of macromolecules using ultracentrifugation, restriction enzyme analysis, electrophoresis, autoradiography, and electron microscopy. Enrollment limited at present to students in the Biochemistry Ph.D. program and to those in the Stanford Medical Scientist Training Program.

5 units, Aut (Davis) by arrangement

299. Research.

1-15 units, any quarter (Staff)

by arrangement

GENETICS

Chairman: Stanley N. Cohen


Assistant Professors: Michele P. Calos, Laurence J. Korn

GRADUATE PROGRAMS

The Department of Genetics offers programs of study and advanced research training in genetics and related fields of molecular and cellular biology leading to the Ph.D. degree. In addition, a limited number of M.D. candidates can combine research training with their medical studies.

The training program is designed as preparation for a career in biomedical research and teaching. The program is intended to provide students with the conceptual and experimental tools that modern geneticists need to approach a variety of biomedical problems of fundamental or clinical importance.

Although the program provides formal course work as well as informal seminars and lectures, its emphasis is on laboratory research involving close interaction between each student and his or her faculty advisor. Principal subject areas for research training include molecular and cellular genetics, developmental genetics, biochemical genetics, population genetics, medical genetics, cytogenetics and immunogenetics. There are special opportunities for the application of advanced instrumentation and sophisticated computer capabilities to a number of problems, including cell detection and sorting, and aspects of human biochemical and population genetics. Interdisciplinary programs can be arranged with other departments in the Medical Center in such fields as clinical genetics, pharmacogenetics, prenatal diagnosis, development, immunology, and bioengineering (instrumentation).

When the interests of an incoming student are well defined at the time of admission, the student can be placed with a faculty preceptor soon after admission. Other students select their area of research specialization after they have explored the various research opportunities available in the department. The usual course of study for the Ph.D. involves four to five years of graduate work, concentrated mainly on dissertation research.

The department's facilities include modern, well-equipped laboratories. Extensive computer support, advanced instrumentation, and specialized facilities are available for research
projects. Collaborative ties with clinical departments facilitate research in clinically relevant areas of genetics.

Accepted students who are U.S. citizens may qualify for full-support stipends under an NIH-supported training grant. Stipends are also available through other sources. Applicants are strongly encouraged to apply independently for National Science Foundation and other fellowships.

For further information on the availability of the following courses, consult the quarterly Time Schedule, or inquire at the department office. Additional courses in genetics are included in the listings of the Department of Biological Sciences, the Program in Human Biology and the Department of Medical Microbiology.

For basic University requirements for the Ph.D. degree, see the "Degrees" section of this bulletin.

**COURSES**

**201. 202. Human Genetics**—Theoretical and experimental basis for modern genetics emphasizing human and medical examples. Lectures and reading in Mendelian genetics, population and quantitative genetics, molecular genetics, immunogenetics, somatic cell genetics, cytogenetics and genetic considerations in clinical medicine. Topics include human gene mapping using conventional and restriction site enzyme polymorphisms; genetics of antibody diversity and regulation; HLA in transplantation and disease; chromosome organization; mitochondrial genetics; relevant clinical case presentations. This course is intended for both medical students and graduate students.

201. 3 units, Aut (Calos, Cann, Cavalli-Sforza, Cohen, Ganesan, Herzenberg, Korn) TTh 9  
202. 4 units, Win (Calos, Cann, Cavalli-Sforza, Cohen, Ganesan Herzenberg, Korn) MWF 9

**249. Cytogenetics**—Principles and modern biochemical methods of chromosome analysis. General structure, replication and structural changes in chromosomes. Influence of these changes in development and evolution—Gene transfer and genetic recombination—Biochemical basis of inherited diseases—Other current topics of genetic research. The course is intended for graduate students, medical students and advanced undergraduates with good knowledge of biochemistry, biology and basic genetics.

3 units, Aut (Ganesan) MWF 2  
given in 1984-85

**HEALTH SERVICES RESEARCH**

**MASTER OF SCIENCE PROGRAM IN THE DEPARTMENT OF FAMILY, COMMUNITY AND PREVENTIVE MEDICINE**

Director: John P. Bunker  
Associate Director: Diana B. Dutton  
Professors: John P. Bunker, Victor R. Fuchs  
By Courtesy: Alain C. Enthoven, Richard W. Scott  
Assistant Professor: Diana B. Dutton  
Clinical Associate Professor: Sheldon S. King  
Clinical Assistant Professor: Roland S. Merchant, Sr.

The Division offers courses for medical and other graduate students in masters and doctoral programs as well as for advanced undergraduates; programs of study and research training leading to a Masters of Science degree in Health Services Research; and doctoral and postdoctoral research opportunities and training.

The master's degree program in Health Services Research (M.S. in HSR) is designed to complement training in the medical and social sciences in preparation for careers in health services or health policy; for example, careers in medicine and nursing, in which responsibilities in administration and health policy are anticipated, and careers in health policy analysis in government, consulting firms, health planning agencies, education, business, or the law. The program provides specialized training in selected areas of health care policy and other health-related topics, in research methodology, and in the application of these skills to a specific research problem. Coursework requirements, based on an individually-designed multidisciplinary curriculum, allow students to design a program of study suited to their individual backgrounds and interests.

Applications will be considered from persons in the following categories:
1. Medical students interested in problems of health care delivery and policy who seek additional training in the applied social sciences. Medical students who intend to pursue careers involving administration may wish to consider coursework in the Graduate School of Business.

2. Graduate students in the other academic disciplines, such as communication, sociology, political science, economics, education, engineering, and business, who want additional expertise in the application of social science research methods to issues in health care.

3. Physicians, nurses, or other professionals in health-related fields who have completed an advanced degree and wish to acquire additional training in health services research.

4. College graduates who have completed a relevant undergraduate degree and who have demonstrated interest in health policy or health services research.

5. Stanford undergraduates majoring in a relevant discipline (e.g., human biology, sociology, economics), who can arrange to fulfill the requirements for the M.S. in HSR coterminous with receipt of the undergraduate degree.

Application for admission should be made to the Office of Graduate Studies prior to March 15 for enrollment the following fall. To apply, students must complete an HSR application, which includes: scores from the Graduate Record Examination, the English Proficiency Exam (if applicable), undergraduate (and, if applicable, graduate) academic transcript, two letters of recommendation, and a tentative outline of the proposed program of study and research to fulfill the M.S. in HSR requirements. If possible, an appropriate faculty advisor should be identified prior to admission, based on the student's area of interest.

Applications will be reviewed and candidates selected for interviews by May 1. At least two interviews are strongly recommended: one should be with an assigned HSR faculty member; the other may be arranged by the student, if desired, and might appropriately be the student's intended faculty advisor.

A limited number of students will be admitted each year. In addition to general academic standards, priority will be given to students with training or work experience related to health care. Students will be notified of admission decisions by June 15.

In order to receive the Masters of Science degree in Health Services Research, students are expected to demonstrate competence in three broad areas, participate in a core seminar, and complete a university thesis. A total of 45 units is required to complete the program, approximately half in coursework and half in research (and not less than 15 units in each). Normally, this requires three quarters of work, but it can be spread over a longer period of time if the student is working concurrently toward another graduate degree. Of the 45 units, 36 must be counted only toward the HSR degree. The remaining 9 units may be double-counted to meet other degree requirements.

For additional information, address inquiries to the Program Administrator, Division of Health Services Research, Department of Family, Community and Preventive Medicine, School of Medicine, Stanford University, Stanford, California 94305.

**COURSES**

The following are selected courses offered through the Division of Health Services Research. Information on additional courses can be obtained by contacting the Program Administrator.

222. Social Controversy and Policy Analysis in Medicine — (Same as Human Biology 40.) The goals of this course are to understand the role and limits of health care and prevention in achieving and maintaining health; to develop a working knowledge of the organization, financing, and regulation of health care in the United States; to learn to plan and carry out analyses of problems in health policy, and to be able to assess the validity of analyses carried out by others; to understand the logical basis for clinical decision-making, especially clinical decision-making under uncertainty and the resulting implications for policy.

4 units, Spr (Bunker, Staff)

250. Social Issues in Health Care—(Same as Sociology 111.) Provides an overview of major social issues and policy problems in health care and their practical application to the present and future roles of physicians. Sociological perspectives and research findings are contrasted with other approaches; discussions stress critical evaluation of alternative viewpoints and evidence. Areas covered include social factors influencing illness and use of health services, patient-provider relationships, education and professionalization of physicians and other providers, incentive structures in various health institutions, the drug industry, and alternatives to health care reform strategies.

5 units, Win (Dutton)

251. Controversies in Current Medical Practice—This seminar-format course will devote two or three sessions to each of a few controversial areas of medical practice, reviewing existing literature and examining relevant scien-
Analytic tools of epidemiology and biostatistics will be applied. Open to undergraduates with permission of instructor.

1 unit, Aut, Win (Bunker, Marton) F 12-1

254. Seminar in Social Issues in Health Care—(Same as Sociology 211.)—Analyzes selected social and policy issues in health and medical care, focusing on current areas of concern. Topics vary from year to year, but include such issues as alternative approaches to health care reform, and the growing connection between industry and academic science. Readings include relevant theoretical issues as well as empirical evidence. Discussions reflect the sociological perspective but stress critical evaluation of multiple viewpoints, methodologies, and evidence. A major research paper is required. Prerequisites: Sociology 111 or similar background. Open to undergraduates with permission of instructor.

4-5 units, Win (Dutton) alternate years, given 1984-85

256. Economics of Health and Medical Care—(Same as Economics 156/256.) Description of problems and institutions, review of analytical studies, and discussion of policy issues. Topics covered include mortality and morbidity, physicians and other personnel, hospitals, the drug industry, national health insurance and health maintenance organizations. Open to graduate students, undergraduate economic majors (seniors and juniors), or by permission of instructor. (Graduate Students enroll in 256.) Prerequisite: Preparation in micro theory and some statistics desirable. Prerequisite: 51 plus some background in math or statistics.

5 units, Spr (Fuchs)

279. Management of Hospitals and Other Health Care Institutions—Covers various administrative aspects of health care institutions. Among those discussed are: organizational elements of hospitals, administration, financial issues and problems, hospital departmental relationships, quality of patient care, principal external pressures (both governmental and non-governmental), consumerism, and community influence.

3 units, Win (King, Merchant) Th 3:15-6:05

391. Political Economy of Health Care—(Same as Business 391.) The purposes of this course include informing students about the financial and public policy context in which the health care system operates, and about the issues in public policy in controlling one of the largest and fastest growing items of public expenditure. The course examines the main issues relating to financing and organization for delivery of health care in the United States, how various existing and proposed financing and organizational arrangements affect the allocation of resources, fee-for-service practice and health maintenance organizations, hospital investment decisions and regional planning, health care costs and national health insurance.

4 units, Aut (Enthoven) MF 8-10

394. Cost-Benefit Analysis in Health Care—(Same as Business 392.) How do you do cost-benefit analysis when the “output” is difficult or impossible to measure? The course will begin with study and discussion of the main literature on the principles of cost-benefit analysis applied to health care. It will then focus on a critical review of a number of actual studies. The emphasis will be on insights into the art of practical application. Prerequisites: Business 200, Micro Economics. Business 309, Public Sector Economics is recommended.

4 units, Spr (Enthoven) MF 8-10

PROGRAM IN HEARING AND SPEECH SCIENCES

Emeriti: Virgil A. Anderson, Jon Eisenson (Professors)
Director: Earl D. Schubert
Professor: Earl D. Schubert
Associate Professors: James H. Dewson III (on leave 1983-84), Dorothy A. Huntington
Cooperating in the offerings of the Program is: Clara N. Bush, Professor of Linguistics

OFFERINGS AND FACILITIES

The aims of the Program are two-fold: (a) to make available to doctoral and postdoctoral students the material essential to a complete understanding of behavioral and physiological aspects of normal and defective processes of human communication; and (b) to provide, at the undergraduate level, a systematic understanding of these processes as a complement to formal study in such disciplines as psychology, biology, linguistics, music, etc. Students may be preparing for careers in university teaching or research, or they may have primary interest in another discipline, e.g., medicine, with a desire for specialized study in some area of human communication.

The available facilities include laboratories for basic and applied research into every major aspect of the hearing and speech sciences. A direct relation with the Division of Otolaryngology of the Stanford Medical School makes it possible to offer excellent opportunities for
training and research in selected clinical aspects of communication disorders. Strong working relationships with other departments of the University, both within the School of Medicine and elsewhere, provide further for a well-balanced undergraduate and postgraduate academic environment.

GRADUATE PROGRAMS

Each student’s doctoral program is planned individually with the needs and interests of the candidate in mind. Candidates may include a formal minor as part of their program. The minor is chosen in consultation with the candidate’s major advisor, but the content and details of the minor program are specified and administered by the department in which the minor is taken. The student will take a qualifying examination prior to admission to the University oral examination. The University oral examination will be focused on the dissertation. The general University requirements for the doctorate are followed as they apply to residence, application for candidacy, etc. (See the “Degrees” section in this bulletin.)

For further information write to the Director.

COURSES

200. Individual Study—Study under direction in fields or subjects of special interest. Prerequisite: consent of instructor.

1-3 units, any quarter (Staff)
by arrangement

212. Phonetic Theory—Consideration of the fundamental assumptions implicit in phonetic descriptions and of the evidence available for assessing their validity; the concept of universal phonetics; the relative roles of articulatory, acoustic, and auditory parameters. Consent of instructor.

3-4 units, Win (Bush) by arrangement alternate years, given 1984-85

220. Instrumental Phonetics—(Same as Linguistics 227.) Techniques of instrumental research in speech perception and production. Theory and instrumentation for analysis and manipulation of speech signals. Laboratory course. Given any quarter. Prerequisite: consent of instructor.

2-4 units, (Huntington)
any quarter, by arrangement

230. Physiology of Speech Production—(Same as Linguistics 121.) Study of the structure of the speech mechanism and its function. Includes laryngeal control in the production of segmented and prosodic features of speech as well as articulatory coordinations and control. Prerequisite: course in phonetics or consent of instructor.

4 units, Win (Huntington) by arrangement

231. Speech Perception—(Same as Linguistics 122.) Perceptual and physiological correlates of the acoustic constituents of speech. Prerequisite: course in phonetics, course 230 or consent of instructor.

3 units, Spr (Huntington) by arrangement


2-3 units, any quarter (Schubert)
by arrangement

292. The Auditory Process—(Same as Psychology 231.) A systematic survey of our current knowledge of the operation of the auditory system. Emphasis is placed on acquiring a knowledge of the acoustic signal, and on an understanding of the methods of measuring a sensory process.

3 units, Aut (Schubert) by arrangement

300. Independent Study—Advanced individual study under direction in fields or subjects of special interest. Maximum 12 units in any one quarter.
any quarter, (Staff) by arrangement

301. Research—Individual research projects under direction. Maximum 12 units in any one quarter.
any quarter, (Staff) by arrangement

308. Special Topics in Speech Science.

3-4 units, Spr (Huntington, Bush)
by arrangement

310. Experimental Phonetics—In-depth coverage of the motor, acoustic, and perceptual correlates of speech. Material will vary, hence may be repeated any quarter for credit. Prerequisite: consent of instructor.

4 units, any quarter (Huntington)
by arrangement

392. Selected Topics in Psychoacoustics—(Same as Psychology 232.) A detailed study of the normal auditory mechanism with particular emphasis on the use of psychoacoustic methods of analysis. Evaluation of current theories regarding auditory processing of information.

3-4 units (Schubert) any quarter
by arrangement

393. Peripheral Auditory Mechanisms—(Same as Psychology 233.) Study of the mechanics and electrophysiology of the middle and inner ear. Analysis of the ear as a transducer and of the neural encoding process.

3 units, Spr (Schubert) by arrangement

394. Central Auditory Mechanisms—Anatomy and electrophysiology of auditory nervous
system. Emphasis will be placed on a review of correlates to perceptual phenomena.

3 units, any quarter (Staff)
by arrangement

400. Doctoral Research.
1-15 units, any quarter (Staff)
by arrangement

MEDICAL MICROBIOLOGY

Emeriti: Sidney Raffel, Carlton E. Schwerdt (Professors), Monroe D. Eaton (Adjunct Professor)
Chairman: Stanley Falkow
Professors: Stanley Falkow, Hugh O. McDevitt, Leon T. Rosenberg, Bruce A. D. Stocker
Associate Professor: Robert J. Roantree
Assistant Professors: John C. Boothroyd, Mark M. Davis, Abdul Matin, Edward S. Mocarski, Gary K. Schoolnik
Professor (Research): Esther M. Lederberg
Professor (Teaching): John P. Steward

OFFERINGS AND FACILITIES

The department of Medical Microbiology offers programs leading to degrees of Bachelor of Science, Master of Science (in exceptional circumstances only), and Ph.D. In addition, research experience is offered to medical students in the course of an M.D. program and to postdoctoral trainees. The current research interests of the department include microbial genetics and molecular biology as related to the pathogenetic process; microbial physiology with special emphasis on energetics and regulation; molecular and genetic studies of the immune response; structure and function of animal viruses, and molecular biology of parasites.

UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE

Requirements include: Biological Sciences, 15 quarter units; Chemistry, 20 quarter units (Chemistry 31, 33, 35, 36, 131, 135 or equivalent); Physics, 12 quarter units. Specific course requirements are the following: Medical Microbiology 101, 102, 203, 204, and 206; Biochemistry 200.

Students in this program can arrange to take units in research (see 199—Undergraduate Research). Under exceptional circumstances, a student may be awarded a degree “with Departmental Honors” for excellence in research.

GRADUATE PROGRAM

MASTER OF SCIENCE

The department does not offer a regular Master of Science program, but the degree is awarded under special circumstances. Students for master’s degree will be expected to have completed the preliminary requirements listed above for the B.S. degree, or their equivalent. In addition, the candidate is expected to complete 45 quarter units of work related to microbiology; at least 25 of these units should concern research devoted to a thesis. The thesis must be approved by at least two members of the department faculty. There will also be an oral examination, which may cover the general fields of the department’s offerings.

DOCTOR OF PHILOSOPHY

Application, Admission, and Financial Aid—Prospective Ph.D. candidates should possess a bachelor’s degree with background in biology or chemistry and preferably also in biochemistry. Formal application should be made through the Graduate Admissions Office, which will submit completed applications to the department. Deadline for receipt of applications with all supporting materials is January 15.

An applicant must file a report of scores on the aptitude tests and the advanced test (normally in biology, but where appropriate in some other subject, e.g., chemistry) of the Graduate Record Examination. It is strongly recommended that the GRE be taken in October so that scores will be available when applications are evaluated.

It should be noted that in recent years, owing to large numbers of well-qualified applicants, only a small proportion of applicants have been accepted. The department is able to provide support for a limited number of new predoctoral candidates through traineeships (restricted to citizens of the United States, or those with permanent residence visas) and teaching and research assistantships, without citizenship requirements. It is current policy not to offer financial support from University-derived funds beyond the third year of graduate study. Qualified applicants are urged to take the initiative in applying for predoctoral national fellowships in open competition, especially those from the National Science Foundation, and to consult Financial Aid Officers at their institutions for information and applications.
Preparation for Graduate Study—A candidate for the degree of Doctor of Philosophy must meet the preliminary requirements (or equivalent) listed for the bachelor's degree and will follow a program designed for the candidate's interests, subject to general University regulations covering this degree.

The student is expected to achieve a "B" or better grade average in those departmental courses listed as required for the Bachelor of Science degree as well as Biochemistry 200 and 201, Computer Science 105 or 106, and Statistics 60 or 70. Formal departmental courses are to be graded by letter, not Pass/No Credit. Grading of research and reading courses is optional for the faculty member concerned.

In addition, other departments in the University offer courses of great interest on various aspects of microbiology. These departments include: Biochemistry; Biological Sciences; Chemistry; Genetics; Pathology; Structural Biology; and Family, Community and Preventive Medicine. The student should consult this bulletin for their course offerings and descriptions and confer with advisors and fellow students as to which most suit his or her interests.

Teaching experience and training are part of the graduate curriculum. During their career in graduate study, students will be expected to serve as teaching assistants in at least one but no more than three departmental courses.

The student is expected to pass a written examination by the sixth quarter of graduate study. This examination will cover the basic principles of microbiology and immunology. By the eighth quarter of residence, each graduate student is expected to present and orally defend a research proposal that will form the basis for the Ph.D. thesis. Students entering the department with advanced standing from other institutions are expected to satisfy the graduate faculty with advanced standing from other institutions.

Courses

101. General Microbiology—A lecture and laboratory course providing an introduction to the biology of bacteria, bacteriophages, and animal viruses. Coverage will include bacterial anatomy, genetics, and physiology, as well as antibiotic action, immunology, and host-parasite relationships. Prerequisites: Chemistry 31, 33, and 35; Biological Sciences 41 recommended.

5 units, Aut (Roantree) MWF 1:15
lab MWF 2:15-4:05

102. Principles of Immunology — This is an introductory course in which the basic facts of immune responses in vertebrates are covered. Immune-like reactions in nonvertebrate animals, as well as in plants and bacteria, are briefly covered as well.

3 units, Aut (Rosenberg) TTh 1:15

198. Directed Reading—Prerequisites: Consent of instructor.

15 units maximum, any quarter (Staff) by arrangement

199. Undergraduate Research—Individual study or research in microbiology by arrangement with a faculty member. Possible fields of study include: general bacteriology, bacterial physiology and ecology, bacterial genetics, microbial pathogenicity, immunology, virology, viral oncology, and molecular parasitology. (Appropriate backgrounds for these various areas are required; to be discussed with the faculty member concerned.)

1-15 units, any quarter (Staff) by arrangement

200. Immunology—(Same as Pathology 220.) Immunology as related to medicine is emphasized. Designed principally for medical, graduate, and advanced undergraduate students. Basic principles of genetics and introductory courses in biochemistry and histology essential.

3 units, tutorials offered for additional unit Spr (McDevitt, Rosenberg, Weissman) MWF 9

200A. Problem Solving in Immunology—(Same as Pathology 220A.) This is designed to provide direct experience in understanding immunology using problems. Each week 3-5 problems are handed out to be corrected and discussed. Prerequisite: Simultaneous enrollment in Immunology (Med Micro 200).

1 unit, Spr (Weissman, Rosenberg, McDevitt) Fleischmann Labs by arrangement

202. Medical Microbiology—A course of lectures and laboratory demonstrations covering the fundamentals of pathogenic microbiology, with particular reference to bacteria and viruses. The course includes a discussion of some aspects of immunology, of laboratory diagnosis, and of preventive measures. Limited to medical students and those graduate students who have the consent of the instructor.

5 units, Spr (Falkow) MWF 2:15-4:05

203. Bacterial Physiology and Ecology—For graduate and advanced undergraduate students. Bacterial nutrition and growth kinetics; bacterial phenotype during nutrient-limited growth; structure and function; terminal energy-yielding pathways (aerobic and anaerobic respiratory chains, proton translocation,
oxidative phosphorylation, nutrient transport); and special bacterial groups or processes. Prerequisites: Biological Sciences 40 and 41.

3 units, Win (Matin) MWF 1:15

204. Bacterial Genetics—A course of lectures (optional minilab may be available) on inheritance in bacteria. Prerequisites: Biological Sciences 41 and Med. Micro. 101 (or equivalents); consent of instructor for minilab.

3-4 units, Win (Stocker) MWF 9, lab MWF 2:15, or by arrangement

206. Animal Viruses—For graduate and advanced undergraduate students. Lectures will cover the molecular biology of virus replication with emphasis on the host-virus interaction. Prerequisites: Med. Micro. 101 or 202, Biochemistry 201, or consent of instructor. Suggested: Biological Sciences 213.

3 units, Spr (Mocarski) MWF 10

207. Pathogenesis of Infectious Diseases—The major emphasis of this course is to provide a better understanding of the molecular mechanisms employed by microorganisms to bring about the infection of animal and human hosts. In addition to formal instruction, there will be class discussion of recent literature pertaining to microbial pathogenicity, as well as normal and acquired host surface mechanisms.

2 units, Win (Falkow) W 3:15-5:05

209. Molecular Parasitology—An advanced seminar course dealing with the molecular biology of parasites, with particular reference to the protozoa. Topics will include antigenic variation, molecular cloning of protective antigens, gene amplification, kinetoplast DNA and host-parasite interactions. (A background in parasitology is recommended, e.g., Family, Community and Preventive Medicine 204.)

2 units, Spr (Boothroyd) T 3:15-5:05

210. Advanced Medical Bacteriology—This course will integrate the clinical features of selected infectious diseases, laboratory procedures used to identify the responsible pathogen, and the molecular basis of pathogenicity. Minimum enrollment of six students. Prerequisite: consent of instructors.

2 units, Win, Spr, (Falkow, Schoolnik, Uyeda) Th 2:15-4:05

270. Seminar—Reports, discussions on selected topics by departmental and outside speakers. Required of all graduate students.

1 unit, Aut, Win, Spr (Staff) Th 9

399. Graduate Research—Students who have satisfactorily completed necessary foundation courses may elect research work in: general bacteriology, bacterial physiology and ecology, bacterial genetics, microbial pathogenicity, immunology, and virology.

15 units maximum, any quarter (Staff) by arrangement

NEUROBIOLOGY

Chairman: Eric M. Shooter
Professors: Denis A. Baylor, Uel J. McMahan, John G. Nicholls, Eric M. Shooter
Assistant Professors: Eric I. Knudsen, Carla J. Shatz, Bruce G. Wallace

GRADUATE PROGRAMS

Graduate students in the department obtain the degree of Doctor of Philosophy through the interdepartmental Neurosciences Ph.D. Program. Remission of fees and a personal stipend are available to those students accepted. Application should be made through the Graduate Admissions Office which will submit completed applications to the department. Applicants are encouraged to familiarize themselves with the research interests of the faculty and, if possible, to indicate their preference on the application form. Medical students are also encouraged to enroll in the Ph.D. Program. The requirements of the Ph.D. program will be fitted to the individual interests and time schedules of the student. Postdoctoral training is available to graduates holding Ph.D. or M.D. degrees and further information should be sought directly from the faculty member concerned.

Research interests of the department include mechanisms of visual transduction and information transmission in vertebrate retina, structure, function and development of auditory and visual systems, integrative mechanisms and regeneration in the central and peripheral nervous system, the biochemistry of neurotransmitters and neuronal growth and differentiation.

COURSES

The Neurobiology Department offers a one quarter course on the structure and function of the nervous system open to medical students, qualified students and advanced undergraduates. Advanced courses given by the department are open to students who have completed the basic course.

200. The Nervous System—An introduction to structure and function of the nervous system, including neurophysiology, neurochemistry and neuroanatomy. Topics range from the properties of neurons to the mechanisms and organization underlying higher functions. The course is designed to present a coherent framework as a
clinical medicine in general, as well as for more advanced work in neurobiology. In addition to the lectures and neuroanatomy laboratories, there will be frequent, informal seminars with students in small groups, and demonstrations. There is an integrated course in which the neuroanatomy and neurobiology components must be taken together. Final exam will be given. No limitation. No prerequisites.

9 units, Aut (Baylor, Knudsen, Nicholls, McMahan, Shatz, Shooter and Wallace) M 9-12; W 9-10; F 9-12 lab W 10-12

213. Functional Organization of the Central Nervous System—An advanced seminar and reading course which will examine the way in which the vertebrate brain processes and codes information, and the role of the experience in establishing neural connections. Attention will be focused on the visual, auditory and somatosensory systems. Emphasis will be placed on the study of original papers and on student presentations. Prerequisites: Neurobiology 200 or the equivalent.

3 units, Win (Knudsen, Shatz) given 1983-84

222. Cellular Electrobiology: Control Function by Membrane Voltage—Designed to provide an in-depth exposure to contemporary ideas in cellular electrophysiology. Involves lectures, student presentations of recent research papers and laboratory work. Voltage-control of function in nerve and muscle cells channel currents. Use of membrane voltage by other cell types and processes surveyed. Final three-four weeks of the course devoted to laboratory work on one or two marine invertebrate preparations in which electricity plays an "unconventional", perhaps little understood, but biologically important role.

5 units, Win (Gilly) given 1983-84

270. Neurobiology Seminar—Prerequisite: consent of instructor. any quarter (Staff) by arrangement

199. Directed Reading (Undergraduate)—Prerequisite: consent of instructor. any quarter (Staff) by arrangement

299. Directed Reading—Prerequisite: consent of instructor. any quarter (Staff) by arrangement

399. Individual Research—Prerequisite: consent of instructor. any quarter (staff) by arrangement

NEUROSCIENCES PROGRAM

For information, see listing under Dean of Graduate Studies and Research section of this bulletin.

PATHOLOGY

Emeriti: Bruno Gerstl, David Glick, Leland J. Rather (Professors)
Chairman: David Korn
Professors: Klaus G. Bensch, David A. Clayton, Ronald F. Dorfman, Richard L. Kempson, David Korn, Irving L. Weissman
Associate Professors: Margaret E. Billingham, Charles B. Carrington, Luis F. Fajardo, Errol C. Friedberg, F. Carl Grumet, Donald A. Kristt, Howard H. Sussman, Roger A. Warnke
Assistant Professors: Eugene C. Butcher, Thomas V. Colby, Edgar G. Engleman, Michael R. Hendrickson, Lorin K. Johnson, Steven C. Quay, Robert V. Rouse, Jeffrey L. Sklar, Roger A. Warnke
Professors (Research): Lawrence F. Eng
Professors (Clinical): Lysia K. Forno (Neuropathology), Jon C. Kosek
Associate Professor (Clinical): Michael R. Hendrickson
Lecturers: Glen B. Haydon, Paul L. Herrmann, William Salyer
Acting Assistant Professor: Jon C. Ross
Visiting Professor Emeritus: Henery Urich
Clinical Professor Emeritus: Donald L. Alcott
Clinical Associate Professors: Robert W. R. Archibald, Stephen S. Chen, John T. Differding, Seth L. Haber, A. Paul Miller, Mahendra Ranchod
Clinical Assistant Professor: Robert M. Cardelli, P. Joanne Cornbleet
Clinical Instructor: Steven K. H. Fong
Senior Research Associate: Teresa S-F Wang
Research Associates: Richard Dixon, Virginia Scofield

PROGRAMS OF STUDY

The Department of Pathology offers a sequence of basic courses in general pathology and special pathology including neuropathology, which are open to medical students and to qualified graduate students. In addition there are a number of advanced courses in selected aspects of pathology and four major clerkships which afford interested students the opportunity for full-time, intensive participation in diagnostic medical, surgical, and neuropathology. The department does not offer advanced degrees in pathology, but qualified graduate students who are admitted to the Biophysics Program or the Cancer Biology Program may elect to pursue their thesis requirements in the re-
search laboratories of the Pathology Department. The discipline of pathology has traditionally served as a bridge between the preclinical and clinical sciences, and is concerned with the application of advances in the basic biological sciences both to the diagnosis of disease in man and to the elucidation of the mechanisms of abnormal molecular, cellular, and organ structure and function that manifest themselves in clinical disease. Accordingly, the research interests of the department encompass a broad range that extends from fundamental molecular biology to clinical-pathological correlations. A primary emphasis of the departmental research program is in experimental oncology.

At the present time, the major areas of investigation in the department include DNA replication and repair in prokaryotes and in cultured eukaryotic cells, genomic derepression in human neoplasms, molecular cytogenetics, structure of the mitotic spindle, ultrastructural and cytochemical studies of human tumors adapted to tissue culture, purification and characterization of marker proteins and lipids that are unique to the central nervous system, developmental and cellular immunology, tumor immunology, viral leukemogenesis, and a variety of clinical-pathological studies with particular emphasis on disease of the cardiovascular and lymphoreticular systems. Research training in all of these areas is available at the present time for qualified medical and graduate students by individual arrangement with the appropriate faculty member.

**COURSES**

205. Clinical-Pathological Correlations—Correlation of clinical histories with surgical and autopsy material, including microscopy.
2 units, Win (Kosek, Fajardo, Forno, Quay, Chen, Rouse, Egbert)
MF 3:15-5:05, VAH
minimum 5 students

1 unit, Aut, Win, Spr (Haydon) by arrangement

208. Interpretation of Electron Micrographs.
1 unit, Spr (Haydon) by arrangement

213. Gross Autopsy Pathology Laboratory—Students examine and discuss unfixed dissected organs from current autopsies and correlate the autopsy findings with a brief history. Prerequisites: Currently taking or previously completed Pathology B, C, or D.
1 unit, Aut, Win (Carrington, Sklar, Bensch), M 1:15-3, F 1:15-3

220. Immunology—(Same as Medical Microbiology 200.) Immunology as related to medicine is emphasized. Designed principally for medical, graduate, and advanced undergraduate students. Prerequisites: Basic principles of Genetics and introductory courses in Biochemistry (equivalent to Biochemistry 200-201) and Histology essential.
3 units, (tutorials offered for additional unit), Spr (Weissman, Rosenberg, McDevitt) MWF 9

220A. Problem Solving in Immunology—(Same as Medical Microbiology 200A). This is designed to provide direct experience in understanding immunology using problems. Each week 3-5 problems are handed out to be corrected and discussed. Prerequisite: Simultaneous enrollment in Medical Microbiology 200 (Pathology 220).
1 unit, Spr (Weissman, Rosenberg, McDevitt) W 5:15-6:15, Fleischmann Labs.

230A,B,C,D.* General and Special Pathology—A four quarter course providing an introduction to general principles of pathology (230A) followed by lectures and laboratories considering the pathology of human disease based upon disordered structure and function of individual organ systems including the nervous system (230B,C,D).

230C*. 4 units, Aut (1983) (Bensch, Carrington, Friedberg, Kempson, Kristt, Staff)

230D*. 4 units, Win (1984) (Bensch, Carrington, Friedberg, Kempson, Kristt, Staff)

230A*. 4 units, Spr (1984) (Bensch, Carrington, Friedberg, Kempson, Kristt, Staff)

230B*. 4 units, Spr (1984) (Bensch, Carrington, Friedberg, Kempson, Kristt, Staff)

271. Immunology/Viral Oncology Literature Reviews—Weekly literature reviews requiring student presentation of 1-3 papers per meeting in detail. Each student will present 1-3 times per year. This course is designed for students working in immunology or virology laboratories. See also Interdepartmental listings for Medical Scientist Training Program Seminars.
2 units, any quarter (Weissman, Butcher) M 8-10 p.m.

281. Practical Introduction to Electron Microscopic Techniques—Laboratory course providing basic familiarity with the major technical problems encountered in the preparation of biological material for electron microscopy through tutorial direction in the completion of two projects. Prerequisite: A basic understanding of electron microscopy.
1 to 4 units, Aut, Win, Spr (Haydon) by arrangement
290. Research in Experimental Neuropathology — Introduction to research methods in experimental neuropathology for students interested in a long-term project in this area. Work consists of participation in neuropathology research under the close supervision of a staff member in neuropathology. Facilities available include electron microscopy, tissue and organ culture, and neurochemistry. Prerequisite: Consent of instructor.

1 to 15 units, Spr (Kristt, Eng, Forno)

292. DNA Repair and Mutagenesis—(Same as Biological Sciences 205, Radiology 205.) Interactions of mutagens and carcinogens with DNA. Response of living systems to damaged genetic material, including molecular mechanisms for DNA repair. Enzymology of DNA modification and repair. Inducible repair responses and "error-prone" mechanisms. Human hereditary deficiencies in DNA repair. Relationships of DNA repair and mutagenesis to carcinogenesis. Prerequisites: Biological Sciences 21 and/or current consent of instructor.

3 units, Spr (Hanawalt, Friedberg, K. Smith) alternate years, given 1983-84

299. Directed Reading — Prerequisite: consent of faculty member

1 to 15 units, any quarter (Korn, Staff) by arrangement

399. Research—The faculty of the Pathology Department are involved in active research programs, both at the Stanford Medical Center and at the Palo Alto V.A. Medical Center. Students interested in research at the molecular, cellular and clinical-pathologic levels are encouraged to seek out faculty advisors. The department is fully equipped for all modern research and maintains an active and vigorous postdoctoral research training program. Prerequisites: consent of the instructor.

1 to 15 units, any quarter (Korn, Staff) by arrangement

PHARMACOLOGY

Emeritus: Robert H. Dreisbach (Professor)
Chairman: Tag E. Mansour
Professors: Avram Goldstein, Dora B. Goldstein, Sumner M. Kalman, Tag E. Mansour.
By courtesy: Leo Hollister, Kenneth Memon, Ferid Murad
Associate Professors: Gordon Ringold, James P. Whitlock, Jr., Terrence Blaschke (Jointly with Medicine)
Assistant Professors: Helen M. Blau, Howard Schulman.
By courtesy: Brian Hoffman, Richard D. Mamlok
Consulting Professors: Ralph I. Dorfman, Alejandro Zaffaroni

PROGRAMS OF STUDY

The department presents two basic courses in contemporary pharmacology (201 and 202) and advanced courses open to qualified medical and other graduate students.

A program of study and research training is offered leading to the Ph.D. degree. Postdoctoral research training is available to graduates having the Ph.D. or M.D. degree. Research opportunities also exist for medical students, graduate students, and a limited number of undergraduate students during the summer.

The Ph.D. program is designed for students with a background in biology, chemistry, physics, or mathematics who wish to pursue a career of research in a field that lies between biology and medicine. Modern pharmacology is concerned with understanding the mechanisms of drug action at the cellular and molecular levels, and utilizing this knowledge for the rational development of new drugs, and their proper use in man.

Research in molecular pharmacology seeks to extend our knowledge of the interactions of chemical agents with biological systems at the molecular level in order to shed more light on the precise mechanisms whereby drugs exert their specific effects. The major fields of research interest in the department are molecular pharmacology, biochemical pharmacology, cellular regulatory mechanisms in carbohydrate metabolism that may be amenable to pharmacologic manipulations, biotransformation of xenobiotics, molecular biology of differentiation and development particularly as it relates to chemical teratogenesis, molecular mechanism of steroid hormone action, biochemical basis for control of synaptic functions, drug metabolism and toxicology, and biochemical mechanisms associated with drug addiction and tolerance.
Students desiring to become candidates for advanced degrees should consult the general University regulations regarding such degrees, as summarized in the "Degrees" section in this bulletin. Further information can be obtained from the department. Consult the Time Schedule for additional advanced courses.

**BASIC COURSES**

Pharmacology 201 and its continuation course, Pharmacology 202 will provide the medical and graduate student with a broad exposure to the principles of pharmacology and the properties of the major drug groups relevant to the proper use of drugs in man. Students may elect a program within this context that best meets their individual needs. Students are expected to have had Biochemistry and Physiology before taking this sequence. Many medical students, however, will choose to take the entire sequence in their second year.

**201. Pharmacology**—A lecture course on the principles of pharmacology and the major drug groups used in medicine. Major topics include the drug-receptor interaction, kinetic aspects of drug absorption, distribution and elimination, drug metabolism and drugs affecting the peripheral nervous system, the cardiovascular system, and the kidney. The emphasis will be on the mechanisms of action of drugs in relation to their use in man. Prerequisites: mammalian physiology and biochemistry.

5 units, Aut (Staff) MTWThF 8

**202. Pharmacology**—Continuation of 201. Major drug groups to be considered include the drugs affecting the central nervous system, hormones, toxicology, chemotherapeutic agents, antibiotics, antiparasitic drugs, and the anticancer agents. Emphasis is on pharmacological principles in relation to the use of drugs in man; centrally acting drugs discussed include convulsants, anticonvulsants, anesthetics, sedatives, analgesics, tranquilizers, and other psychoactive drugs. Problems of drug abuse are also considered.

5 units, Win (Staff) MTWThF 8

**ADVANCED COURSES**

Advanced courses are open to students in all parts of the University, but the instructor's consent is required prior to registration. In general, these courses require as a prerequisite a good knowledge of physiology and biochemistry and sometimes of microbiology or genetics. Students are advised to consult with the instructor about the adequacy of their preparation.

**216. Opiates, Opioid Peptides, and Opioid Receptors**—A series of lectures emphasizing recent research developments and relating events at the molecular level to physiological and pharmacological phenomena.

2 units, Win (A. Goldstein) T 4:15-6:05

**217. Clinical Pharmacology: Principles of Therapeutics**—(Same as Medicine 217.) A series of clinically oriented presentations on principles of drug use in humans. The course will consider various pharmacological physiological and disease factors involved in the choice of appropriate drug therapy and its method of administration. Clinical evaluation of drug efficacy, therapeutic pitfalls, manifestations of drug toxicity and drug interactions will be included.

2 units, Spr (Staff of Pharmacology Department and Division of Clinical Pharmacology) W 8-9:50

**230. Membranes and Signal Transduction**—The diverse mechanisms by which hormones and neurotransmitters interact with cell surface receptors will be analyzed. Emphasis will be placed on molecular mechanisms by which various stimuli are transduced into an intracellular signal. The course will consist of student led seminars and weekly group analysis of assigned papers.

2 units, Spr (Schulman) T 4:15-6:05

**231. Regulations of Gene Expression in Differentiation**—The course will focus on the role of cytoplasmic regulators in the expression of nuclear genes. Model biological systems for the study of differentiation and development will be analyzed at a cellular, biochemical level. A lecture and student discussion course of recent research developments.

2 units, Aut (Blau) T 4:15-6:05

**270. Research Seminar**—Weekly conference for discussion of current research in pharmacology. Seminars presented will be reviewed and discussed in a separate conference with a member of the faculty.

2 units, Aut, Win, Spr (Staff) Th 4:15-6:05

**280. Tutorial Program**—Guided readings in the literature of any area of pharmacology. A critical review paper may be required. Primarily for graduate students in pharmacology.

any quarter (Staff) by arrangement

**299. Directed Reading.**

any quarter (Staff) by arrangement

**399. Research.**

any quarter (Staff) by arrangement

**COURSES REGULARLY OFFERED, BUT NOT DURING 1983-84**

**204. Effects of Drugs on Membrane Bilayers**—Lectures and discussion about drug effects
on membrane lipids and on the physical properties of biomembranes. No limitation. Prerequisite: Biochemistry 201 or equivalent.

2 units, (D. B. Goldstein) by arrangement

206. Toxic Effects of Environmental Pollutants—This course will include discussions of heavy metals, chlorinated hydrocarbons and other organic pesticides, components of smog, asbestos, contaminants of food and water, and the casual use of medicinal products. Drugs will be discussed in terms of their misuse or overuse and the attendant hazards.

1 unit, (Kalman) by arrangement

207. Molecular Mechanisms of Hormone Action—An advanced course dealing with mechanisms for transduction and transmission of biological signals. Topics will include molecular basis for the action of steroid and thyroid hormones, growth factors, morphogens, neuroregulators and polypeptide hormones. Open to graduate students, medical students and advanced undergraduates. To include lectures and discussions.

2 units, (Ringold) by arrangement

209. Developmental Biology: Genetic and Environmental Influences—Course will deal with several aspects of developmental biology, including the effects of drugs on developmental processes. Topics will include analysis of model systems for the study of regulation of differentiation, mechanisms of normal and abnormal fetal development, and the molecular basis of genetic variability in drug metabolism. Open to graduate students, medical students and advanced undergraduates. To include lectures and discussions.

2 units, (Blau) by arrangement

221. Chemical Carcinogenesis—Biochemical aspects of the production of neoplasia by chemicals. Topics include: causes of cancer, initiation and promotion, carcinogen metabolism, oncogenes, growth factors, tumor cell heterogeneity, cellular responses to DNA damage, carcinogen detection, and quantitative risk assessment.

2 units, (Whitlock) by arrangement

222. Variation in Drug Response: Pharmacokinetic and Pharmacodynamic Approaches—Quantitative approaches to assessing the sources of individual variability in response to drugs will be presented in this course. This will include the use of pharmacokinetic and pharmacodynamic modeling as a research tool. Workshops involving problem-solving and the use of computers in modeling will be an integral part of the course.

2 units, (Blaschke) by arrangement

225. Frontiers of Pharmacology: Biogenic Amine Receptors—Lectures and discussions on the localization, characterization and control of different biogenic amine receptors. Emphasis will be on biochemical and molecular aspects of these receptors in vertebrate as well as invertebrate animals. Weekly lecture and weekly group analysis of assigned papers. Prerequisites: Biochemistry 200 or equivalent.

2 units, (Mansour)

PHYSIOLOGY

Emeritus: Jefferson M. Crismon, Frederick A. Fuhrman, Ronald Grant, Maurice E. Krahl (Professors)

Acting Chairman: Eugene D. Robin

Professors: Julian M. Davidson, Eugene D. Robin

Consulting Associate Professor: Noel Thompson

PROGRAMS OF STUDY

The Department of Physiology offers required and elective courses for students in the School of Medicine, open also to other qualified students with the consent of the instructor. The main emphasis is on training of medical and postdoctoral students. For a very limited number of highly qualified students, the department offers the Ph.D. degree, but not the master's or bachelor's degrees.

GRADUATE PROGRAMS

Students with undergraduate or master's degrees who have completed a year each of college chemistry (including lectures in organic and physical chemistry), physics, calculus, and biology will be considered for admission to graduate study. An applicant must submit a report of scores (aptitude and advanced biology) on the Graduate Record Examination as part of the application. In the case of certain students, especially those with degrees in engineering or physics, the department will consider admission even if the above requirements have not been met. In those cases the students will be expected to complete the requirements during their graduate studies.

Emphasis is placed on providing all graduate students with a strong background in the laboratory study of major physiological phenomena, from which they may undertake highly individual courses of advanced research and study. The total course of study is expected to occupy four years, including three summers. Required courses for all students are: General Biochemistry 200 and 201 (without laboratory),
Physical Chemistry (Chemistry 171 and 173), and Physiology courses 200, 201, 202, 203, and 204. In addition, students will take at least three other courses selected from departmental or extradepartmental offerings. Courses in computer science, mathematics, statistics, chemistry, physics, biology, or engineering may be arranged by agreement between the student and the faculty supervisor.

At present the chief research interests of the department are in behavioral physiology, respiratory physiology, and neuroendocrinology. By arrangement with affiliated extradepartmental instructors, research training is also available in cardiovascular, endocrine, renal, and gastrointestinal physiology.

Qualifying Examination—At the end of the second year in residence as a graduate student, each Ph.D. candidate will be given a written comprehensive examination. This examination may be taken only after the respective courses have been completed to the required standard. Students will undertake individual research studies as early as possible after consultation with their preceptor.

Dissertation and University Oral Examination—The results of independent, original work by the students are to be presented in a dissertation. The oral examination will be largely a defense of the dissertation.

FINANCIAL AID

Research assistantships are occasionally available to postdoctoral fellows, or graduate students who have completed substantial work toward the Ph. D. degree in Physiology. Tuition aid may be awarded to students holding research assistantships. Graduate students who are also medical students are eligible for financial aid from the Office of Student Affairs, Stanford Medical School.

In general, graduate students must expect to find the majority of their financial support outside the University.

COURSES

200. Clinical Physiology - (Cell, Cardiovascular) — Offered jointly with the Department of Medicine. Lectures, clinical presentations and demonstrations on normal and disordered function in the cardiovascular system. Final exam given. Prerequisites: an understanding of general biochemistry.

6 units, Aut (M. Perlroth, E. Robin) MWF 9-10:50


6 units (201-4 units; 202-2 units), Win (D. Feldman, R. Marcus, G. Reaven, J. Kriss, J. Davidson-Endocrinology) (G. Gray, A. Cooper - Gastrointestinal) MWF 9-10:50

203-204. Clinical Physiology - (203-Renal) (204-Respiratory) — Offered jointly with the Department of Medicine. Lectures, clinical presentations and demonstrations on normal and disordered function in the respiratory, renal, fluid and electrolyte, and acid-base systems. Final exam given. Prerequisites: an understanding of general biochemistry.

6 units (203-3 units; 204-3 units), Spr (E. Robin-Respiratory), (R. Jamison, R. Maffly-Renal) MTF 10-11:50 am

205. Introduction to Mathematical Methods in Physiology and Chemistry—Course will examine the solution of several differential equations using methods useful in physiology and chemistry. Standard methods, Laplace Transforms, analog computer and digital computer methods will be considered. Prerequisite: one year of college calculus.

3 units, Spr (Thompson) TTh 4:15-5:05

210. Neuroendocrine Physiology of Sex — Lectures and discussions on physiological mechanisms involved in sexual and reproductive function of animals and humans. Hormonal factors and their relationships to the nervous system will be emphasized.

2 units, Spr (Davidson) W 1:15-3:05

211. Thoracic and Abdominal Anatomy and Physiology—This course is intended for those students who, because of their studies, require a knowledge of human anatomy and physiology as it relates to the thorax and abdomen but who will not be taking the mainline medical anatomy and physiology courses. Primary attention given to the major organs and vessels in these body compartments. Material is presented by lectures and dissections.

3 units, Win (Thompson) TTh 4:15-5:30

213. Special Topics in Physiology—A seminar course of guided reading and discussion in both introductory and advanced physiological topics. Topics are agreed upon by an individual instructor and interested students. Prerequisite: consent of instructor.

(Staff) by arrangement

215. Tutorial in Clinical Physiology—Guided study, with readings and discussions in both introductory and advanced physiological topics, to supplement 200, 201, 202.

1-2 units, any quarter (Robin, Staff) by arrangement
299. Directed Reading. Prerequisite: Consent of instructor.

any quarter (Staff) by arrangement

399. Advanced Research—Investigations sponsored by individual faculty members may be undertaken by interested, qualified medical or graduate students. The hours and units may be arranged by the student. The fields of research open to students include: endocrinology, neuroendocrinology, central nervous system function, reproductive physiology, chemistry and mechanism of action of toxins in marine biology, cybernetics (systems analysis and instrumental techniques).

any quarter, (Staff) by arrangement

RADIOLOGY

Chairman: Malcolm A. Bagshaw


Professors of Radiology (Clinical): William H. Marshall, Jr., Bruce R. Parker

Professor of Radiology (Teaching): Peter Fessenden

Associate Professors: J. Martin Brown, C. Norman Coleman, Sarah S. Donaldson, Dieter R. Enzmann, Don R. Goffinet, David A. Goodwin, Michael L. Goris, George M. Hahn, Richard T. Hoppe, I. Ross McDougall

Associate Professors of Radiology (Clinical): James F. Silverman

Assistant Professors: Malcolm F. Anderson, Barbara A. Carroll, Diana F. Guthaner, Anthony E. Howes, James Lear, F. Graham Sommer, Stuart W. Young

PROGRAMS OF STUDY

Although the Department of Radiology does not offer degrees, its faculty teaches a variety of courses open to medical students, graduate students and undergraduates. The department also accepts students in other curricula as advisors for study and research. Graduate students in the biophysics curriculum, for example, may choose Radiological Sciences as a major and pursue their dissertation in this field; similarly, students in the Cancer Biology Ph.D. Program may major in Radiobiology. Undergraduate students may also arrange individual research projects under the supervision of Radiology faculty.

Radiology is a discipline which is focused around the use of radiation as a diagnostic, as a therapeutic and as a research tool. The fundamental and applied research within the department reflects this broad spectrum: in diagnostic radiology as the discipline relates to anatomy, pathology and physiology; in therapeutic radiology and clinical oncology; in radiobiology and tumor biology; and in the application of nuclear medicine techniques to the study of physiology and pathology.

At the present time, the major areas of basic research investigation in the department include: DNA breakage and repair in bacterial and mammalian cells by ultraviolet and ionizing radiation, effects of heat, drugs and radiation on the killing and repair of mammalian cells both in vitro and in vivo, studies of cell kinetics and reoxygenation in animal tumors after irradiation, chemotherapy, heat, and combinations of these modalities, studies of the effect of radiation on the microvasculature and blood flow in normal and malignant tissues, radiosensitization of tumors in vivo with a variety of drugs, studies of the late effects of radiation on a variety of normal tissues in young and adult animals, and in an in depth investigation of the role of viruses in the etiology of animal and human tumors, studies in developing contrast agents to improve diagnosis in conventional radiography, computed tomography and ultrasound, analysis of tissue signature characterization by ultrasound for diagnostic use, studies in advanced diagnostic imaging systems in computed tomography, digital radiography, and digital fluoroscopy; studies on pulmonary oxygen toxicity and development factors in immature/growing lung; studies on the microvasculature.

Courses offered by the department which are open to undergraduate and postgraduate students are listed below.

COURSES

101. Selected Readings in Radiology Research.

Aut, Win, Spr (Staff) by arrangement

154. Biosocial Aspects of Cancer—(Same as Human Biology 154.) This course is concerned with various aspects of cancer as a biological phenomenon and as a clinical, emotional and societal problem. The diagnosis and treatment of human neoplasms, their psychosocial and economic impact, the organization of cancer care and research will be discussed. There will be detailed considerations of the specific control mechanisms operative in vitro and/or in vivo and a delineation of their influence in an at-
tempt to characterize the differences between normal and malignant growth.

3 units, Spr (Kaplan, Brown, Hahn)  
W 7:30-9:30,  
alternate years, given 1983-84

201. Biological Effects of Radiation—Basic physical and chemical events, relevant biochemical pathways and molecular targets, repair of molecular lesions, cellular and tissue radio-biological determinants, radiation dose modifier effects on tumors and specific tissues and organs, whole body effects, carcinogenesis, hazards, and permissible dose standards. Prerequisite: Biochemistry 200, or consent of instructor.

2 units, Win (Kallman, Staff)  
by arrangement  
alternate years, given 1984-85

202. The Radiobiology of Radiotherapy—This course is intended primarily for residents or fellows in the Radiotherapy Division training program; however, medical or postgraduate students interested in radiotherapy can take the course. Focus is on the basic radiobiological processes underlying the treatment of malignant disease by radiation. Carcinogenesis and mutagenesis by radiation will also be covered. Limited to 4 students. Prerequisites: some familiarity with cell biology and physiology, and consent of instructor.

2 units, Spr (Brown) T or W 8,  
alternate years, given 1983-84

205. DNA Repair and Mutagenesis—(Same as Biological Sciences 205.) Interactions of mutagens and carcinogens with DNA. Response of living systems to damaged genetic material, including molecular mechanisms for CNA repair. Enzymology and DNA modification and repair. Inducible repair responses and "error-prone" mechanisms. Human hereditary deficiencies in DNA repair. Relationships of DNA repair and mutagenesis to carcinogenesis. Prerequisite: Biology 21 and/or consent of instructor.

3 units, Spr (Hanawalt, Freidberg,  
K. C. Smith) TTh 1:15,  
alternate years, given 1984-85

208. Experimental Nuclear Medicine—This is a course designed to familiarize the student with computer applications in medicine, particularly in the use of radioisotopes as tracers. Some knowledge of physiology and calculus desirable.

Spr (Goris) by arrangement

241, 242, 243. Molecular and Cellular Aspects of Cancer Biology—This newly designed course will be given over three academic quarters and will cover primarily three major subject areas: cancer cell biology, carcinogenesis, and fundamental principles of therapy. Each of these should occupy approximately one academic quarter. This course is not intended to replace other specialized courses offered under departmental headings, but will give a comprehensive view of the major, relevant scientific bases and advances in areas directly relating to the understanding and control of neoplastic growth. The course will be organized and coordinated by E. C. Friedberg (Dept. Pathology), and its faculty will be drawn almost exclusively from the list of Stanford faculty participating in the Cancer Biology Program.

242. 3 units, Win (Staff) dhr

243. 3 units, Spr

299. Research.  
any quarter, (Staff) by arrangement

STRUCTURAL BIOLOGY

Emeriti: Donald J. Gray, William W. Greulich, Hadley Kirkman, Robert S. Turner (Professors)  
Chairman: James A. Spudich  
Professors: Roger D. Kornberg, James A. Spudich, Lubert Stryer, Nigel Unwin  
Assistant Professors: Robert Fox, Peter Parham, Peter B. Sargent  
Lecturer: Patricia Cross

PROGRAMS OF STUDY

The department offers opportunities for course work and research in structural biology. The courses offered include "Molecular Biology of the Cell," a two-quarter course taught by the entire faculty which deals with the molecular basis of cell function. Also offered is a two-quarter sequence "Structure of Cells and Tissues," which deals with the structural organization of tissues in relation to their function. These courses are open to medical students, graduate students, and advanced undergraduates.

GRADUATE PROGRAMS

The graduate program in Structural Biology leads to the Ph.D. degree. Remission of fees and a personal stipend are available to graduate students in the department. Prospective applicants should write to the Department of Structural Biology for further information. The department also participates in the Medical Scientist Training Program in which individuals are candidates for both the Ph.D. and M.D.
degrees. Postdoctoral research training is available to graduates holding a Ph.D. or M.D. degree.

The research of the department deals with the interplay of biological structure and function at the molecular and cellular levels. The current interests of the department are mainly in the areas of cell membranes, cell motility, the cytoskeleton, development, gene expression, and protein structure.

**COURSES**

208. Molecular Biology of the Cell—This course deals with the molecular basis of cell function. The three-dimensional architecture of supramolecular assemblies will be explored in relation to their biological activity. Topics to be covered include: membrane receptors, membrane channels and gates, histocompatibility antigens, the cytoskeleton, contractile assemblies, coated vesicles, nuclear pores, and ribonucleoprotein particles. Two lectures, and a one-hour discussion session per week. Prerequisite: Knowledge of introductory biochemistry.

3 units, Aut (Staff)


3 units, Win (Staff)

211. Structure of Cells and Tissues—This course deals with the structural organization of tissues in relation to their function. Topics to be covered include light and electron microscopy, epithelia, muscle, connective tissue, bone and cartilage, blood, cardiovascular system, lymphoid tissue, nervous tissue, and skin. Two lectures and a three-hour histology laboratory per week.

3 units, Aut (Staff)

212. Structure of Cells and Tissues—Continuation of 211. Topics to be covered include endocrine, exocrine, gastrointestinal, respiratory, urinary, female and male genital systems, and the ear and eye. One lecture and a three-hour histology laboratory per week.

2 units, Win (Staff)

224. Biological Membranes—Structure, dynamics and function of selected membrane assemblies. This course will focus on membrane receptors and channels as exemplified by the acetylcholine receptor, rhodopsin, porin, the purple membrane protein, and gap junctions. Three-dimensional image reconstruction techniques and spectroscopic methods for elucidating membrane architecture and dynamics will be presented.

4 units, Spr (Stryer, Unwin)

260. Supervised Study—Research or advanced tutorial for undergraduates.

1-15 units, any quarter (Staff)

270. Structural Biology Seminar

1-3 units, any quarter (Staff)

299. Directed Reading

1-15 units, any quarter (Staff)

399. Individual Research

1-15 units, any quarter (Staff)
The Vice Provost and Dean of Graduate Studies and Research is generally responsible for graduate instruction within the University. In particular, the Dean oversees admission to graduate standing, supervises the assignment of graduate fellowships, research assistantships and teaching assistantships, administers regulations for advanced degrees that have been established by the Academic Council or the Committee on Graduate Studies, oversees the fulfilling of University degree requirements for advanced degrees, and works for the improvement of graduate study at Stanford and for the welfare of graduate students.

As the University's principal officer for research, the Dean of Graduate Studies and Research is responsible for the Independent Laboratories and Institutes at Stanford, as well as a number of independent programs and committees. The Interdisciplinary Training Programs and Committees include: Graduate Division Special Program, Committee on Biophysics, Cancer Biology Program, Neurosciences Program. The term Independent Laboratories and Institutes covers those units whose academic programs go beyond the scope of any one of the organized schools of the University. They report to the Provost through the Vice Provost and Dean of Graduate Studies and Research. These units are: Center for Materials Research, Center for Research on International Studies, Center for Economic Policy Research, Center for Research on Women, Institute for Energy Studies, Hansen Laboratories, Institute for Mathematical Studies in the Social Sciences, Low Overhead Time Sharing Facility, Northeast Asia-U.S. Forum on International Policy, Stanford Center for Chicano Research, Stanford Humanities Center, Stanford Synchrotron Radiation Laboratory. Following is a description of the activities of each of the above organizations and programs including the research activities and, where applicable, courses offered.

**GRADUATE DIVISION SPECIAL PROGRAM**

**SPECIAL Ph.D. PROGRAM**

The Graduate Division Special Program is designed for students seeking Ph.D.'s whose study plans do not fall within the province of any one department.

Requirements are:
1. Prior admission to a doctoral program in a school or department at Stanford University.
2. Completion of a minimum of two full-time quarters and no more than three years enrollment in doctoral study at Stanford University.
3. Academic performance in graduate work at Stanford that is of a quality expected of Ph.D. candidates.
4. Agreement of a member of the Academic Council to act as committee chair.
5. Agreement of three other Academic Council members to serve on the committee. At least two of the committee should be tenured professors. Committee persons should be chosen to represent the student's various fields of interest and must be from at least two academic departments.
6. Filing of Declaration of Intention (Form G54).
7. Approval of the University Committee on Graduate Studies. In addition to the above, the committee will ascertain that the proposed program cannot be accommodated in any existing department.

Further information on the program and details of application procedures are available from the Graduate Program Office, Building 590, Room 104.

Students registering for special research under the guidance of their committee or for the Ph.D. dissertation should use the following course numbers:

**400. Research**
- by arrangement

**401. Ph.D. Dissertation**
- by arrangement
NONMATRICULATED
GRADUATE STUDY

Graduates of colleges and universities of recognized standing are eligible to apply for nonmatriculated status in the Graduate Division of the University. Nonmatriculated status is granted to students of demonstrated ability who are not seeking an advanced degree from Stanford University, but who would benefit from course work at Stanford for a variety of reasons. Some schools and departments do not regularly permit nonmatriculated students to enroll in courses. Some programs also require full-time registration if nonmatriculated students are to take any courses. Details can be obtained from the Graduate Admissions Office. This status is granted for the current academic year only. Any extension of enrollment privileges into the next academic year requires approval in writing from the Office of the Dean of Graduate Studies. Should a nonmatriculated student later apply for matriculated status, the normal admission requirements must be completed at that time. Nonmatriculated students should not anticipate any special priority for admission to a degree program because of work completed in nonmatriculated status.

No more than one academic quarter of course work as a nonmatriculated student may be counted towards a master's level degree and no more than two quarters may apply toward completion of requirements for Engineer's or doctoral degrees at Stanford.

Applicants interested in nonmatriculated status for the Summer Quarter only need not apply through the Graduate Admissions Office but rather through the Summer Sessions Office and if approved will be permitted to register as summer visitors.

Nonmatriculated students will obtain academic credit for courses satisfactorily completed and may obtain an official transcript for the usual fee. They are eligible to use University facilities and services. In classes of limited enrollment, however, students in degree programs have priority over nonmatriculated students. Nonmatriculated students may apply for housing, but will not receive placement until the needs of all matriculated students have been cared for.

BIOPHYSICS PROGRAM

Committee on Biophysics: Philip C. Hanawalt, Professor of Biological Sciences, Chairman; David A. Clayton, Professor of Pathology; Oleg Jardetzky, Professor of Pharmacology; Harden M. McConnell, Professor of Chemistry; Robert D. Simoni, Professor of Biology; Lubert Stryer, Professor of Structural Biology

The Biophysics Program offers instruction and research opportunities leading to the Ph.D. in biophysics. Students admitted to the program may perform their graduate research in any appropriate department.

GRADUATE PROGRAM

A small number of highly qualified applicants will be admitted to the program each year. Applicants should present strong undergraduate backgrounds in the physical sciences and mathematics. The graduate course program, beyond the stated requirements, will be worked out for each student individually with the help of appropriate advisors from the Committee on Biophysics.

The requirements for the Ph.D. degree include the following:

1. Training in physics or chemistry equivalent to that of an undergraduate physics or chemistry major at Stanford.
2. A graduate minor in physics, chemistry, or biology (or in a related field). Consult appropriate departmental announcements for minor requirements.
3. Completion of the following courses (or their equivalents):
   a) Biophysics 250.
   b) Biochemistry 200, 201.
   c) Chemistry 131, 171, 173 and 175.
   d) Additional courses as required for the individually tailored program.
4. Proficiency in one or more foreign language and/or a computer language may be required at the discretion of the major professor.
5. The completion of eight sections of teaching apprenticeship during the first nine quarters at discretion of advising committee.
6. Successful passing of a comprehensive qualifying examination in biophysics is required for admission to Ph.D. candidacy. This examination is normally taken early in the second year of study and it emphasizes the area of specialization in biophysics.
7. Preparation of a Dissertation Proposal defining the research to be undertaken, including
methods of procedure. This proposal should be submitted by Spring Quarter of the second year and it must be approved by a committee of at least three members including the principal research advisor and at least one member from the Committee on Biophysics. The candidate will be called upon to defend the dissertation proposal in an oral examination. The dissertation reading committee will normally evolve from the dissertation proposal review committee.

8. The presentation of a Ph.D. thesis as the result of independent investigation and expressing a contribution to knowledge in the field of biophysics.

9. The successful passing of the University oral examination which is to be taken only after the student has substantially completed the research. The examination will be preceded by a public seminar in which the research will be presented by the candidate.

COURSES

250. Molecular Biophysics—Physical biochemistry and physical approaches to biological problems at the molecular level. Lectures include discussion of macromolecular structure and intermolecular interactions, physical methods for characterizing proteins and nucleic acids, the interaction of electromagnetic radiation with biological molecules, isotopic tracer techniques, and classical physics of cellular processes. Open to qualified advanced students upon consent of instructor.

4 units, Aut (Hanawalt, Jardetzky, Staff)
TTh 10 and Th 1:15-3:05 p.m., alternate years, given 1983-84

273. Magnetic Resonance in Biology—Principles and applications of High Resolution Nuclear Magnetic Resonance and other magnetic resonance techniques to problems of protein structure and macromolecular dynamics, conformational changes and transducer functions of macromolecules and the organization of membranes. Prerequisites: Chemistry 171 and 173 or consent of instructor.

3 units, Aut (Jardetzky) TTh 10 plus
1 hour by arrangement, alternate years

300. Research.
(Staff) by arrangement

350. Seminar in Biophysics—Presentation of current research projects and topical literature by faculty, graduate students, and visiting speakers. All graduate students in Biophysics will be expected to participate.

1 unit, Aut, Win, Spr (Staff) by arrangement

RELATED COURSES

Other courses recommended to Biophysics students:
Chemistry 287, 289, 291; Biological Sciences 205, 211, 252, 255; Structural Biology 211; Radiology 201; Applied Physics 130, 232, 233; Physics 170, 171, 172, 230, 234.

CANCER BIOLOGY PROGRAM

Committee on Cancer Biology: Errol C. Friedberg, Associate Professor of Pathology (Chairman and Program Director); Steven G. Boxer, Associate Professor of Chemistry; Laurence H. Kedes, Professor of Medicine; Robert D. Simoni, Associate Professor of Biological Sciences; Irving L. Weissman, Professor of Pathology; James P. Whitlock, Jr., Associate Professor of Pharmacology.

The Cancer Biology Program is designed to provide a framework for students with an interest in the understanding and control of neoplastic growth to build a curriculum in varied biomedical areas relevant to that subject. Students in this Program are based in departments appropriate to their specialty and are subject to the core requirements specified below. The degree offered is the Ph.D. in Cancer Biology. Basic University requirements for the Ph.D. are described under the "Degrees" section at the beginning of this bulletin.

PROGRAM OF STUDY

A limited number of well qualified applicants will be admitted to the Program each year. It is preferable that applicants will have completed an undergraduate major in the biological sciences; applicants with undergraduate majors in physics, chemistry, or mathematics may be admitted under the condition that they will complete background training in biology during the first two years of study. During the first year in the Program each student is required to constitute a three person Advising Committee which will assist him/her with the development of an appropriate program of courses and provide advice and consultation on thesis-related research. The appointment of this committee is normally carried out in consultation with the student's research preceptor, who will chair the Advising Committee.

The requirements for the Ph.D. degree are as follows:

1. Training in biology equivalent to that of an undergraduate biology major at Stanford.
2. Completion of the following courses (or their equivalents, except for the Cancer Biology course):
   a) Biochemistry 200, 201. General Biochemistry and Advanced Molecular Biology.
   b) Pathology 230A. First Quarter of Pathology.

3. Each student must take at least 12 units of courses that are offered by 4 or more different Stanford faculty members. It is recommended that these be selected from a preferred listing of relevant courses (furnished by the Director). Course work to be taken will be determined in consultation with each student’s Advising Committee.

4. Attendance at the Seminar in Cancer Biology. First year Cancer Biology students are urged to attend this seminar, and students in their second and later years are required to attend and participate in the seminar.

5. Successful completion of a comprehensive qualifying examination in Cancer Biology is required for admission to Ph.D. candidacy. This examination must be completed prior to the end of the second full year of study in the Program. The examination is set by the Advising Committee and consists of two parts. The first is a written examination that covers materials relevant to Cancer Biology and to the special research interests of the individual student. The second is an oral presentation to the Advising Committee of thesis research or proposed thesis research. The Advising Committee shall be presented with a brief written description of this research prior to the oral examination.

6. The presentation of a Ph.D. thesis as the result of independent investigation and constituting a contribution to knowledge in the area of cancer biology.

7. The successful passing of the University oral examination which is to be taken only after the student has substantially completed his or her research. The examination will be preceded by a public seminar in which the research will be presented by the candidate. The oral examination will be conducted by a Dissertation Reading Committee which will include one member of the Committee on Cancer Biology.

COURSES

241, 242, 243. Molecular and Cellular Aspects of Cancer Biology—This course will be given over three academic quarters and will cover primarily three major subject areas: cancer cell biology, carcinogenesis, and fundamental principles of therapy. Each of these should occupy approximately one academic quarter. This course is not intended to replace other specialized courses offered under departmental headings, but will give a comprehensive view of the major, relevant scientific bases and advances in areas directly relating to the understanding and control of neoplastic growth. The course will be organized and coordinated by Errol C. Friedberg, and its faculty will be drawn almost exclusively from the list of Stanford faculty participating in the Cancer Biology Program.

241. 3 units; Aut (Staff) TTh 4:15-5:05, alternate years, given 1983-84
242. 3 units, Win
243. 3 units, Spr

251, 252. Special Topics in Cancer Biology — Tentatively, series of 4 minicourses each quarter, each consisting of 2-6 hours of lectures. Minicourses will be given by different lecturers and will cover topics of major importance in cancer research. Students may enroll for 2, 3 or 4 of the minicourses each quarter; and units will be given proportionately.

251. 1-2 units, Aut (Staff) TTh 4:15-5:35
252. 1-2 units, Win (Staff) TTh 4:15-5:35 alternate years, given 1982-1983

271. Seminar in Cancer Biology—A weekly seminar on research in Cancer Biology, with presentations by students, postdoctoral fellows, faculty, and guest speakers. To meet weekly throughout the year.

1 unit, Aut, Win, Spr (Staff) alternate years, given 1983-84
MEDICAL INFORMATION SCIENCES PROGRAM

Committee: Edward H. Shortliffe, Assistant Professor of Medicine and by courtesy of Computer Science, Chairman; Bruce G. Buchanan, Professor of Computer Science (Research); Edward A. Feigenbaum, Professor of Computer Science; Michael L. Genesereth, Assistant Professor of Computer Science; Richard L. Popp, Professor of Medicine; Allen K. Ream, Associate Professor of Anesthesia; Harold C. Sox, Jr., Associate Professor of Medicine (Clinical); Gio C. M. Wiederhold, Associate Professor of Medicine (Research) and Computer Science (Research); Leslie Zatz, Professor of Radiology

The Medical Information Sciences program is an interdepartmental program that offers instruction and research opportunities leading to graduate degrees in Medical Information Sciences with subspecialization in Medical Computing or Medical Decision Making. The faculty members in the Program are drawn from the Departments of Anesthesiology; Biochemistry; Computer Science; Electrical Engineering; Engineering-Economic Systems; Family, Community, and Preventive Medicine; Genetics; Medicine; Obstetrics and Gynecology; Pathology; Psychology; Radiology; Statistics and Biostatistics; and the Graduate Schools of Business and Education.

Participating Faculty:
- **Anesthesiology:** John P. Bunker (Professor), Allen K. Ream (Associate Professor)
- **Biochemistry:** Douglas L. Brutlag (Associate Professor)
- **Computer Science:** Thomas O. Binford (Professor), Bruce G. Buchanan (Professor), Edward A. Feigenbaum (Professor), Michael L. Genesereth (Assistant Professor), Edward H. Shortliffe (Assistant Professor by courtesy), Gio Wiederhold (Assistant Professor)
- **Electrical Engineering:** Susan S. Owicki (Associate Professor)
- **Engineering-Economic Systems:** Ronald A. Howard (Professor), Edison Tse (Associate Professor)
- **Family, Community, and Preventive Medicine:** Byron W. Brown, Jr. (Professor), John P. Bunker (Professor)
- **Genetics:** Stanley N. Cohen (Professor)
- **Medicine:** Terrance Blaschke (Associate Professor), Lawrence Crapo (Assistant Professor), James F. Fries (Associate Professor), Charlotte Jacobs (Assistant Professor), Laurence Kedes (Associate Professor), Roy H. Maffly (Professor), Keith Marton (Assistant Professor), Edward H. Shortliffe (Assistant Professor), Harold C. Sox, Jr. (Associate Professor)
- **Obstetrics and Gynecology:** Emmet J. Lamb (Professor), Desmond McCallum (Physician Specialist)
- **Pathology:** Howard H. Sussman (Associate Professor)
- **Psychology:** Amos N. Tversky (Professor)
- **Radiology:** Leslie M. Zatz (Professor), Dieter Enzmann (Assistant Professor)
- **Statistics & Biostatistics:** Byron W. Brown Jr. (Professor)
- **Graduate School of Business:** Alain C. Entchoven (Professor)
- **Graduate School of Education:** Richard E. Snow (Professor), Lee S. Shulman (Professor)

This interdisciplinary program was created in response to a recognized need for well-trained researchers and academic leaders in the expanding field of medical information sciences.

FACILITIES

Stanford University's extensive computing facilities are described under the Computer Science Department section in this bulletin.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The University's basic requirements for the master's degree are discussed in the section "Degrees" in this bulletin. The Medical Information Sciences Program offers both masters and doctoral degrees with students selecting to subspecialize in either medical computing or medical decision making. In all degree programs the candidate must attain a 3.0 average. Students who fail to maintain a 3.0 average in a category of the core curriculum (see categories listed below) will be expected to pass a comprehensive exam in that area before the graduate degree will be granted. In addition, all degree candidates must pass an oral examination that tests the student's ability to integrate the various components of the curriculum and to relate them to the overall field of Medical Information Sciences. The Program's masters degrees are intended as terminal professional degrees. Admissions to a masters program may negatively affect the outcome of a subsequent application to the Ph.D. program, and students wishing to obtain a Ph.D. are therefore encouraged to apply directly for Ph.D. training.

The core curriculum is common to all degrees offered by the Program, but is adapted or augmented depending upon the interests and prior
experience of the student. Deviations from the core curriculum outlined below must be justi-
ified in writing and approved by the student’s MIS advisor and the Chairman of the MIS
Committee. It should be noted, however, that the Medical Information Sciences Program is
intended to provide flexibility and to complement other opportunities in applied medical
research that exist at Stanford (e.g. Program on Engineering in Biology and Medicine, Grad-
uate Division Special Programs). Although most students will be expected to comply with
the basic program of study outlined here, special arrangements can be made for those with
unusual needs or those simultaneously enrolled in other degree programs within the Univer-
sity.

CORE CURRICULUM

All students are expected to participate regularly in the MIS Journal Club (MIS 201) and
Colloquia (MIS 200). In addition, all students are expected to fulfill requirements in the fol-
lowing five categories:

1. Medicine (7-21 units): The student is expected to acquire a basic knowledge of
human physiology, anatomy, and disease. Required are Human Biology 111 (Human
Physiology) or the Clinical Physiology series (Physiology 200-204). Also required is Clin-
ical Diagnosis (MIS 202 or Medicine 202) and Introduction to Clinical Environments
(MIS 205).

2. Computer Science (9 units): The student is expected to acquire a knowledge of the use of
computers, computer organization, and programming. It is assumed that students will
have had prior computing experience at least equivalent to CS 105 or 108A,B. None of
these courses may be counted towards the degree requirement if it is taken at Stanford.
In addition, all students are required to take a minimum of 9 units of courses in the
computer science department, and these must include CS 111 (or CS 111S) and CS
161 if similar courses have not been taken previously. At least 6 units must be taken in
courses numbered 135 or higher.

3. Decision Making (13-14 units): Students will be expected to learn basic probability
theory, Bayesian statistics, decision analysis techniques, and experimental design tech-
niques. Required courses are Statistics 219
and 220 (Statistical Inference); Statistics 116
(Theory of Probability) or E-ES 221 (Prob-
abilistic Analysis); E-ES 231 (Decision Analysis).

4. Medical Computer Science (8-10 units): All students are expected to acquire a general
knowledge of the state-of-the-art and future frontiers for medical computer science. Re-
quired courses are MIS 210 (Medical Com-
puter Science), MIS 211A (Computer-Based
Medical Decision Aids), and MIS 211B (Project Course).

5. Health Policy/Social Issues (7 units): Candid-
ates will be expected to be familiar with key
issues regarding public health policy, financ-
ing, ethics, and legal topics. Required courses are FCPM 200 (Health and Society)
and Human Biology 40 (Public Decision Making Regarding Human Health).

Note that the core curriculum generally en-
tails a minimum of 44 units of coursework, but
can require substantially more or less depend-
ing upon the courses selected and the previous training of the student. The varying back-
grounds of students are well recognized and no one will be required to take courses in an area in
which he or she has already been adequately trained; under such circumstances, students
will be permitted to skip courses or substitute more advanced work. Students will design
appropriate programs for their interests with the assistance and approval of their MIS
advisor.

MASTER OF SCIENCE IN MEDICAL INFORMATION
SCIENCES-Computing (MIS/CS)

This degree is designed for individuals who
wish to undertake in-depth study of computer applications in medicine. Normally a student
will spend two years in the program and will implement and document a substantial project
during the second year. The first year will in-
volves acquiring the fundamental concepts and
tools through coursework and research project
involvement. Graduates of this program will be
prepared to contribute creatively to basic or
applied projects in medical computer science.

PROGRAM REQUIREMENTS

Programs of at least 54 units that meet the
guidelines in the following categories will nor-
manly be approved:

1. Same as core curriculum, but students are
encouraged to take the advanced physiology
course(s) that deal(s) with the domain of their
research project.

2. Core curriculum requirements (CS111, not
CS111S) and a total of 15 units of formal
coursework in computer science, including
three of the following: CS135, CS145,
CS222, CS223.

3. Same as core curriculum.

4. Same as core curriculum.

5. Same as core curriculum.
Electives: Additional courses as desired by candidate to bring total to 54 or more units.

MASTER OF SCIENCE IN MEDICAL INFORMATION SCIENCES-DECISION MAKING (MIS/DM)

This degree is designed for individuals who wish to study decision theory applied to medicine in depth. Normally a student will spend two years in the program and will undertake and document a substantial project during the second year. The first year will involve acquiring the fundamental concepts and tools through course work and research project involvement. Graduates of this program will be prepared to contribute creatively to basic or applied projects in medical decision sciences.

PROGRAM REQUIREMENTS

Programs of at least 54 units that meet the guidelines in the following categories will normally be approved:
1. Same as core curriculum, but students are encouraged to take the advanced physiology course(s) that deal(s) with the domain of their research project.
2. Same as core curriculum, but additional courses strongly encouraged.
3. Same as core curriculum, with a minimum of 15 units of formal coursework in this category including Psychology 256.
4. Same as core curriculum.
5. Same as core curriculum.
Electives: Additional courses as desired by candidate to bring total to 54 or more units.

MASTER OF SCIENCE IN MEDICAL INFORMATION SCIENCES-(MIS)

This special program is designed as post-doctoral training for individuals with established research credentials who may wish to acquaint themselves broadly with the field of Medical Information Sciences, emphasizing formal coursework. Candidates will be required to complete the core curriculum and to supplement coursework with approved electives to obtain a total of 42 units. A research project is encouraged but not required. Candidates will be permitted to complete the program in no less than four quarters. Students in this program will be drawn from applicants with doctoral degrees in medicine, computer science, decision theory, or related fields; for example, an academic physician on sabbatical might wish to undertake this program of study. The degree is designed to allow its graduates to complement their area of primary academic or research activity by providing them with a heightened ability to work affectively in collaborative research projects.

DOCTOR OF PHILOSOPHY

Individuals wishing to prepare themselves for careers as independent researchers in medical computer science or medical decision science should apply for admission to the doctoral program in Medical Information Science. The university's basic requirements for the doctorate (residence, dissertation, examination, etc.) are discussed in the "Degrees" section in this bulletin. The following are additional requirements imposed by the MIS Interdisciplinary Committee:

1. A student should plan and successfully complete a coherent program of study including the core curriculum, oral examination, and additional requirements for the masters program corresponding to his or her area of primary interest (Medical Computing or Medical Decision Making). In addition, doctoral candidates will be expected to complete at least 6 additional units of advanced coursework in the category of their specialization. For computer science specialization, this will require 6 additional units in CS courses numbered 135 or higher. For decision making specialization, the courses will be chosen with the student's MIS advisor, but will generally involve advanced courses in Decision Analysis. The master's requirements, including the oral examination, should be completed by the end of the second year in the Program (six quarters of full-time study, excluding summers). A student's advisor has primary responsibility for the adequacy of the program, which will be regularly reviewed by the Graduate Study Committee of the MIS program.

2. Each student, to remain in the Ph.D program must attain a grade average as outlined for the masters programs above, and must pass a comprehensive exam covering introductory level graduate material in any curriculum category in which he or she fails to attain a 3.0 average. The student must fulfill these requirements and apply for admission to candidacy for the Ph.D. by the end of six quarters of full-time study (excluding summers).

3. By the end of nine quarters (excluding summers) each student must orally present a thesis proposal to members of the Graduate Study Committee of the MIS Pro-
gram. The Committee will determine whether the student's general knowledge of the field (Medical Computing or Medical Decision Making), and the details of the planned thesis, are sufficient to justify proceeding with the dissertation.

4. As part of the training for the Ph.D., each student is required to complete two units of teaching assistant service, one unit (10 hours per week for one quarter) being required during the first two years as evidence of satisfactory progress toward the degree.

5. The most important requirement for the Ph.D. degree is the dissertation. Prior to the oral thesis proposal and defense, each student must secure the agreement of a member of the Program Faculty to act as dissertation advisor. In some cases, the advisor need not be an active member of the MIS Program Faculty.

6. No oral examination will be required upon completion of the dissertation. The oral defense of the thesis proposal satisfies the University Oral Examination requirement.

7. The student is expected to demonstrate an ability to present scholarly material orally and will present his or her research in a lecture at a formal seminar.

8. The student is expected to demonstrate an ability to present scholarly material in concise written form as well. Each student will be required to write a paper suitable for publication, usually his or her doctoral research project. This paper must be approved by the student's advisor as suitable for submission to a refereed journal before the doctoral degree will be conferred.

9. The dissertation must be accepted by a reading committee, composed of the principal dissertation advisor, a second member of the Program Faculty, and a third member chosen from anywhere within the University. The principal advisor and at least one of the other committee members must be academic council members.

10. Upon successful completion of the dissertation and other degree requirements, the candidate will be granted the degree "Doctorate in Medical Information Sciences - Computing" or "Doctorate in Medical Information Sciences - Decision Making" depending upon the field of subspecialty that he or she has pursued.

COURSES

200. Medical Information Sciences Colloquium—Series of colloquia, offered by program faculty, students, and occasional guest lecturers. Meets once per week.
1 unit, Aut, Win, Spr by arrangement

201. Medical Information Sciences Journal Club—Journal club for all students and several faculty. Participants report on recent relevant articles from the Medical Information Science literature. Meets once per week. (May be taken no more than 3 times for credit)
1 unit, Aut, Win, Spr by arrangement

202. Clinical Diagnosis—Specifically designed for the learning of techniques of interviewing and symptom analysis by the study of a variety of common and well-defined clinical entities by role-playing in a problem-solving setting. No final exam. Medical students should enroll in Medicine 202. Available only to students in an MIS degree program.
2 units

205. Introduction to Clinical Environments—This one quarter course is designed for students who are not enrolled in the MD program or do not have an MD degree. Students will spend one afternoon per week becoming familiar with a variety of clinical settings at Stanford Medical Center and the Veterans Administration Medical Center. The students will be assigned to selected faculty members who will introduce them to the medical wards, outpatient clinics, emergency room, operating room, intensive care unit, psychiatry ward, and rehabilitation ward. Meeting time will be adjusted to suit the student's class schedule. Available only to students in an MIS degree program.
1 unit, by arrangement

210. Medical Computer Science—(Same as Computer Science 120, Medicine 219.) This one quarter lecture series provides an overview of medical computer science activities in both research and applied environments. Topics covered include office systems, hospital information systems, medical databases, pharmacy systems, laboratory systems, image analysis, EKG and EEG analysis, history taking, library systems, multiphasic health testing, medical computer-aided instruction.
3 units, Aut (Shortliffe) TTh 12:15

211A. Computer-Based Medical Decision Aids—(Same as Medicine 211A, Computer Science 121A). We will study representative examples from each of several major medical computing paradigms as they relate to computer-based clinical decision aids. Topics include 1) clinical algorithms, 2) clinical databanks, 3) mathematical models of physical processes, 4) pattern recognition, 5) Bayesian statistics, 6) decision analysis, and 7) artificial intelligence.
3 units, Win (Shortliffe, Buchanan) TTh 12:15
211B. Continuation of MIS 211A—(Same as Medicine 211B, Computer Science 121B). Intended for students who have completed 211A and wish to implement some of those ideas in a computer project. Meets twice weekly.

2-4 units, Spr (Shortliffe, Buchanan)
TTh 12:15

214. Seminar on Computers in Biomedical Research—(Same as Computer Science 321, Electrical Engineering 306). This seminar will survey medical computing research at Stanford and nearby industries. Lectures will be presented by local faculty and research staff. Typical topics include computers in the operating room, automated interpretation of medical data, and applications of artificial intelligence and databases to medical problems. Meets once per week.

1 unit, Spr (Owicki and Shortliffe)

299. Directed Reading and Research—Students wishing to receive credit for research time should register for this course.

**NEUROSCIENCES PROGRAM**

Committee: Stephen G. Waxman, Professor of Neurology (Chairman); Jack D. Barchas, Professor of Psychiatry & Behavioral Sciences; Denis A. Baylor, Professor of Neurobiology; Corey Goodman, Assistant Professor of Biological Sciences; David A. Prince, Professor of Neurology; Peter B. Sargent, Assistant Professor of Structural Biology; Carla J. Shatz, Assistant Professor of Neurobiology; Richard Thompson, Professor of Psychology; Stuart Thompson, Assistant Professor of Biology; Jeffrey J. Wine, Associate Professor of Psychology; Student Members: Michel Kliot, Tina Seelig

The Neurosciences Program is an interdepartmental program which offers instruction and research opportunities leading to a Ph.D. in Neurosciences. The program is administratively under the aegis of the Graduate School. The Dean of the Medical School, Dr. Dominick P. Purpura (himself a neuroscientist), acts in an advisory capacity to the program and welcomes the opportunity to meet with students. The Faculty of the Program is drawn from the Departments of Biological Sciences, Anesthesiology, Neurobiology, Neurology, Pathology, Pharmacology, Physiology, Psychology, Psychiatry, Structural Biology and Surgery. Participating Faculty:

**ANESTHESIA**
Joan E. Kendig (Associate Professor of Biology in Anesthesia)

**BIOLOGICAL SCIENCES**
William F. Gilly (Assistant Professor), Corey S. Goodman (Assistant Professor), H. Craig Heller (Associate Professor), Richard H. Scheller (Assistant Professor), Stuart Thompson (Assistant Professor)

**NEUROBIOLOGY**
Denis A. Baylor (Professor), Eric I. Knudsen (Assistant Professor), U.J. McMahan II (Professor), John G. Nicholls (Professor), Carla J. Shatz (Assistant Professor), Eric M. Shooter (Professor and Chairman), Bruce G. Wallace (Assistant Professor)

**NEUROLOGY**
Barry W. Connors (Assistant Professor), Jeffery Kocsis (Assistant Professor), Arnold Kriegstein (Assistant Professor), David A. Prince (Professor and Chairman), Bruce Ransom (Assistant Professor), Marion E. Smith (Professor, Research), Lawrence Steinman (Assistant Professor), Steven Waxman (Professor), Michael Weinrich (Assistant Professor)

**NEUROSURGERY**
Richard H. Britt (Assistant Professor)

**PATHOLOGY**
Lawrence F. Eng (Professor, Research), Donald A. Kristt (Associate Professor)

**PHARMACOLOGY**
Dora Goldstein (Professor), Howard Schulman (Assistant Professor)

**PHYSIOLOGY**
Julian M. Davidson (Professor)

**PSYCHIATRY AND BEHAVIORAL SCIENCE**
Patricia R. Barchas (Assistant Professor), Jack D. Barchas (Nancy Friend Pritzker Professor), Phillip A. Berger (Associate Professor), Roland D. Ciarenello (Assistant Professor), Seymour Levine (Professor), Eckard Weber (Assistant Professor)

**PSYCHOLOGY**
Richard Thompson (Professor), Jeffrey J. Wine (Associate Professor)

**STRUCTURAL BIOLOGY**
Peter B. Sargent (Assistant Professor), Lubert Stryer (Winger Professor)
SURGERY
David M. Maurice (Adjunct Professor),
Michael F. Marmor (Associate Professor)

GRADUATE PROGRAM

The requirements for a Ph.D. degree follow those of the University and in addition are tailored to fit the background and interests of the student. Remission of fees and a personal stipend are available to those students accepted. Qualified applicants should, where possible, apply for predoctoral fellowships in open competition, especially those from the National Science Foundation. Formal application should be made through the Graduate Admissions Office which will submit completed applications to the Neurosciences Ph.D. Program Admissions Committee. Deadline for receipt of applications with all supporting material in the University’s Graduate Admissions Office is January 15th. A supplemental application (which can be obtained from the Neurosciences Program Office, Fairchild D 201A, Stanford University) must be submitted to the Neurosciences Office by January 1st.

Applicants are encouraged to familiarize themselves with the research interests of the faculty and, to indicate their preferences clearly on the application form.

Since students enter with differing backgrounds and the laboratories in which they may elect to work cover several different disciplines, the specific program for each student is worked out individually with his or her advisory committee. All students are required to complete the basic courses in neurobiology (Neurobiology 200 or its equivalent). The remaining courses are then chosen to reflect the student’s interests in one or more of the biochemical, neurophysiological, neuroanatomical or biobehavioral aspects of the subject.

It is anticipated that the required course work will be completed by the end of the second year. Successful passing of a comprehensive oral preliminary examination given by the student’s advisory committee is required for admission to Ph.D. candidacy. This examination is usually taken in the second year of study and must be completed by the end of the second year. Students are strongly encouraged to begin research on entry or at the latest during the winter quarter of the first year. The student will be required to present a Ph.D. thesis which is the result of independent investigation and which contributes to knowledge in an area of neuroscience and to defend his or her thesis in a University oral examination, including a public seminar.

Medical students may also participate in this program provided they meet the prerequisites and satisfy all the requirements of the graduate program as listed above. The timing of the program may be adjusted to fit in with their special circumstances.

SELECTED COURSES

The course selections of individual departments participating in the Neurosciences Program should also be consulted for complete offerings.

Biological Sciences 153. Introductory Neurobiology—(Same as Psychology 107.) A survey of neural mechanisms and interactions underlying behavior. Prerequisites: 42 and 43, or Psychology 1, or consent of instructor.

4 units, Aut (Wine) given 1983-84

Biological Sciences 154. Cellular and Molecular Neurobiology—(Same as Psychology 107.) A study of the function of the nervous system at the cellular and molecular level. Discussion of membrane biophysics, synaptic transmission, biochemistry and molecular genetics of neuronal function, and their relationship to behavior and learning. Prerequisites: 42 and 150, or consent of instructor.

3 units, Win (Scheller, Goodman) given 1983-84

Biological Sciences 155. Developmental Neurobiology — (Formerly 109.) A study of the development of the nervous system at the cellular and molecular level. Discussion of axon guidance and cell migration, neuronal determination and lineage, and synaptogenesis and selective pruning. Prerequisites: 42 and 150, or consent of instructor.

4 units, Win (Goodman, Scheller)

Biological Sciences 165H. Experimental Neurobiology — An intensive laboratory and lecture course in cellular and organismal neurophysiology. Lectures emphasize (1) cellular processes such as membrane excitability, synaptic transmission, neuronal metabolism, and neuropharmacology, (2) the organization of sensory, motor and integrative systems. In addition, supplemental lectures deal with practical matters concerning modern techniques and data analysis. The laboratory is the center of the course. It offers experience with several marine invertebrate preparations and with a wide range of investigative techniques. This course is offered to advanced undergraduates, graduate students and postdoctoral students. Previous exposure to neurobiology is suggested.

6 units, (Thompson) by arrangement given 1983-84

Biological Sciences 222. Cellular Electrophysiology: Control of Function by Membrane Voltage—(Same as Neurobiology 222.) A course
designed to provide an in-depth exposure to contemporary ideas in cellular electrophysiology. It will involve lectures, student presentations of recent research papers and laboratory work. Voltage-control of functions in nerve and muscle cells will be covered in considerable detail, with emphasis on gating currents and single-channel currents. Use of membrane voltage by other cell types and processes will also be surveyed. The final three-four weeks of the course will be devoted to laboratory work on one or two marine invertebrate preparations in which electricity plays an "unconventional", perhaps little understood, but biologically important role.

5 units, Win (Gilly) given 1983-84

Biological Sciences 307. Seminar in Integrative, Developmental and Molecular Neurobiology.

Aut, Win, Spr (Goodman, Scheller, Wine)

Human Biology 167. Neurochemical Aspects of Behavioral Disorders in Children—This course consists of a series of lectures which cover principles of neurotransmitter dynamics as they relate to our understanding of behavioral disorders in children. Current hypotheses concerning the neurochemical and neurobiological basis of behavior disorders in children will be discussed. Clinical syndromes including infantile autism, childhood schizophrenia, and hyperkinetic syndromes and childhood depression will be discussed in terms of disturbed neurochemical of neurophysiological functioning. The course is limited to junior and/or senior students. Prerequisites: Human Biology or Biology Core or permission of the instructor. In addition, Human Biology 111, Human Biology 163 and organic chemistry are strongly recommended.

4 units, Win (Ciaranello) given 1983-84

Neurobiology 200. The Nervous System—An introduction to structure and function of the nervous system, including neurophysiology, neurochemistry and neuroanatomy. Topics range from the properties of neurons to the mechanisms and organization underlying higher functions. The course is designed to present a coherent framework as a preparation for neurology, neuropathology and clinical medicine in general, as well as for more advanced work in neurobiology. In addition to the lectures and neuroanatomy laboratories, there will be frequent, informal seminars with students in small groups, and demonstrations. This is an integrated course in which the neuroanatomy and neurobiology components must be taken together. Final exam will be given. No limitation. No prerequisites.

9 units, Aut (Baylor, Knudsen, Nicholls, McMahan, Shatz, Shooter, and Wallace)

Neurobiology 212. Neurochemistry—An advanced seminar and reading course dealing in detail with the biochemistry of neurons and synaptic transmission. Topics covered will include neurotransmitter metabolism, neurotransmitters and peptides, nerve growth factor and regeneration. Emphasis will be placed on the study of original papers and on student presentations. Prerequisites: Neurobiology 200 or equivalent.

3 units, Spr (Shooter, Wallace)

Neurobiology 213. Functional Organization of the Central Nervous System—An advanced seminar and reading course which will examine the way in which the vertebrate brain processes and codes information, and the role of experience in establishing neural connections. Attention will be focused on the visual, auditory and somatosensory systems. Emphasis will be placed on the study of original papers and on student presentations. Prerequisites: Neurobiology 200 or the equivalent.

3 units, Win (Knudsen, Shatz) given 1983-84

Neurobiology 216. Membrane and Cellular Mechanisms of Neural Function—Selected topics in mechanisms of excitability, sensory transduction, and synaptic transmission will be treated by reading original papers. Student presentations and small group discussions will be the usual format. The general aim is to look at a few topics in some depth, with emphasis on the nature of the experimental evidence and the scientific context. In previous years, course topics have included: microanalysis of transmitter action by iontophoretic application and noise analysis, visual transduction in vertebrates, gating currents and Hodgkin-Huxley experiments, trophic effects of nerve on muscle and quantal release of neurotransmitter.

3 units, Win (Nicholls, Baylor)

Neurobiology 217. Extracellular Matrix—Examines current views on the structure, function and regulation of extracellular matrix in a variety of tissues, but with emphasis on the nervous system. Prerequisites: Introductory courses in cell biology and biochemistry.

3 units, Win (McMahan)

Neurobiology 222. Cellular Electrobiology: Control of Function by Membrane Voltage—(Same as Biological Sciences 222.) A course designed to provide an in-depth exposure to contemporary ideas in cellular electrophysiology. It will involve lectures, student presentations of recent research papers and laboratory
work. Voltage-control of function in nerve and muscle cells will be covered in considerable detail, with emphasis on gating currents and single-channel currents. Use of membrane voltage by other cell types and processes will also be surveyed. The final three-four weeks of the course will be devoted to laboratory work on one or two marine invertebrate preparations in which electricity plays an "unconventional", perhaps little understood, but biologically important role.

5 units, Win (Gilly) given 1983-84

Neurology 204. Physiology of Mammalian Central Nervous System—Laboratory course designed for advanced students interested in neurological sciences. Introduction to a variety of techniques used in current research in physiology of mammalian central nervous system. No final exam. Limited to 8 students. Prerequisites: consent of instructors.

4 units, Spr (J. Kocsis, B. Connors)

Neurology 205. Pathophysiology of Nervous System Diseases—A seminar series on application of the neurosciences to the understanding of disease processes affecting the human nervous system. No final exam. Limited to 20 students. Prerequisites: neurobiology, neuroanatomy or consent of instructor.

2 units, Win (A. Kriegstein, Staff) given 1983-84

Physiology 210. Neuroendocrinology—A lecture and discussion course on selected topics of current interest in the general area of nervous and endocrine system interrelationships. Special emphasis will be placed on mechanisms for control of pituitary function and behavioral aspects of neuroendocrinology. Prerequisites: Basic knowledge of Neurophysiology, Neuroanatomy and Endocrinology; consent of instructor.

2 units, Spr (Davidson) given 1983-84

Psychology 107. Introduction to the Nervous System—(Same as Biological Sciences 153.) A survey of neural interactions underlying behavior. Prerequisite: 1 or equivalent and elementary biology.

4 units, Aut (Wine) given 1983-84

Psychology 206. Behavioral Neuroscience — The focus of this course is on neurobiological substrates of behavior. Topic areas are for the most part organized in terms of categories of behavior. The neuroanatomical, neurophysiological, neurochemical, hormonal and pharmacological aspects of these behavioral phenomena will be explored.

3 units, Win (R. Thompson, Staff)

Psychology 227. Seminar: Cellular Neurophysiological Approaches to Behavior— A detailed consideration of selected examples of current research that have solved or are close to solving persistent problems. We will also try to identify problems and preparations which might profitably be explored. Sample topics: the Mauthner cell system; the function of muscle spindles; efferent control of sensory input.

3 units, Spr (Wine) by arrangement given 1983-84


1-3 units, Spr (Goodman and Wine) given 1983-84

Structural Biology 218. Cellular Analysis of Neuronal Development—Selected topics in neuronal development with emphasis on invertebrates and on the peripheral nervous system of vertebrates. Topics include cell proliferation, cell lineage and determination, cell migration, axonal guidance, cell differentiation, synapse formation, cell death, and synapse elimination. The course is based on the current literature and requires extensive student participation. Prerequisites: Biology 155 (formerly Biology 109) and Neurobiology 200 or consent of instructor.

3 units, Win (Sargent)

Structural Biology 224. Biological Membranes—Structure, Dynamics and Function of Selected Membrane Assemblies—This course will focus on membrane receptors and channels as exemplified by the acetylcholine receptor, rhodopsin, the purple membrane protein, and gap junctions. Three-dimensional image reconstruction techniques and spectroscopic methods for elucidating membrane architecture and dynamics will be presented. Prerequisites: Knowledge of introductory Biochemistry.

4 units, Spr (Stryer, Unwin) given 1983-84
SPECIAL PROGRAMS

CENTER FOR TEACHING AND LEARNING (CTL)

Director: Michele Fisher
Assistant Director: Callie Marie Elliston

Since 1975, the Center for Teaching and Learning (CTL) has provided the Stanford community with services and resources on effective teaching. Its aims are several: to identify and involve successful teachers who are willing to share their talents with others; to provide those who are seeking to improve their teaching with the means to do so; to acquaint the Stanford community with important innovations and new technologies for teaching; to prepare inexperienced teachers for their responsibilities; to expand awareness of the role of teaching at research universities and to increase its rewards.

Goals are carried out by offering a variety of continuing programs—videotaping and consultation, small group evaluation, workshops and lectures, a handbook on teaching and a library of teaching materials, an annual orientation—and by working with individuals, groups, and departments on their specific needs. If you are currently teaching or will teach in the future, you are encouraged to drop by the CTL offices, acquaint yourself with the activities, and participate in the programs. Especially urged to talk with the Center are those who are eager to share teaching skills or who would like to assist in the development of new services. The extension is 7-1326.

COURSES

CTL offers a variety of short-term non-credit workshops on topics related to teaching and public speaking. To be regularly informed regarding these offerings, call 7-1326 and request to be placed on the mailing list.

INDEPENDENT LABORATORIES AND INSTITUTES

CENTER FOR MATERIALS RESEARCH (CMR)

Director: T. H. Geballe
Assistant Director: R. P. Girouard
Director, Crystal Science Division: R. S. Feigelson
Associate Director, Crystal Science Division: D. Elwell
Affiliated Faculty: Currently 75 members from the following departments: Aeronautics and Astronautics, Applied Earth Sciences, Applied Physics, Chemical Engineering, Chemistry, Civil Engineering, Electrical Engineering, Geology, Geophysics, Materials Science and Engineering, Mechanical Engineering, Physics, Hansen Laboratories, and the Stanford Synchrotron Radiation Laboratory

The Stanford University Center for Materials Research (CMR), located in the McCullough Building, is one of 14 university laboratories throughout the United States supported by the Division of Materials Research of the National Science Foundation under its Materials Research Laboratory (MRL) Program.

The purpose of the MRL Program is to support major central research facilities, to provide seed money for funding junior faculty or provide initial funding for established faculty who are changing research fields, and to support coherent multi-investigator projects in major thrust areas requiring expertise in two or more materials related disciplines—so-called “Thrust” research.

To fulfill these goals CMR operates extensive materials characterization facilities and, at the present time, sponsors 14 seed programs and six multi-investigator, multidiscipline Thrust programs. CMR’s professional staff also conducts research programs in Crystal Synthesis and Vapor Phase Synthesis.
Director: Robert E. Ward
Associate Director: Ronald Herring

The Center for Research in International Studies (CRIS) was established in 1967 as a means of coordinating Stanford’s numerous activities in the fields of international, comparative, and regional studies.

CRIS provides the University with a means of planning, financing, stimulating, and coordinating a variety of activities and programs that relate to teaching and research in the international field. It is specifically concerned with the nature and quality of Stanford’s curriculum in the sphere of international, comparative, and foreign area studies and has played a leading role in the development of the undergraduate curriculum in International Relations and the A.M. program in International Policy Studies. It is continuously and closely involved in the planning, support, and coordination of Stanford’s foreign area and language programs and a variety of major research programs as well. CRIS also raises and administers funds from governmental, foundation, and private sources to support the University’s activities in the international field and uses these funds in part to finance related faculty research, student fellowships, library development, graduate student exchanges, and appointment of new faculty members and international visiting professors.

The operations of CRIS are University-wide and extend to research and teaching activities in the Schools of Humanities and Sciences, Law, Business, and Education. Relations with the various departments in the social sciences and humanities are especially close, as are those with the Hoover Institution on War, Revolution and Peace which is very heavily involved in international studies and research.

CRIS administers a program to develop internationally oriented curriculum materials for use by public school teachers and to provide in-service training for pre-collegiate educators who teach in this field. These activities are undertaken by four area-oriented projects on China, Japan, Africa and Latin America which are organized within the Stanford Program on International and Cross-cultural Education (SPICE).

CRIS also administers on behalf of two consortia of major universities the Inter-University Center for Japanese Language Studies in Tokyo and the Inter-University Program for Chinese Language Studies in Taipei. Between them these provide the United States’ most outstanding facilities for advanced professional training in the Japanese and Chinese languages.

CRIS is administered by a Director and Associate Director who work with a small administrative and secretarial staff. The Director has the advice and assistance of a Committee composed of faculty members and students representing many sectors of the International Studies community at Stanford. The offices are located in the Lou Henry Hoover Building (Telephone: 415 497-4581).

CRIS neither offers courses nor confers degrees. These academic functions are performed by the schools, departments, and programs with which CRIS is associated.

AREA STUDIES PROGRAMS

Stanford has four interdisciplinary language and area programs: East Asian Studies, Latin American Studies, Russian and East European Studies, and African Studies. These are separately organized as Centers responsible for coordinating the University’s resources in all schools and departments for teaching and research relating to each of these areas. The relevant faculty members from these schools and departments constitute the staff of the four Centers. The great majority of area-related courses and seminars are offered by the school or department concerned, not directly by the Centers. Undergraduate degree programs are coordinated by staff associated with each of the area programs. Special graduate programs leading to the A.M. in Latin American Studies, East Asian Studies and Russian and East European Studies are available and are described separately in this bulletin. The area studies programs do not offer the Ph.D. but qualified doctoral candidates may develop an area specialization within their discipline. Students may also design a cross-disciplinary specialization which emphasizes the area interest within an individually organized program of interdisciplinary preparation.

UNDERGRADUATE PROGRAM

A special interdisciplinary program in International Relations, including an undergraduate major, has been developed in response to initiatives to review this aspect of the international studies curriculum. The relevant course offerings are described under the rubric "International Relations Program" in the School of Humanities and Sciences section of this bulletin.
The Inter-University Center for Japanese Language Studies in Tokyo, Japan is a cooperative enterprise of 12 major academic institutions in the United States and Canada with Stanford University as the administrative agency. The purpose of the Center is to provide qualified graduate and undergraduate students with intensive audio-lingual Japanese language instruction, as well as to further the students' familiarity with Japanese texts and materials preparatory or leading to research in given disciplinary or professional fields. The location of the Center in Tokyo provides maximum opportunities for students to gain fluency in both the written and spoken language in a Japanese-speaking and Japanese cultural environment. Language study is carried on in small classes or in individual tutorial sessions by Japanese instructors. Advanced and post-doctoral students may be given opportunities for specialized work in the language, as well as other individual study, dependent upon programs as established by their home institutions.

The academic year at the Center is equivalent to four full quarters, beginning in early September. Any student may apply for admission provided that he or she (a) is a student in good standing, and is a degree candidate at an accredited university or college, or provides sufficient evidence of intending to enroll in a graduate program after attending the center; (b) will have successfully completed prior to attendance a minimum of two years of Japanese or its equivalent at the college level; and (c) takes a written screening examination in the Japanese language.

Stanford students attending the Inter-University Center for credit should enroll in Asian Languages J400 Advanced Language Training (15 units per quarter). This course will be graded on a Pass/No Credit basis.

For further information please write to:
Center for Research in International Studies
Room 200, Lou Henry Hoover Building
Stanford University
Stanford, California 94305

INTER-UNIVERSITY PROGRAM FOR CHINESE LANGUAGE STUDIES IN TAIPEI

The Inter-University Program for Chinese Language Studies in Taipei, Taiwan, was established in September 1963. It is sponsored by ten American universities, with Stanford University as the administrative agency. The program is a cooperative effort drawing upon the accumulated experience of the profession in providing advanced language training offerings at American institutions.

The purpose of the program is to provide graduate and undergraduate students with intensive audio-lingual language instruction (usually 20 hours a week), as well as to further the students' familiarity with Chinese texts and materials preparatory or leading to research in given disciplinary or professional fields. The program, however, is not a research institution but a language-training facility.

Undergraduate, graduate, or postdoctoral candidates are eligible to apply to the program if they have successfully completed a minimum of two academic years, or its equivalent, of Chinese language study at the college level. Applicants must also pass a short written screening examination in the Chinese language.

Stanford students attending the Inter-University Program for credit should enroll in Asian Languages C400, Advanced Language Training (15 units per quarter). This course will be graded on a Pass/No Credit basis.

For further information please address your inquiries to:
Center for Research in International Studies
Room 200, Lou Henry Hoover Building
Stanford University
Stanford, California 94305
The primary function of this organization is to stimulate faculty and graduate student research, and to disseminate the findings, on economic aspects of public policy questions that can be expected to remain of continuing importance to the American people. In extension of these functions, the center brings to Stanford academic visitors, as well as representatives of government, business and labor. Other activities of the center are: 1) a program of visiting research professorships, visiting research associates and guest seminar speakers; 2) a lecture series on Economics and Public Policy; 3) graduate student Fellowships in Economic Policy Research; 4) the Koret Conference Series; 5) curriculum development grants in the economics and public policy area, oriented to undergraduate teaching at Stanford. The center does not offer any courses for academic credit, nor admit students, nor award degrees, nor appoint faculty affiliates not otherwise belonging to the Academic Council of Stanford University, nor appoint research associates to permanent positions of any kind.
The Center acts as an organizational and administrative focus for gender-related, interdisciplinary education and research whose major objectives are:

1. To conduct research on women and gender-related issues.
2. To stimulate gender-related research among Stanford faculty members, graduate and undergraduate students and CROW Affiliated Scholars.
3. To disseminate research and educational findings to the larger Stanford community including presentation of lecture series and campus conferences.

Courses are not offered through the Center, per se, but are offered within academic departments. Course information may be located under Feminist Studies.

The Institute for Energy Studies is an interdepartmental activity that serves to stimulate, focus, and coordinate energy-related graduate research and educational activities within the various departments and schools.

The Institute maintains a special Energy Information Center which houses a unique collection of reports, journals, and special documents containing data pertinent to energy studies.

A major role of the institute is the provision of funds to faculty for initiation of new energy research. With these funds, a faculty member and his or her Ph.D. research students are able to carry their work to the point where support from an appropriate sponsoring agency can be obtained. Ph.D. candidates interested in working in the energy area should discuss the opportunities afforded by the Institute with their dissertation research advisor.

The Institute administers a number of energy-related graduate fellowships and traineeships. These are allocated to the participating departments primarily for first year graduate students. Interested students should apply directly to their departments, indicating their interest in energy studies.

Academic programs important to energy problems are offered by many departments in the Schools of Business, Earth Sciences, Engineering, Humanities and Sciences, and Law. A student interested in energy studies should apply to the department most closely aligned with his or her interests.

The Hansen Laboratories consist of two distinct programs: the High Energy Physics Laboratory (HEPL), and the Edward L. Ginzton Laboratory. HEPL is engaged in basic research in high, intermediate and low temperature physics, which currently includes experiments involving superconducting accelerators, particle detection at SLAC and other National Laboratories, gravity waves, gamma ray detection in space, and a free electron laser. The Ginzton Laboratory houses a number of Electrical Engineering and Applied Physics faculty and graduate students, who are engaged in research on quantum electronics and lasers, fiber optics, acoustics and nondestructive testing, and superconducting materials and electronics.

INSTITUTE FOR MATHEMATICAL STUDIES IN SOCIAL SCIENCES

Director: Patrick Suppes
Assistant Director: Joyce Firstenberger

IMSSS is a research institute primarily funded by government grants and contracts. It was founded in 1959. The current major emphases are on research in computer-assisted instruction, mathematical economics, and organizational theory. The staff includes research associates, graduate student research assistants, programmers, and several faculty.
LOTS COMPUTER FACILITY

Director: Ralph E. Gorin

OFFERINGS AND FACILITIES

The LOTS (Low Overhead Time-Sharing) Computer Facility supports instruction and unsponsored research programs on campus. The two LOTS DECsystem 2060's are located in the Center for Educational Research at Stanford (CERAS) Building. A large number of terminals located at the CERAS Building and at theerman Engineering Center provide access to the computer. Students and faculty may use LOTS without charge. Information about obtaining accounts is available at the LOTS office, CERAS Building.

Interactive services available include a text editor, many programming languages such as FORTRAN, BASIC, PASCAL, LISP and SAIL, and Statistical Packages, e.g., SPSS, BMDP, MINITAB, NAG, IMSL.

The LOTS student coordinator and student consultants provide limited advice on program development and system features for users of the computer. However, it is expected that users will do all their own programming and make necessary adaptations of available programs for their particular application.

Short orientation classes on the use of major programming languages and utilities are offered each quarter by the LOTS staff. A schedule of the courses for each quarter is available from the LOTS office. Requests for information should be directed to the LOTS office, (497-3214).

COURSES

No registration required.

2. Introduction to LOTS I & II—Two one-hour orientation sessions designed for users who are familiar with computing concepts but who need a guide to the use of the LOTS facility. The course includes information about obtaining accounts, an introduction to the file system, and a demonstration of the use of the editor to create and run a program.

0 units, Aut, Win, Spr, Sum

10. Introduction to FORTRAN—It is assumed that the student knows FORTRAN already. The particular features of FORTRAN available at LOTS are discussed. Persons not already familiar with FORTRAN should consider taking the course, Introduction to FORTRAN offered by the Stanford Center for Information Technology (CIT), or Computer Science 103.

0 units, by arrangement

11. Introduction to PASCAL—A one-hour session dealing with the characteristics of PASCAL at LOTS. PASCAL is an ALGOL-like language gaining in popularity due to its clarity, simplicity and powerful data-structure manipulation and type definition facilities. Familiarity with some programming language is assumed.

0 units, by arrangement

12. Minitab—An introduction to Minitab, an easy to use statistical computer package for small to moderate sized statistical problems. The lecture assumes little previous experience with computers, but previous attendance in Introduction to LOTS I & II helpful.

0 units, by arrangement

13. SPSS—A one-hour orientation session designed for persons who are familiar with SPSS at some other computer facility. The version used at LOTS is similar to the version presently used at CIT. If you are not already familiar with SPSS, the Stanford Center for Information Technology (CIT) offers a course each quarter. No previous computer experience is required, but a knowledge of elementary statistics is necessary.

0 units, by arrangement

14. SAIL—(an ALGOL-like language.) Introduces the student to the specifics of using SAIL at LOTS. Covers control structures, declarations, procedures, and input/output facilities. This one-session orientation lasts one hour. Familiarity with an ALGOL-style language is assumed.

0 units, by arrangement

NORTHEAST ASIA-UNITED STATES FORUM ON INTERNATIONAL POLICY (NEXUS)

Director: John Lewis

The Northeast Asia-United States Forum on International Policy brings together Stanford's programs on U.S.-China Relations and U.S.-Japan Relations, and is affiliated with the Arms Control and Disarmament program. NEXUS serves as a focal point at Stanford for research, training, and exchange activities related to these areas. Some 60 faculty members throughout the University are Fellows of the Forum.

The Forum's programs have in residence each year a group of visiting fellows and graduate student research assistants. Current areas of research include projects on high technology industries in Japan and the U.S.; energy policy and management in the People's Republic of China; strategic issues; and work on communication, education, and health.
STANFORD CENTER FOR CHICANO RESEARCH

Director: Albert Camarillo
Associate Director: Armando Valdez

The Stanford Center for Chicano Research (SCCR), is a research unit designed to conduct original research on urban Chicanos in American society. SCCR will sponsor symposiums on public policy issues concerning Chicanos, engaged in collaborative research with other private and public institutions, and publish research findings that contribute to knowledge about Chicanos.

The purpose of SCCR is to develop studies that can significantly contribute to the formation of public policy concerning Hispanics. The four major research areas are: demography, communication, education, and health.

STANFORD HUMANITIES CENTER

Director: Ian Watt
Associate Director: Morton Sosna

The Stanford Humanities Center was founded in 1980 as part of President Donald Kennedy's effort to strengthen research and teaching in the humanities at Stanford. In addition to the Director and Associate Director, the Center consists of six Stanford Faculty Fellows (internal fellows), 3-5 Faculty Fellows from other universities (external fellows), and 5-10 Stanford Graduate Fellows. All fellows are in residence during the academic year and meet regularly.

The general aims of the Stanford Humanities Center are to promote humanistic studies and interests in three main ways: by operating a fellowship program mainly concerned with research; by supplementing and otherwise strengthening humanistic teaching at Stanford; and by conducting studies of problems in the area of the humanities broadly defined, and of their relationship to other disciplines. In 1983-84, the Center will continue to sponsor colloquia, seminars, and lecture series concerning various aspects of humanistic study. A major conference on the subject of Individualism, is being planned for February, 1984. The fellows, who are selected on the basis of an open competition, are primarily given opportunities for their own research but also contribute to the intellectual life of the Stanford community, usually by giving a regular course or seminar within a particular department, or by leading other Center activities.

Departments through which Fellows will teach courses during 1983-84 include Anthropology, Classics, Comparative Literature, English, Feminist Studies, History, Modern Thought and Literature, and Philosophy.

STANFORD SYNCHROTRON RADIATION LABORATORY (SSRL)

Director: A. Bienenstock
Associate Directors: R. Gould, K. Hodgson, I. Lindau, H. Winick

The Stanford Synchrotron Radiation Laboratory (SSRL) is a national research facility for the utilization of synchrotron radiation for research in the natural sciences and engineering and is supported by the Department of Energy and the National Institute of Health.

Synchrotron radiation is electromagnetic radiation emitted by relativistic charged particles curving in magnetic fields. The radiation emitted from the storage rings SPEAR extends from the infrared to 100 keV x-rays with intensity 1000 to a million times that available from conventional sources. The radiation is used for studies of fundamental properties of matter as well as studies of technological interest. Development of advanced sources of synchrotron radiation and associated instrumentation are also a major undertaking of the facility. SSRL is a user-oriented facility which welcomes proposals for experiments from all qualified scientists including graduate students.
LIBRARIES AND INFORMATION SERVICES

HOOVER INSTITUTION ON WAR, REVOLUTION AND PEACE

Director: W. Glenn Campbell
Deputy Director: Dennis L. Bark
Associate Directors: Richard T. Burress, John H. Moore
Budget and Finance Officer: Sally J. Vanders
Program Planning Officer: Charlene S. Seifert
Public Affairs Coordinator: George Marotta
Assistant Directors: Joseph Kladko, Laverne M. Rabinowitz, Dennis Spellmire

RESEARCH AND PUBLICATIONS

Honorary Fellows: Friedrich A. Hayek, Ronald W. Reagan, Alexander Solzhenitsyn
Consultant: Yuan-li Wu

Executive Secretary of National, Peace and Public Affairs Program: Dennis L. Bark
Publications Program—Publications Manager: Phyllis M. Cairns, Marketing and Distribution Manager: David L. Fleenor

THE LIBRARY AND ARCHIVES

Associate Director for Library and Archival Operations: John H. Moore (Acting)
Assistant Director for Technical Services: Joseph Kladko
Readers' Services Head: David W. Heron
Africa and Middle East Collection—Curator: Peter J. Duignan; Deputy Curators: Lewis H. Gann, Karen Fung
East Asian Collection—Curator: Ramon H. Myers; Research Fellow: Fu-mei C. Chen; Deputy Curators: Emiko Moffitt, Mark W. Tam
East European Collection—Curator: Robert Conquest; Deputy Curator: Joseph D. Dwyer
Latin American Collection—Curator: Joseph W. Bingaman
West European Collection—Curator: Agnes F. Peterson
Hoover Institution Archives—Archivist: Milorad M. Drachkovitch (on leave), Charles G. Palm (Acting); Deputy Archivist: Robert Hessen; International Associate: Weldon B. Gibson; Special Representative: Franz G. Lassner
British Labour Collection—Honorary Curator: Peter Stansky
Imperial Russian Collection—Honorary Curator: Vasili Romanov
Spanish Archival Collection—Honorary Curator: Burnett Bolloten

Since its founding by Herbert Hoover in 1919 as a special collection dealing with the causes and consequences of World War I, the Hoover Institution on War, Revolution and Peace has become an international center for documentation, research, and publication on problems of political, economic, social, and educational change in the twentieth century.

The library includes one of the largest private archives in the United States, and has outstanding area collections on Africa, East Asia, Eastern Europe, Latin America, the Middle East, North America, and Western Europe.
Holdings include government documents, files of newspapers and serials, manuscripts, memoirs, diaries and personal papers of men and women important in world affairs, publications of ephemeral societies and of resistance and underground movements, and the publications and records of national and international bodies, both official and unofficial, as well as books and pamphlets, many of them rare and irreplaceable. The materials are open to all Stanford students, faculty, and staff, and to scholars from outside the University.

The Institution has a resident research staff of historians, economists, educators, political scientists, and sociologists, and promotes basic research and documentary studies. Notable long-term research topics include public policy analyses and research in the areas of African colonialism, post-Mao China, the international communist movement, non-Russian nationalities in the Soviet Union, Latin America, national security, and the role of education in war, revolution, peace, and development. Research on the latter subject has been enhanced by the establishment of the Paul and Jean Hanna Collection on the Role of Education. Peter J. Duignan coordinates the International Studies Program.

The Institution has expanded its Domestic Studies Program, which has become comparable in size and quality to International Studies. Thomas G. Moore is coordinator of Domestic Studies. Research currently underway is concerned with income redistribution, government regulation, taxation, and domestic health and energy policies.

In addition to its own research staff, the Institution has been visited over the years by tens of thousands of American and foreign scholars. In recent years, increased use of the Institution's resources has been encouraged by providing more funds for postdoctoral fellowships. Illustrative of this aim is the National Fellows Program, which includes a special category of Peace fellowships. Dennis L. Bark coordinates the National Fellows Program. For those selected, the program offers support for unrestricted research in modern history, political science, international relations, education, economics, and sociology. The Institution also maintains a publications program, which focuses on policy studies in both domestic and international affairs.

The many interrelationships with Stanford University include library cooperation, joint appointments, co-sponsorship of seminars and lectures, and courses offered by Hoover Institution scholars. Examples include senior fellow Robert Hall on joint appointment with the Economics Department; senior fellow Seymour Martin Lipset on joint appointment as the Caroline S. Munro Professor of Political Science and with the Sociology Department; senior fellow James G. March on joint appointment as the Fred H. Merrill Professor of Management with the Graduate School of Business and with the Departments of Political Science and Sociology and, by courtesy, Education; senior fellow Alex Inkeles on joint appointment with the Sociology Department and, by courtesy, Education; senior research fellow John Ferejohn on joint appointment with the Political Science Department; senior research fellow Henry S. Rowen on joint appointment with the Graduate School of Business; senior research fellow Kenneth E. Scott on joint appointment with the Law School. Professors Kenneth J. Arrow and Michael Boskin in Economics, Heinz Eulau and Robert E. Ward in Political Science, Nancy B. Tuma in Sociology, and William J. Goode in Sociology are senior fellows (by courtesy). East Asian curator Ramon H. Myers is adjunct professor at the Food Research Institute; deputy archivist Robert Hessen teaches in the Graduate School of Business; and senior research fellows James B. Stockdale and George Marotta offer undergraduate seminars.

In addition, Peter J. Duignan, who is the Institution's curator on Africa, also serves as curator for the African program of the University as a whole. Curatorial functions on a university-wide basis for materials in Arabic, Turkish, and Persian are also performed at the Hoover Institution. The East Asian library also collects research materials in the Chinese and Japanese languages for all of Stanford University.

Hoover scholars have received many awards and distinctions. In addition to the five Nobel laureates associated with the Hoover Institution, thirteen staff members are fellows or honorary members of the American Academy of Arts and Sciences, eight are fellows of the American Association for the Advancement of Science, eight are members of the National Academy of Sciences, and four are members of the National Academy of Education.

With the dedication of the Herbert Hoover Federal Memorial in July 1978, the Institution has become one of the outstanding research facilities in the United States. The Hoover Institution's complex now includes the Tower and two adjacent buildings. An exhibit building displays selected archival and library materials for the public.
Emeriti: M. Celeste Ashley (Drama Librarian); Joseph A. Belloli (Senior Reference Librarian); Virginia Bonnici (Physics Librarian); Edward Colby (Music Librarian); Kathryn N. Cutler (Earth Sciences Librarian); Florence Furst (Chemistry Librarian); Elmer R. Grieder (Associate Director of Libraries); Jennette E. Hitchcock (Chief Catalog Librarian); Anna Hoen (Reference Librarian, Lane Medical Library); Paul J. Kann (Curator for Romance Languages); Susan V. Lenkey (Rare Books Librarian); Clara S. Manson (Chief Librarian, Lane Medical Library); Charlotte W. Mercado (Assistant Chief for Monograph Cataloging); Emily Olson (Education Librarian); Jack Plotkin (Chief Circulation Librarian); Ruth Pressman (Assistant Director, Lane Medical Library); Ruth Scibird (Curator of the Stanford Collection); Margaret Windsor (Assistant Chief Librarian)

UNIVERSITY LIBRARIES

Director: David C. Weber

Assistant Director for Administrative Services: Joseph A. Jezukewicz

Associate Director for Collection Development: Paul H. Mosher

Associate Director for Public Services: Dale B. Canelas

Associate Director for Technical Services: James N. Myers

Library Development Officer: Susan G. Abernethy

Department Chiefs: Shere Connan (Serials); Carolyn Henderson (Personnel); Cynthia Gozzi (Acquisition); (Vacant) (Reference); Tamara Frost (Catalog); Michael T. Ryan, (Special Collections); Elizabeth M. Salzer (Meyer Library); Joan K. Krasner (Access Services); Carol A. Turner (Government Documents); Celine F. Walker (Science)

Branch Librarians: Alan Baldridge (Hopkins Marine Station); Charlotte R. Derksen (Banner Earth Sciences); Harry P. Llull (Mathematical and Computer Sciences); (Vacant) (Physics); Barbara M. Van Deventer (Cubberley Education); Jerry C. Persons (Music); Alexander Ross (Art and Architecture); (Vacant) (Swain Chemistry and Chemical Engineering); Michael V. Sullivan (Engineering); Beth Weil (Falconer Biology)

University Archivist: Roxanne-Louise Nilan

Curators—Collection Development Program: William P. Allan (English and American Literature Collections); James M. Breddlove (Latin American Collections); Peter R. Frank (Germanic Language Collections); James Knox (U.S. and British History Collections); Karen Wittenborg (Social Science Collections); Mary Jane Parrine (Romance Language and Humanities Collections); Michael T. Ryan (Special Collections); Alexander Ross (Art and Architecture Collections); Roberto Trujillo (Chicano Collections) Celine F. Walker (Science Collections); Wojciech Zalewski (Russian and East European Collections)

Curators—Honorary: William R. Moran (Archive of Recorded Sound); Samuel I. Barchas (History of Science); Margaret Sowers (Map Collections); Charles Tanenbaum (Exhibitions); Conyers Herring (Physics Collection); Samuel Stark (Theatre Collection)

FOOD RESEARCH INSTITUTE LIBRARY

Librarian: Charles C. Milford

HOOVER INSTITUTION

See “Hoover Institution” listing in this catalog.

J. HUGH JACKSON LIBRARY

OF BUSINESS

Director: Bela Gallo

Assistant Director/Head Technical Services Librarian: Robert E. Mayer

LANE MEDICAL LIBRARY

Director: Peter Stangl

LAW LIBRARY

Law Librarian: J. Myron Jacobstein

Associate Law Librarian: Rosalee M. Long;

Public Service Librarian: Iris J. Wildman

Associate Public Services Librarian: Joan Howland; Reference Librarian: J. Paul Lomio;

Head Catalog Librarian: Eliska Ryznar;

Catalog Librarian: Harriet Wu

LINEAR ACCELERATOR CENTER LIBRARY

Head Librarian: Robert Gex

Associate Head Librarian: Louise Addis

The Libraries of Stanford University sponsor a variety of instructional activities in order to promote awareness of the library resources and services that are available to the campus community and to expedite their effective use.

The reference librarians in all major library units provide professional advice and consultation in locating and utilizing published information. Curators and branch librarians offer similar bibliographic help within their subject specialities. Other types of instruction aid in-
clude tours, audio-visual presentations, and lectures to classes at the instructor’s request.

Numerous library publications are prepared to inform and instruct library users. The most general and basic of these are the guide series entitled “Guides to the Stanford University Libraries,” which include information on orientation to physical facilities, scope of collections, and services offered. A general description of the libraries, their collections and services is also included in the Information Bulletin.

The formal courses listed below are intended to serve those students for whom a more extended study of bibliographic organization is useful.

**COURSES**

Library 1. Library Resources and Research Methods—Designed for students at all levels who wish to improve their ability to use libraries in general and the Libraries of Stanford University in particular. Emphasizes major types of material and the use of catalogs, bibliographies, indexes, abstracts, and other aids to study. Directed to the individual student’s subject interests as far as possible. May not be repeated for credit.

3 units, Aut, Win, Spr (Staff)

Art 236. Art History Bibliography and Library Methods—An introduction to important reference works in art and architectural history. A working reading knowledge of French, German and Italian is assumed. Primarily for art history graduate students, although junior or senior undergraduate majors who plan to continue in art history on the graduate level may enroll with the consent of the instructor.

4 units, Aut (Ross)

CHST 186. Chicano Bibliography: Information Sources and Search Strategies—An introduction to the fundamentals of library research for the study of the historical and contemporary condition of the Chicano/Mexicano population in the United States. This is a class on Chicano bibliography that will include the study and use of standard library resources as well as subject specialized information sources. Class design is to help the student studying the Chicano experience develop search strategies for locating diverse types of information and resources related to their specific interests.

3 units, Aut (Trujillo)

French and Italian 397. Introduction to Bibliography in French and Italian Studies—As an introduction to library resources in French and Italian studies, the course will help graduate students do research more effectively and to impart that knowledge to their own students. The seminar format allows participants to benefit from shared observations on research methods and includes broad coverage of basic reference works and bibliographies as well as an emphasis on students’ particular fields of interest. Designed for graduate students, though undergraduates may enroll with instructor’s permission.

3 units, Aut (Parrine)

German 300A. Introduction to German Studies—Bibliographical research is a time-consuming task until one acquires the necessary skills to find, to know and to handle the essential bibliographies, reference works, etc. in the vast field of German Studies—culture, literature, history, political science, and so on. It is the aim of this course to enable students to find all facts and information needed for study and research by themselves and in the shortest possible time.

3 units, Aut (Frank)

Latin American Studies 260. Colloquium on Latin American Bibliography—This course is directed to the needs of beginning graduate students. Its purpose is two-fold; to acquaint the student with the principal resources for Latin American studies in the humanities and social sciences and to teach the mechanics of utilizing the bibliographic data available for the study of Latin America in the Stanford University libraries.

2 units, Aut (Breedlove)


3 units, Aut (Persons)

Slavic 184. Introduction to Slavic Bibliography—Historical and evaluative analysis of Slavic bibliographic and research tools with emphasis on Russian and Soviet materials. Application of bibliographic search methodology. Final bibliographic project required. Knowledge of Russian and/or another Slavic language helpful.

3 units, Aut (Zalewski)
Stanford’s Center for Information Technology (CIT) provides services and guidance to faculty and students engaged in research, course work, or administrative assignments requiring computation and computerized information processing. Consultants are available to academic programs, research centers, and libraries. Individual faculty members, research staff, and students may consult with CIT staff about how computing systems might facilitate the organization or structure of their research. They may also wish to discuss the development of special research tools, such as bibliographic or technical data bases, statistical analysis packages, or microprocessor interfaces. There are also various systems available for computer-supported academic writing, printing, and publishing.

CIT operates an IBM 3081 at Forsythe Hall in Jordan Quad, and provides many machine and staff services to the Stanford community. Public terminals are located at Forsythe Hall and at several other easily accessible locations on the campus, and portable terminals may be obtained to allow access to CIT systems from almost anywhere in the world. CIT also maintains connections for Stanford to many national networks, such as Tymnet and Telenet, and is working on the development of a campus-wide network, which will allow interconnection of the approximately 300 separate systems now in use on the campus.

SERVICES

CIT offers the following computing services to the users of the IBM system: text editing (WYLBUR) and formatting (SCRIPT) programs, to aid in preparing reports, theses, letters, manuscripts, data, etc.; several modes of batch processing including extensive facilities for submitting and retrieving results from jobs using terminals; interactive use of the computer through the ORVYL timesharing system; and online information collection and retrieval with SPIRES.

A comprehensive library of analysis programs and statistical routines is maintained to assist users in solving their data processing problems. Extensive data files are also available on a variety of subjects. Programming languages for use in interactive and/or batch mode include APL, BASIC, COBOL, FORTRAN, PL/360, PL/I, SNOBOL, SORT, and SPIRES. Many other software packages that run under the IBM VS operating system are also available.

CIT staff provide advice on program development and problem solving to present and potential users of the computer; however, users are expected to do their own programming and make use of the consulting, documentation, and education services available to learn efficient use of the system.

The courses and seminars described below are offered to help new users learn to use the computer independently. The courses are non-credit but do require registration through CIT and a fee. Some are orientation seminars to introduce you to the computer center. Others are beginning-level courses in the use of the computer for functions such as text editing, information retrieval, or statistical analysis. Others are more advanced seminars. Detailed descriptions of course offerings are published each quarter by CIT in a special flyer. The entire curriculum has undergone extensive review, and more current information on courses being offered is contained in the quarterly flyers. Contact the Forsythe Hall Information Desk (497-4392) to receive a copy of the flyer.

Research assistantships are available for graduate students and part-time work is sometimes available for undergraduates. Inquiries should be addressed to Director, Computing Systems and Services, CIT (497-3907).

COURSES

1. Computing Center Overview (for beginning computer users)—Designed for anyone who is new to computing and intends to use CIT services for the first time. A prerequisite for any first-timer intending to take one of the beginning level courses. Not a survey of computing in general, but an overview of the Center's computer and an introduction to some basic computing concepts. Topics covered include different kinds of computer use, defining a program, descriptions of interactive and basic computing, and a brief description of hardware and software. Computer languages, accounts, charges, and documentation are discussed.

2. Computing Center Overview (for experienced computer users)—Practical orientation for users who have programming experience and are familiar with computing concepts but have never used the Center's IBM computer. Topics covered include the hardware, software, and services available at the Center, as well as a general discussion of terminal use, accounts and rates, documentation and courses. Previous computing experience is required.

0 units, Aut, Win, Spr, Sum
10. Introduction to WYLBUR—A complete introduction to the terminal and text-editing capabilities of the WYLBUR editor. The course covers the use of the terminal, and the collection, editing, storage and printing of information such as manuscripts, computer programs, and data. Attendance at one of the CIT Overview seminars is required.

0 units, Aut, Win, Spr, Sum

12. Accelerated Introduction to WYLBUR—Covers the same material as Introduction to WYLBUR but in half the time. Designed for users familiar with a text editor on another computer system (e.g., LOTS). Those without previous computing experience should enroll in Introduction to WYLBUR. Attendance at one of the overview seminars is required.

0 units, by arrangement

13. Text Formatting with SCRIPT—Introduction to SCRIPT, a program useful for producing a report, thesis, or other manuscript with the help of the computer. SCRIPT features presented include control over page layout, footnote placement, divisions of a document, creation of a table of contents, and aids to producing an index. WYLBUR knowledge is required.

0 units, Aut, Win, Spr, Sum

14. Thesis Preparation with SCRIPT—This one-session course explains the THESIS layout in the modified version of SYSPUB called SYSPUBT, which provides formatting functions for producing dissertations. The discussion includes the commands used in the THESIS layout, use of special character sets, and costs. Knowledge of WYLBUR and SCRIPT are required.

0 units, Aut, Win, Spr, Sum

15. CONTACT/EMS — CONTACT/EMS is a one-session seminar for people who are interested in becoming acquainted with the electronic mail system on the IBM computer. Some of the features of the system include: forwarding mail, replying to mail, filing and retrieving of mail, and use of distribution lists. CONTACT/EMS uses the facilities of SPIRES to store your mail, indexing each mail item by date, subject, keyword, and sender. Basic WYLBUR knowledge is required.

0 units, Aut, Win, Spr, Sum

30. SPIRES Searching and Updating — Introduces how to search SPIRES files and add, update, and remove records in them. Primary emphasis is placed on the search capabilities of SPIRES, using examples from a collection of public data files. Anyone using or planning to use information systems developed in SPIRES should take this course. Students need no prior programming experience but a knowledge of WYLBUR is required.

0 units, Aut, Win, Spr, Sum

31. SPIRES Concepts and Facilities — Presents an overview of basic facilities in SPIRES, including concepts of file definition, data entry, indexed and sequential searching, protocol definitions, and simple output formats. Main emphasis is on basic ideas behind SPIRES rather than on detailed discussions. Simple applications will be developed. Anyone interested in developing an information system application should attend. Basic WYLBUR and programming concepts are required. Knowledge of SPIRES searching and updating is recommended.

0 units, Aut, Win, Spr, Sum

33. Batch Processing — Explains the batch job system, including WYLBUR commands and Job Control Language (JCL), used to run programs. JCL needed to read and write data to disk is also discussed. Knowledge of WYLBUR required.

0 units, by arrangement

40. SAS Overview—Statistical Analysis System is a package of computer programs used to analyze data. Sophisticated data management capabilities as well as routines for handling complex statistical procedures. A brief introduction to SAS for those with experience in other statistical packages. Includes general program setup, data management capabilities, and JCL for running the programs. Knowledge of WYLBUR and elementary statistics required.

0 units, Aut, Win, Spr, Sum
OTHER DEPARTMENTS, INSTITUTES AND PROGRAMS

PROGRAM IN ACOUSTICS AND NOISE

Chairman: Krishnamurti Karamcheti
Professors: Daniel Bershader, I-Dee Chang, Chi-Chang Chao, Krishnamurti Karamcheti (Aeronautics and Astronautics); Gordon S. Kino, Robert L. White (Electrical Engineering); James P. Johnston, Charles R. Steele (Mechanical Engineering); Joseph B. Keller, Harold Levine (Mathematics); Earl D. Schubert (Hearing and Speech Sciences); John M. Chowning (Music); Roger N. Shepard (Psychology); Edwin M. Good (Values, Technology, Science and Society)

Adjunct Professors: Ronald Alexander (Communications), Bertram A. Auld (Applied Physics), Sotiris P. Koutsoyannis (Aeronautics and Astronautics)

Lecturer: A. Ahumada (Aeronautics and Astronautics)

Acting Assistant Professor: Elizabeth A. Cohen (Physics), Anjaneyulu Krothapalli (Aeronautics and Astronautics)

Consulting Professor: Vincent Salmon (Aeronautics and Astronautics)

STATEMENT OF PURPOSE

Acoustics is the science of generation, transmission, and reception of sound and of the application of the principles underlying these to various technological problems. The aims of this program are two-fold: (a) to provide a means for students to acquire an awareness and understanding of an interdisciplinary field that holds scientific challenge together with high relevance for societal concerns; and (b) to make available to students the programs of study essential to acquire special training in one of the other fields of acoustics while majoring in their own chosen disciplines or obtain a degree in acoustics under an "Individually Designed Major." As acoustics is a field encompassing a variety of disciplines, the program will serve as an umbrella for those which cross both departmental and school lines at Stanford. As such, it will hold interest and provide opportunities for interaction among students and faculty in science and engineering, humanities, medicine, law and business.

GENERAL INFORMATION

Although Stanford University presently does not offer a formal degree program in Acoustics and Noise, teaching and research in that area has been an ongoing activity in several departments. These include Aeronautics and Astronautics, Electrical Engineering, Mechanical Engineering, Applied Physics, Mathematics, Communications, Hearing and Speech Sciences, Neurobiology, Music, Physics, and Psychology. The program relates as well to the interdisciplinary program on Values, Technology, Science and Society.

Students desiring to acquire special training in the field of Acoustics and Noise are encouraged to undertake a regular departmental major of their choice such as Physics, Electrical Engineering, Mechanical Engineering, or Music. The course requirements and descriptions for the basic major studies are stated under appropriate department sections. Students desiring guidance in developing a course of study with Acoustics and Noise, forming a minor complementing a regular departmental major, should contact the Chairman of the Program in Acoustics and Noise.

Students who wish to major in Acoustics and Noise may elect to create an Individually Designed Major in that field in consultation with the Program Faculty and the Dean’s Advisory Committee on Individually Designed Majors.

Graduate programs in Acoustics and Noise are carried out in the departments of Aeronautics and Astronautics, Applied Physics, Electrical Engineering, Hearing and Speech Sciences, Music, and Psychology. Opportunities for graduate research are also available at the Center for Computer Research in Music and Acoustics and the (Stanford — NASA) Joint Institute for Aeronautics and Acoustics. Students interested in graduate studies relating to Acoustics and Noise should contact the chairman of this program.

COURSES

UNDERGRADUATE COURSES

AERONAUTICS AND ASTRONAUTICS

135. Introductory Acoustics
136. Introduction to Psychoacoustics
139. Room Acoustics

MECHANICAL ENGINEERING

138. Noise Pollution

PHYSICS

14. Physics of Music
THE COMMITTEE ON AFRICAN STUDIES

The aim of the Committee on African Studies is to develop a comprehensive interdisciplinary program in African Studies for undergraduate and graduate students from a variety of departments. Furthermore, under the aegis of the Stanford/Berkeley Joint Center for African Studies, it is possible to incorporate offerings into one's program by special arrangement.

The Joint Center for African Studies sponsors instruction in a wide variety of African languages, most of them on an individual basis, at the request of interested students. In the past three years over a dozen different languages have been offered for credit by instructors who grew up speaking these languages.

Courses in African Studies are sponsored by departments and programs throughout the university. A sampling of courses is listed below.

UNDERGRADUATE STUDY

Undergraduates who wish can choose an African studies focus among several alternative paths:

1. A major in a traditionally defined academic department (e.g. Political Science, History, Anthropology, etc.) These departments afford ample opportunity to enroll in courses outside the major, leaving the student free to pursue the interdisciplinary study of Africa.
2. Interdepartmental majors, such as African and Afro-American Studies or International Relations, which offer coordinated and comprehensive interdisciplinary course sequences, permitting a concentration in African Studies.
3. An individually designed major in African Studies. Under the supervision of a faculty advisor, and two other faculty members, the student can plan a program of study focused on Africa which draws courses from any department or school within the university. If approved by the Dean's Advisory Committee on Individually Designed Majors, the program becomes the curriculum for the A.B. degree.

Undergraduates can study for a year in Africa. In recent years, students have been able to enroll at the University of Nairobi, Kenya, and at Universite du Benin, Togo. Students may check with the Overseas Studies Office to see what arrangements are currently available.

It is not uncommon for undergraduates to arrange for a co-terminal A.B. and A.M. program, whereby they extend their period of study for approximately one year and graduate with a A.B. and A.M. degree.

GRADUATE STUDY

At the graduate level, Stanford offers the following possibilities for those who wish to become specialists in African Studies.

1. As a field of concentration within the regular master's and Ph.D. programs of the different academic departments. It is common for students in the departments of Anthropology, Political Science, History, and Sociology, and in the School of Education to declare African Studies as the area of specialization for their Master's and Ph.D. thesis work. Other departments, programs, and institutes permit students to specialize in African Studies as well. The new M.A. program in International Policy Studies aims to prepare students for careers in policy-determining positions of an international sort in the private and public sectors. The Food Research Institute, which offers the M.A. and Ph.D., has a long-standing interest in research and teaching related to problems of food, agriculture, and rural development in tropical Africa. The program in International Development Education in the School of Education focuses on issues of educational policy and planning in Africa and in the Third World more generally. It offers both a Ph.D. and an M.A., for which specialization in international educational policy and administration is possible.

2. Through a Graduate Division Special Program administered by the Dean of Graduate Studies and Research. The student seeking a Ph.D. may, with approval, form a committee of four faculty members, representing at least two academic departments, and pursue an individually tailored graduate program.

COURSES

For (DR) notations, see respective departments

Introduction to African and Afro-American Studies — (Enroll in African and Afro-American Studies 105 or Anthropology 105). A lecture course introducing African and Afro-American Studies as an interdisciplinary field by exploring contrasting and contradictory interpretations of several key, representative aspects of African and Afro-American social and cultural institutions. Topics covered in 1982-83 are: 1) The question of African survivals in the New World; 2) Interpretations of slavery in the New World; 3) Contrasting interpretations of the black family; 4) The Afro-American as Artist; and 5) the Afro-American identity. The course also considers why particular ideas developed at particular times and examines the relationship between African and Afro-American Studies and other academic disciplines. Optional discussion sections will be arranged. No prerequisite.

5 units, Aut (Drake, Gibbs, Jackson, Wynter) section by arrangement

African Societies in a Changing World — (Enroll in Anthropology 108.) This lecture course examines the social institutions and cultural forms of black Africa in the wider context of colonialism, political independence, and national strategies of development. Topics explored include: shifts in patterns of marriage and family life, the emergence of new classes, the impact of Islam and Christianity, and the use of art and oral literature to consolidate and express ethnic power. Botswana, Ethiopia, and Liberia will be used as case studies, while supplemental material will be drawn from other Sub-Saharan nations.

Alternate years, given 1984-85

Law in Radically Different Cultures — (Enroll in Anthropology 157, Law 316 or Human Biology 147.) (Graduate students register in Anthropology 257.) Comparison of legal systems in Western, capitalist, secular, industrialized democracies with legal systems in radically different cultures. Using American law as a benchmark, this course examines comparable issues in the law of the Peoples Republic of China (Eastern law), Republic of Egypt (religious law), and the Republic of Botswana (traditional law) in order to identify the historical, philosophical, social, and cultural factors which contributed to the development of different attitudes and practices regarding law. Issues considered are the passing on of status and property rights — especially at death, the handling of anti-social or "criminal" behavior, the handling of promises and contracts, and the
use of law as an instrument of social change in the introduction of family planning. This course is open to law students, graduate students in other departments and to juniors and seniors.

3 units, Win, Spr (Barton, Gibbs, Merryman)

Ethnographic Film—(Enroll in Anthropology 128 or Communication 115.) Nature of the ethnographic film as a documentary form is examined through viewing and analysis of classical and current films; also explores uses of film and video tapes as a tool for the analysis and presentation of cognitive, social, and kinesic aspects of culture and as a vehicle for the anthropological research. Prerequisite: Anthropology 1 is recommended.

5 units, Spr (Gibbs)

Introduction to African History—(Enroll in History 148.) Survey of African cultures, societies, economies and politics from earliest times to the present; state building, the slave trade, colonialism, nationalism and independence.

4-5 units, Aut (Jackson)

Imperialism, Colonialism and Neo-Colonialism — (Enroll in History 149B.) This course covers the phenomenon of imperialism on the world historical stage. A variety of topics and issues are discussed in the class: the ethos that generated imperialism, the persons who forged its foundations, the institutions that made imperialism work, and the theories of imperialism. Also discussed are the consequences of the imperialist age.

5 units, Win (Jackson)

Undergraduate Colloquium: Mau Mau — Anti-Colonial Rebellion in 1950’s Kenya — (Enroll in History 247S/447.)

5 units, Spr (Jackson)

Undergraduate Colloquium: The New History of Africa—(Enroll in History 246/346.)

5 units, Spr (Jackson)

Graduate Colloquium: History and Anthropology—(Enroll in History 349.)

5 units, Win (Jackson)

Colonialism and Nationalism in the Third World — (Enroll in Political Science 25.) A comparative historical analysis of European exploration, conquest, and colonial rule in Latin America, the Caribbean, Africa, and Asia. Factors affecting the timing, character, and effectiveness of nationalist movements in the Third World. Impact of colonialism on post-colonial political and economic systems.

5 units, Spr (Abernethy)


5 units, Aut (Samoff)

International Dependence—(Enroll in Political Science 131.) What is meant when we say that one state is dependent upon another, more powerful state? What are the implications of a dependency relationship for the domestic political economy of both parties? What occurs when a weak state tries to reduce its dependence on a strong state? These questions will be examined through an historical analysis of European colonialism in Africa and Latin America and through contemporary case studies, examining U.S. relations with a Latin American country, France with an African country, and the U.S.S.R. with an Eastern European country. Desirable prerequisite: Political Science 35.

5 units, Spr (Abernethy) given 1983-84

Seminar: Multinational Corporations and the Third World—(Enroll in Political Science 140M.) Employs case studies to analyze interests and resources of multinational corporations (MNCs); patterns and trends in MNC relationships with Third World Governments; economic, social, cultural and political impacts of MNC activity. How persuasive are conservative, liberal, and radical perspectives on the role MNCs play in Latin America, Africa and Asia?

5 units, Spr (Abernethy)

Typology and Universals of Language—(Enroll in Linguistics 208 or Anthropology 174). The relation between typology and universals; universals in phonology, grammar and semantics; universals and linguistic change; the role of universals in overall explanatory theory in linguistics; universals research in contemporary linguistic theory.

5 units (Greenberg)

alternate years, given 1984-85

Practicum in Phonology and Morphology:—(Enroll in Linguistics 223.) Practice in problem-solving, using data from a lesser known language. The course is designed to increase proficiency in dealing with linguistic evidence and to contribute to scholarship in lesser-known languages.

4 units, (Leben)

alternate years, given 1984-85
Structure of Hausa—(Enroll in Linguistics 285.) A sketch of Hausa syntax, morphology and phonology with emphasis on points of current theoretical interest. Prerequisite: Linguistics 220 and 230 or consent of instructor.
4 units, Spr (Leben)

Language Change — (Enroll in Linguistics 245 or Anthropology 245.) The nature of linguistic change in phonology, grammar and semantics, problems of internal and comparative reconstruction, and basic issues in the explanation of diachronic processes in language. Prerequisite: Linguistics 120 or consent of instructor.
4 units, Win (Greenberg)

Beginning Swahili—(Enroll in Linguistics 606 A,B,C.) Swahili is the major lingua franca of East Africa. Conversation, grammar, reading. Successful completion of 606C may fulfill the foreign language requirement.
5 units, Aut, Win, Spr

Intermediate Swahili—(Enroll in Linguistics 607A,B,C.)
3-5 units, Aut, Win, Spr (Staff)

Beginning Hausa—(Enroll in Linguistics 602A,B,C.) Hausa is one of the three major languages of Nigeria and is widely used as a lingua franca in parts of West Africa. It has an extensive literature, and is one of the African languages most widely studied by scholars. Successful completion of 602C may fulfill the foreign language requirement.
5 units, Aut, Win, Spr (Staff)

Intermediate Hausa—(Enroll in Linguistics 603A,B,C.)
5 units, Aut, Win, Spr (Staff)

Beginning Yoruba—(Enroll in Linguistics 610A,B,C)
3 units, Aut, Win, Spr (Staff)

Intermediate Yoruba—(Enroll in Linguistics 611A,B,C)
3 units, Aut, Win, Spr (Staff)

(Please note: Any other African language can be taught, through the Special Language Program, provided a tutor is available. Some languages which have been taught in the past are: Amharic, Kikuyu, Twi, Ewe, and Oromo.)

The World Food Economy — (Enroll in Food Research 103 or Economics 106.) Examines the interrelationships between food, population, and economic development. Emphasis is on the role of agricultural and rural development in achieving economic and social progress in low-income nations. Attention is given to the economic and nutritional characteristics of the major types of food and to changes in food consumption associated with economic development. The focus is on Asia, tropical Africa, and Mexico. The U.S. and Japan receive attention in highlighting structural changes in agriculture and in food consumption. A policy analysis perspective to decision-making related to the design of rural development strategies is stressed. Prerequisite: Economics 1 or equivalent understanding of economics; Economics 51 recommended.
3 units, Aut (Johnston) MWF 10

International Trade Policy—(Enroll in Food Research 166, or Economics 166.) (May be taken as 266 by graduate students.) Formulation and effects of selected government policies affecting international trade. Trade policy and economic welfare, government responses to competition from imports, issues underlying the international negotiation of reductions of barriers to trade, multination commodity agreements and cartels, and special trade arrangements for developing countries.
5 units, Spr (Pearson)

Food and Nutrition Strategies and Development — (Enroll in Food Research 251.) This course examines major policy issues related to raising food consumption levels and improving nutritional status of populations in developing countries, assessing both production—and consumption-oriented policies and programs, and problems of determining an appropriate balance between income-generating activities and social services. The principal focus will be on the low-income developing countries. Economic, technical, institutional, and political factors that influence design and implementation of food and nutrition strategies will be discussed, including problems of restructuring growth to achieve broad participation of rural populations in gains in productivity and income. Attention will also be given to the interrelationships between “patterns” of agricultural development and of population growth and to integrated nutrition, health, and family planning programs. (It is recommended, but not required, that this course follow Food Research 250.)
5 units, Spr (Johnston)

An Introduction to Africa Through Film: Tarzan, Terrs, and Liberation—(Enroll in Education 195.) The Images of Africa that reach American audiences are dominated by a vision of primitive backwardness (Tarzan), armed conflict and terrorists (Terrs), and the struggle for self-determination (Liberation). Beginning with those images, this class will work to understand both the African reality that the images often obscure and the factors that explain the persistence of the images themselves. Through an intensive exposure to, and critique of, films on
Africa, students in this class will develop a basic familiarity with the contemporary African situation and with the use of film as an instructional medium. There are no prerequisites, and no particular background is assumed. Those students who have already done some work on Africa will be expected to focus on the images of Africa projected to external audiences. (IDE)

4 units, Aut (Samoff) alternate years, given 1984-85

Introduction to the Study of International Development Education—(Enroll in Education 206A) Introduction to the theoretical orientations and the research agenda in International Development Education, and to resources for study and research at Stanford. Required for all first-year students in SIDEC: others by consent of instructor. (IDE)

2-3 units, Aut (Weiler and Staff)

Project Workshop in International Development Education—(Enroll in Education 206B) Course concludes the 4-quarter A.M. program in SIDEC, and is required of all A.M. students. It is organized around the students' "Masters Project", and will provide in-depth reviews of draft project reports. The final version of the report is due at the end of the course. (IDE)

4 units, Sum (Fuenzalida)

International Cooperation in Education Development—(Enroll in Education 207X.) Critical review of current policies, priorities, and practices in international cooperation in education, with special attention to the role of international organizations (World Bank, Unesco, OECD, etc.) and of national development assistance agencies. (IDE, SSE)

4 units, Spr (Weiler)

Implementing Educational Reform—(Enroll in Educational 209X.) Examination of efforts to devise and implement educational reform policies in a single Third World country, focusing on: (1) the problem(s) the new policies are expected to address (and thus the political economy of the country studied); (2) the formation and articulation of alternative policies, emphasizing the social location of ideas and values; and (3) the policy making process and the implementation of the new policies, especially organizational characteristics, bureaucratic imperatives, political mobilization, and external influences. Organized as a seminar; each participant will study intensively a particular reform policy. No formal Prerequisites; previous Third World course work and/or professional experience and familiarity with Education 306A-D topics helpful. (IDE)

4 units, Win (Samoff)

Teaching a Global Perspective: Cross Cultural Approaches — (Enroll in Education 217S.) An overview of current research and practice in the field of global education in American Schools. Emphasis will be on cross cultural approaches utilizing materials from Asia, Africa and Latin America. Models and promising practices will be critically reviewed, especially the work of the Stanford Program on International and Cross Cultural Education (SPICE). Designed primarily for SPICE staff and research assistants. Consent of instructor. (CTE, IDE)

4 units, Spring (Grossman)

Ethics of Development in a Global Environment (EDGE)—(Enroll in Education 274A,B,C; Anthropology 133A,B,C; Engineering 297A, B, C; Political Science 140A, B, C; Social Thought and Institutions 197A, B, C.) The EDGE seminars present a series of speakers on current development issues with emphasis on the problems of the poorer nations. Autumn Quarter speakers discuss basic world resources—energy, food, housing, population and environment—and the political development and dependencies of developing regions. Winter Quarter speakers address the international institutions and their roles: international banking, international businesses, U.S. and foreign Universities, East-West political policies, and organizations of developing countries. Spring Quarter speakers address the roles of individuals in national and international institutions dealing with the problems of developing countries.

The speakers present a wide range of political, professional, and national backgrounds and present candid and often differing points of view. The series gives students working in developing countries or in institutions dealing with developing countries a better knowledge of the challenges they face and the issues they must deal with. (IDE, SIDEC)

One unit credit for attendance of the speaker series; three units additional credit for optional workshops treating selected issues in more depth. (Sequential registration not required.)

1 unit (lecture only) or 4 units (plus workshops), Aut, Win, Spr (Fagen, Fuenzalida, Lusignan, McWhorter, Siegel, Textor) Workshops by arrangement

Social Structure of World Society—(Enroll in Education 231, or Sociology 152.) This course pursues a sociological analysis of society on a world-wide basis, that is, all the people inhabiting the earth and the institutions through which their lives are organized, are treated as participants in one global social system. Competing models of the emerging world order will be reviewed and compared. Among the topics to be covered will be the worldwide population dynamics, the nature of the world economy,
communication of persons on a global scale, socio-economic stratification of the world population and education, science and technology as global systems. (IDE)

5 units, Aut (Inkeles) and by arrangement

Education and Work—(Enroll in Education 277X.) The course will examine traditional models of socio-economic structure and educational change, concentrating on the relationship between education and work. Emphasis will be put on functionalist and dialectical models. The literature covered by the course will include work done in the U.S., Europe and the Third World. Specific case studies will be used to illustrate the models. The course is open to students from all areas.

5 units, Win (Carnoy)

285X. Education, Contemporary Crises, and the World System—(Enroll in Education 285X.) This course is concerned with the settings in which education and educators operate; it is intended as a complement to other courses International Development Education and Social Sciences in Education. The notion of crisis has become a major feature in discussion of the contemporary situation, yet rarely is that notion used systematically. One focus in this course will be on crisis as an analytic tool for understanding contemporary society and particularly with the argument that crises are endemic, generated not by deviations from a stable equilibrium, but rather by structural features of the world in which we live. A second focus will be on the conceptualization of world system as an analytic tool. Clearly, global interactions are increasingly a matter of necessity rather than choice. What happens in one place can, and often does, have rapid and powerful consequences throughout the world system. Recurrent crises and the structure of the world system are settings within which education must operate. A third focus, then, will be on understanding educational outcomes in terms of crises and world system (IDE)

3 units, Spr (Samoff) alternate years, given 1984-85

Education and Economic Development—(Enroll in Education 306A.) An introduction into the analysis of the role of education in economic growth and development. Case material will consider development problems both in the U.S. and abroad. Discussion sections will deal with special economic aspects of educational development. (IDE, SSE)

5 units, Aut (Carnoy)

Education and Political Change — (Enroll in Education 306B or Political Science 221.) Introduction to the analysis of the relations between education and politics from a comparative perspective. Special attention will be given to different theoretical approaches to the study of education and politics, questions of legitimacy in educational policy, international factors in educational development, the politics of educational planning and reform, processes and conditions of political learning. (IDE, SSE)

5 units, Win (Weiler)

Sociology of Development and Education—(Enroll in Education 306D.) This course offers a systematic comparison between modernization and dependence approaches to development, emphasizing the different treatment education receives in each of them, and the consequent different approach toward educational reforms in developing countries. (IDE, SSE)

5 units, Aut (Fuenzalida)

Knowledge and Legitimation: The Politics of Educational Research—(Enroll in Education 307X or Pol. Sci. 328.) Within the theoretical framework of legitimation theory, the course develops the notion of "compensatory legitimation" for the analysis of the national and international politics of educational research. Case studies review the work of agencies for research support, cooperation, and dissemination. Research seminar for doctoral students; consent of instructor required. (IDE, SSE)

5 units, Win (Weiler)

Higher Education Institutions in Developing Countries—(Enroll in Education 373.) This course analyses the extent to which present higher education institutions in developing countries contribute to self-centered development or to socio-cultural incorporation of these countries into the world economic system, at a general-theoretical level and with emphasis on familiarization with current literature. (IDE)

3 units, Win (Fuenzalida)

Education and Radical Change: African Experiences—(Enroll in Education 395 or Political Science 221.) Focuses on two dimensions of education and radical change: 1) schools as the targets of protest and 2) education as a core element in development strategy. Begins with an examination of the education system in South Africa, where assess and quality are limited by race. Proceeds to an exploration of the efforts of South African students - most visible since the uprising of June, 1976 - a focus on the educational system as a mechanism for organizing for broader changes. The second dimension will be concerned with efforts of educators in those African states that have achieved majority rule. The experience of Tanzania and Guinea-Bissau will offer comparative insight and through student research presentations insight
will be gained of Angola, Mozambique and Zimbabwe. (IDE)

5 units, Spr (Samoff)
TTh 12-2:05 and by arrangement

Research Workshop in International Development Education—(Enroll in Education 408A,B,C) Continuing research workshop for the review of (a) key issues in the methodology and epistemology of social research in education, and (b) research proposals and findings by students and faculty. Prerequisite: 306A-D or equivalent. Limited enrollment; priority given to advanced doctoral students in SIDEC and SSE. (IDE, SSE)

408A. Research Workshop in IDE I.
2-5 units, Aut (Samoff and Carnoy)

408B. Research Workshop in IDE II.
2-5 units, Win (Carnoy and Fuenzalida)

408B. Research Workshop in IDE III.
2-5 units, Aut (Samoff and Weiler)

ATHLETICS,
PHYSICAL EDUCATION,
AND RECREATION

Emeriti: John E. Nixon (Professor); Margaret C. Barr, Luell W. Guthrie, Miriam B. Lidster, Marian S. Ruch (Associate Professors); William P. Fehring (Director of Intramurals); Joseph H. Ruetz (Athletic Director); Robert G. Young (Associate Director)

Director: Ferdinand A. Geiger

Assistant to the Director: Jimmy Johnson, Sue LemMon

Associate Director — Allan A. Cummings

Associate Director — Educational Programs: Pamela L. Strathairn

Assistant Director — Business and Finance: Nancy Padgett

Associate Director — Development: David Glen

Assistant Director — Operational Services: Greg Asbury

Chairman of Physical Education: Wesley K. Ruff

Director of Intramurals: Howard Dallmar

Coordinator of Dance: Diane Freccero

Coordinator of Club Sports and Recreation: Shirley H. Schoof

Coordinator of Lifetime Activities: Elizabeth P. Weeks

Associate Professors: Wesley K. Ruff, Pamela L. Strathairn

Sports Directors: Thomas Davis (Basketball - men); Dante Dettamanti (Water Polo), George Haines (Swimming and Diving - women), Skip Kenney (Swimming and Diving - men), Frank Brennan (Tennis-women), Richard Gould (Tennis-men), Sadao Hamada (Gymnastics-men and women), Edwin Hurst (Fencing), Brooks Johnson (Cross Country, Track and Field), Frederick Sturm (Volleyball), Nelson Lodge (Soccer), Mark Marquess (Baseball), Dorothy McCrea (Basketball-women), Timothy Schaaf (Golf), Paul Wiggin (Football), Chris Horpel (Wrestling), Anne Killefer (Field Hockey)

Sport Assistant Coaches: David Wollman (Cross Country, Track and Field), James Fassell (Football), Ray Handley (Football), Bruce Pearl (Basketball-Men), Michael Kehoe (Basketball-Women), Dean Stotz (Baseball), Michael Tomasello (Cross Country, Track and Field), Esther Stroy (Cross Country, Track and Field) Andrew Christoff (Football), Michael Nolan (Football), Larry MacDuff (Football), David Ottmar (Football), Pete Magurian (Football), Tim Baldwin (Golf), Tony Igwe (Soccer), Richard Schavone (Diving), Don Shaw (Volleyball)

Senior Teaching Associates: Carroll G. Diaz, Inga Weiss

Teaching Associates: Susan Cashion, Lisa Codman, Diane Freccero, Jancy Limpert, Mary Margaret Neal, Elizabeth P. Weeks, Sharon Williams

Teaching Specialists: Joe Petrucci (Sailing), Shirley H. Schoof (Sports), Mark Reiman (Weight Training)

The department is responsible for the development and administration of the University’s programs in athletics, dance, physical education, and physical recreation. The department’s aims are to: (1) increase understanding of the value and role of physical activity as an important dimension of the human condition; (2) develop performance skills; (3) encourage, through satisfying learning experiences, the participation habit; and (4) develop leadership competency in aquatics, dance, sport, and other physical activities. To this end, the program encompasses a diversity of learning and participating opportunities which extend from informal recreation through organized intramural competition, basic instructional classes, and theoretical study to, and including, intercollegiate athletic competition and dance performance.

ACADEMIC DEGREES AND SPECIAL CURRICULUM

Although the Bachelor of Arts in Physical Education and Dance degrees are not offered, the
department’s curriculum provides course work which satisfies most requirements for admission to graduate study in physical education and dance here at Stanford or elsewhere. Coterminal degree program (master’s degree in Education) may be planned by undergraduate students interested in a Dance Specialization. Undergraduate students interested in a teaching and/or coaching career are encouraged to plan their study schedules for inclusion of theoretical course work offered by the department and by the School of Education. Specific information may be found in the School of Education section of this bulletin or is available from Professors Ruff and Strathairn and Director of Graduate Programs, Garcia Dance, Degree Advisor, Cashion.

The Sports Theory and Special Curriculum Section has been developed to focus on the interests undergraduate and graduate students have in the theoretical dimensions of sport, exercise sciences, and human movement. In conjunction with other University departments and programs sharing common and related interests, the department sponsors special lectures, course work, mini-courses, conferences and workshops for the University community. Current collaborators in these programs include the Heart Disease Prevention Program, School of Education, Committee on Black Performing Arts, Committee on the Lively Arts, and the Cowell Health Center.

LIFETIME ACTIVITIES

The Lifetime Activities basic instructional program is diverse to accommodate the interests of undergraduate and graduate male and female students. Only intercollegiate men’s and women’s teams are limited to undergraduate enrollment. Homogeneous skill groupings and limited class sizes enable the student, beginner through the advanced performer, to achieve success within the limits of individual motivation and potential. Skill level and knowledge about a specific activity as well as available space during class-list signing are the only limitations to enrollment.

Academic Credit—Activity classes carry one unit of credit for satisfactory completion of work. Although there is no limitation on the number of one-unit physical education classes in which a student may enroll, no more than 12 units of these activity classes may be applied toward graduation requirements. Classes which are exempt from this University policy are identified as “PE.X.”

A class may be repeated for credit provided the instructor advises the repeat. Units for satisfactory completion of a lower skill level class in the same sport and activity in which units have been received previously will not count toward graduation.

Auditing—students, faculty, and staff may audit any course (exception: no faculty, staff or graduate students in intercollegiate JV or varsity team classes), with permission of the respective instructors, only on a “space-available” basis after enrollment of the “credit-enrollees” is completed. Students have first priority for auditing and must record this enrollment on their Official Study Lists. Enrollment and grade received will be reflected on the End-Quarter Grade Reports and student transcripts.

Equipment and Uniforms—No department uniform is required. Students must provide their equipment for frisbee, badminton (racket), tennis (racket and balls), and Advanced SCUBA (see course description). Specific information on equipment and recommended class attire is available from the department, from those at Registration tables, and on the first day of class instruction.

Lockers—Lockers are available for students, without charge, from the Gym Store in Encina Gym and from the Roble Gym Equipment Keeper. The number of lockers at the Roble Gym requires that students not enrolled in a class wait until the second week of each quarter for locker assignment.

Towels and Swim Caps—Towels may be purchased at the Encina Gym Store or the Roble Gym locker room. The towel laundry and exchange service is available, without charge, for those who purchase towels. Swim caps are required at the Roble Gym pool only. They may be purchased at the Roble Gym locker room.

Class Fees—Fees are charged for enrollment in badminton, bowling, fencing, golf, skin and SCUBA diving, sailing, windsurfing, and the Club Program classes.

Fees are payable at the first class meeting and required by the second class meeting for a student to remain in class. Enrollees after the first class meeting are required to submit their class fees no later than the second time they attend the class.

Full refund is given to students dropping a class during the first week of classes and requesting a refund at that time. Half refund is given to students dropping a class and requesting the refund during the second week of classes. No refunds will be given if a student either neglects to request a refund under the conditions listed previously or drops the class anytime after the second week of classes.

DANCE PROGRAM

Dance as a performing art is the focus of the Stanford Dance Program. The program introduces the student to traditional styles, tech-
niques and cultural forms of dance. Opportunities are provided for the accomplished dancer to practice his or her art in performance, choreography, teaching or scholarly work.

The major concentration of course offerings is in modern dance. Classes in ballet, jazz, folk and ethnic forms are also scheduled to increase the breadth of the student's dance training. Fundamental and advanced principles of choreography as well as courses and workshops for developing improvisation and performance techniques are also available. Undergraduate courses are intended to stress the study of dance as an art form, to enrich a general undergraduate program and to provide creative activity for the student community. Undergraduates may enter the coterminous degree program during their eighth quarter, which permits them to study simultaneously for the master's degree in education: Dance Specialization and a bachelor's degree of their choice.

Graduate students interested in dance education leading to a performing or teaching career may apply for admission to the master's degree program in Education: Dance Specialization. A prerequisite to successful completion of all graduate work in dance is technical proficiency as demonstrated by preparation in dance at Stanford, a bachelor's degree in dance from another institution, or documented training in dance. The master's degree program expects graduate students to develop skill in choreography, production, teaching and research. Achievement of these skills is demonstrated by performance of the student's own choreography, completion of a teaching internship and submission of a research paper.

For further information about the Stanford Dance Division and its program, contact Susan Cashion, Degree Program Coordinator.

INTERCOLLEGIATE ATHLETICS

In keeping with our cultural heritage and American university tradition, Stanford offers a broad intercollegiate athletic program. The primary purpose is to provide talented male and female students with a variety of opportunities for participating in individual and team competition with other colleges and universities. As a member of the Pacific Ten Conference (Pac-10) and the National Collegiate Athletic Association (NCAA), Stanford fields men's varsity teams in baseball, basketball, cross country, fencing, football, golf, gymnastics, soccer, swimming and diving, tennis, track and field, volleyball, water polo, and wrestling. As a member of the Western Collegiate Athletic Association (WCAA) and the National Collegiate Athletic Association (NCAA), Stanford fields women's varsity teams in basketball, cross country, fencing, field hockey, golf, gymnastics, swimming and diving, tennis, track and field, and volleyball.

Additional intercollegiate athletic competition is available for junior varsity teams (for men and for women) in selected sports. Club Sport teams (for men and for women) provide similar intercollegiate competition opportunities.

CLUB SPORTS PROGRAM

The Stanford Club Sports Program is coeducational and exists to provide additional opportunities in competition, instruction, and recreation for undergraduate and graduate students in those physical activities which are not funded through the intercollegiate athletic, physical education, intramural, and/or recreation programs of this department. Although the department will provide encouragement to, guidance for, and general supervision of the various affiliated clubs, the emphasis in the Club Program is on student interest and leadership to initiate, organize, and conduct their respective clubs. Clubs, which meet criteria for inclusion in the formal curriculum, may apply for academic credit through Elizabeth Weeks. Those Club Sport Teams competing against other college, university, and/or club teams and requiring eligibility certification for their team members must make such arrangements through the department. For further information, contact Shirley Schoof.

INTRAMURAL SPORTS

Students interested in recreational opportunities through intramural competition may receive information from Mr. Dallmar. The full program includes formal competition in league and tournament play, many different sports leading toward the All-University Coed, and Women's Intramural championships. Competing organizations, teams, and individuals are urged to contact the IM Office at Encina Gym on Registration Day to obtain meeting dates and times. Each quarter's printed materials and IM Handbooks are available in or after Registration Day in Room 354, Encina Gym. The Intramural Manager meetings are held the first Wednesday of Registration Week.

RECREATION

The department provides facility-use for faculty, staff, and students (and, for some activities, their families) to participate in aquatics, conditioning, dance, and sports for general recreation. Swimming pools, gymnasium, tennis courts, fields, and jogging trails are all available.
with specific recreation hours publicized throughout the year. The Golf Course and Driving Range are also available for use by faculty, staff, and students, on a fee basis; information available from the Golf Pro Shop or department Information Desk. For further information on recreation, contact Shirley Schoof.

**FACILITIES**

Athletic fields, gymnasium buildings, swimming pools, tennis and volleyball courts, and weight training facilities are located at the Roble Gym Complex and near the Encina Gym. The deGuerre Complex houses swimming and diving pools as well as handball, racquetball, and squash courts. The Dance Studio (for classes and performances) and small activity rooms are located at the Roble Gym Complex along with the department’s library and repository for the University Dance Collection of reference materials. The 18-hole championship golf course and driving range and Lake Lagunita, are also available for the department’s programs.

**COURSES**

**SPORTS THEORY AND SPECIAL CURRICULUM**

See “School of Education” section for additional course offerings.

100. Individual Study—With instructor’s approval, administrative internship or in-depth study of topics directly related to the disciplines of Dance and Physical Education. (PE:X)  
3-5 units, Aut, Win, Spr (Ruff, Strathairn, Staff) by arrangement

104. Analysis of Human Movement—Overview of skeletal and muscular anatomy and study of the mechanical principles of movement as related to efficient performance in aquatics, dance, sports. (PE:X)  
3 units, Aut, Spr (Weeks) TTh 9-10:50

105. Physiology of Exercise—(Same as Education 177.) Physiological adaptations, both long and short term, of the human organism to exercise and environmental stress. Limited to those who have had or are taking Anatomy. (PE:X)  
3 units, Spr (Ruff) MWF 10

105T. Sport Physiology—Study of the stress of exercise upon the body and the benefits to be derived. Includes bio-energetics, nutritional factors, environmental stress plus theory and principles of training. (PE:X)  
2 units, Aut (Ruff) TTh 11

106. Psychological Aspects of Learning and Performance—Comprehensive analysis of psychological factors that can both improve and inhibit motor learning and performance. (PE:X)  
3 units, Spr (Staff) TTh 11

109. Optimal Health and Fitness—Combination lecture and exercise course. Topics include fitness parameters, nutrition, stress management, heart disease and cancer prevention, alcohol and drug use, venereal disease. Also, includes participation in exercise class, health faire and competitive run. Readings and papers. (PE:X)  
4 units, Spr (Staff) T 7-9:30 P.M. and MW 2:15 or TTh 2:15 P.M.

180T. Sports Instructor Internship—For the highly skilled student in a given sport who anticipates becoming a teacher/coach of that sport. Teaching and coaching opportunities under close, experienced guidance of specified teacher/coaches. Written project required. Student may not intern for same level of activity more than once and receive credit. Prerequisite: consent of instructor. (PE:X)  
1-2 units, Aut, Win, Spr (Staff) by arrangement

181. Athletic Team Management—For student managers of intercollegiate teams. Prerequisite: consent of respective varsity team coaches.  
1 unit, Aut, Win, Spr (Staff) by arrangement

183. Intramural Sports Management—For student managers of IM sports and competitive organizations. Prerequisite: consent of instructor.  
1 unit Aut, Win, Spr (Dallmar) by arrangement

200. Individual Study—With consent of instructor, administrative internship or continued in-depth study of specific topics related to the disciplines of Dance or Physical Education. (PE:X)  
3-5 units, Aut, Win, Spr, (Ruff, Strathairn, Staff) by arrangement

201. Seminar on Motor Learning—(Same as Education 359.) Undergraduate and Graduate Seminar concerned with the psycho-motor principles of learning and performance. Includes motor learning theories, neuropsychological aspects, motivation, anxiety and skill-ability topics. (PE:X)  
3 units, Win (Staff) MW 8
205T. Sports Medicine: Medical Aspects of Land, Underwater and Altitude Sports—(Same as Medicine 280). Emphasis on basic physiology, proper training, and conditioning for endurance sport, underwater sports, racquet and contact land sports, and altitude sports. Biomechanics and weight training introduced; goal to enhance understanding and enjoyment of these sports and to prevent injury. Prerequisite: biology or basic physiology highly recommended. (PE:X)  
2 units, Aut (Spivak) F 3:15-5

207. Seminar on Physical Education Issues—(Same as Education 459.) Discussion of controversial issues confronting athletics and physical education profession. Includes readings and oral and written projects. (PE:X)  
3 units, Win (Staff) MW 9

290. Seminar on Contemporary Sport Sociology—The study of sport as a social institution, its value orientations, major social concerns, modes of interaction and structural relationships with other social institutions. (PE:X)  
3 units, Aut (Staff) TTh 11

SPORTS THEORY AND TECHNIQUE

Each class is designed to develop an understanding of the skills and strategies of the respective sports with focus on cognitive learning rather than activity participation. For the high intermediate and advanced skill level performer. Lecture-discussions of relevant theory in support of teaching and coaching methods and performance techniques, psychological and interpersonal relationship phenomena, training dimensions. Prerequisites: Analysis of Human Movement and/or Foundations of Physical Education highly recommended. All courses are 2-units except 152 which is 3 units (PE:X)

101T. Adapted Physical Education  
Aut, Win, Spr (Ruff)  
by arrangement

116T. Gymnastics  
Aut (Hamada, Sardina)  
by arrangement

117T. Track  
Aut (Johnson) by arrangement

123T. Golf  
Spr (Diaz) by arrangement

129T. Badminton  
Win (Schoof) by arrangement

131T. Fencing  
Aut, Spr (Hurst)  
by arrangement

133T. Tennis  
Win (Brennan) by arrangement

135T. Baseball  
Aut (Marquess) Th 7-9 pm

136T. Basketball  
Aut (Davis) by arrangement  
alternate years, given 1984-85

137T. Field Hockey  
Spr (Killefer) by arrangement

138T. Football  
Spr (Wiggin) by arrangement  
alternate years, given 1983-84

140T. Soccer  
Win, (Lodge) by arrangement

141T. Volleyball  
Win (Sturm) by arrangement  
alternate years, given 1984-85

149T. Competitive Swimming  
Aut (Kenney) TTh 11

152. Water Safety Instructor  
3 units, Spr (Weeks, Williams)  
MTW 3:15-4:45

SPORTS OFFICIATING

Each class is concerned with the rules, scoring records, responsibilities and limitations of officials for the respective sports. Includes practical experience in organizing meets and tournaments as well as development of officiating skill and technique in the game situation. All classes are 1 unit.

131W. Fencing  
Aut, Spr (Hurst) by arrangement

137W. Field Hockey  
Spr (Killefer) by arrangement

149W. Swimming  
Win (Haines) by arrangement

DANCE ACTIVITY AND THEORY

Except as noted, all classes/courses are coeducational. Recommended prerequisite for all classes is 57 — Introduction to Dance Styles. Series classes (A,B,C) should be taken in order or with consent of instructor. Most classes are graded Pass/No Credit. For additional and related courses, see Drama (Movement for Actors).

57. Introduction to Dance Styles — For students with no previous movement training. Various faculty members will present a survey of traditional dance styles: modern dance, jazz, ballet, and ethnic.  
1 unit, Aut (Cashion)

58. Dance Techniques for Men — Introductory class in modern dance for men. Move-
ment problems geared to the structural potential of the male body.

1 unit, Win

61A,B,C. Modern Dance I — Elementary modern dance technique with particular emphasis on movement and rhythm as a form of creative personal expression and communication.

61A. 1 unit, Aut, Win
61B. 1 unit, Win, Spr
61C. 1 unit, Spr

62A,B,C. Modern Dance II — Intermediate technique for developing and refining clarity in movement skills. Emphasis on movement phrases and understanding the rhythmic basis of all movement. Prerequisite: 61 series or equivalent.

62A. 1 unit, Aut
62B. 1 unit, Win
62C. 1 unit, Spr

63A,B,C. Modern Dance III — Primary focus on technique with an emphasis on performance skills. Special attention to clarity of form, spatial awareness, and rhythmic versatility. Prerequisite: 62 series or consent of instructor.

63A. 1 unit, Aut
63B. 1 unit, Win
63C. 1 unit, Spr

64A,B,C. Modern Dance IV: Advanced Technique — Advanced modern dance technique. Increasing complexity of sequences and subtlety in phrasing. Greater breadth and facility with movement qualities. Prerequisite: consent of instructor.

1 unit, Aut, Win, Spr (Limpert)

70A,B,C. Ballet Technique I — Elementary ballet terminology and technique stressing placement, basic barre exercises, simple movement combinations in the center and across the floor.

70A. 1 unit, Aut, Win, Spr
70B. 1 unit, Aut, Win
70C. 1 unit, Spr

72A,B,C. Jazz Dance I — Introduction to jazz dance styles with reference to their historical origins. Emphasis on rhythmic variation, coordination, isolation of body parts and movement combinations.

72A. 1 unit, Aut, Win, Spr
72B. 1 unit, Win
72C. 1 unit, Spr

73. Afro-American Jazz Dance I — Introduction to jazz dance based on techniques from Africa and Caribbean dance styles. Includes historical information and the Afro-American influence on American jazz dance.

1 unit, Aut, Win, Spr (Osumare)

74. Afro-American Jazz Dance II — Intermediate class emphasizing the Afro-American contribution to American jazz dance. Focus on rhythmic vitality, movement isolation and performance techniques. Prerequisite: consent of instructor.

1 unit, Aut, Win, Spr (Osumare)

78. International Folk Dance — Origins and characteristics of dance from different cultures. Exploration of dance forms and music as resource material and enhancement for all dance.

1 unit, Aut, Win, Spr (Codman)

79. Conditioning Techniques for Dance — Fitness techniques designed for the particular needs of a dancer. Analysis of each student's movement problems and capabilities as the basis for designing individualized training programs.

1 unit, Win (Freccero)

161T. Dance Composition I: Improvisation — Exploration of basic tools of dance composition. Solo and group choreography emerging from spontaneous and structured improvisational situations dealing with a wide range of dance elements: rhythm, spatial design and shape, movement qualities, words, music, etc. (PE:X)

2 units, Aut, Win, Spr

162T. Dance Composition II: Choreographic Form — Development of the craft of choreography, emphasizing concepts of design, form and content. Prerequisite: 161T or equivalent. (PE:X)

2 units, by arrangement

163T. Dance Composition III: Themes for Choreography — Further development of compositional skills using elements explored in Composition I and II. Emphasis on themes for choreography derived and inspired from sources such as literature, music, and theatre. Prerequisite: 161T and 162T or equivalent. (PE:X)

2 units, by arrangement


2 units, Aut (Weiss)

165T. Advanced Contemporary Dance II — More intense study of form and manipulation of movement ideas. Prerequisite: 164T or equivalent. (PE:X)

2 units, Win (Weiss)

166T. Advanced Contemporary Dance III — Identification of artistic trends in contemporary dance. Comparative studies in stylization and
technical concepts for performance. Prerequisite: 164T or 165T or equivalent. (PE:X)
2 units, Spr (Weiss)

167T. Variations for Dancers I — A performance class dedicated to the integration of sound and movement, relating vitality and temperament to movement and music. Technical efficiency required in order to focus on musical form. (PE:X)
2 units, Aut (Weiss)

168T. Variations for Dancers II — Development of a suite of dance forms and individual study of theme and variations. Prerequisite: 167T or equivalent. (PE:X)
2 units, Win (Weiss)

173T. Ethnic Dance: (selected culture) — Movement/lecture class concentrating on dance forms of a specific culture (to be announced each year). Dances taught for technical and cultural understanding. Emphasis on origin, development, and styling of the material. (PE:X)
2 units, Spr (Codman)

175T. Mexican Dance and Folklore — Popular and religious dances of Mexico focusing on a specific regional area. Choice of material for technical and cultural understanding designed for the novice dancer. (PE:X)
2 units, Aut (Cashion)

176T. Mexican Dance and Folklore II — Dance forms of a selected region of Mexico taught within the framework of their cultural context. Concentration on increasing skill in footwork. (PE:X)
2 units, Win (Cashion)

177T. Mexican Dance and Folklore III — Materials selected from the diverse repertoire of Mexican dance. Emphasis given to origin, development and styling. Performance opportunities available. Consent of instructor. (PE:X)
2 units, Spr (Cashion)

179. Stanford International Folk Ensemble — Work on developing stylistic versatility in the execution of complex traditional folk dance forms. Several performances each quarter.
1 unit, Aut, Win, Spr (Codman)

178T. Folkloric Dance Styles — Movement/lecture class of intermediate level. Films and video tapes to enhance understanding of international dance forms.
2 units, Aut, Win (Codman)

257T. Dance Repertory — Resources for choreographic concepts and the process of selecting and defining thematic material for dance productions. Collaboration with a composer or accompanist including study of music literature and terminology. Rehearsal of material and examination of methods of dance presentation. (PE:X)
2 units, Spr (Weiss)

261T. Performance Workshop: Tools and Techniques — Introductory class designed to develop individual and group performing skills including breadth, clarity, focus, rhythmic precision, dramatic motivation, etc. Performance opportunities included. (PE:X)
2 units, (Limpert) by arrangement

262T. Performance Workshop: Public Performance — Informal or experimental dance productions dealing with specific pieces of choreography, concerts, or lecture demonstrations. (PE:X)
2 units, by arrangement

263T. Musical Theatre Workshop — Dance performance skills and choreography appropriate for musical theatre productions. Extensive dance background not required. (PE:X)
2 units, Aut (Cashion)

264. Faculty Choreography — Rehearsal and performance of faculty choreography. Selection by audition.
1 unit, by arrangement

266. Dance Exploration for Educators — Examination of the role of dance in education with emphasis on elementary and secondary school levels. Explores the relationship of dance to the arts as well as other academic disciplines. In addition to weekly theory and technique sessions, students will have the opportunity to work in a lab situation with the children's dance program at Stanford. (PE:X)
3 units, Aut (Valenzuela)

267. Dance Practicum Internship — Conceptual work pertaining to the teaching of dance within a variety of situations. Instruction and guided practice in the preparation of lesson plans, developing sequence and progression in a class setting. Weekly seminar and lab. (PE:X)
3 units, Win

268. Perspectives in Dance — History of dance in Western Culture as a framework for examining a variety of theoretical issues: dance in education, dance and the companion arts, contemporary problems and current trends, etc. Lectures amplified by readings, films, and discussion. (PE:X)
3 units, Aut (Cashion and Freccero)

363. Dance Production Management — Analytical and practical experience in producing events offered by the dance division. Students will work individually on a particular event under the supervision of the faculty coordinator. Focus will be on the areas of finance,
publicity, booking, technical production, and artistic direction of a dance event. (PE:X)

3 units, Win (Limpert)

364. Graduate Design for Production — Individual development of choreography or production designs for a creative project leading to completion of the A.M. degree in Dance. Dance degree candidates only. (PE:X)

5 units, by arrangement

368. Dance Research — Tools and methods for dance research. Seminar sessions focus on selection and development of research topics. Research paper required. Prerequisite: 268. (PE:X)

3-5 units, Spr (Cashion)

LIFETIME AQUATICS, INDIVIDUAL, AND SPORTS ACTIVITIES

48. Swimming: Beginning — For non-swimmers or those who are so novice as to have self doubts. Includes instruction in the basic strokes and personal safety skills. Minimum goal—drown-proofing; optimal goal—enjoy swimming as a recreational activity.

1 unit, Aut, Win, Spr (Williams, McCrea)

49. Swimming: Intermediate — Continued work on crawl, elementary backstroke, sidestroke, and safety skills. Introduction to or review of breaststroke and back crawl. Basic water safety. Conditioning as ability permits. Prerequisites: fair crawl, elementary backstroke, and sidestroke; fair level of conditioning.

1 unit, Aut, Win, Spr (Weeks, Kenney)

51. Water Polo — Introduction to and refinement of skills used in the sport of water polo.

1 unit, Aut, Win, Spr (Dettamanti)

52T. Lifesaving — Increasing awareness of water hazards and preventing accidents in, on, and around the water. Learning appropriate rescue techniques. American Red Cross Advanced Lifesaving Certificate upon successful completion of the course. Prerequisites: Strong crawl, breaststroke, sidestroke, and 3-5 minutes, surface dives; 500 yard continuous swim. (PE:X)

2 units, Aut, Win, Spr (Williams, Weeks)

55. Sailing: Beginning — Basic skills, theory, and techniques to enable beginners to sail with confidence. Fee.

1 unit, Aut, Spr (Petrucci)

55A. Sailing: Intermediate — Refinement of skills. Introduction to racing. Fee. Prerequisite: Consent of instructor.

1 unit, Aut, Spr (Petrucci)

56. Windsurfing — Theory and techniques of windsurfing safely and confidently. Fee.

1 unit, Aut, Spr (Petrucci)


1 unit, Aut, Win, Spr (Staff, Haines)

152. Water Safety Instructor — Learning to teach swimming and lifesaving. American Red Cross certification for successful course completion. Prerequisites: current Red Cross Advanced Lifesaving certificate and advanced swimming skills. Priority given to those whose summer jobs depend upon certification. Letter indicating same required at first class meeting. (PE:X)

3 units, Spr (Weeks, Williams)

153. Skin and SCUBA Diving — Highly rigorous program for expert swimmers. Includes classroom lectures and two skin, three SCUBA dives in open water. NAUI Basic Certificate and/or PADI certification for successful completion of course. Fee assessed for equipment. Prerequisites: medical clearance, skill test and consent of instructor. (PE:X)

3 units, Aut, Win, Spr (Williams)

253T. Advanced SCUBA/Sport Diving — Open water program developing competence beyond basic levels. PADI open water certification on successful completion of course. CPR certification available. Emphasis on navigation skills. NAUI certification available. Fee. Provide own gear, including depth gauge and compass. Prerequisites: SCUBA certification and consent of instructor. (PE:X)

1-3 units, Aut, Spr (Williams)

INDIVIDUAL AND SPORTS ACTIVITIES

1. Posture and Body Mechanics — Individual fitness and posture evaluation; exercises for proper body alignment; techniques for correct body mechanics; weight management; group and individualized exercise program.

1 unit, Aut, Win (Weeks, Diaz, Williams)

2. Conditioning — Introduction to the various approaches to improving muscular and cardio-respiratory fitness. Emphasis on proper stretching. Includes Introduction to Running. May include introduction to swim conditioning, weight training, aerobic dance and/or other aerobic activities. General knowledge of physiological aspects of conditioning, fitness parameters, and principles of training. Individualized according to ability.

1 unit, Aut, Win, Spr (Staff)

2A. Swim Conditioning — For students wanting to improve cardio-respiratory endurance
through directed swimming workouts. Prerequisite: advanced swimmer.  
1 unit, Spr (Haines)

1 unit, Aut, Win, Spr (Reiman, Staff)

3A. Weight Training: Intermediate/Advanced — Review of basic exercises and techniques progressing to sports of power-lifting. Olympic lifting and body building. Emphasis on individualized programs. Further discussion on Exercise Physiology. Prerequisite: Beginning Weight Training of thorough knowledge of basic weight training principles.  
1 unit, Aut, Win, Spr (Reiman, Ruff)

4C. Frisbee—Fundamentals of all throws and catches; basic rules of Frisbee Golf, Ultimate, Freestyle, and other field events; disc selection. Basics of Aerodynamics.  
1 unit, Aut, Spr, (Staff)

15. Gymnastics: Beginning — Fundamental gymnastics movement including various flexibility and strength exercises taught on mats and on the Olympic apparatus for men and for women.  
1 unit, Aut, Win, Spr (Hamada, Sardina)

16. Gymnastics: Intermediate/Advanced — For students with background in gymnastics. Group instruction and individualized work to enable some specialization on the various pieces of apparatus for men and for women.  
1 unit, Aut, Win, Spr (Hamada, Sardina)

22. Golf: Beginning—Fundamentals of the golf swing, use of various clubs, golf etiquette, and knowledge of the rules to enable a beginner to play a round of golf. Fee.  
1 unit, Aut, Win, Spr (Hamada, Sardina)

23. Golf: Intermediate — Improvement and perfection of previously learned fundamentals. Utilization of these skills in the game. Fee. Prerequisite: promoted from 22 or the equivalent or ability to score in the 60's for nine holes on a regulation length course.  
1 unit, Aut, Win, Spr (Diaz)

24C. Ski Conditioning — A conditioning program geared to preparing the skier physically for the ski season.  
1 unit, Aut, (Staff)

1 unit, Aut, Win, Spr (Staff)

1 unit, Aut, Win, Spr (Staff)

1 unit, Aut, Win, Spr (Staff)

1 unit, Aut, Win, Spr (Hurst)

32. Tennis: Beginning—Covers fundamental strokes (forehand, backhand, service and net play), rules and scoring.  
1 unit, Aut, Win, Spr (Gould, Neal, Staff)

33. Tennis: Intermediate—Review of fundamental strokes, introduction to the lob and overhead strokes, and utilization of strategy and tactics in game playing. Prerequisites: knowledge of rules and scoring, average ability in fundamental strokes.  
1 unit, Aut, Win, Spr (Neal, Staff)

34. Wrestling: Beginning—Introduces the intercollegiate sport of wrestling. Includes conditioning and cultivates the spirit of one-on-one competition. Basic skills as well as high level sequences of upper and lower body technique.  
1 unit, Win, Spr (Horpel)

36. Basketball—Extensive use of drills to refine fundamental skills and utilize offense and defense tactics.  
1 unit, Aut (Staff)

37. Field Hockey: Beginning—Focus on fundamental play, stick work, individual and team tactics, strategy and rules.  
1 unit, Spr (Killefer)

40. Soccer: Beginning—Introduction to the sport covering basic skills and laws of the game. Small-sided games utilizing basic skills.  
1 unit, Aut, Win, Spr (Igwe, Lodge)

40A. Soccer: Intermediate—Review of basic skills and introduction to the full game of soccer. Tactics and techniques used in small and full game situations. Prerequisite: 40 or equivalent or experience on a club team.  
1 unit, Aut, Win, Spr (Igwe, Lodge)

41. Volleyball: Beginning/Intermediate — Drills to improve skills and game playing
strategy. As ability indicates, more emphasis on team play and strategy.

1 unit, Aut, Win, Spr (Staff, Sturm)

42. Lacrosse: Beginning — Fundamental skills and tactics. Coed.

1 unit, Win

101. Adapted Physical Education—Individualized programs or opportunities to accommodate the physically inconvenienced student.

1 unit, Aut, Win, Spr (Ruff, Staff)

122. Golf: Advanced—Focus on understanding of and refining the golf swing as well as increasing power and distance. Fee. Prerequisites: ability to hit the ball with relative accuracy and distance and swing with good form.

1 unit, Aut, Win, Spr (Diaz)

128. Badminton: Advanced—Emphasis on refinement of all strokes; concentration on developing high level of ability and on strategic skills practiced in a competitive atmosphere. Fee.

1 unit, Aut, Win, Spr (Staff)

131. Fencing: Advanced—Concentration on practice of attacks. Individual lessons and some competitive experience. Fee. Prerequisite: promoted from 31 or equivalent.

1 unit, Aut, Win, Spr (Hurst)

131A. Fencing: Sabre and Epee—Concentration on moves of each of the weapons for offense and defense. Fee. Prerequisite: promoted from 31 or equivalent.

1 unit, Spr (Hurst)

132. Tennis: Advanced — Review of fundamental strokes. Drills to emphasize footwork, service and return, approach shot and volley, lob, and overhead. Strategy for competition in singles and doubles. Prerequisite: well above average stroking and game playing ability.

1 unit, Aut, Win, Spr (Neal, Brennan, Staff)

132A. Tennis: Tournament—Advanced drills and practice sessions for tournament-experienced players of near varsity level ability. Consent of instructor.

1 unit, Aut, Win (Brennan, Gould)

140. Soccer: Advanced—Advanced passing skills and techniques; new and old defensive and offensive systems utilized in actual game situations. Considerable soccer experience desirable.

1 unit, Win (Lodge)

141. Volleyball: Advanced—Refinement of all skills with emphasis on offensive and defensive strategies. Prerequisites: strong skills and general knowledge of game plans.

1 unit, Aut, Win, Spr (Staff)

ATHLETICS, PHYSICAL EDUCATION, AND RECREATION

INTERCOLLEGIATE ATHLETICS

Varsity and junior varsity men’s and women’s teams in Pac-10 and WCAA competitive schedules for the highly talented and motivated undergraduate student. Most squads are limited in size and have prerequisite performance standards. Unless specified, team tryouts are open to men and women students.

116V. Gymnastics: Varsity, (men’s and women’s teams).

1 unit, Aut, Win, Spr (Hamada, Sardina)

MTWThF 2:15

117V. Track and Field: Varsity, (men’s and women’s teams).

1 unit, Aut, Win, Spr (Johnson, Staff)

MTWThF 2:15

118V. Cross Country: Varsity, (men’s and women’s teams).

1 unit, Aut (Tomassello, B. Johnson)

MTWThF 3:15

123V. Golf: Varsity, (men’s and women’s teams).

1 unit, Aut, Win, Spr (Schaaf, Baldwin)

MTWThF 2:15 and by arrangement

131V. Fencing: Varsity—Men’s foil, epee and saber teams and women’s foil team.

1 unit, Aut, Win, Spr (Hurst)

MWThF 3:15 p.m. and T 7-10

133V. Tennis: Varsity, (men’s and women’s teams).

1 unit, Aut, Win, Spr (Gould, Brennan) MTWThF 2:15

134V. Wrestling: Varsity.

1 unit, Aut, Win, Spr (Horpel)

MTWThF 3:15

135V. Baseball: Varsity.

1 unit, Aut, Win, Spr (Marquess, Stotz)

MTWThF 2:15

136V. Basketball: Varsity.

1 unit, Aut, Win (T. Davis, Staff) men’s team

MTWThF 3:30-6:30

(McCrea, Staff) women’s team

Aut, Win, MTWThF 1:30-3:30 p.m.

137V. Field Hockey: Varsity—Women’s team.

1 unit, Aut (Killefer) MTWThF 2:15

Spr, MWF 2:15

137J. Field Hockey: Junior Varsity—Women’s team.

1 unit, Aut (Killefer) MTWThF 2:15

138V. Football: Varsity.

1 unit, Aut, Spr (Wiggin, Staff)

MTWThF 3:15
140V. Soccer: Varsity.
   1 unit, Aut (Lodge, Igwe) MTWThF 3:15
   Spr, MTWThF 2:15

141V. Volleyball: Varsity, (men’s and women’s teams).
   1 unit, Aut, Win, Spr, (Sturm)
   MTWThF Aut - Men 6:30-8:30 A.M.
   Women - 6-9 P.M.
   Win - Reverse
   Spr - Both - 7-9:30 P.M.

149V. Swimming: Varsity, (men’s and women’s teams).
   1 unit, Aut, Spr (Kenney, Haines)
   MTWThF 3:15
   Win MTWThF 2:15

150V. Diving: Varsity, (men’s and women’s teams).
   1 unit, Aut, Win, Spr (Schavone)
   by arrangement

151V. Water Polo: Varsity.
   1 unit, Aut (Dettamanti) MTWThF 2:15
   Spr, MW 3:15

CLUB SPORTS PROGRAM

The Stanford Club Sports Program currently includes twenty-nine (29) student initiated, organized, and conducted physical activity groups affiliated with the department. Clubs, which meet the criteria for academic credit, are scheduled for regular instruction times as published each quarter in the Time Schedule. Teams desiring formal affiliation in Pac-10, WCAA, and/or NCAA conferences may be so certified upon request. All Clubs are coeducational except as specified. For additional information, contact Mrs. Schoof.

6C. Self Defense.
   1 unit, Aut, Win, Spr, Sum

7C. Aikido
   1 unit, Aut, Win, Spr, Sum MTWThF 11-1

8C. Shotokan Karate.
   1 unit, Aut, Win, Spr

9C. Karate Do.
   1 unit, Aut, Win, Spr

10C. Kenpo Karate.
   1 unit, Aut, Win, Spr, Sum MW 7-8:30 pm

112C. Capoeira Club.
   1 unit, Aut, Win, Spr

113C. Judo.
   1 unit, Aut, Win, Spr

114C. Ultimate Frisbee Team.
   1 unit, Aut, Win, Spr

124C. Ski Club Team.
   1 unit, Win

125C. Cycling Club.
   1 unit, Aut, Win, Spr

129C. Badminton Club Team.
   1 unit, Win, Spr

139C. Rugby Club Teams (men’s and women’s).
   1 unit, Aut, Win

140C. Soccer Club Team (Women’s).
   1 unit, Aut, Spr

142C. Lacrosse Club Teams (Men’s and Women’s).
   1 unit, Win, Spr

143C. Ice Hockey Club Team
   1 unit, Aut, Win

145C. Women’s Softball Club Team.
   1 unit, Win, Spr

147C. Synchronized Swimming Club Team.
   1 unit, Aut, Spr, Win

151C. Water Polo Club Team (Women’s).
   1 unit, Aut, Win, Spr

155C. Sailing Club Team
   1 unit, Aut, Win, Spr

156C. Crew Club Teams (Men’s and Women’s).
   1 unit, Aut, Win, Spr

The Bowling Club (men’s and women’s), Cricket Club, Polo (horse) Club, Racquetball Club, Squash Club and the Surf Club have activities scheduled each quarter for no credit.
The Stanford Linear Accelerator Center (SLAC) is devoted to experimental and theoretical research in elementary particle physics and the development of new techniques in high energy accelerators and elementary particle detectors. The center is located on 480 acres of Stanford property west of the main campus, parallel to and south of Sand Hill Road and is operated under a contract with the Department of Energy.

The two-mile long linear accelerator, which began operations for physics research during 1966, can provide an electron beam at energies up to 29 GeV and at beam intensities up to 30 microamperes average current. Positrons can also be accelerated to a maximum energy of about 19 GeV, at average beam currents up to about one microampere.

A new method of operation has recently been put into effect which permits producing electron beams of up to 30 GeV at lower current. Polarized electron beams can be produced with polarization 40% at full beam intensity and energy, and up to 85% at lower intensities. In 1978 one of the experiments performed using this beam established the existence of clear connections between the weak and electromagnetic interactions.

A "switchyard" of magnetic elements at the end of the accelerator can direct the beams to any of several experimental areas. A large number of secondary beams of special character, including pion, kaon, muon, and photon beams, is available. A complement of large research instruments available for use with the accelerator includes three magnetic spectrometers capable of analyzing momenta up to 1.6, 8, and 20 GeV; a 40-inch diameter, cylindrical bubble chamber which operates in a hybrid mode with triggering counters; and a large aperture superconducting solenoid spectrometer system (SPEAR) for studies of multihadron final states. An electron-positron storage ring facility (SPEAR) is engaged in a full research program with colliding beams each of 3.7 GeV energy. The SPEAR facility was used in the discovery of the psi particle for which the 1976 Nobel Prize in physics was awarded. Among other major discoveries was that of a new heavy lepton, the \( \tau \), made in 1975.

PEP, the Positron-Electron Project, was designed to expand the field of investigation which has been opened by SPEAR. This is one of the major enterprises for high energy physics in the United States, and its construction was managed jointly by SLAC and the University of California, Lawrence Berkeley Laboratory. The electron-positron ring allows interactions to be studied up to energies of 18 GeV per beam and with an event rate higher than any machine of its kind. Experiments at PEP have measured the lifetime of the \( \tau \) lepton, the interference of the weak and electromagnetic interactions, and properties of the strong interaction as depicted with quarks and gluons.

SLAC physics groups (and a U.C. Berkeley collaboration) have moved the Mark II solenoidal detector from SPEAR to PEP to continue its research program at the higher energies available there. In addition, a SLAC group (together with a Stanford Physics Department group) has installed a modified Delco detector (Direct Electron Counter), previously used at SPEAR, at another PEP interaction region. Another Stanford Physics Department group in collaboration with SLAC and several other universities has built and installed a large calorimetric detector.

At SPEAR, experiments will continue using a new detector, Mark III, constructed by SLAC and collaborating universities.

A new colliding beam device called the Stanford Linear Collider (SLC), is now under design with a two and one-half to three year estimated construction period expected to begin in Oct-
ober 1983. The SLC project is the first of a new class of electron-positron colliding beam devices which promise to reach much higher center-of-mass energies (up to 100 GeV) at lower costs than those of the presently used technique of colliding beam storage rings. This high energy will not only allow physicists to continue to expand the study of the basic building blocks of matter, but will also allow a beginning to the study of perhaps an even more profound question—the number of fundamental forces in nature.

SLAC is operated by Stanford as a national facility so that qualified scientists from universities and research centers throughout the country and world, as well as those at Stanford, may participate in the high energy physics research program of the Center. As of January 1983, physicists from 81 other institutions have had research programs accepted for execution at the Center. The faculty of the Center leads a group of some 90 physicists in research programs on theoretical and experimental particle physics. In addition, the faculty offers lecture series on various aspects of high energy physics, and conducts seminars on topics of current interest. The SLAC Summer Institute on Particle Physics is an annual meeting which combines pedagogic lectures with a critical review of recent progress in high energy physics.

The experimental research program at SLAC deals with almost all areas of elementary particle physics at high energies. To name but a few, experiments are in progress on high energy elastic and inelastic electron scattering, the study of high energy photon and hadron interactions both with bubble chamber and electronic techniques, studies of decay properties of weakly interacting particles, and the study of electron-positron annihilation to form hadrons, leptons, and photons. The work in theoretical physics deals with all phases of elementary particle theory.

Stanford graduate students may, with the approval of their departments, carry out research for the Ph.D. degree with members of the SLAC faculty. Graduate students from other universities also participate in the research programs of visiting groups.

Research assistantships are available for qualified students by arrangement with individual faculty members. There are also opportunities for summer employment in the research groups at the Center. Interested students should apply to Professor David Leith, Graduate Student Advisor.

Stanford Overseas Studies Programs offer a variety of study opportunities to Stanford undergraduate and graduate students. General studies programs in Austria, Britain, France, Germany, and Italy provide courses for undergraduates in the history, politics, literature, art, and economics of each country. Programs in Germany, France, Israel, Egypt, Spain, and Africa afford advanced undergraduates a chance to study in foreign universities. Graduate students can use the centers as a base for advanced research.

Students in Berlin, Tours, and Vienna live mostly in student dorms and generally take courses specifically organized for Stanford students, although students with a strong language background may take courses at local universities. In Florence students live in a residential center and take courses designed for Stanford students. In Haifa, Paris, and Salamanca, students are regularly enrolled in local universities and live in dorms and apartments; a similar program for advanced language students in German exists at the Free University (FU) of Berlin.

Stanford Overseas Studies also administers and/or participates in consortium programs in Lima, Peru; São Paulo, Brazil; Rome, Italy; Cairo, Egypt; Dar Es Salaam, Tanzania; Kano, Nigeria; and Lomé, Togo. Specific information about these programs should be obtained directly from the Overseas Studies Office.

Students in Berlin, Tours, and Vienna live mostly in student dorms and generally take courses specifically organized for Stanford students, although students with a strong language background may take courses at local universities. In Florence students live in a residential center and take courses designed for Stanford students. In Haifa, Paris, and Salamanca, students are regularly enrolled in local universities and live in dorms and apartments; a similar program for advanced language students in German exists at the Free University (FU) of Berlin.

All regularly enrolled Stanford students are eligible to attend an Overseas Studies Center. Language and preparatory course requirements vary for each center, however. In general, students can study overseas for one, two, or three quarters. Tuition overseas is the same each quarter as on the home campus and the overseas fee closely approximates the quarterly room and board fees on the home campus.

All courses taken overseas receive regular University credit. Courses taken at an overseas studies center will satisfy Distribution Requirements according to the "DR:" designation and as noted in the Appendix. Overseas courses do not automatically receive major credit in departments on the home campus. More information about departmental credit for overseas courses may be obtained at the Overseas Studies Office and at individual departmental offices.

Application deadlines for Berlin, Florence, Tours, and Vienna are:
To begin Spring Quarter, 1983—84
December 2, 1983
To begin Summer Quarter, 1983-84
January 27, 1984
To begin Autumn Quarter, 1984-85
March 9, 1984
To begin Winter Quarter, 1984-85
May 25, 1984
Application deadline for the advanced language university-based programs (Paris, Berlin-FU, Salamanca, Lima, Sao Paulo, Cairo, Dar Es Salaam, Kano, and Lome) is January 27, 1984. Applications for the fall semester Haifa program 1983-84 are due December 2, 1983. Applications for Winter Semester Haifa Program (corresponds to Stanford’s Winter and Spring Quarters) are due on May 25, 1984. For more information about offerings, requirements, fees, and application deadlines, see the publication Stanford Overseas Studies, 1983-84 or the appropriate program folder, both available in the Overseas Studies Office, room 112, Old Union.

More detailed information about courses described below can be found in the Overseas Studies Course Abstracts. Courses are not listed for the FU-Berlin, Haifa, Paris, S Sao Paulo or Salamanca programs because students choose from among the courses offered at the university in which they are enrolled.

**STANFORD PROGRAM IN BERLIN**

**Academic and administrative personnel:**
Karen Kramer, Associate Director, Hannelore Noack, Administrative Assistant, Hazel Usher, Program Secretary, Maria Biege, William Eddelman, Eike Gebhardt, Volker Gransow, Manfred Gortemaker, Jürgen Müller, Franz Neckenig, Leonard Ortolano, Amy Sims, Frieder Wolf

**SCIENCE AND SOCIAL SCIENCES**

171A. Environmental Planning—Course introduces what can be done and what is being done to improve environmental quality in industrialized nations. It introduces a framework for examining air and water quality management problems, analyzes regulatory strategies and policies, and studies environmental impact assessment. Case study illustrations are taken from Germany. Course compares the environmental citizens’ groups in the U.S. with the more political “Greens” urging environmental restraint in Germany. (DR:8)

4 units, Aut (Ortolano)

160. Special Problems as Social Movements—Course investigates the special problems of dissent and deviance arising in Germany and attempts to integrate or excommunicate dissenting groups. Students discuss problems compounded by the uncertainties of democratic traditions. Class studies the social movements that have emerged in response to problems such as the nuclear arms race, the paranoia about radicals, the squatter’s movement, etc. 4-5 units, Aut (Gebhardt)

130. State and Economy in West Germany—This course will investigate the role of the state in relation to private enterprise in West Germany, through examination of a number of case studies. Comparisons will be drawn with other European countries and the United States. The aim of the course is to demonstrate some of the tools which are used to achieve various industrial policy aims and to analyze their effectiveness from a micro-economic viewpoint. 4-5 units, Aut (Müller)

128. Nazi Germany—Course begins with the roots and origins of National Socialism leading to Hitler’s take-over of Germany in 1933, but focuses on Germany 1933-1945. Students discuss the nature of National Socialism, Hitler’s “Social Revolution”, foreign policy of the Third Reich, life of various groups under Hitler, the Holocaust, World War II, and other main themes. (DR:5)

4-5 units, Win (Sims)

131. The Two Germanies—An introduction to the politics and social structure of the two Germanies and their relations with each other. Course deals with both East and West Germany and tries to take advantage of the unique opportunities of Berlin for field trips and films. 4-5 units, Win (Gransow)

127. Introduction to German History, Politics and Culture—A general introduction to the historical, political and cultural development of Germany from the Middle Ages to the present. Special attention is given to the characteristics of social and ideological premises with social reality. (DR:5)

5 units, Aut (Neckenig)

130. Marx and His Followers—An introduction to the thought of Karl Marx and the tradition in German thought that it spawned from early Socialists and Political Economists to the Frankfurt School. 4-5 units, Win (Wolf)

OVERSEAS STUDIES 669
237A. Berlin: Its History, Politics & Culture: 1250-1871—This course will study the vital role Berlin has played in German history, through an interdisciplinary approach including on-site examination of Berlin art, historical sites and contemporary cultural events. (DR:5)
4 units, Spr (Neckenig)

135. The German Federal Republic in the International System — This course deals with the emergence of West Germany’s Foreign Policy since the early 1950s. Special attention will be given to the changing international and domestic conditions (political and economic) which have influenced the position of the Federal Republic in its international environment, especially those which have an impact on German-American relations and the role of the Federal Republic in the East-West conflict.
4-5 units, Spr (Gortemaker)

4 units, Win (Neckenig)

LITERATURE AND ARTS

176B. East and West German Theater—Course will discuss the rich and varied theatrical heritage of the 19th and early 20th Century German dramatists, directors, designers and performers and how they created a unique theatrical world combining intense intellectual/aesthetic explorations and experimental approaches with large production budgets. Will explore the works of Brecht, Handke, Mueller, Strauss and Duerrenmatt, among others. Students will review theater productions in East and West Berlin. (DR:2)
4 units, Spr (Eddelman)

182. Weimar Culture: Theater, Film, Music, Dance—Course will explore the interrelationships among the cultural forms (theater, film, dance) that made the Weimar period one of the most creative and experimental cultural explosions in Western History. Class studies the plays of Brecht, the theater of Reinhardt and Piscator, the films of Murnau and Lang and the music of Weill and Hindemith. Students will view films from this period. (DR:2)
4 units, Spr (Eddelman)

120. New Ways of Seeing — This course will attempt to interpret art objects in the Berlin cityscape, museums and galleries as historical symbols. Students seek access to the cultural and ideological movements of the various epochs through an analysis of form and content, ground plan and facade, artistic details, aesthetic effects and symbolic meanings. (DR:2)
4 units, Win (Neckenig)

176A. German Theatre As Seen in Berlin—Plays and productions of German theatre will be discussed in their historical, literary and socio-political context. Attendance at theatrical productions from the classical and modern repertory in both East and West Berlin will be an integral part of the course. (DR:2)
4 units, Aut (Kramer)

GERMAN LANGUAGE PROGRAM

60. Special Intensive German—Grammar, composition, reading, and conversation are covered in a special, intensive course designed for interns to increase their language proficiency as quickly as possible and to help them become integrated into Berlin and profit from its many cultural opportunities. Required of all interns who have had fewer than two quarters of German.
10 units, Aut (Staff)

70. Intensive German—Grammar, composition, and conversation will be covered in a course designed to increase students’ fluency in German language as rapidly as possible and to help them take advantage of the many opportunities in Berlin.
6 units, Aut, Win, Spr (Staff)

80. Intermediate German—A course designed for students who wish to improve their knowledge of the German language and begin reading texts from such areas as history, literature, politics, and economics.
3-4 units, Aut, Win, Spr (Staff)
90. Advanced German—This course is for advanced students who wish to expand their knowledge of the German language and to become more familiar with the finer points of German grammar and style.

3-4 units, Win, Spr (Staff)

93. Contemporary Berlin: Newspaper Reading — A conversation course using newspaper articles as a basis for the discussion of current events. Vocabulary will be expanded in the fields of politics, economics, sports, and the arts.

2 units, Win, Spr (Staff)

STANFORD PROGRAM IN BRITAIN

The Stanford program in Cliveden will close in August 1983 to prepare for the move to Oxford. It is expected that the Stanford in Oxford program will begin in Autumn 1984.

STANFORD PROGRAM IN FLORENCE

Academic and administrative personnel:
Giuseppe Mammarella, Director
Carla Lekai, Assistant Director
Joan M. Mammarella, Language Program Coordinator
Beverly Allen
Lucia Benini
Franca Celli
Napoleone Colajanni
George Collier
Jane Collier
Roberto D'Alimonte
Mario Draghi
Solomon Feferman
Guelfo Frulla

SCIENCE AND SOCIAL SCIENCES

130. Psychology of Sex Roles—Course will examine factors involved in the development of masculine and feminine roles. It will draw upon theory and research in several areas of psychology (including personality, social, cognitive, developmental, and biological) as well as sociology and anthropology. Special emphasis will be on cross-cultural comparisons between the United States and Italy. Topics discussed are sex differences, conceptions of sex roles, theoretical perspectives (psychoanalytical, learning, cognitive-development), socialization processes, roles and relationships, issues in work and power. (DR:4)

4 units, Aut (Zimbardo, Maslach)

150. Seminar: Cross-Cultural Psychology—The purpose of this course is to provide training in the design, execution, and conduct of cross-cultural research. Each student will select one of three research topics to investigate as part of a small team. Topics of inquiry are sex roles, shyness, and individuation. Students will conduct interviews and field observations.

4 units, Aut (Zimbardo, Maslach)

100. Introduction to Contemporary Italy—Each quarter students at the Florence program will be required to take this introductory course which provides a brief overview of Italian history, geography, politics and culture. An integrated, interdisciplinary course, it will be taught by members of the Florence faculty and will be coordinated with field trips, cultural events in Florence, and visiting lecturers.

4 units, Spr, Aut (Mammarella)

131A. The U.S. and Western Europe after World War II—Course deals with the economic, political, military, and cultural relations between the United States and Western Europe. Analyzes the different American policies toward Europe from 1945 to 1974 within the framework of East-West relations. Particularly stresses the European answer at political and economic levels. Course is designed to give an understanding of the European point of view toward American policy. (DR:5)

5 units, Aut (Mammarella)

103. The Greeks in the West—Students are introduced to basic facts and key issues of Greek history, but always with a focus on the Greeks in the West. Course reading includes original sources in English translation such as Homer's Odyssey, the poets Stesichorus and Ibycus, the philosophers Pythagoras, Empedocles and Parmenides, Thucydides, Plato and Plutarch. Discussion focuses on distinctiveness of Greek civilization, what forms it took in the West, and how it influenced the Etruscans, Rome and the modern world. (DR:5)

4-5 units, Win (Jameson)

215. The City-States of Greece and Italy—Living close to a number of prime examples of the Italian city-states, students have the opportunity to observe the phenomenon and to compare the Italian with the Greek cities. Students discuss the relation of city and country, city-planning, social classes, economic life, religious and cultural cohesion, and causes of the cities rise and decline. (DR:5)

4-5 units, Win (Jameson)

187. Evolution of Italian Urban Form—Course surveys how the form of Italian cities evolve over four time periods: Ancient, Roman, Medieval, Renaissance and Baroque. In each period we consider elements of urban form: dwelling units, public buildings, public monu-
ments, street plans, piazzas, waterworks and sewerage, and fortifications. Principal focus is on understanding how these urban elements changed over the four time periods. Concepts of urban typology are used to organize information. (DR:5)

4 units, Win (Ortolano)

171A. Seminar: Environmental Planning—Course introduces what is being done and what can be done to improve environmental quality in industrialized nations. It introduces a framework for examining air and water quality management problems. The course also introduces environmental impact assessment. Emphasis is on techniques for assessing biological and visual impacts and for predicting changes in noise levels, air quality and water quality. Case study illustrations are taken from the United States and Italy. (DR:8)

4 units, Win (Ortolano)

117. Economic Policy in Post-War Italy — The course will deal with the economic history of Italy in the first phase of post-war economic growth (1945-59). The changes in the structures of the Italian economy, as well as the government economic strategies in their legislative and political aspects will be examined. The growth of the Italian economy during the years of the "economic miracle" will be studied.

4 units, Win (Draghi)

60. Problems and Issues of Italian Contemporary Politics—A close look at the Italian political system and how it functions as seen by following the day to day political events of government through the news media. Guests for lectures and discussions will be current political figures. (DR:5)

5 units, Win (D'Alimonte)

107. European Society and Culture 1050-1220 — Course surveys the significant social, institutional, and cultural achievements of the twelfth-century renaissance. Topics discussed are demographic and economic growth, feudalism and the development of national monarchies in France, England, and Sicily, the decline of the German Empire, urban expansion and the rise of the Italian communes, the Crusades, the rise of the papacy, religious dissent and heresy, the revival of law and medicine, the origins of universities, chivalry and courtly love, and scholastic thought and Gothic art. Focus is on those aspects of these developments which took place in Italy and which involved Italians. (DR:5)

5 units, Win (D'Alimonte)

211. St. Francis of Assisi and Pope Innocent III—Seminar compares the personalities, careers, and religious ideals of Francis of Assisi and Pope Innocent III and evaluates their impact on Italian society and culture. The writing of Innocent and Francis will be analyzed as well as other contemporary sources. Each participant is required to complete a research project which demonstrates the impact of Innocent or Francis on Italian society or culture.

5 units, Spr, (Ferruolo)

198. Mathematics and the Rise of Science—The central role of mathematics in the rise of physical science from the time of the Greeks to the 17th century is discussed. Mathematical ideas and methods will be explained leading from geometry and algebra to basic ideas of the differential calculus. Substantial applications to astronomy and physics will be presented, as well as uses of mathematics in cartography and navigation. The framework is historical. (DR:6)

4-5 units, Spr, (Feferman)

197. Mathematics and Science in Italian Culture—Seminar will deal with selected topics from the 13th through the 20th centuries. Among the topics discussed are: Leonardo Fibonacci of Pisa and the 13th century commercial revolution; perspective in Renaissance painting and projective geometry; the mathematical and engineering problems of Renaissance architecture; Leonardo da Vinci's inventions; Bruno, Galileo and the church; Peano's logical language and campaign for a universal language. Students will write and present papers. (DR:6)

3-5 units, Spr (Feferman)

115. Firenze nel Rinascimento — A study of Florentine civilization from Dante to Machiavelli, including intellectual and political history. Students visit important Florentine sites of the Renaissance. (DR:5)

5 units, Spr (Frulla)

180. Mediterranean Problems—After briefly reviewing the historical background, students will concentrate on developments in the Mediterranean area between World Wars I and II (particularly the partitioning of the Ottoman Empire), the Cold War, and the more recent problems associated with the Arab-Israeli conflict. (DR:5)

5 units, Spr (Giovine)

LITERATURE AND ARTS

Survey of Italian Literature—The following three courses constitute an Italian literature series offered partially in English and partially in Italian. Each course can be taken independently and there are no prerequisites.

110A. Masterpieces of Italian Literature Origins to Dante. (DR:2)

4-5 units, Aut, Spr (J. Mammarella)

110B. Masterpieces of Italian Literature 1300-1500. (DR:2)

4-5 units Win (J. Mammarella)
180. Modern Italian Novel—This will be an introductory study of the Italian novel from before the turn of the century almost to the present. Readings will begin with Verga, D'Annunzio and Pirandello and conclude with Pasolini, Calvino and Sciascia. Discussion will center on the development of the novel in Italy from post-unification verismo and decadence through the wars and the ventennio nero of Fascism to neo-realism and the present. (DR:2)

4 units, Aut (Allen)

148A. Foreigners in Florence—This course is a study of travel accounts and other literary texts describing visits by foreigners to Italy, and to Florence in particular. Examination of the travel account as a literary genre, notions of narrativity as presented by the novels read, various versions of what being "foreign" in Italy means, travel as metaphor, and the symbolic value of Italy to foreign visitors of several centuries.  

4 units, Aut (Allen)

121. Tuscan Art from Giotto to Leonardo—A chronological analysis of the stylistic development of Tuscan art from the 13th to 15th centuries, including study of such masters as Giotto, Donatello, Botticelli, and Leonardo. (DR:2)

4 units, Aut, Spr (Todorow)

126. Etruscans and Roman Culture—Course introduces students to the most important native cultures of ancient Italy, discussing art and artistic trends against the background of contemporary history and economy. Topics discussed are the Etruscan heritage in Rome, the rise of the Roman Republic, its turn into a world-wide empire, and Roman art. Culture and history is interpreted from the abundant archeological evidence.

4 units, Aut (Scichilone)

5. L'Opera Italiana—An historical and aesthetic introduction to some of the best Italian operas, including Monteverdi's *Orfeo*, Mozart's *Don Giovanni*, and Rossini's *Barbiere di Siviglia*.

4 units, Win (Frulla)

122. The High Renaissance and Mannerism in Florence, Rome, and Venice — A study of the stylistic trends, iconography, and social history of Italian art, concentrating on Michelangelo and Raphael but including such artists as Bronzino, Vasari, Titian, Tintoretto, and Caravaggio. Particular emphasis will be given to the classical influence on the artists studied. (DR:2)

4 units, Win (Todorow)

127. Museum Science—Course means to give a deep understanding of the technical, cultural, and historical reality of modern museums, after a brief historical introduction, the course deals with modern museology and environmental problems of museums.

4 units, Win (Scichilone)

125. Art and Culture of the Greek World—A discussion of the generally agreed upon sequences of "periods" in Greek Art between the 11th and 2nd centuries B.C. based on historical, literary and archeological evidence. (DR:2)

4 units, Spr (Scichilone)

THE ITALIAN LANGUAGE PROGRAM

Intensive Italian—Grammar, conversation, and composition. Students enroll in Intensive Italian at the appropriate level during their first quarter in Florence.

80. Intermediate Italian.  

5 units, Aut, Win, Spr (J. Mammarella, Benini, Celli, Gori)

90. Advanced Italian.  

5 units, Aut, Win, Spr (J. Mammarella, Benini, Celli, Gori)

Italian Language Continuation Courses—Grammar, conversation, and composition are presented in the context of a literary or social issues theme. Students enroll in Language Continuation at the appropriate level during their second and third quarters in Florence.

5 units, Aut, Win, Spr (J. Mammarella, Celli, Benini, Gori)

STANFORD PROGRAM IN TOURS

Academic and administrative personnel:

Paul LeMoal, Director
Claude Doubinsky Assistant Director
Anne Durand, Assistant Director

Patrick Baleyndau
Jean Noel Billard
Gerald Chaix
Daniel Dayan
Annie Galinié
Albert Guerard
André Gorgues
Nancy Green

Ralph Hester
Michelle Jomaron
Guy Leboucher
Ségolène LeMen
Francoise Perdoux
Robert Sautet
Eric Smee
Steven Urn

SURVEY COURSES

Each quarter students are required to take one survey course from among the following:

103A. Survey of French Literature: 20th Century—Course studies some of the masterworks of the 20th century French novel. Introductory lectures on the historical and cultural context are complemented by discussions of the main
674 OTHER DEPARTMENTS, INSTITUTES AND PROGRAMS

themes of the texts, and by detailed analysis of
significant excerpts. (DR:2)

4 units, Aut (Doubinsky)

130A. Survey of French History to 1789—
General introduction to the political, social, and
cultural history of France from the Medieval
period thru the Ancient Regime, the Enlighten-
ment, the Industrial Revolution, and the
French Revolution. (DR:5)

5 units, Aut (Green)

130B. Survey of French History: 1789 to Pre-
sent—A chronological and thematic approach to
modern French history from the French Revo-
lution to the present, covering political, social,
and economic developments of the period.
Throughout the quarter, the class discusses
basic questions such as how were the French
Republics constituted, what was the nature of
republicanism, what forces threatened it, and
how they were overcome. (DR:5)

5 units, Win (Uran)

102A. French Literature Survey: 19th Cen-
tury—A survey of the evolution of the 19th
century French novel which will focus on works
by Stendhal, Balzac, Flaubert and Zola. Works
by these novelists will be studied in detail not
only for their intrinsic literary qualities but also
because, taken together, they trace the progres-
sion of realism in French fiction. (DR:2)

4 units, Win (Doubinsky)

120. History of Art: Medieval to Reniassance
—Students are acquainted with great periods,
monuments, and masterpieces of French Art.
Lectures focus on the architecture and interior
decoration of castles, churches, and cities, on
French painting and sculpture, as well as on the
chief artistic techniques used over the cen-
turies. Field trips are organized to cities and
museums. (DR:2)

4 units, Win (Doubinsky)

101A. French Literature Survey: 17th & 18th
Centuries—Emphasis is on the works and
authors that made the most significant contri-
butions to western literary culture. The 17th
century is viewed as the Age of Classicism.
Starting with a brief introduction to the main
features of Renaissance Humanism as they re-
late to intellectual developments in the 17th
century, lectures focus on the pessimistic vision
of the French moralists (Pascal, La Rochefou-
cauld, La Bruyere, Madame de Lafayette) and
on some of the most important plays of Cor-
neille, Racine, and Moliere. (DR:2)

4 units, Spr (Doubinsky)

120B. History of Art: Classical to Impression-
ism—Students are acquainted with the master-
pieces of French art. Lectures will focus on the
architecture and interior decoration of castles and
palaces, on painting and sculptures, as well as on the chief artistic techniques. Slides will
illustrate the study of each significant work,
each lecture being intended to encourage stu-
dents to visit, in their own free time, the re-

gions, cities and museums where these works
can be found. Field trips will be organized to
museums and cities. (DR:2)

4 units, Spr (Smee)

SOCIAL SCIENCES

115. Les problèmes contemporains de la crois-
sance économique — An investigation of the
concept of economic growth will include its
definition and measurement, short term and
long range consequences, relationship to infla-
tion, and its specific expression in the French
economy.

5 units, Aut (Leboucher)

136. La politique extérieure de la France —
France's role in, and reaction to the interna-
tional problems produced by the Cold War and
the ensuing policies of detente will be the focus
of this course (DR:5)

5 units, Spr, Aut (Billard)

117. L'économie de la France moderne —
Contemporary French economy will be studied
in terms of the diverse traditions and economic
activities of the various regions of the country.
The economy of the Tours region will provide a
special focus of attention. French international
economics will also be discussed. (DR:5)

5 units, Win (Leboucher)

137. Introduction à l'Histoire religeuse de la
France — Course demonstrates the specificity
and significance of religious phenomena in early
modern France, and their impact on French
civilization. Surveys the new methods of in-
quiry in religious history and focuses on the
religious revolution of the sixteenth century,
the development of Protestantism and the re-
vival of Catholicism. A major objective of the
course is to raise essential themes which help
not only to interpret the past but to understand
contemporary France as well. (DR:5)

5 units, Win (Leboucher)

163. Le système légal français—This course
will consist of a survey and analysis of the organi-

tization and functioning of the French legal sys-
tem and the fundamental principles that under-
lie it.

5 units, Win (Baleynaud)

131A. Survivances de l'Ancien Regime dans la
France Contemporaine—The three-fold ob-
jective of this course is: to pose the problem of
Absolutism as a form of government and exam-
ine its structure; to study the specific develop-
ment of Absolutism in 16-17th century France;
and to trace the effect of traditional French centralism and state control on present-day France.

5 units, Spr (Chai)

124. La politique française contemporaine—Two major aspects of the French political system, political institutions under the Fifth Republic and agents of political action (such as political parties and pressure groups), will be studied. Comparisons with the American political system will be an integral part of the course.

(DR:5)

5 units, Spr (Gorgues)

FRENCH LANGUAGE
LITERATURE AND ARTS

113. Modern French Poetry—A study of the poetry of Baudelaire, Rimbaud and Eluard—three major voices in the French poetry of the last hundred years. Course discusses how all three used the medium of poetry to pursue a spiritual experiment, a quest for the absolute, and attempted by divergent roads (Romanticism, Surrealism), to explore the mystery of the human condition.

4 units, Aut (Perdoux)

143. The New French Cinema—Images of French society found in contemporary films will be studied along with the specific languages and aesthetics of the medium of cinema.

4 units, Aut (Galine)

112. L'Existentialisme Littéraire—An approach to the literary expression of existentialism through the studies of representative works. Emphasis is on the exploration of the feeling of the absurd, the exaltation of the spirit of rebellion, the discovery of a new humanism and a relatively optimistic moral. Readings are centered around Camus and Sartre.

4 units, Win (Jomaron)

114. The French Novel—Course combines a study of French society and French attitudes as reflected in Classic novels of the 19th and 20th century with study of the French novel as an art form. Students read about the traditional rural society of Madame Bovary, the upper bourgeoisie of Swann's Way, the demi-monde of Cheri, the intellectual world of young people of the early 20th century in The Counterfeiters, the inward conflict of the repressed intellectual in The Immoralist, etc. Lectures and novels are used to illuminate various ways in which French society, past and present, differs from the world known to the student. (DR:2)

4 units, Spr (Guerard)

80. Writing About the European Experience—This seminar aims to enrich the student's European experience through the organized meditative evocation of it in writing for an audience. Students write about anything in their European experience that is worth recording in an organized way.

3 units, Spr (Guerard)

160. A Semiological Approach to Film—Textual theory will be applied as a tool to study a group of modern French films by Renais, Godard, Bresson and others. The contrast with "classical" French films by Renoir, Carne and Clement and with foreign films will be emphasized.

4 units, Spr (Dayan)

LANGUAGE PROGRAM

70, 80, 90. Intensive French—Grammar, conversation, and composition, emphasizing rapid acquisition of verbal skills necessary to use the French language in daily life.

70. Elementary French.

6 units, Aut, Win, Spr (Blot, Jomaron, Perdoux)


6 units, Aut, Win, Spr (Blot, Jomaron, Perdoux)

90. Advanced French.

6 units, Aut, Win, Spr (Blot, Jomaron, Perdoux)

123. French Language Continuation—This will be an advanced language class dealing with more sophisticated grammatical analysis, composition and explication de textes.

4 units, Win, Spr (Jomaron, Perdoux)

127. Colloquium on Translation—A practical approach to the problems of expression in English and French and of translation from one language to the other, through examples taken mostly from contemporary sources.

4 units, Spr (LeMoal)

STANFORD PROGRAM IN VIENNA

Academic and administrative personnel:
Siegfried Korninger, Director
Hedwig Thimig, Associate Director
Margaret Mehrl, Language Program Coordinator
Roswitha Benesch
Hans Heinrich
Wolfgang Kuhn
Walter Lohnes
Maximillian Peyfuss
Wendelin Schmidt-Dengler
Gottfried Scholz
Karl Vocelka
Karl Wagner
SOCIAL SCIENCES

124. A Survey of Habsburg History—An introduction to historical problems of Central Europe under Habsburg rule from the late Middle Ages to the beginning of the First World War. Emphasis is on the extension of Habsburg dominion, the internal structures of these territories, and the economic, social and cultural development of the Habsburg lands. Topics include the problems of industrialization, the secularization and centralization of the state, and the difficulties of a multinational empire. (DR:5)

4 units, Aut (Vocelka)

125. Austrian History 1918-1980—Course covers the thorny path which led from the collapse of the Habsburg Empire to the present prosperity and stability of the tiny Austrian Republic. Material covers economic, social, and political inheritance of the Austro-Hungarian Monarchy, problems of Austrian national identity, international economic crisis, Anschluss and World War II, and finally, statehood and neutrality in 1955. Role of Austria as mediator between east and west is explored.

4 units, Win (Vocelka)

126. Eastern Europe Since 1945—Course explores the moving forces and main trends of post World War II political, economic and social development in Eastern Europe. Using comparative techniques, different patterns and variations are explained by the interplay of external and domestic factors. Special attention will be given to the analysis of decision making processes under the specific economic social and political constraints characteristic of the East European area.

4 units, Win (Heinrich)

138. Cultural and Political Geography of East Central Europe—Course will deal with the changing map of East Central Europe and the relationship of the German-speaking countries with their neighbors to the East; ethnic boundaries vs. national borders; linguistic problems in East Central Europe; population movements, especially after World War II; physical features and the influence on cultural cohesion and diversity; centralism vs. regionalism; Cultural centers, and national and regional stereotypes.

4 units, Spr (Lohnes)

136. The Contemporary German Language: Standard vs. Dialects—An overview of major patterns of the standard language followed by topics such as observable language change in syntax and lexicon, regional deviations from standard German, distribution and characteristics of German dialects; the language of journalism and advertising; technical and scientific German and their relationship to international standards. Students will collect language material on the local scene and during their travels.

4 units, Spr (Lohnes)

123. Austria and Southeast Europe—The role of Austria in the history of Southeastern Europe will be examined from the time of the Ottoman onslaught through the Christian liberation, the two World Wars and the Soviet aftermath. (DR:5)

4 units, Spr (Peyfuss)

LITERATURE AND ARTS

2C. Opera—An introductory lecture course on Opera which will include attendance at performances of the Staatsoper and the Volksoper. Lectures will serve to cover the history and development of opera and to prepare students for the performances they will attend. Follow-up sessions and critical review of the performances will be held as well. (DR:2)

4 units, Aut (Kuhn)

159. Mozart and His Music—Designed for the general student. The course will include readings, discussions, listening lessons, visits to local places of interest and attendance at appropriate concerts to allow an in-depth study of the life of Mozart and his music. Each student will write a research paper.

4 units, Aut (Kuhn)

102. Art and Museums 1500-1800—A study of the development of European art and architecture from the 16th to the 18th centuries. Special emphasis will be placed on works of art in the Kunsthistorisches Museum in Vienna and on Viennese architecture of this period. (Enrollment limited to 20 students.) (DR:2)

4 units, Aut, Spr (Benesch)

167. Austrian Literature—A survey of the major Austrian literary works of the 19th and 20th centuries. (DR:2)

4 units, Aut (Korninger)

103. Art and Museums in Vienna: 1800-Present — The major focus of this course will be on Viennese and Austrian art of the last two centuries, including comparisons with the mainstreams of European art during this period. (Enrollment limited to 20 students.) (DR:2)

4 units, Win (Benesch)

146. European and Austrian Theater History —This course explores the development of European and Austrian theater as far as stage design, costume and lighting are concerned. Also covers theater “revolutions” like Goethe’s theater at Weimar, Tieck in Berlin, and Brecht,
Piscator and Reinhardt in the twentieth century. (DR:2)

4 units, Aut (Thimig)

145. Drama in Vienna Theatres I—A survey of typical Austrian dramatic forms which reflect the social and political conditions of their times during the 19th and 20th centuries. Students will attend performances in Vienna when possible. (DR:2)

4 units, Win (Thimig)

147. Drama in Vienna Theaters II—The second of a two course sequence which explores typical Austrian dramatic forms that reflect the social and political conditions of their times. Students attend performances in Vienna. May be taken without having completed first part of sequence.

4 units, Spr (Thimig)

243. The Intellectual Scene Since 1900 — An introduction to the literary, cultural, and political contributions of Austrian intellectuals, such as Freud, Wittgenstein, Schnitzler, Hofmannsthal, and Kafka. (DR:2)

4 units, Win (Schmidt-Dengler)

005. Classical Music in Modern Vienna—Since Vienna ranks among the leading music centers of the world, this course will primarily study works being performed in Vienna while it is offered. Although musical pieces will not be studied chronologically, the course will constitute a good survey of various periods of European music.

4 units, Win, Spr (Staff)

165. Survey of German Literature—The purpose of this course is to provide students with an ordered account of German literature from the beginnings to recent times. A primary aim is to allow the student to come to terms with the manner in which German literature has developed.

4 units, Win (Wagner)

THE GERMAN LANGUAGE PROGRAM

70. Intensive German—The equivalent of German 3, using the Lo-Stro text with supplementary material which will concentrate on the speaking and comprehension of everyday German.

6 units, Aut, Win, Spr (Mehrl, Staff)

80. Intermediate Intensive German—Review of grammar, reading of texts and essay writing, plus concentration on speaking and comprehension.

6 units, Aut, Win, Spr (Mehrl, Staff)

90. Advanced Intensive German—Concentration on increasing the student’s active vocabulary, including reading, essay writing, and limited grammar review.

6 units, Aut, Win, Spr (Mehrl, Staff)

STANFORD PROGRAM IN HAIFA

STANFORD PROGRAM IN PARIS

Gordon Wright, Larry Friedlander, Directors 1983-84

STANFORD PROGRAM AT THE FREE UNIVERSITY IN BERLIN

Karen Kramer, Associate Director

STANFORD PROGRAM IN SALAMANCA

Isabel Criado, Director

PROGRAM IN VALUES, TECHNOLOGY, SCIENCE, AND SOCIETY

Emeriti: Eric Hutchinson (Chemistry), Walter G. Vincenti (Aeronautics and Astronautics)

Chairman: James L. Adams
Associate Chairman: Robert E. McGinn
Director, Western Culture Sequence: Paul S. Seaver

Professors: James L. Adams (Industrial Engineering and Engineering Management), Barton J. Bernstein (History), Raymond B. Clayton (Psychiatry), Sidney D. Drell (SLAC), Mark Edwards (Classics), Edwin M. Good (Religious Studies) (on leave 1983-84), Michael T. Hannan (Sociology), Alex Inkeles (Sociology), Stephen J. Kline (Mechanical Engineering), John W. Lewis (Political Science), Robert E. McGinn (Industrial Engineering and Engineering Management and VTSS), Gilbert M. Masters (Civil Engineering), Leonard Ortolano (Civil Engineering), Robert L. Rabin (Law), Everett M. Rogers (Communications), Nathan Rosenberg (Economics), Paul S. Seaver (History)

Associate Professor: Paul Turner (Art)

Assistant Professors: Diana B. Dutton (Family, Community, and Preventive Medicine), Peter Galison (Philosophy and Physics), Wilbur R. Knorr (Classics and Philosophy)
Lecturers: Joseph J. Corn (VTSS and American Studies), Janet V. Gardiner (VTSS), Donald E. Jordan (VTSS), Barry M. Katz (VTSS), Richard Meehan (VTSS), Janet K. Schmidt (VTSS)

STATEMENT OF PURPOSE

Values, Technology, Science and Society (VTSS) studies the ways technology and science affect and are affected by human values and social institutions. The program is rooted in the assumption that technology and science are pivotal forces in modern society, intimately bound up with its evolving character, problems, and potentials. Thus VTSS believes that it is important to obtain a broad understanding of technology and science in their individual human, social, and cultural contexts. To this end, VTSS courses approach the study of technology and science and their interrelations with other sectors of the cultural system from a variety of humanistic and social scientific perspectives.

Since this purpose requires an understanding of technology and science, general education courses on these topics are also included among VTSS offerings and as requirements in some program curricula.

GENERAL INFORMATION

VTSS courses may be used, individually or in integrated groups, in a variety of ways:
1. To satisfy University Area Distribution Requirements.
2. To satisfy the Technology and Society category in the breadth requirement of the School of Engineering.
3. In student-designed concentrations required for majors in Humanities in the Department of Humanities Special Programs.
4. To constitute a VTSS Honors Program complementing any standard major (see below).
5. To comprise part of an Individually Designed Major in Science, Technology, and Society (see below).
6. As general education courses.

For information on which Distribution Requirement Area(s) a given VTSS course satisfies, inquire at the VTSS office, Building 370, Room 372, 497-2565.

VTSS courses will be particularly valuable for undergraduates planning further study in graduate professional schools (e.g., business, education, engineering, law, medicine) as well as for students wishing to relate the specialized knowledge of their major fields to broad, technology- and science-related aspects of life in modern society and culture.

INDIVIDUALLY DESIGNED MAJOR IN SCIENCE, TECHNOLOGY, AND SOCIETY

STATEMENT OF PURPOSE

Technology and science are activities of pivotal importance in modern industrial society. If their pursuit is to enhance human well-being, they should be better understood by non-technical professionals and ordinary citizens as well as engineers and scientists. Lawyers, public officials, and business people are increasingly called upon to try cases or make decisions for which a basic understanding of modern technology or science, and of their ethical, social, and environmental impacts, is essential. Ordinary citizens are being asked with increasing frequency to pass judgment on controversial matters of public policy which are science- or technology-intensive.

The Individually Designed Major in Science, Technology, and Society, is an interdisciplinary curriculum devoted to understanding critically the nature and significance of technology and science in modern society. To this end the major combines analysis of technology and science from ethical, historical, and social perspectives with study sufficient to attain a meaningful level of technical knowledge in some field of science or engineering and a grasp of basic scientific and technological concepts and methods. This combined knowledge finds application in the major's third component: a concentration on some technology- or science-related theme or problem chosen by the student.

REQUIREMENTS

Students wishing to major in Science, Technology, and Society must submit proposals to the Individually Designed Majors Committee for approval (see the general guidelines for such proposals under "Individually Designed Majors Program" in this bulletin). Proposals should be submitted only after consultation with the VTSS Chair, Associate Chair, or other VTSS faculty member. It is suggested that students declare the major no later than the beginning of their junior year.

The major should fulfill the following requirements:
1. VTSS Core (7 courses)
   a) Five Basic VTSS Courses, two from each of two categories and one from the remaining category.
      1) Philosophical and Ethical Perspectives (VTSS 110, 112, 145)
      2) Historical and Cultural Perspectives (VTSS 101, 121)
      3) Social-scientific Perspectives (VTSS 107, 150, 153, 155, 172)
Nature of Technology

1) The Nature of Engineering (VTSS 116)
2) Core Seminar (1983-84: VTSS 122)

Science or Engineering Depth (5 courses)

a) Technical Depth Sequence of four courses in one of the following fields:
   1) biology (e.g., Biology 40, 41, 42, 43)
   2) chemistry (e.g., Chemistry 31, 33, 35, 135)
   3) physics (e.g., Physics 51, 53, 55, 57)
   4) a field of engineering science, such as applied mechanics (e.g., Engineering 3, 11, 21, 32) or materials science (e.g., Engineering 3, 50, 51, 52)
   5) a field of engineering, such as civil (e.g., Engineering 3, 11, 21, and Civil Engineering 107 or 114), electrical (e.g., Engineering 41, 42, 43, 101), industrial (e.g., Industrial Engineering 100, 121, 125, 141), or mechanical (e.g., Engineering 3, 12, 32, Mechanical Engineering 33)
   6) computer science (e.g., Computer Science 107, 111, 112, 135)
   7) a sequence of four coordinated courses in some other field of engineering or science.

b) Computer Literacy, normally demonstrated by
   1) completing Computer Science 106 or equivalent with a grade of B and
   2) giving evidence of ability to use the computer in scholarly work, e.g., by utilizing a text-editing system in executing a term paper.

Thematic Concentration (6 courses)

Six courses centered on a technology- and/or science-related theme or problem. One of the six must be an appropriate VTSS course and one should be an appropriate course in science or technology. Examples of themes around which concentrations may be built are the interactions of technology and science with: public policy, history, the arts and humanities, resources, information and environment. Sample concentration packages are available in the VTSS Office.

Besides the courses required for the major, students are expected to fulfill whatever prerequisites may exist for courses in their depth and concentration components. A maximum of three courses may be taken on a Pass/No Credit basis. Majors wishing to do an honors thesis should consult with the chairman or associate chairman.

While the STS curriculum outlined above will normally lead to a B.A. degree, a student with a sufficiently large number of units in technology and science may qualify for the B.S. degree. The VTSS program is particularly inter-
5. Electives: two VTSS courses—excluding VTSS 1, 2, 3—at least one of which is not listed above under requirements No. 1-4 (8-10 units).

6. Honors Project—a critical essay or investigative project on a VTSS topic of general importance. The topic must be approved by the Administrative Committee (10-12 units: normally 2 units spring, junior year; 5 units autumn and 5 units winter, senior year).

7. Academic Quality—both the Honors Project and each of the courses taken in conjunction with requirements 1-3 must be completed with a grade of at least "B".

Students who fulfill these requirements will have the designation "Honors Program in Values, Technology, Science, and Society" affixed to their transcript.

WESTERN CULTURE SEQUENCE

1,2,3. Western Culture and Technology—The development of Western culture from the ancient world to the 20th century through exploration of the interconnections among the three major realms of culture: intellectual, material, and social. The course does not require the use of mathematics.

1. The Ancient World—From the earliest civilizations in the Near East to the fall of the Roman Empire. (DR:1; three-quarter sequence)
   5 units, Aut (Edwards, Knorr, and Staff) MTW 10
two-hour section by arrangement

2. Middle Ages, Renaissance, and Enlightenment—Society, religion, and technology from the Middle Ages to the 18th century. (DR:1; three-quarter sequence)
   5 units, Win (Seaver, Vincenti, and Staff) MTW 10
two-hour section by arrangement

3. The Modern World—Industrialization and its impact on social and economic structures; artistic, political, and ideological perspectives on 19th and 20th century science and technology. (DR:1; three-quarter sequence)
   5 units, Spr (J. Corn, McGinn, and Staff) MTW 10
two-hour section by arrangement

101. Contemporary Technological Society—The nature, problems, and potentials of contemporary technological society, with special reference to America. Materials from anthropology, philosophy, literature, history, and policy analysis. Topics: technology and the transformation of cultures; frameworks for assessing social changes arising from technological innovations; technology, science, and the emergence of modern consciousness; technology and everyday experience in traditional English village and 20th-century American urban life; case studies in technology and public policy (e.g., robotization, computers in education, human reproduction technologies, limits to urban growth, and Third World modernization). (DR:5)
   4 units, Aut (McGinn) T 2:15-4:05
   and Th 2:15-3:45 or 4:15-5:45

106. The Nature of Technology in Modern Society—The nature and function of technology in modern Western society. The relationship between the physical bases of Western societies and their social and value elements; contrasts with several types of non-industrial cultures. The rise of science and the relationship between science and technology. The world views of science and technology as contrasted with those of other disciplines. Changes in the nature of technological organizations underlying the creation of societies of abundance: e.g., production, marketing, and distribution. Edison and the rise of the research and development laboratory. Processes of innovation in the 20th century. The rate of technological change and its social effects. Technology, human needs, and the future. (DR:8)
   4 units, Spr (Kline) TTh 10
   section T or W 2:15-4:05

107. Technology and Modern Industrial Society—(Same as Economics 113.) The interrelationships between technology and the nature and form of industrial societies over the past 200 years. Technological change as a socio-economic process illuminating the history of industrial societies. Factors influencing the rate and direction of technological change and diffusion. Implications for economic structure and the growth of large-scale organizations. The impact of these changes on modern industrial man as producer and consumer. (DR:5)
   4 units (Staff)

110. Philosophical and Ethical Issues in Public Policy—(Same as Public Policy 103.) Philosophical and ethical aspects of public policy. Analysis of ethical and value conflicts in policy-making and use of case studies to explore their complexity and role in the design of socially responsible public policy. Topics: "freedom," "justice," "rights," and other key terms in public policy discourse. Applications to cases from biomedical policy (abortion, euthanasia, in vitro fertilization), environmental policy (wilderness,
energy, amenity rights), and public policies with international dimensions (food and hunger, population, immigration). (DR:3)

5 units, Aut (McGinn) MTW 11

two-hour section by arrangement

112. Technical Professions and Ethics—Origin and development of the technical professions, especially engineering and the applied sciences, as seen from anthropological, historical, and literary perspectives. Professional ideologies, values, and protocols. Expert-client relations, responsibilities, legal problems, and ethics. Case histories of ethical problems in governmental and corporate settings. Student readings, case histories, and field work.

4 units, Spr (Meehan) TTh 9-10:50

116. The Nature of Engineering—(Same as Engineering 001.) Course is intended to show what engineering is and what engineers do. It consists of lectures, demonstrations, case studies, problems, discussions, and field trips designed to cover the various phases of the engineering process; problem definitions, conceptualizations, optimizations, detailing, production, and commercial implementation. Open to freshmen and sophomore engineering students and all non-engineering students.

3 units, Aut (Adams) MWF 1:15

121. Technology in Society: Historical Perspectives—Origins of contemporary industrialized civilization, interplay of technological change and societal development from ancient times until the beginning of the twentieth century. Among the topics are: Egyptian pyramids; Chinese and Islamic technology; technosocial influences of medieval Christianity; clocks and the concept of time; cannon, ships, and European expansion; origins and impact of the Industrial Revolution; technological influences in nineteenth-century America; significance for today. (DR:5)

4 units, Fall (J. Corn) TTh 10-11

Section W 9-10:50 or 2:15-4:05 or Th 2:15-4:05

122. Technology and Modern Western Culture—Seminar examining the pivotal role of technology in the transformation of modern Western culture. The interplay of technology with philosophical and religious ideas; technological innovations and social change; and modern technology in literature and the arts. Topics include: philosophical and literary responses to industrialization; the transformation of work and leisure; mass society and mass culture; and technology in modern art, architecture, and design, e.g., in Italian Futurism. Enrollment limited to 16.

4 units, Win (McGinn) TTh 2:15-4:05

125. Transportation, Technology, and American Society — Historical examination of relationships between ships, railroads, automobiles, and aircraft and social change, from the early nineteenth century to the present. Topics include science, technology, and transport innovation; transport and economic growth; impact on community form and development; legal and regulatory aspects of transport; effects on organizations and institutions; and influence on literature and the arts.

5 units, (J. Corn) given 1984-85


4 units, Win (Katz) MW 2:15-4:05

131. Growth of Scientific Knowledge—(Same as Philosophy 60.) Introduction to the philosophy of science by way of an historical analysis of philosophical-scientific debates on space, time and energy. Will study: Descartes, Galileo, Newton, Mach, Minkowski, and Einstein. Some discussion of the nature of historical scientific change. Readings from philosophers, scientists, historians and various hyphenated permutations thereof. (DR:3)

4 units, Spr (Galison) MWF 11

132. The Scientific Revolution—(Same as Philosophy 145 and History of Science 145.) Social, intellectual and institutional background of the period that established modern science, the 17th century. Stress on theories of matter and motion, especially Descartes, Galileo, and Newton. Historical controversies: Yates’ thesis on hemeticism and magic; Martin on Protestantism and science; Hessen on the economic basis of scientific change. Readings from 17th century texts and modern historical studies.

4 units, Win (Galison) MWF 11

133. History of Modern Physics—(Same as Philosophy 168, History of Science 168, and Physics 168.) History of the physical view of the fundamental nature of matter from Maxwell’s time to the present. Will discuss the mechanical and electromagnetic world views, special relativity, quantum mechanics and the standard model of elementary particle physics. Will focus on several case studies to illustrate the historical problem orientation of each period, as well as the connection between theory and experiment. Readings: original scientific texts, archival material and secondary sources.

4 units, Aut (Galison) TTh 9:45-11

134. Experimentation in Twentieth-century Physics—(Same as Philosophy 169, History of Science 169, and Physics 169.) Explore several
of the formative physics experiments of the 20th century. Will examine changes in the standards of demonstrations over the last 100 years, as well as changes in the type of instrumentation, from torsion balances to drift and bubble chambers. Case studies will include experiments in electromagnetism, quantum theory and particle physics. The fundamental questions of the course: how have experimentalists convinced themselves that they have demonstrated something; have these criteria changed?

4 units, Win (Galison) MW 3:15-4:30

135. Technology Transfer: Silicon Valley to Europe—The transfer of electronics technology from the United States to Europe using for case studies the Silicon Valley, the major source of electronics technology and investment in Europe, and Ireland, the most rapidly expanding European location for the electronics industry. Examination of electronics firms’ motivation to build manufacturing plants and marketing facilities in Ireland and the success of these investments. Analysis of the role the electronic industry is assigned to play in Ireland’s economic plans; the incentives that Ireland offers to U.S. firms to invest in the country; the social, cultural, political, environmental, and economic impact of the electronics industry in Ireland. Implications for Ireland, the European Community, and Silicon Valley.

3-5 units, Spr (Jordan) MW 1:15-3:05

145. Chemistry and the Life Sciences in Historical and Philosophical Perspective—Development of chemical and biological ideas in the context of Western social, philosophical and religious thought, emphasizing the impact of these ideas on the concept of man in the 20th century. Topics include: the enduring human drive to understand and control nature, including the life process; the 17th-century religious roots of the scientific establishment; 18th-century context of the chemical and physiological revolutions; 19th-century Romanticism’s impact on science; scientific creativity; tension between vitalistic, and mechanistic, interpretations of life; challenges to traditional values posed by recent biomedical science and technology. Open to juniors and above. Requirement: at least one course in chemistry or biology (or consent of instructor). Limited enrollment.

4 units, Spr (Clayton) MW 1:15-2:05 and F 1:15-3

151. Technology in American Society—(Same as History 270.) This undergraduate colloquium will focus upon five related areas—the impact of industrialization on work and some living patterns, the roles of professionals in directing technology, the problems in bio-medicine of applying and developing technology, the development and uses of technology in weaponry and foreign policy, and the problem of whether there should be limits on the development and uses of technology. The analysis of these problems will, necessarily, require consideration of the society and political economy in which particular technologies have developed. Limited enrollment.

5 units, Win (Bernstein)

153. Industrial Organization—(Same as Sociology 168.) Explores sociological approaches to understanding the structure of industries, especially change in industrial organization. The main themes concern the effects of broadscale changes in technology, social organization, and politics on the forms of enterprise. Topics covered include: evolution of industrial strategies, changing forms of labor organization and protest, internal labor markets and careers, innovation and the structure of the firm, and cross-national comparisons of industrial forms. Prerequisite: Sociology 160 or consent of instructor.

5 units, Win (Hannan) TTh 8:30-10

154A,B. Arms Control and Disarmament—(Same as Political Science 138A,B.) The introductory course 154A, is a general survey of international security relations, the revolutionary development of modern weapons, the arms competition and efforts at arms control and disarmament in the post World War II period. Political, conceptual and technological problems of national security policies and arms controls are stressed. Time is devoted to the evolution of strategic doctrines and negotiations on strategic arms control in SALT I and SALT II. The course is taught by an interdisciplinary faculty. 154A is a prerequisite to 154B. 154B is a tutorial and research course.

154A. Arms Control
5 units, Win (Lewis)

154B. Seminar: Arms Control
5 units, Spr (Lewis)

155. Social Structure of World Society—(Same as Sociology 152.) Sociological analysis of society on a world-wide basis, i.e., all the people inhabiting the earth and the institutions through which their lives are organized are treated as participants in one global social system. Competing models of the emerging world order will be reviewed and compared. Sequence of topics: world-wide population dynamics; the world as a system of organized violence; global stratification patterns; producing and consuming the world’s food; world trade patterns; and science and technology as global systems. Mixed lecture-discussion format.

5 units, Aut (Inkeles) TTh 10-12
157. The Machine and American Culture—
(Enroll in American Studies 221.) Technology in life and imagination in nineteenth and twentieth century America. Through an interdisciplinary approach—history, art, and literature—the seminar will focus on three large items: the fear and celebration of technology; the realities and myths surrounding “Yankee Ingenuity”; and technology as spectacle as seen through world’s fairs and similar events.
5 units, Win (J. Corn)

158. Material Culture—(Enroll in American Studies 217.) Introduction to material aspects of American culture. Study of three-dimensional and two-dimensional objects, including structures and buildings, arts and crafts, machines and machine-made artifacts. Course reveals American attitudes, values, and beliefs embodied in and reflected by the production, use, collection, and preservation of artifacts.
5 units, (J. Corn) given 1984-85

165. Technology and Musical Expression—Interrelations between the technology that produces means of making musical sound and the expressive ways composers have used those means in Western art music, 18th century to the present. Focus on the history of specific instruments or instrument groups. (DR:2)
4 units, (Good) given 1984-85

170. Work and Society — Historical and contemporary perspectives on work, particularly as conditioned by technology and transformed by technological change. Topics: work in the pre-industrial world; the impact of the industrial revolution on work, leisure, and community; philosophies of work and work-society relations; the Labor Movement in Europe and America; key 20th-century work legislation and court cases in America; recent innovations in work theory and practice in Japan, West Germany, Sweden, and the U.S.; the productivity and job satisfaction controversy; and work and technology in the future. (DR:5)
4 units, Win (McGinn) given 1984-85

172. Diffusion of Innovations—(Same as Communications 167.) Course takes multidisciplinary approach to diffusion in business, education, law, government, and consumer groups. Emphasis is on role of communication in spread of new technology, new ideas, and new values among individuals within organizations, and among organizations in the U.S. and abroad. Special emphasis upon (1) computer-related innovations, and (2) energy-conservation innovations, and on scaling down in a limited growth future.
3-4 units, Spr (Rogers) TTh 11-1

175A,B. Modern Architecture I, II—(Enroll in Art 175A,B.) A two-quarter course tracing developments, largely in Europe, which led to the present state of architecture and urbanism. Emphasis on the designer’s responses to new materials, technology, and environmental conditions.
4 units, Win, Spr (Turner)

181. Problem Solving—(Same as Industrial Engineering and Engineering Management 201 and Engineering 190.) An investigation of problem solving with particular emphasis on problem definition, creativity, and interpersonal and organizational factors that influence thinking. Common blocks to problem solving will be explored and methods of dealing with them will be presented. The advantages of integrating various problem solving strategies will be stressed through use of reading, abstracted problem situations, and projects. Open to undergraduates and graduates in any field.
3 units, Spr (Adams) TTh 10-12

182. Environmental Science and Technology—(Same as Civil Engineering 170.) An introduction to the causes, effects and methods of controlling environmental degradation. Stress placed on problems associated with water resource development and water pollution; air pollution; population; and environmental effects of energy consumption. (Intended for both science and nonscience majors).
3 units, Aut (Masters) MWF 8

183. Environmental Planning—(Same as Civil Engineering 171.) Alternative strategies for air and water quality management; environmental impact assessment requirements; interactions between land use, physical infrastructure and environmental quality; forecasting and evaluating environmental effects; survey of techniques for assessing visual, biological, noise, air quality and water quality impacts. Open to all students. One year of college mathematics and C.E. 170 are recommended, but not required.
3 units, Win (Ortolano) MWF 9

190A,B,C. Honors Project—Project for VTSS Honors students.

190A. Submission of Proposal—Preliminary planning and study. Project proposal to be submitted to VTSS Administrative Committee by middle of Spring Quarter of junior year.
2 units, Spr (Staff) by arrangement

190B. Continued Study and Writing—Regular meetings with tutor. Prerequisite: 190A.
5 units, Aut (Staff) by arrangement
190C. Final Work on Project—Regular meetings with tutor; participation in honors project seminar. Project due in final form in first week of Spring Quarter. Prerequisite: 190B.
5 units, Win (Staff) by arrangement

STATEMENT OF NONDISCRIMINATORY POLICY

Stanford University admits students of either sex and any race, color, or national and ethnic origin to all the rights, privileges, programs, and activities generally accorded or made available to students at the University. It does not discriminate against students on the basis of sex, race, color, handicap, or national and ethnic origin in the administration of its educational policies, admissions policies, scholarships and loan programs, and athletic and other University-administered programs.

TITLE IX OF THE EDUCATION AMENDMENTS OF 1972

It is the policy of Stanford University to comply with Title IX of the Education Amendments of 1972 and its Regulation, which prohibit discrimination on the basis of sex. Sally Mahoney, Associate Provost and Registrar, has been appointed to coordinate the University’s efforts to comply with the law. Anyone who believes that in some respect Stanford is not in compliance with Title IX and its Regulations should contact Ms. Mahoney at (415) 497-1550.

REHABILITATION ACT OF 1973

In its programs, activities and employment, Stanford University does not discriminate on the basis of handicap. Santiago Rodriguez, Affirmative Action Officer, has been appointed to coordinate the University’s efforts to comply with the Rehabilitation Act of 1973 and regulations promulgated thereunder prohibiting discrimination on the basis of handicap. Anyone who believes that in some respect Stanford is not in compliance with the Rehabilitation Act and its regulations should contact Mr. Rodriguez at (415) 497-3483.
These University Publications contain information of general interest. Many Schools and Departments publish pamphlets of a more specific nature, and should be contacted directly for a complete listing.

About Visiting Stanford—available at the Admissions Office.
Academic Staff Handbook—available at the Provost's Office.
Administrative Guide—(guide to administrative organization, policies, and procedures) inquire at the Controller's Office.
A Guide to Archival and Manuscript Collections—available from Stanford University Archives.
African Studies—available at the Center for Research in International Studies.
Associated Students of Stanford University: Constitution and By-Laws—inquire at ASSU Office.
ASSU Course Guide—(review of selected courses through tabulation of questionnaires) inquire at the ASSU Office.
Black Students at Stanford—available at Admissions Office.
Campus Report—University's weekly faculty/staff newspaper: available at the Post Office, Old Union lobby, Tresidder Union, and News & Publications.
Committee and Senate Handbook—available at the Academic Secretary's Office.
Conference Planning at Stanford—available at the Conference Office.
Endowed Professorships at Stanford University—limited quantity—inquire at the Office of Development.
Facts: Stanford University—available at the Office of Development.
Faculty Handbook—available at the Provost's Office.
Faculty/Staff Directory—on sale at Stanford Bookstore.
Food Service at Stanford University: Student Dining Information—available at the Food Services Office.
Graduate Division, Stanford University, Application Booklet—available at the Graduate Admissions Office.
Graduate Opportunities for Chicano Students—available at the Graduate Admissions Office.
Graduate Opportunities for Minority Students at Stanford University—available Graduate Admissions Office.
Guide for the Physically Limited—available at the Dean of Student Affairs Office.
Guide to Stanford University Resources for Graduate Students—available at Dean of Student Affairs Office.
Information Bulletin—(general administrative procedures; rules governing withdrawal, leaves of absence; fee listings, etc.)—available at Registrar's Information Window.
Information for Prospective Graduate Applicants from Other Countries—available at Office of Graduate Admissions.
Information for Prospective Undergraduate Applicants from Other Countries—available at Admissions Office.
Interdisciplinary Undergraduate Program in International Relations—available from the School of Humanities and Sciences.
Library guides (available at any major library):
Guides to the Stanford University Libraries (a series of information booklets).
Libraries of Stanford University (Map)
Libraries of Stanford University: Hours for Academic Year 1983-84
Selected Facts: Stanford University Libraries
Life off the Farm—on sale at the Rental Housing Office.
The Lively Arts at Stanford—current season brochure available at the University Events and Services Office.
Public Events Policy and Practices Manual—inquire at University Events and Services Office.
Regulations Governing Student Conduct and Procedures for Their Enforcement—available at the Office of the President.
Rosters of the Senate, Advisory Board and various committees—available at the Academic Secretary's Office.
Staff Handbook—available at Benefits Section, Personnel Office.
Stanford Campus Guide Map—on sale at Visitor Information Office, Memorial Court; and Bookstore.
Stanford from the Beginning—booklet on sale at Visitor Information Office, Memorial Court; Bookstore; and Tresidder Union Store.
Stanford Memorial Church—booklet on sale at Stanford Bookstore and Visitor Information Centers located at main entrance to the Quad and in the Hoover Tower lobby.
The Stanford Observer—University's monthly newspaper: available at News & Publications, free to alumni and parents.
Stanford Para Mi? !Seguro Que Si!—available at the Admissions Office.

Stanford Today—available at Admissions Office.
Stanford University Bulletins:
Available at the Registrar's Office: Information
Summer Session
Quarterly Time Schedule
Available at the School or Department:
Hopkins Marine Station
School of Law
Graduate School of Business
School of Medicine
Overseas Studies
APPENDIX

COURSES CERTIFIED FOR 1983-84 AS FULFILLING THE DISTRIBUTION REQUIREMENTS FOR FRESHMEN ENTERING IN 1980 AND THEREAFTER AND FOR TRANSFER STUDENTS ENTERING IN 1982 AND THEREAFTER

Information regarding the Distribution Requirements may be found in the Degrees section of this book. The following courses have been certified as fulfilling the Distribution Requirements in 1983-84 for Freshmen entering in 1980 and thereafter and for Transfer students entering in 1982 and thereafter.

The symbol (*) indicates courses which also fulfill the non-Western culture requirement.

PLEASE ALSO NOTE: Except where noted otherwise, no course may be applied to more than one Area of the Requirements by an individual student. In addition, certain sequences must be completed in their entirety for Distribution Requirement fulfillment, and those sequences are so noted below.

Overseas Studies courses which have been certified in 1983-84 also appear below.

AREA 1: WESTERN CULTURE
Comparative Literature 021, 022, 023; Major Texts in Western Culture
Great Works of Western Culture 001, 002, 003
History 001, 002, 003; Europe from the Middle Ages to the Present
Humanities 061, 062, 063; Western Thought and Literature
Philosophy/Religious Studies 005A, B, C; Ideas in Western Culture
Program in Structured Liberal Education Values, Technology, Science, and Society 001, 002, 003; Western Culture and Technology

AREA 2: LITERATURE AND FINE ARTS
A) Courses typically taken either by non-majors or by people without special preparation
Art 001; Introduction to Art
Art 002; Ideas and Forms in Asian Art
Art 003; Introduction to the History of Architecture
Art 004; Theme and Style in Japanese Art
Art 005; Birth of European Art
Art 010; Important Events in European Art (Renaissance to Modern)
Art 100A, B, or C; Ancient Art (Greece and Rome)

Art 105 or 105A; Medieval Art (France and Britain)
Art 107; Medieval Architecture
Art 108; Netherlandish Painting: Van Eyck to Bosch
Art 110 A, B, or C; Renaissance Art (Italy and the North)
Art 115 A or B; Baroque Art (Italy and the North)
Art 116A; Monuments and Masterpieces of the Age of the Baroque
Art 117; Art in 18th Century European Culture
Art 120 A, B, C, or D; Modern Art (European Art, 1760-1900)
*Art 126A or B; Introduction to Chinese Art/Painting
Art 130A, B, or C; American Art (18th-20th Centuries)
*Asian Languages 110; Japanese-Western Literary Interaction
*Asian Languages 114; Haiku
*Asian Languages 131; Chinese Poetry and Drama in Translation
*Asian Languages 132; Chinese Fiction in Translation
*Asian Languages 133; Modern Chinese Literature in Translation
*Asian Languages 136; Early Japanese Literature in Translation
*Asian Languages 137; Japanese Literature in Translation: The Middle Period
*Asian Languages 138; Modern Japanese Literature in Translation
*Asian Languages 176; Chinese Myths, Legends, and Folktales
*Asian Languages 177; Classic Japan
*Asian Languages 178; Japanese Poetry from Manyōshū to Shinkokinshū
*Asian Languages 179; Classical Japanese Drama
*Asian Languages 181; Japanese Women Writers
*Asian Languages 182; Japanese Popular Religious Literature
*Asian Languages 197; Images of Women in Modern Japanese Literature
Classics 011; The Classical Epic
Classics 012; Greek Tragedy
Classics 021; Euripides to Shakespeare
Drama 001; Introduction to Drama
Drama 002; Introduction to Theatrical Styles
Drama 059; Shakespeare (also English 073)
Drama 151; Greek Tragedy
Drama 152; Medieval and Renaissance Drama
Drama 153; Noeclassic Drama
Drama 154; Romantic and Early Realistic Drama
Drama 155; Modern Drama, 1870-1914
Drama 156; Contemporary Drama, 1918 to the Present
Drama 157; American Drama since 1920
Drama 160; History of Theater: Classical Greece to the 18th Century
Drama 161; History of Theater: 19th and 20th Centuries
English 025; Masterpieces of English Literature I: Chaucer, Shakespeare, Milton, and their Contemporaries
English 030; Introduction to the Novel
English 035; Masterpieces of English Literature II: From the Enlightenment to the Modern Period
English 040; Introduction to Drama
English 045; Masterpieces of American Literature
English 050; Introduction to Poetry
English 060; The Bible as Literature
English 073; Shakespeare
English 119; Modern British Literature
English 122; American Literature: 1855 to 1917
English 123; American Literature: 1917 to the Present
English 128; Reflection on the American Condition
English 131; The English Novel through the 18th Century
English 132; The English Novel in the 19th Century
English 133; The English Novel in the 20th Century
English 163A; Women's Writing as Critique and Vision: The 19th Century
English 163B; Women's Writing as Critique and Vision: The 20th Century
English 167A; The Literature of Fantasy
English 173A, B, or C; Shakespeare
English 179A; Fitzgerald and Hemingway
English 179B; Faulkner
French 114A; The 19th Century Novel
French 119; Literature and Marxism
German Studies 032A/132; Culture and Civilization
German Studies 071A; Novels of the 20th Century
German Studies 083A; Goethe's Faust: The Work and its Age
*History/Asian Languages/Humanities 092; East Asian Civilization
Italian 140; Dante: Inferno
Italian 141; Dante: Purgatorio
Italain 142; Dante: Paradiso
Italian 143; Boccaccio: Decameron
Medieval Studies/Art 065; Introduction to Medieval Culture and Society
Music 001; Introduction to Music
Music 002A; The Symphony
Music 002B; The Concerto
Music 002C; The Opera
Music 004A; The Music of Bach
Music 004B; The Music of Mozart
Music 004D; The Operas of Mozart
Music 005A; Music in America
Music 006C; Music in the History of Ideas
Music 021; Elements of Music
Music 100; Music History: Medieval and Renaissance
Music 101; Music History: Baroque
Music 102; Music History and Theory: Classic
Music 103; Music History and Theory: Romantic
Music 104; Music History and Theory: Modern
Religious Studies 021; Old Testament
Slavic Languages 145; Survey of Russian Literature in Translation I: The Age of Experiment
Slavic Languages 146; Survey of Russian Literature in Translation II: The Novel and Beyond
Slavic Languages 147; Survey of Russian Literature in Translation III: A Fractured Culture
Slavic Languages 151; Fyodor Dostoevsky
Slavic Languages 153; Leo Tolstoy
SLE 091, 092, 093; Structured Liberal Education (entire sequence must be completed and thereby also satisfies Areas 1 and 3)
VTSS 165; Technology and Music Expression
b) More advanced courses that can still be appropriate
Art 020, 021, 022, 111, 112, 116, 121A, 121B, 122, 126E
c) Courses where some foreign language preparation is necessary
*Asian Languages 241, 242, 243
French 130, 131, 132, 171
German Studies 150, 153, 154, 155, 157, 161, 162, 163
Greek 101, 102, 103, 111
Italian 128, 129
Latin 101, 102, 103, 111
Slavic Languages 167, 168, 169, 187

AREA 3: PHILOSOPHICAL, SOCIAL, AND RELIGIOUS THOUGHT
Anthropology 153; Anthropology of Religion
*Asian Languages/Philosophy 046; Introduction to Chinese Philosophy
Biology 051; Scientific Philosophy and Bioethics
Classics 003; Democracy and Imperialism
Classics 008; Classical Politics
Classics 017; Christianity and Classical Culture
Classics 018; Greek Mythology
Economics 100; Economic Theory in Historical Perspective
Economics 120; The Marxian and Radical Tradition
English 038; Modern Literature and the Irrational
French 115; Introduction to Existentialism
French 290; Civilisation I: 17e & 18e siecle
German Studies 033A/133; Culture and Civilization III
*History/Asian Languages/Humanities 091; Traditional East Asian Civilization
History 105A; The History of Socialism and Marxism
History 110; Age of the Reformation
History 136; European Thought in the 18th Century
History 136A; European Thought in the 19th Century
History 136B; European Thought in the 20th Century
Humanities 090; Introduction to the Humanities
Philosophy 010; God, Self, and World
Philosophy 020; Introduction to Moral Philosophy
Philosophy 030; Public Morality: Introduction to Political Philosophy
Philosophy 060; The Growth of Scientific Knowledge (also VTSS 131)
Philosophy 080; Mind, Matter, and Meaning
Philosophy/History of Science/Classics 138A, B; Introduction to Exact Sciences: Cosmology (either course satisfies Area 3; entire sequence also satisfies Area 6)
Philosophy 172; Marx's Moral and Political Philosophy
Political Science 050; Freedom and Order in Western Political Thought
Political Science 150; Ancient and Classical Political Thought
Religious Studies 001B; Comparative Religious Personalities
*Religious Studies 001C; Comparative Religious Thought
*Religious Studies 001D; Religions of the East
*Religious Studies 013; Hinduism
*Religious Studies 014; Buddhism
Religious Studies 023; Judaism
Religious Studies 024B/124B; Christianity to the Year 1000
Religious Studies 031; Founders in Myth and History
Religious Studies 038A/138A; Religious Belief and Reason
Religious Studies 042/142; Philosophy of Religion

APPENDIX

Religious Studies 047; Modern Christian Thought
Religious Studies 078; American Religious Thought
*Religious Studies 116; Japanese Buddhism
*Religious Studies 118; Zen Buddhism
SLE 091, 092, 093; Structured Liberal Education (entire sequence must be completed and thereby also satisfies Areas 1 and 2)
Sociology 170; Classics of Modern Social Theory
VTSS 110; Philosophical and Ethical Issues in Public Policy (same as Public Policy 103)
VTSS 145; Chemistry and the Life Sciences in Historical and Philosophical Perspective

AREA 4: HUMAN DEVELOPMENT, BEHAVIOR, AND LANGUAGE

*Anthropology 001; Social and Cultural Anthropology
Anthropology 005; Biology and Evolution of Language (also Human Biology 113 and Linguistics 013)
*Anthropology 012; Sex and Gender
*Anthropology 165; Psychological Anthropology

Communication 170; Communication and Children
English 101; Linguistics and Literature (also Linguistics 011)
English 102; History of the English Language
German 019A/119; Introduction to the Germanic Languages (also Linguistics 081)
German 118/218; Introduction to German Dialects (also Linguistics 182)
Greek 051-052; Intensive Beginning Greek (entire sequence must be completed)

History 163; The Female Experience: Victorian Heritage (also English 163D)

Human Biology 002B-003B-004B; Human Biology Core (entire sequence must be completed and thereby also satisfies Area 5)

Latin 051-052; Intensive Latin (entire sequence must be completed)
Linguistics 010; Introduction to Linguistics

Linguistics 045; Language and Culture (also Anthropology 004)
Linguistics 056; Language and Social Issues in America
Linguistics/Computer Science 075; Computers and Language

Linguistics 085; Black English
Linguistics 101/201; Mathematics for the Study of Language

Philosophy 181A; Philosophy of Language
Psychology 001; General Psychology

Psychology 102; Perception
Psychology 111; Developmental Psychology
Psychology 111; Developmental Psychology  
Psychology 115; Social Development  
Psychology 132; Theories of Personality  
Psychology 146; Language and Thought (also Linguistics 170)  
Psychology 159A; Perception, Cognition, and Music  
*Religious Studies 001E; Eastern and Western Conceptions of the Self  
Religious Studies 049; Approaches to the Study of Religion  
Slavic Languages 001-002-003; Beginning Russian (entire sequence must be completed)  
Sociology 065; Status, Friendship, and Social Pressure  
Sociology 120; Interpersonal Relations  
Sociology 122; Introduction to Sociobiology  
Sociology 149; Youth in Modern Society

**AREA 5: SOCIAL PROCESSES AND INSTITUTIONS**

*African & Afro-American Studies 105; Introduction to Afro-American Studies  
*African and Afro-American Studies 115; Ancient African History: The Truth Revealed  
*Anthropology 001; Social and Cultural Anthropology  
Anthropology 002; Biology and Culture in Human Evolution  
*Anthropology 003; Human Prehistory  
*Anthropology 006; Problems in Anthropology  
*Anthropology 008; Introduction to China  
Anthropology 011; Sex Roles in Society  
Anthropology 015; Anthropological Perspectives on American Culture  
*Anthropology 102; Native Culture of North America  
*Anthropology 103; Peoples of Mesoamerica  
*Anthropology 108; African Societies in a Changing World  
*Anthropology 115; Peoples of Island Southeast Asia  
*Anthropology 117; Chinese Culture and Society  
Anthropology 129; Evolution of Mesopotamian Civilization  
Anthropology 148; Cultural Approaches to Alternative Futures  
*Anthropology/Human Biology 188; Evolution of Prehistoric Civilizations  
*Asian Languages 152; Nomad Empires of Inner Asia  
Classics 014; Classical Athletics  
Classics 101; History of Greece  
Classics 102; Early Rome and the Hellenistic World  
Classics 103; History of the Roman Empire

Classics 107; Sailing to Byzantium: The Mediterranean World from Constantine to Leo II (312-717 A.D.) (also History 112A)  
Classics 117; Greek Religion and Society  
Communication 001; Mass Communication and Society  
Communication 156; Scientific and Technical Communication  
Economics 001; Elementary Economics  
Economics 051Q, V; Economic Analysis I  
Economics 052; Economic Analysis II  
*Economics 121; Economic Development in China  
Education 105; American Education and Public Policy (same as History 158)  
Education 201; History of Education in the U.S. (also History 158)  
Feminist Studies 101; Women's Situation (also Sociology 102)  
German Studies 031A/131; Culture and Civilization  
German Studies 134; Readings in Contemporary German  
*History/Latin American Studies 080; Culture and Society in Latin America (also Political Science 123D)  
*History/Asian Languages/Humanities 093; East Asian Civilization  
History 107; The Twelfth-Century Renaissance  
*History 120A, B, or C; Russian History  
History 129A or B; Modern Germany  
History 132A or B; Modern France  
History 141; Yorkist and Tudor England  
History 142; Stuart England  
History 144; Britain: 1658-1851  
History 145B; Britain: 1851-Present  
*History 146; The United States and Africa  
*History 148; Introduction to African History  
*History 148B; Africa in the Era of the Slave Trade  
*History 148C; Africa in the 20th Century  
History 153; Interpretive Overview of American History  
History 157; Afro-American History  
History 165A, B, or C; United States History  
History 173A or B; History of Women in America  
History 177; Latin America Since 1870  
*History 192A, B, or C; Chinese History  
*History 194A or B; Japanese History  
Human Biology 002B-003B-004B; Human Biology Care (entire sequence must be completed and thereby also satisfies Area 4)  
Linguistics 056; Language and Social Issues in America  
Political Science 001; Major Issues of American Public Policy
History of Science/Philosophy/Classics 138A-B; Introduction to Exact Sciences: Cosmology (entire sequence must be completed and thereby also satisfies Area 3)

Linguistics 101/201; Mathematics for the Study of Language

Mathematics 015, Introduction to Mathematics

Mathematics 019, 020, 021,, 022 023, 041, 042, 043; Calculus and Analytical Geometry

Mathematics 113, or 113S; Linear Algebra

Operations Research 050; Models and Applications of Operations Research in Society

Philosophy 017; From Philosophy to Mathematics

Philosophy 057; Introduction to Logic

Psychology 060; Statistical Methods

Statistics 040; Chance and Strategy

Statistics 060; Introduction to Statistical Methods I

Statistics 110; Statistical Methods in Engineering and the Physical Sciences

Statistics 116; Theory of Probability

AREA 7: NATURAL SCIENCES

Biology 040; Evolutionary Biology

Biology 041; Biochemistry and Molecular Biology

Biology 042; Cell and Development Biology

Biology 043; Organismal Biology

Biology 101; Biology for Humanists

Biology 128; Systematics and Ecology of Vascular Plants

Biology 165; Animal Behavior: Ecological and Evolutionary Aspects

Chemistry 031; Chemical Principles

Chemistry 033; Structure and Reactivity

Geology 001; Interpreting the Earth

Geology 002; Earth History

Geology 142; Vertebrates of the Past

Geology 150; The Oceans: An Introduction to the Marine Environment

Human Biology 002A-003A-004A; Human Biology Core (entire sequence must be completed to satisfy Area 7)

Physics 011; Symmetries of Nature

Physics 014; Physics of Music

Physics 015; Cosmic Horizons

Physics 019; Introduction to Physics

Physics 021, or 021H; Mechanics and Heat

Physics 023; Electricity and Optics

Physics 025; Modern Physics

Physics 051; Mechanics

Physics 053; Electricity and Magnetism

Physics 055; Light and Heat
Physics 057; Atomic Physics
Physics 061, 062, or 063; Advanced Freshman Physics

**AREA 8: TECHNOLOGY AND APPLIED SCIENCE**

Applied Physics 010; Physics and Technology
Chemical Engineering 020; Introduction to Chemical Engineering
Civil Engineering 170; Environmental Science and Technology
Civil Engineering 176; Small Scale Energy Systems
Engineering 001; Introduction to Engineering
Engineering 003; Applied Mechanics: Statics
Engineering 011; Applied Mechanics: Stress Analysis
Engineering 012, Intermediate Dynamics
Engineering 032; Introduction to Thermosciences
Engineering 041; Circuits
Engineering 044; Basic Electronics
Engineering 050; Introduction to the Science of Materials
Engineering 090; Energy in the USA
Engineering 095; Automotive Technology
Geophysics 003; Earthquakes and Man
Linguistics/Computer Science 075; Computers and Language
Operations Research 050; Models and Applications of Operations Research in Society
Operations Research 152; Introduction to Operations Research I
Petroleum Engineering 103; Survey of the Energy Industries
VTSS 106; Nature of Technology in Modern Society
VTSS 180; Energy and Society (also Mechanical Engineering 180)

**OVERSEAS STUDIES COURSES**

A) Courses Taught by Regular Stanford Faculty

Environmental Planning, L. Ortolano (Civil Engineering), Berlin, Autumn, Area Eight
Modern Italian Novel, B. Allen (French & Italian), Florence, Autumn, Area Two
The City—States of Greece and Italy, M. Jameson (Classics), Florence, Winter, Area Five
The Greeks in the West, M. Jameson (Classics), Florence, Winter, Area Five
Evolution of Italian Urban Form, L. Ortolano (Civil Engineering), Florence, Winter, Area Five
Environmental Planning, L. Ortolano (Civil Engineering), Florence, Winter, Area Eight

European Society & Culture, S. Ferruolo (History), Florence, Spring, Area Five
Mathematics & the Rise of Science, S. Feferman (Mathematics), Florence, Spring, Area Six
Mathematics & Science in Italian Culture, S. Feferman (Mathematics), Florence, Spring, Area Six
Psychology of Sex Roles, P. Zimbardo (Psychology), Florence, Autumn, Area Four
The French Novel, A. Guerard (English), Tours, Spring, Area Two
Weimar Culture: Theater, Film, Music, and Dance, W. Eddelman (Drama), Berlin, Spring, Area Two
East and West German Theater, W. Eddelman (Drama) Berlin, Spring, Area Two

B) Courses Taught by Other Faculty

From this list a student may apply one course per quarter and no more than two courses overall towards fulfillment of the Distribution Requirements.

Berlin: History & Culture I; Berlin, Area Five
Berlin: History & Culture II; Berlin, Area Five
German Art in the Weimar Republic & Nazi Period; Berlin, Area Two
German Theater; Berlin, Area Two
Introduction to German History, Politics, and Culture; Berlin, Area Five
Nazi Germany; Berlin, Area Five
New Ways of Seeing; Berlin, Area Two
Art & Culture in the Greek World; Florence, Area Two
Contemporary Italian Politics; Florence, Area Five
Firenze nel Rinascimento; Florence, Area Five
High Renaissance and Mannerism in Florence, Rome, and Venice; Florence, Area Two
Masterpieces of Italian Literature: Origins to Dante; Florence, Area Two
Masterpieces of Italian Literature: 1300-1500; Florence, Area Two
Mediterranean Problems; Florence, Area Five
Tuscan Art from Giotto to Leonardo; Florence, Area Two
US and Western Europe after WWII; Florence, Area Five
French Literature Survey; 17th & 18th Centuries, Tours, Area Two
French Literature Survey; 20th Century; Tours, Area Two
French Literature Survey: 19th Century; Tours, Area Two
History of Art: Medieval to Renaissance; Tours, Area Two
History of Art: Classical to Impressionism; Tours, Area Two
Introduction a l'Histoire religieuse de la France; Tours, Area Five
L'Economie de la France moderne; Tours, Area Five
La Politique extérieure de la France; Tours, Area Five
La Politique française contemporaine; Tours, Area Five
Survey of French History to 1789; Tours, Area Five
Survey of French History: 1789 to Present; Tours, Area Five
Art and Museums: 1500-1800; Vienna, Area Two
Art and Museums: 1800-Present; Vienna, Area Two

Austrian and European Theatre History; Vienna, Area Two
Austria & Southeast Europe; Vienna, Area Five
Austrian Literature; Vienna, Area Two
Drama in Vienna Theatres I; Vienna, Area Two
Opera; Vienna, Area Two
Intellectual Scene Since 1900; Vienna, Area Two
Survey of Habsburg History; Vienna, Area Five
A.B. Degree, 8
Academic Advising,
Undergraduate 13
Academic Information Center, 13
Academic Standing,
Subcommittee on, 8, 9
Acoustics and Noise, Program in, 649
Action Research Liaison Office, 593
Administrative Services
Credentia, 62
Advanced Degrees, 14
Advanced Graduate Registration, 15
Advising, Undergraduate
Academic, 13
Aeronautics and Astronautics, 102
Asian Languages, 243;
see also
Bachelor Degree, Second, 9
Astronomy Course Program, 251
Astrophysics, 226, 227
Athletics, Intercollegiate, 658
Athletics, Physical Education, and Recreation, 254, 656
Bachelor of Arts Degree, 8
Bachelor of Arts and Science Degree, 8
Bachelor of Science Degree, 8
B.A.S. Degree, 8
Berlin, Stanford Program in, 669, 677
Biochemistry, 605
Biological Sciences, 254
Biography and Medicine, Engineering in, 91
Biophysics Program, 625
Black Performing Arts, Committee on, 269
Britain, Stanford Program in, 671
Broadcasting, 290, 291, 292
B.S. Degree, 8
Business, Graduate School of, 21
Calendar, University, 3
Cancer Biology Program, 626
Candidacy, Advanced Degrees, 15
Casa Italiana, 387
Center for Economic Policy Research, 639
Center for Information Technology, 647
Center for Materials Research, 636
Center for Research in International Studies, 637
Center for Research on Women, 639
Chemical Engineering, 116
Chemical Society, American, 271
Chemistry, 270
Chicano Fellows Program, 278
Chicano Research, Stanford Center for, 642
Chicano Studies, Courses in, 573
Spanish and Portuguese Concentration in, 567, 568
Chinese Language Studies in Taipei, Inter-University Program for, 245, 638
Chinese, Programs of Study in, 243, 244
Chinese, Summer Program of Intensive Language Courses, 245
Civil Engineering, 120
Classics, 279
Greek, Courses in, 283
Latin, Courses in, 285
Classics and Humanities, 283
Cliveden, Stanford Program in, 671
Club Sports, 658, 666
Communication, 289
Communication Research, Institute for, 292
Communication, Social Sciences, Major in, 290
Comparative Literature, 299
Comparative Literature and Humanities, 299
Comparative Politics, 511, 516
Computational Fluid Dynamics, 190
Computer Science, 307
Computer Systems, Electrical Engineering, 139
Construction Engineering and Management, 121
Contents, Table of, 4
Continuous Registration, 15
Coterminal Programs, AB and BS Degrees, 9
Bachelor's and Master's Degrees, 9
Courses of Instruction, 20
Creative Writing, 359
Credentia, Administrative Services, 62
Credentia, Teaching, 62
CRIS, 637
CROW, 639
Dance Program, 657, 660, see also
African and Afro-American Studies; Drama; and Music
Dean of Graduate Studies and Research, 624
Dean's Advisory Committee on Individually Designed Majors, 588
Decision Analysis, Engineering-Economic Systems, 158
Decision Processes, Engineering Management, and Design, 88
Decision Systems, Engineering-Economic Systems, 158
Degrees, Advanced, 14
Undergraduate, 9
Design, Art, 230, 232
Engineering, 177, 181
Distribution Requirements, 11; see also Appendix
Distribution Requirements for Freshmen Entering from 1980, and for Transfer Students entering in 1983, Courses Certified as Fulfilling the, see Appendix
D.M.A. Degree, 17
Doctor of Education, 61
General Requirements for, 17
Doctor of Jurisprudence, General Requirements for, 17
Doctor of Medicine, General Requirements for, 18
Doctor of Musical Arts, Departmental Requirements for, 479
General Requirements for, 17
Doctor of Philosophy, Admission to Candidacy, 18
Dissertation, 19
Foreign Language Requirement, 18
General Regulations, 18
Teaching Requirement, 18
Inter-University Program for Chinese Language Studies in Taipei, 638
Intramural Sports, 658
Italian and English Literatures, 360, 387
Italian and French Literatures, 384
Italian, 386
Italy, Stanford in, 387
Japanese, Programs of Study in, 243, 244
Japanese Studies in Tokyo, Inter-University Center for, 638
Japanese, Summer Program of Intensive Language Courses, 245
Jasper Ridge Biological Preserve, 255
J.D. Degree, 17
J.M. Degree, 17
Jordan, David Starr, 6
Journalism, 289, 290, 292
Journalism, Professional Fellowship Program, 289
J.S.D. Degree, 18
J.S.M. Degree, 17
J.M. Degree, 17
JAS, 14, 594
Land Resources Planning, 24
Language Laboratory, 446
Language Requirement, Foreign, 10, 12
Language, Special Program, 452
Latin, see Classics
Latin American Literature, Courses in, 573, 575
Latin American Studies, Center for, 446
Latin American Studies, Summer Grants, 447
Law, School of, 599
Learning Assistance Center, 14, 594
Libraries, 645
Libraries and Information Services, 643
Lima, Peru, Stanford Program in, 568
Linguistics, 449
Literature in Translation, 460
Logic and Computer Systems, 88
Logic of Formal Systems, 485
LOTS Computer Facility, 641
Maison Francaise, 384
Major, the Undergraduate, Individually Designed, 13
Limits on Requirements of, 13
Purpose of, 13
Structure of, 13
Management, M.S. Degree in, 21
Management Option, Applied Earth Sciences, 27
Petroleum Engineering, 52
Marine Biology, Hopkins Marine Station, Division of, 266
Mass and Energy Transfer, 88
Mass Media Institute, 293
Master of Arts, General Requirements for, 15
Master of Business Administration, General Requirements for, 16, 21
Master of Fine Arts, General Requirements for, 16
Master of Jurisprudence, General Requirements for, 17
Master of Legal Studies, General Requirements for, 16
Master of Science, General Requirements for, 15
Master of the Science of Law, General Requirements for, 17
Master’s Degree, General Requirements for, 15
M.A.T. Degree, 59
Materials Science and Engineering, 170
Materials Science and Properties, 88
Mathematical Sciences, 461
Mathematical System Analysis, Engineering-Economic Systems, 159
Mathematics, 462
M.B.A. Degree, 16, 21
M.D. Degree, 18
Mechanical Engineering, 176
Mechanics of Materials, 171
Mechanics of Solids and Fluids, 87
Medical Information Sciences, Program in, 628
Medical Microbiology, 612
Medicine, School of, 601
Medieval Studies, 433
M.F.A. Degree, 16
Microwave Physics and Electronics, Electrical Engineering, 139
M.L.S. Degree, 16
Modern Thought and Literature, 471
Modern Thought and Literature and Humanities, Joint Ph.D. Degree in, 473
Monotype, 232
M.S. Degree, 15
Music, 477
Musical Arts, Doctor of, see Doctor of Musical Arts
Neuro- and Biobehavioral Sciences, see Neurosciences
Neurobiology, 614
Neurosciences Program, 632
NEXUS, 641
Nondiscriminatory Policy, Statement of, 684
Northeast Asia-United States Forum on International Policy, 641
Operations Research, 197
Ore Deposits and Exploration, 27
Organizational Economics, Engineering-Economic Systems, 158
Overseas Studies, Stanford, 668
Overseas Studies, Distribution Requirements, 692
Painting, 232
Paris, Stanford Program in, 677
Paris, University of, 384
Pathology, 615
Petroleum Engineering, 49
Petroleum Geology, 28
Pharmacology, 617
Ph.D. Degree, 18
Philosophy, 484
Philosophy and Humanities, Joint Ph.D. Degree in, 489
Philosophy of Language, Special Program in, 488
Philosophy and Logic of Formal Systems, Special Program in, 485
Philosophy and Religious Studies, 486
Philosophy of Science, Special Program in, 488
Photography, 232
Physical Education, 656
Physical Therapy, 601
Physics, 497
Physiology, 619
Plasmas, Electrical Engineering, 139
Political Science, 507
Political Theory, 514, 517
Portuguese, Courses in, 574
Preclinical Requirements, 256
Premedical Advising Office, 256
Premedical Requirements, 256
Preparatory Medical Education, 256
Product Design, 91, 180
Psychology, 519
Psychology, Applied Cognitive Program, 522
Psychology Colloquium, 523
Public Administration and Policy, 511
Public Policy, Political Science Concentration in, 507
Public Policy Program, 534
Public Policy, Public Administration and, 511
Publications, University, 685
Quantum Electronics, Electrical Engineering, 139
Radiology, 621
Radioscience, Electrical Engineering, 138
Recreation, 636
Registration Categories, Advanced Degree, Advanced Graduate, 15
Terminal Graduate, 15
Unit Basis, 15
Rehabilitation Act, 684
Religious Studies, 535
Religious Studies and Humanities, Joint Ph.D. Program in, 537
Religious Studies and Philosophy, 536
INDEX 697

Requirements, Undergraduate, 8
Distribution, 11, see also Appendix
Language, 12
Writing, 10
Research and Education, Student Center for Innovation in, 597
Residence Requirement, 14
Rome Classical Center, 281
Russian, Bachelor of Arts, 542
Master of Arts, 543
Russian and East European Studies, Center for, 541

Salamanca, Spain, Stanford Program in, 568, 677
Sao Paulo, Brazil, Stanford Program in, 568
School of Earth Sciences, 22
School of Education, 57
School of Engineering, 86
Courses, 86
Graduate Program, 93
Undergraduate Programs, 86
School of Humanities and Sciences, 204
Graduate Programs, 204
Undergraduate Programs, 204
Science, Technology, Science and Society, Individually Designed Major in, 678

SCIRE, 597
Sculpture, 232
Second Bachelor's Degree, 9
SLAC, 667
Slavic Languages and Literatures, 542
Slavic Languages and Literatures and Humanities, Joint Ph.D. Program in, 545

SLE, 586
Sloan Program, Stanford, 21
Social Analysis, Engineering-Economic Systems, 159
Social Sciences, Anthropology Major in, 213
Communication Major in, 290
Sociology Major in, 552
Sociology, 549

Sociology, Joint Program with the Law School, 553
Sociology, Social Sciences Major in, 552
Solid State, Electrical Engineering, 138
Sophomore Seminars, 594
Space Science and Astrophysics, Center for, 565
Space Physics and Radioscience, Electrical Engineering, 138
Spanish and Humanities, Joint Ph.D. Program in, 569
Spanish and Portuguese, 567
Spanish Language Program, 570
Special Programs, Graduate, 624
Undergraduate, 588
Speech Sciences, 610
SSRL, 642
Stanford, Leland, Jr., 6
Stanford, Senator and Mrs., 6
Stanford Center for Chicano Research, 642
Stanford in France, 384
Stanford Humanities Center, 642
Stanford in Italy, 387
Stanford Linear Accelerator Center, 667
Stanford Overseas Studies, 668
Stanford Sloan Program, 21
Stanford Synchrotron Radiation Laboratory, 642
Stanford Teacher Education Program, 63
Stanford Workshops on Political and Social Issues, 596
Statistics, 578
Statistics, Data Analysis and Statistical Computing, 579
STEP, 63
Structural and Geotechnical Engineering, 122
Structural Biology, 622
Structured Liberal Education Program in, 586
Student Center for Innovation in Research and Education, 597
Studio Art, 232
Summer Session, 20
SWOPSI, 596

Systems Economics, Engineering-Economic Systems, 158
Table of Contents, 4
Taipei, Inter-University Program of Chinese Language Studies in, 638
Teaching Credentials, 62
Teaching, Master of Arts in, 59
Technology and Society, 88
Telecommunications and Space Information Systems, Electrical Engineering, 138
Terminal Graduate Registration, 15

TGR 15
Thermodynamics, 87
Thermosciences, 178
Tokyo, Inter-University Center for Japanese Studies in, 638
Tours, Stanford Program in, 673
Translation, Literatures in, 460
Undergraduate Academic Advising, 13
Undergraduate Degrees, 8
Undergraduate Special Program, 598
Undergraduate Study at Stanford, 10
Unit Basis Registration, 15
University Publications, 685
Urban Studies, Program in, 589

Values, Technology, Science, and Society, Program in, 677
Vienna, Stanford Program in, 675

Western Culture and Technology, Courses in, 587
Western Culture Program, 586
Women's Studies, see Center for Research on Women and Feminist Studies
World Religions, 537
Writing Requirement, 10

7290PS29M883